China's Compliance with Food Safety Requirements for Fruits and Vegetables

Promoting Food Safety, Competitiveness, and Poverty Reduction

Acknowledgments

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Acronyms and Abbreviations

ADB	Asian Development Bank
ARD	Agriculture and Rural Department
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine
BHC	benzene hexachlorine
BRC	British Retail Consortium
CCFA	China Chain Store and Franchise Association
CCP	Critical Control Point
CIQ	China Entry/Exit Inspection and Quarantine Bureau
CNCA	Certification and Accreditation Administration
CODEX	CODEX Alimentarius (standard-setting body for food safety)
DDT	dichlorodiphenyltrichloroethane
DRC	Development Research Center of the State Council
DRCC	Domestic Resource Cost Coefficients
EASRD	East Asia and Pacific Region, Rural Development and Natural Resources Management
ESSD	Environmentally and Socially Sustainable Development
EU	European Union
EUREPGAP	Euro-Retailer Produce GAP
FAO	Food and Agriculture Organization of the United Nations
FDI	foreign direct investments
GAP	good agricultural practice
GB	Guo Biao (Chinese national standards)
GC/HPLC	gas chromatograph/high performance liquid chromatograph
GMP	good manufacturing practice
GMS	General Merchandize Stores
ha	hectare(s)
HACCP	Hazard Analysis and Critical Control Point
IFOAM	International Federation of Organic Agricultural Movements
IFPRI	International Food Policy Research Institute
IPM	integrated pest management
IPPC	International Plant Protection Convention (standards-setting body for plant protection)
ISO	International Organization for Standardization
JAS	Japan Agricultural Standard
MAFF	Ministry of Agriculture, Forestry and Fisheries of Japan
MARD	Ministry of Agriculture and Rural Development of Colombia
MHLW	Ministry of Health, Labor and Welfare of Japan
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOH	Ministry of Health
MOST	Ministry of Science and Technology
MOU	Memorandum of Understanding
MRL	Minimum Residue Level
MT	metric ton
Mu	area unit: 1 ha =15 mu
NDRC	National Development and Reform Commission
OIE	World Organization for Animal Health (standard-setting organization for animal health)
POP	point of purchase
QS	Quality and Safety Certification
RCA	Revealed Comparative Advantages
RMB	Renminbi
SAIC	State Administration on Industry and Commerce

SEPA	State Environment Protection Agency
SFDA	State Food and Drug Administration
SME	small and medium enterprise
SPS	sanitary and phytosanitary
SSOP	sanitation standard operating procedures
TA	technical assistance
TBT	technical barriers to trade
US FDA	United States Food and Drug Administration
WHO	World Health Organization
WTO	World Trade Organization

Executive Summary

The overall goal of this study is to identify the most effective public sector actions that improve China's food safety compliance for fruits and vegetables, contribute to the competitiveness of the sector, and reduce poverty. The study draws four main conclusions.

1. The government's efforts can become more cost-effective by streamlining responsibilities of public sector agencies and by coordinating their activities.
2. Providing training, education, and adequate information to all stakeholders and enforcing regulations will strengthen the government's role in ensuring food safety for the population.
3. Setting the proper framework for private sector incentives will strengthen the private sector's role in controlling food safety. Much of the cost to boost food safety management and competitiveness can be borne by private investment.
4. Many improvements in food safety and competitiveness benefit the poor and these synergies can be strengthened by giving priority measures that support small-scale farmers and poor consumers.

Over the past two decades, China's production and consumption of fruits and vegetables have increased rapidly, mainly in response to rising incomes. The affordability of fruits and vegetables has increased substantially, including for the poor. In 2003 rural and urban households spent approximately 16 percent and 17 percent, respectively, of their food expenditures on fruits and vegetables. According to United Nations Food and Agriculture Organization (FAO) statistics, China produces approximately 350 million tons of vegetables and 80 million tons of fruit annually, which comprise 45 percent and 16 percent of the world's production, respectively. China also has become a major exporter of fresh and processed fruits and vegetables with value of approximately US$ 4.5 billion. Its share in the volume of world exports of vegetables is approximately 12 percent, and of fruits approximately 2.5 percent. The increase of production and exports of fruits and vegetables has contributed favorably to income and employment because of the labor intensity of growing and post-harvest handling of these products. These contributions have been achieved mainly in the coastal areas, where most production is concentrated.

Problems exist in the area of food safety, with negative effects on public health. A thorough review of the food safety management system conducted by Chinese researchers shows that China still has major deficiencies in food safety standards, food safety monitoring, interagency cooperation in food safety management, and food safety results (DRC 2004). No consistent system of standards and monitoring exists that clearly reveals China's food safety status. However, fragmented evidence indicates that food safety is a significant issue for the country's fruit and vegetable markets. A 2004 DRC report estimates that 500,000 Chinese suffer from pesticide poisoning every year and that the death toll from pesticides may exceed 500. For fruits and vegetables, scattered tests show that often up to 30 percent of samples of vegetables have residue levels in excess of the norm. There are still major problems with pesticide residues that result from inadequate control and enforcement of pesticide production, marketing, and use. A second and growing problem is heavy metals and other contaminants from emissions of industry, power generation, and transport.

Food safety is also, and increasingly, a key factor in competitiveness both domestically and abroad. World trade in fruits and vegetables, as well as domestic demand for them, are likely to continue to grow. Rising incomes and awareness mean that this growth will be accompanied by increased demand for food safety, quality, and diversity. These demands will result in more opportunities to add value to the supply chain (World Bank 2005). However, China's rapidly emerging domestic supermarket sector faces difficulties in finding suppliers of fruits and vegetables that can meet its requirements. Similarly, China struggles to meet international requirements for food safety. Food safety incidents in export markets have contributed to image problems, and export growth is driven almost exclusively by the country's price advantage. However, international public and private sector requirements continue to tighten and require advance planning. Increasingly, safety standards and other market requirements are the most crucial factors for international market access. In addition, wage levels in China's most developed areas are increasing rapidly, putting at risk

the sustainability of pure price competitiveness.

Well-designed government policies for the fruit and vegetable sector must be specific for three distinct market segments: (1) traditional markets, which still constitute over 90 percent of the volume of production, (2) emerging modern domestic urban markets, and (3) high-standard export markets (table 1). Traditional markets are characterized by relatively low awareness of food safety issues, supply-driven production, low prices, and erratic supply. Incentives for farmers and enterprises to improve food safety are weak. Competitiveness depends on low cost.

The export markets at the opposite end of the spectrum are demand driven; highly sensitive to food safety; have controlled supply chains, increasingly with tracking and tracing; and have high prices. In export markets, investment in food safety management by the private sector not only is necessary but also often has high returns.

The emerging domestic urban markets range in between. They have some incentives to better control food safety, but their returns on investment for doing so are often low. Some policy interventions should focus on issues of relevance to all producers and consumers; other interventions will be specific for the private sector in each market segment.

Table 1. Characteristics of three production and market segments

	Traditional local	*Modern urban*	*Export*
Food safety awareness, compliance	Low	Emerging	High
Supply-chain organization	Scattered, supply driven	Efforts to control by processor, retailer	Demand driven, control by exporter
Price, value added, standardization	Low	Increasing	High
Participation of small-scale producers	No constraint	Constrained by still underdeveloped producer organization	Almost excluded; need for producer organizations
Competitiveness depends on:	Low cost	Sufficient quantity, consistency	Quality, volume, flexibility, innovation
Trust between buyers and sellers	Not so Important	Emerging role	Crucial factor

Source: Table 16 of this report.

The government continues to strengthen its capacity and efforts to improve food safety. In recent years, the government has made major efforts to control its food safety management. It has given priority to preventing trade disruption in *export* markets. Since its accession to the World Trade Organization (WTO) in 2002, China has made efforts to establish a system based on international standards and compliance with WTO rules. Despite various food safety incidents with foreign trading partners, the volume and value of its exports have increased. Significant policy measures and reforms as well as investments also have improved the *domestic* food safety situation in China. This process of strengthening the government's capacity and efforts needs to continue.

First, addressing the country's food safety issues in a cost-efficient manner requires a well-defined institutional framework with strong policy coordination. While China has made major efforts in this respect, not least the establishment of a State Food and Drug Administration (SFDA) in 2003, major issues remain. The number of agencies with direct responsibilities for food safety management is perhaps too large and, in the absence of any sufficiently strong coordinating body, results in much overlap in responsibilities. *It is recommended to streamline responsibilities and to strengthen coordination substantially.* Moreover, potential conflicts of interest that exist within individual agencies need to be addressed. International experiences and trends show that *potential conflicts of interest can be reduced by separating risk assessment, monitoring and surveillance, and risk management*.

Second, government interventions to enhance food quality and safety need to focus on core public responsibilities. These are enforcing the relevant laws and regulations; providing education, training, and information; and developing the infrastructure. By focusing on these areas, which will not be undertaken by the private sector, the government will ensure the efficiency and cost-effectiveness of its interventions. These priority measures will bring high returns to the general public and the economy as a whole. The poorer part of the population clearly will benefit, often disproportionately. In addition, such measures will benefit the newly emerging supermarkets as well as export markets. Moreover, if government agencies are well coordinated, transaction costs are low. Key areas for these interventions are:

a. ***Strengthen pest management and enforcement of pesticide regulations.*** Illegal and incorrect use of pesticides has strong negative effects on food safety compliance and public health. Improved control of production, trade, and use of pesticides and enforcement of regulations deserve high priority. The main obstacles to improvement are conflicts of interest among local, provincial, and state-level agencies. The production, sale, and application of agrochemical products not approved for food production could be made criminal offenses. Disincentives to law enforcement deserve attention as well.

b. ***Monitor better and more efficiently.*** Many agencies at the state and local levels monitor food safety and testing. Because there is little coordination among them, the returns from these efforts are much lower than desirable, and there is a serious waste of time and resources. As a start to improve this system, *conducting a comprehensive review of the present monitoring system is recommended.* Better results can be achieved by improving the system's methodology, coordination, and interagency cooperation. Transparency concerning the food safety situation will contribute to consumer awareness, greater efforts by the industry, and an improved image abroad.

c. ***Raise awareness of the importance of food safety*** among consumers, farmers, and workers in the food industry is a crucial element in improved performance. Therefore, it is recommended to launch a program for raising awareness with activities tailored to the relevant stakeholders and social group: consumers, farmers, factory workers, and small and medium enterprises (SMEs). Awareness-raising will add incentives to the system. Clearly, the mass media can also play an even more important role in this than it already does. For farmers, training in integrated pest management (IPM) and proper use of pesticides deserve priority.

d. ***Intensify education and training.*** More skilled staff is needed to manage food safety and supply chains, especially in the private sector. Increased numbers could be achieved by creating enough specialized centers and training programs in universities and research institutions. One or a few centers of expertise could promote the formation and strengthening of coordinated supply chains. The role of a center would be to provide intermediating services, collect and disseminate information on good practice, and coordinate applied research. Partnerships with institutions in industrial countries will accelerate these efforts and contribute to the quality of work. The quality, safety, and productivity of fruits and vegetables produced by small-scale farmers need to be gradually upgraded by training, improving technology, and developing good agricultural practice (GAP).

e. ***Plan infrastructure well.*** Improved market access for fruits and vegetable production in inland areas will contribute to growth and poverty reduction and, in some cases, also to food safety through reduced use of pesticides. Targeted improvement of infrastructure in inland areas will accelerate the spread of production to suitable locations and could include improvement of market places, cold chains, and transport. Planning in consultation with the private sector is recommended.

Third, to meet the challenges of the future, the public and the private sector need to be better aligned. Until now, the country's approach to food safety compliance has been oriented largely to government control. The roles of private enterprises and small-scale farmers have been somewhat neglected. The government should review its current activities and, to avoid unfair competition and inefficient use of resources, cease those that can be carried out by the private sector.

Better public-private alignment should include strengthening the cooperation between the two groups. Research shows that well-designed public-private partnerships are one of the most effective systems for food

safety management. The government can consider providing targeted support to enhance private sector capacities for managing quality, food safety, and image. Such support needs to be well targeted and is often in the form of training, technical assistance, or matching grants. The support needs to focus on improving the functioning of the private sector and to avoid creating or increasing any dependency of the private sector on the public sector.

This support might include:

1. ***Improve participation and empowerment of small-scale farmers through promotion of farmer-based organizations.*** Small-scale farmers are efficient producers of fruits and vegetables. However, their limited organization, such as through farmer-based associations, reduces their ability to improve efficiency in production and marketing, negotiate prices, or efficiently access information and training. Better organization is also a basis for the inclusion of small-scale farmers in coordinated supply chains that provide access to the export markets and the rapidly growing modern domestic retail markets. Above all, the establishment and promotion of farmer-based institutions require the right legal and institutional frameworks, as well as training and facilitation of the process by agents who are accountable to farmers themselves.
2. ***Strengthen the role of trade and industry organizations.*** The role of these organizations is to provide services to their members including interacting with government concerning the development of markets and experiences with food safety management. Empowering such organizations and cofinancing their activities can enhance their effectiveness.
3. ***Improve business development services.*** The industry needs a wider range of private sector business development services in the fields of testing, marketing, and advisory services for food safety management. Unfair competition from public sector providers can harm the development of such private services and should be avoided. On the other hand, government grant mechanisms can accelerate the growth of private business development enterprises. For example, the government can provide services to help stakeholders overcome high start-up costs to initiate coordinated supply chains for training and applied technology, traceability in the supply chain, disseminating information about good practice, and overcoming lack of trust and experience in cooperation between farmers and companies.
4. ***Support investment and innovation by the private sector*** that enhances food safety and quality management. Support can be given in such a way that it contributes to the development of markets and private service providers. Well-targeted grant support to investors can be used to overcome market failure and high start-up costs.

Finally, concerns for the poor should be addressed. In fact, better food safety and quality can improve poverty reduction as well as public health and competitiveness. There are many synergies among food safety, competitiveness, and poverty reduction. A 2005 World Bank study found that improved food safety management results in increased employment in supply chains. Most of this labor is in production and post-harvest handling, and thus benefits the relatively poorer rural areas or provides employment opportunities for workers including migrant laborers.

In addition, there are some trends that benefit the poorer parts of society. These are "win-win" opportunities for the government to actively support. One such opportunity is that the increased wage gap between coastal and inland areas, consumer demand for year-round delivery of fresh fruits and vegetables, and favorable agroclimatic and environmental conditions favor a partial shift of the production from coastal areas to areas in the West, North, and South. For example, the Inner Mongolian Autonomous Region, and Heilongjiang and Jilin provinces are ideal for the cultivation of summer vegetables, while parts of Sichuan, Yunnan, and Guizhou provinces are fit for winter vegetable cultivation. Improved public investment in infrastructure will facilitate this shift. As a result, more economic activity will develop in areas with low income and areas in which quality and safety can be achieved more easily due to better climate and less pollution.

A second opportunity for "win-win" development is that better access to information and better organization will enable small-scale farmers to improve market access and participate in supply chains for export markets

and domestic supermarkets. Stronger government support for better organization of the farmers themselves will enable them to maximize their potential as efficient and low-cost producers.

At the same time, new trends and developments as well as government interventions need to be evaluated based on their effects on the poor. For example, the rapidly growing supermarket sector will result in supply chain coordination and integration with a substantial risk that small-scale farmers increasingly will be excluded. It is therefore important to carefully assess government policies and ensure that priority is given to those that also benefit poorer populations. Law enforcement, particularly in the areas of pesticide management; awareness-raising among poor consumers; and infrastructure development in poor areas are examples.

0 Introduction

0．1 Rationale

In the past decade, vegetable and fruit consumption in China has more than doubled. In addition, China has been very successful in increasing its share of the value of world exports for fruits to 2 percent, and for vegetables to 7 percent. These increases have contributed to growth and employment, especially in the coastal areas. However, China remains a low-cost exporter in the lower-quality segment of international markets and struggles to meet international and domestic requirements for food safety. The country's approach to compliance is focused largely on government control. As a result, the role of private enterprises has been somewhat neglected, and the participation of small-scale farmers in export markets is limited. The risk is that small-scale farmers also will be largely excluded from the rapidly growing modern domestic retail sector.

Challenges ahead urge a new approach. Wage levels in China's most developed areas are increasing rapidly. One challenge is to shift from competitiveness based on low cost to competitive quality. International and domestic requirements for food safety and quality management are progressively tightening. China must boost its image in international markets for food safety and quality and improve its domestic food safety. Addressing rural poverty and improving the services in rural areas are other important aims of the government. How to enhance the participation of small-scale farmers in growing market segments is a key question in these concerns. Finally, increased environmental pollution threatens the production base of many products.

This study analyzes China's position in international fruit and vegetables markets with respect to competitiveness and food safety control. It also analyzes trends in domestic markets, market organization, and government policies. It shows options and makes recommendations concerning how to strengthen competitiveness and food safety compliance in export markets and at home, and how strengthening them can contribute to poverty reduction.

Improving food safety is an important priority for the Chinese government. The fruit and vegetable sector was chosen for this study because it is a rapidly growing sector, it is labor intensive and employs large numbers of rural poor. China also has long-term comparative advantage in this sector. Nevertheless, to realize its potential, the sector must solve major food safety control problems. Food safety problems are not limited to the export markets; they also are urgent for the domestic market, and the two arenas are linked in several ways. Although much more must be done, the export sector has made more progress in controlling food safety than has the domestic sector. Many of the lessons learned in the export sector–good as well as bad–can be used to find solutions for the domestic sector.

0．2 International Context

A 2005 World Bank study shows that food safety has become an important factor in international consumer markets, especially in the industrial countries. Food scares and scandals have heightened public awareness. Many countries have responded to public concerns by tightening standards and strengthening their food control systems. Private companies also have reacted. Food scandals are a major commercial risk for modern retailers and food processors, and they have developed sourcing strategies that reduce their risks. They are rapidly abandoning anonymous wholesale markets and increasingly are sourcing from preferred suppliers, from whom they require tracking and tracing and certification throughout the supply chain.

The World Bank study summarizes the main challenges of the tightening requirements (box 1). Tightened food safety requirements are a universal trend. They are most pronounced in markets in Northwest Europe, followed by Japan, North America, other industrial countries, and Eastern Europe. The level of requirements in the urban consumer markets of transitional and developing countries is still much lower and their impact on markets less, but the trend toward increasing food safety requirements is clear.

Modern supply-chain requirements introduced by the private sector form an important instrument for controlling food safety and quality. EUREPGAP, for example, is a detailed protocol of requirements of a group of mainly European retailers for production on the farm level with tracking and tracing and certification requirements. The British Retail Consortium (BRC) has a protocol for food packers. Most leading retailers and

food companies in Japan, North America, and Europe have such systems or are introducing them. The requirements include not only detailed specifications for food safety, quality, quantity, homogeneity, and delivery schedules, but also traceability and, increasingly, certification at each level of the supply chain. Meeting such requirements is not easy and is particularly difficult for small-scale producers. As a consequence, many small-scale producers can no longer participate in such supply chains unless they obtain support through a cooperative arrangement with a company in a "coordinated" supply chain.

Participation of small-scale farmers in coordinated supply chains is necessary for them to meet food safety requirements. However, in many cases they are excluded. As a result, the food they produce is less safe and the prices they receive relatively low. Small-scale farmers are usually efficient producers, especially for labor-intensive products, but they face difficulties in marketing their products. The amounts they produce are small and heterogeneous, and transaction costs with traders can be high. Farmers' participation may involve risks to traders if farmers do not follow good agricultural practice and do use pesticides unsafely. The new competitive environment in fruit and vegetable markets is not always conducive to the participation of small producers. Nonetheless, there also are many cases in the world–Ghana and Thailand, and in China–in which they have been successful in capturing new opportunities. Governments generally have options for enhancing the inclusion of small producers and small traders in supply chains, but specifics differ from case to case.

Box 1. World Bank research program findings on the role of sanitary and phytosanitary measures

The World Bank's recent research program on sanitary and phytosanitary (SPS) measures, including a main report and 15 country case studies published in 2005, was designed to improve the understanding of policy and commercial issues in food safety and agricultural health. The program covered selected supply chains in Ethiopia, India, Jamaica, Kenya, Morocco, Nicaragua, Senegal, Thailand, and the countries of Latin America's Southern Cone. "Buyer studies" were carried out in the European Union, Japan, and United States.

Increasingly stringent food safety and agricultural health standards in industrialized countries pose major challenges for continued developing country success in international markets for high-value food products such as fruits and vegetables. On the other hand, in many cases, such standards have played a positive role, providing incentives for the modernization of export supply and the adoption of safer and more sustainable production and processing practices. In recent years, in response to food scares in industrialized countries, increased scientific knowledge, and official concerns over bioterrorism, many such standards have been tightened or extended into new areas, The private sector also has reacted to consumer concerns by developing its own sets of standards and by limiting its product sourcing to "preferred" suppliers.

The cost of complying with food safety and agricultural health standards has been a major source of concern in the increasingly international development community and among developing countries. Many worry that SPS standards will work to the disadvantage of developing countries that lack the administrative, technical, and other capacities to comply with new or more stringent requirements. However, the available evidence indicates that, in many instances, these challenges are manageable and the compliance costs are a worthwhile investment, especially relative to the value of exports and associated benefits.

Many of the potential benefits of complying with stringent SPS standards are long term, intangible, or accrue to stakeholders. As a consequence, benefits such as productivity gains, reduced waste, worker safety, environmental benefits, and even the value of continued market access may be underestimated or even go unnoticed altogether.

Although compliance (and noncompliance) can bring about changes that negatively affect the poor, those who are able to participate in evolving supply chains may benefit. This potential certainly applies to small-scale farmers who operate in suitable locations with adequate infrastructure that includes effective producer organizations and long-term relationships with buyers. In addition, tightening standards sometimes has increased off-farm employment opportunities, especially in product cleaning, handling, processing, and packing, as well as in a broad array of process controls. Although not optimal, the terms and conditions of these types of employment in the formal supply chains almost certainly are better than in the informal sector, in part because many foreign buyers are imposing labor standards.

According to the findings, the challenges and opportunities posed by standards can be addressed better through strengthening public and private capacities to effectively manage food safety and agricultural health risks. Many developing countries are faced with rising SPS standards in their export markets. By adopting a strategic

approach to food safety, agricultural health, and trade, these countries can maintain and improve their market access, position industries for long-term competitiveness, mitigate potential adverse effects on vulnerable groups, and improve domestic food safety and agricultural productivity. For the countries and suppliers who are well prepared, rising standards represent an opportunity; for those who are poorly prepared, they pose safety and market access risks.

Developing country governments should move beyond control functions to emphasize awareness-building on quality/SPS management and facilitating individual or collective actions which can be taken by private companies, farmers, and others. Adopting a long-term and strategic approach to managing SPS standards and international market access obliges policymakers and technical administrators to work closely with the private sector to identify emerging challenges and opportunities, make appropriate regulatory changes, and choose suitable strategies and needed investments.

Source: World Bank 2005a.

0．3 Chinese Context

Domestic food safety

Food safety is an increasingly important issue for China from both the domestic and the trade points of view. China's 2002 accession to the WTO requires a thorough revision of its food safety management. The situation is very well summarized in a recent Food Safety Strategy Research study by government institutions (DRC 2004). Although improving, China's domestic food safety is far from satisfactory. Many international standards still must be implemented, and many of the existing standards do not meet international requirements. Inspection and surveillance capacities are insufficient, and awareness and monitoring weak. Policies overlap among various ministries and administrations and need to be streamlined. Capacities for developing good agricultural practice (GAP) to produce safe and good quality food and for providing guidance to small-scale farmers to adopt GAP are still limited.

Chinese exporters have not always been sufficiently prepared to face the world markets' evolving food safety requirements. Consequently, trading partners have imposed a number of bans on China's exports and have had conflicts with Chinese exporters. To counteract this history, China needs to improve the image of its products in foreign markets. For China to capture market segments with relatively better prices and higher value added, it must make a sustained effort in the years ahead to move upward to higher quality and safer products.

Domestic markets

Rapid urbanization and increasing incomes have resulted in the rapid growth of domestic food markets and retail systems. Supermarkets make up approximately 30 percent of urban food markets, and their share is increasing rapidly (Hu and others 2004). Despite several food scandals that have heightened public concerns, food safety control capacities are still inadequate. With increased income and awareness, consumer preference for safety and quality will become a more important force in the market. It is expected that this consumer demand and the response by supermarkets and other retailers will have a major effect on food markets. Hence, the domestic market potential for "safe food" remains largely untapped.

The Chinese government has been working to reform food safety control for the last two years, as evidenced by the already mentioned Food Safety Strategy Research study (DRC 2004). This study is an important milestone and provides ample information for policymakers. Yet, it has limitations as well. It gave relatively little attention to commercial development in domestic and international markets and to the roles of private sector and private standards. Although some decisions have been made by the State Council, China does not yet have a clear and full-fledged National Food Safety Strategy. Related new legislation is still pending.

Whatever the new strategy, substantial investments, especially in the farm and private sectors, will be necessary to implement it, and to meet the requirements of international market forces and the WTO system. China is cooperating with international partners on how to identify, evaluate, and prioritize these investments. This study complements the work done by DRC and analyzes competitiveness and poverty reduction as they are related to food safety and standards in fruits and vegetables.

0．4 Objectives, Methodology, and Outline of the Study

Goals and objectives.

The overall goals of the study are to assist China to:

（1）Improve its food safety compliance for fruits and vegetables

（2）Contribute to competitiveness

（3）Help reduce rural poverty through identifying the most effective public sector actions for improving smallholder access to, and food safety compliance required by, modern supply chains.

The specific objectives of the study are to:

（1）Detect possible improvements in supply-chain organization and management

（2）Sketch investment options to strengthen public and private capacities in managing food safety, boosting competitiveness, improving export performance, and reducing poverty.

Methodology and approach.

Analysis of food safety management utilizes many disciplines and fields of practice. Core fields of study involve what legislation, regulation, and enforcement are needed; what the public and private responsibilities should be, and what kinds of institutions and institutional arrangements are needed to manage the whole system.

Work on these questions has an important international dimension. The 1994 WTO agreement on Sanitary and Phytosanitary issues (SPS) gives principles for how countries can regulate food safety and agricultural health in cross-border trade. The SPS agreement requires countries to harmonize their control systems and food safety management with international requirements. Important scientific principles also are involved: how to set standards, how to measure, how to control, and under what conditions tests by other countries and laboratories should be accepted as authoritative.[1] The DRC's 2004 Food Safety Strategy Research study focuses on, among other things, SPS. Other donors, including the World Health Organization (WHO) with funding from the Asian Development Bank, are providing support to the Chinese government for improving its food control system.

The current study complements these efforts by providing more details on the food safety status of the fruits and vegetables sector and makes specific recommendations for managing food safety in this sector. Meeting the international SPS requirements generally is considered difficult and relatively expensive for developing countries. Consequently, there are concerns that developing countries may not profit from the opportunities that the WTO trade agreements offer.

The DRC study and the WHO work give little attention to these questions. A 2005 World Bank study does analyze this field. Among its major conclusions are:

- Managing SPS should be considered a core issue in the competitiveness of developing countries
- In many cases, the standards imposed by private sector buyers are more demanding than those of the public sector
- Private requirements have contributed to new arrangements in the supply chains among producers, traders, and buyers.

The study also indicates that, indeed, there are costs involved in meeting higher food safety requirements but that often the benefits are much higher, especially for exporters who take a pro-active approach in which there is good public-private cooperation. The current study builds partly on the findings of this earlier World Bank study but, at the same time, focuses on identifying ways to improve Chinese food safety management within its competitive context.

[1] Important international institutions in this area are the standards-setting bodies, OIE, IPPC, and CODEX Alimentarius, for which FAO, WHO, and OIE are the parent organizations.

Literature is accumulating on the rapid spread of supermarkets in China (Hu, Reardon, Rozelle, Timmer, and Wang 2004; Reardon, Berdegue, and Timmer 2005). Supermarkets increasingly will have important implications for the organization of supply chains in China. A most relevant question is whether supermarket chains in China already are introducing the same level of food safety controls as those in industrial countries. This question is not well addressed in the available literature on supermarkets. *The current study focuses on the share of fresh fruits and vegetables channeled through modern retail chains and the intensity of supply-chain control exerted to date.*

The assessment of competitiveness can focus on general issues of the investment climate and costs. It also can involve detailed analysis of particular products, domestic and international markets, and supply chains. The horticultural sector in China consists of many dozens of fruits and vegetables grown over vast areas with different climatic and economic conditions. These products are sold in local and urban areas in China and in a range of other countries with widely differing characteristics and institutional arrangements (Chen 2004, Hu and others 2004). Recent World Bank research on the investment climate for small and medium enterprises (SMEs) in southwest China also has focused on supply chains (World Bank 2005). Most work in these areas does not specifically look at the role of food safety. The current study takes a broad view of China's performance in foreign markets. It goes into depth in an analysis of China's position in the Japanese market, in which food safety is a critical element. The current study also assesses characteristics in China's different market segments, including exports, with regard to food safety management and supply chain organization.

Poverty reduction can be approached from many angles. Many development efforts to assist the poor focus on helping the poor in the areas in which they live. The current study focuses on the opportunities and risks of income and employment offered by developments on the demand side. This study stresses the labor-intensive character of modern horticulture and employment creation. The latter is the most powerful means to reduce poverty and is dependent on market access, competitiveness, growth, and value added.

The field work for the current study assessed obstacles for meeting food safety requirements and competitiveness at different levels of the supply chains. It gave special attention to the views of producers, traders, processors, retailers, and exporters, as well as employees of local, provincial, and State government agencies. The study focused mainly on supply chains for Japanese leek in Shandong and Shanghai, and for apples in Shandong and Shaanxi (the last is a major inland producing and exporting province). These focus areas were chosen because they have well-established commercial production and export bases from which relevant experiences could be learned.

Trends in urban retailing were studied primarily in Shanghai, Beijing, and Qingdao. The study included HACCP-based assessments of a number of supply chains of Japanese leek for the export market from field to packing house. Special case studies and more than 20 interviews were conducted from August 2004 to January 2005 in Japan with importers, wholesalers, and retailers to better understand developments in China's chief export market for fruits and vegetables.

A short preparatory mission took place in May 2004. The main work started with a field study in August and September in which approximately 25 interviews were carried out with specialists and managers in a range of large and small-scale companies engaged in production for export and local use, fresh product handling, processing, and retail. Although the main focus was on fresh leek and apples, it appeared that most companies handled a range of products for fresh sale as well as processing. Thus, experiences obtained often concerned other products or were generic. Retail outlets visited ranged from emerging supermarket shops in smaller towns to top-end establishments in Beijing, Shanghai, and Qingdao. Government agencies visited ranged from State ministries and agencies, provincial agencies, and Shanghai and Qingdao city administrations to local agricultural bureaus and inspection agencies. Several surveys were undertaken by the consultants, who made additional interviews and also revisited some of the persons interviewed in August and September for more detailed data collection.

The field surveys on apple and Japanese leek provided additional information on the organization of supply chains from producers and traders. However, the quantitative information obtained was mainly illustrative and, given the limited sample size, not sufficient for quantitative analysis. The reasons are that both apple and leek production include a range of different varieties. Moreover, leek is cultivated almost year-round under differing

growing and marketing conditions.

Various members of the consultant team for the study possessed (1) expertise in food safety regulations and control by public agencies in China, especially for the export sector; (2) knowledge about market development for high-value products in China, including the role of supermarkets and specialized traders, and (3) experience in organizing fresh vegetable production in China for export to Japan, buying and shipping vegetables for import in Japan from China and other countries, and practical experience with Japanese regulations for food imports.

Organization of the report.

Chapter 1 analyzes Chinese production and trade of fruits and vegetables. It indicates major markets and unit values for Chinese exports, briefly reports on indicators of China's competitiveness, and argues that the increased production and exports of horticulture have contributed to poverty reduction. Chapter 2 discusses the different characteristics of traditional markets, emerging modern urban markets, and export markets for industrial countries. In the latter markets, integrated and coordinated supply chains are becoming the dominant organizational form. Chapter 3 provides an overview of the food safety situation in fruits and vegetables in China, and various aspects of food safety management. Chapter 4 discusses market access and efficiency of supply chains. The final chapter discusses the options for public intervention to improve food safety and competitiveness, and shows that such interventions can contribute to poverty reduction.

1 China's Fruit and Vegetable Sector

1. 1 Production and Consumption

According to a recent FAO study, developing countries as a group show rapid increase in production of fruits and vegetables, with China in a leading role in growth and share of world production (table 2).[2] China's production of fruits and vegetables has grown by a factor of 2.5 over the last ten years (1994–2004). Domestic demand has been the major source of growth of production (World Bank 1996). In 2004 China produced 423 million MT of vegetables and almost 81 million MT of fruit, 48.9 and 16.0 percent of the world totals, respectively. By contrast, Japan saw its share of world production decline significantly from 3.4 percent to 2.3 percent for vegetables and from 1.1 to 0.7 percent for fruits.

Table 2. Production of vegetables and fruits

	Vegetables				
	1994		*2004*		*Index*
	(1000 MT)	*(%)*	*(1000 MT)*	*(%)*	*2004 (1994=100)*
World	533,421	100%	865,810	100%	162
Developed countries	150,788	28%	172,553	19.9%	114
Developing countries excl. China	194,244	36%	269,888	31.2%	139
China	188,388	35%	423,369	48.9%	225
Japan	13,410	3.4%	11,699	2.3%	087
	Fruits				
	1994		*2004*		*Index*
	(1000 MT)	*(%)*	*(1000 MT)*	*(%)*	*2004 (1994=100)*
World	397,642	100.0%	503,278	100%	127
Developed countries	118,111	29.7%	128,636	25.6%	109
Developing countries excl. China	242,262	60.9%	293,996	58.4%	121
China	37,270	9.4%	80,646	16.0%	216
Japan	4,236	1.1%	3,706	0.7%	087

Source: FAOSTAT data, 2005.

Note: 2004 is preliminary data.

By China's domestic definition,[3] 540 million MT of vegetables were produced in 2003, more than double the amount produced in 1995. Of this, approximately 535 million MT vegetables were produced for the domestic market and largely met domestic demand. In 2003 only 5.5 million MT of vegetables were exported and only 0.09 million MT were imported (table 3). In 2003 urban households spent 10 percent of food expenditure, or RMB236 per capita, on vegetables, a 21 percent nominal increase from 1999.[4] Rural residents, respectively, spent approximately 13 percent of food expenditure, or RMB118, on vegetables, a 16 percent nominal increase from 1999. The urban retail price of vegetables in 2003 was RMB2 per kg., a 17 percent nominal increase from 1999.[5]

China reports that 145 million MT of fruit were produced in 2003, an almost 250 percent increase from 1995. As with vegetables, nearly all fruit is produced for the domestic market. In 2003 only 2.7 million MT of fruit

[2] Data in this section are based on FAO 2004. This source does not include bananas and citrus.

[3] The sources for this section are *China Agricultural Yearbook*, 2004, *China Statistical Yearbook*, and Customs of China. The definitions of production include root crops as vegetables and, since 2003, melons as fruits. Exports and imports include processed, frozen, and dried products.

[4] *China Statistical Yearbook*.

[5] Data obtained from the Ministry of Agriculture. Rural prices were assumed 55% of urban retail prices.

were exported, and 1.0 million MT were imported (table 3).

Table 3: Balance sheet for vegetables and fruits

Units: Million MT	*Vegetables*		*Fruits*	
	1995	*2003*	*1995*	*2003*
Total supply	**257.3**	**540.4**	**42.4**	**146.2**
Production	257.3	540.3	42.1	145.2
Imports	..	0.1	0.2	1
Total demand	**257.3**	**540.4**	**42.4**	**146.2**
Consumption and waste	255.2	534.9	41.7	143.5
Exports	2.1	5.5	0.7	2.7

Source: China Statistical Yearbook and Customs of China.

Households spend significantly less on fruit than vegetables. In 2003 urban households spent 7.2 percent of food expenditure, or RMB175 per capita on fruits, a 24 percent nominal increase from 1999. Rural residents spent 3 percent of food expenditure, or RMB26.6 on fruits, a 21 percent nominal increase from 1999.[6] The retail price of fruit in 2003 was RMB3 per kg, a 27 percent nominal increase from 1999.

In 2003 vegetables were sown on 18 million hectares (ha) in China, 11 percent of the national sown area of major farm crops and orchards (table A8.1). The regions with the largest vegetable production areas include central provinces (Henan, Hubei, Hunan), eastern provinces (Hebei, Jiangsu, Shandong) and south/south-eastern provinces (Sichuan, Guangxi, Guangdong).[7] The provinces that use large shares of their land for vegetables–34-20 percent–are the densely populated and urbanized regions Shanghai, Beijing, Tianjin, Guangdong, and Fujian. Provinces that use relatively small shares are mainly in the north and west. As the infrastructure improves, incomes increase, and the vegetable market develops, poorer northern and western provinces will have an opportunity to expand their vegetable production.

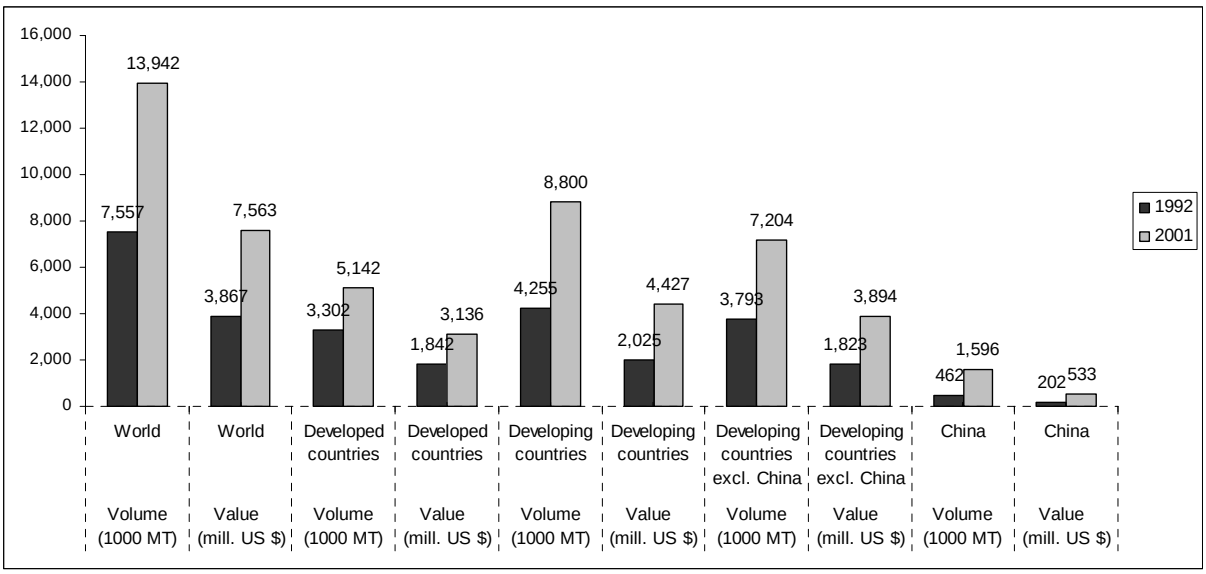
In 2003 China's orchard areas totaled 9.5 million ha, or 6 percent of the area sown with major farm crops and orchards. The regions with the greatest orchard areas were largely in southern (Guangdong, Guangxi) and eastern/central (Hebei, Shandong, Shaanxi) China. Provinces with a high share of land in orchards are Beijing (22 percent), and Fujian, Guangdong, Shaanxi, and Hainan (18 percent–15 percent). Together, apple, pear and citrus make up almost half of the total orchard area.

1．2 International Trade

From 1992–2001 world vegetable exports almost doubled in volume and value (figure 1). Developing countries increased their share of exports by approximately 6 percentage points to approximately 60 percent. Much of this increase was the result of China's relatively rapid growth—China more than tripled its export volume. In terms of US$ value, China's share grew relatively less because its unit value declined by 24 percent, while developed and developing countries combined experienced a small increase. In 2001 China's unit value in exports was only 60 percent of that of developed and other developing countries. The multiple reasons for this are discussed later.

From 1992–2001, world exports of fruits increased by approximately 39 percent in volume but only 30 percent in value, reflecting a decrease in unit value (figures 2 and 3). The performance of developing countries, excluding China, differed little from the developed countries. China, on the other hand, tripled its share of export volume of fruits, but faced a decline in unit values for vegetables.

[7] *China Agricultural Yearbook*.



Source: Table A8.2.

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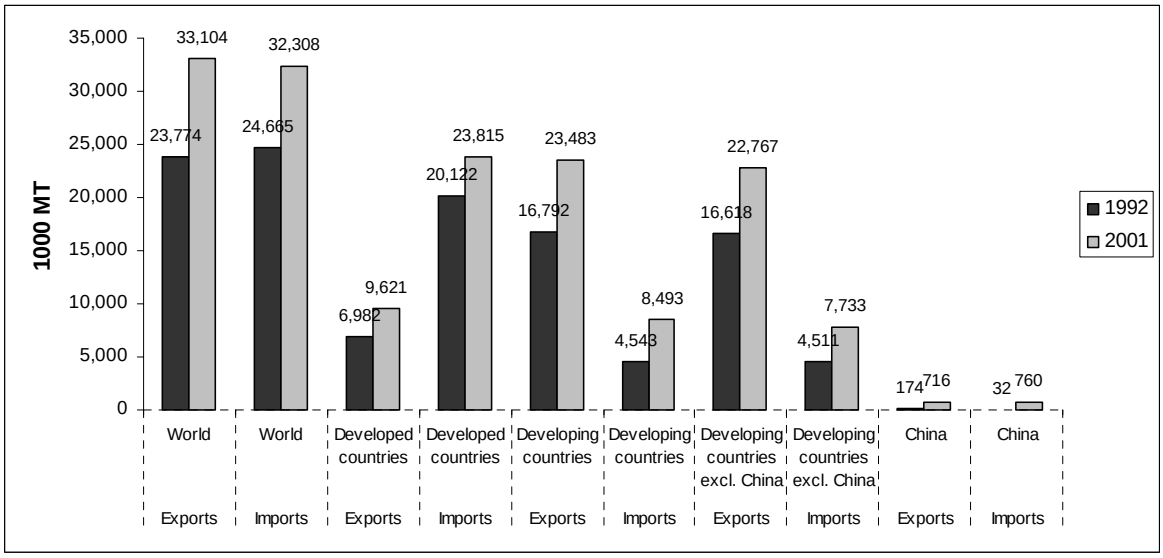
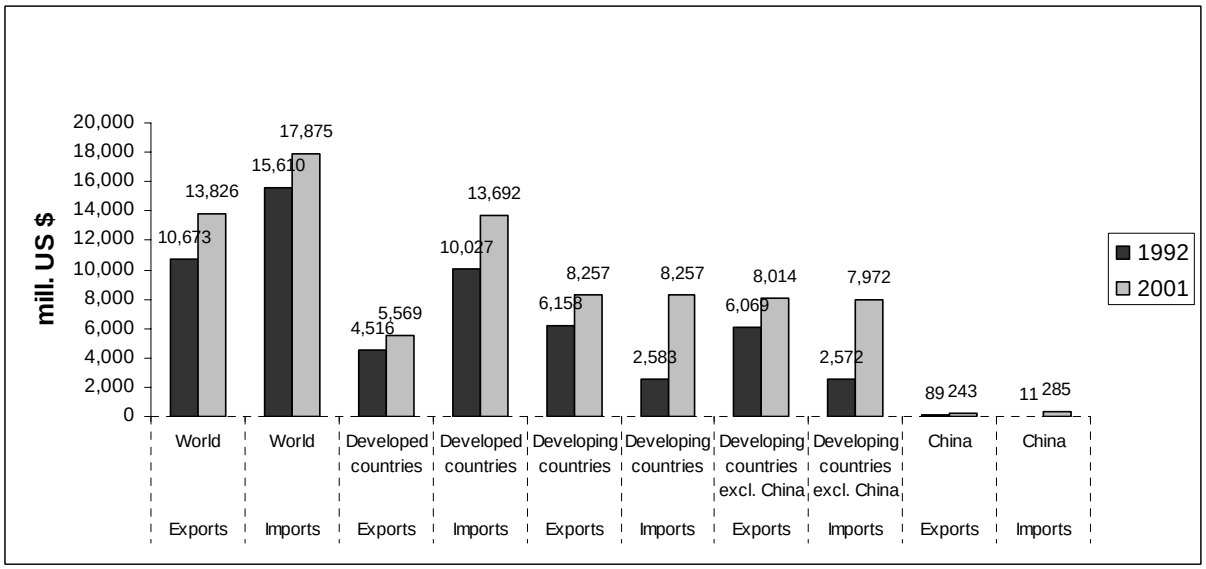
Figure 1. Volume and value of export of vegetables



Source: Tables A8.3 and A8.4.

Figure 2. Volume of import and export of fruits



Source: Tables A8.3 and A8.4.

Figure 3. Value of import and export of fruits

Although China has emerged as a major world exporter of fruits and vegetables, its exports are still a small percentage of its production, at 0.9 percent and 0.5 percent, respectively. However, using the broader definitions of China's statistical sources, the percentages are approximately 2 and 1 percent (table 3).[8] Moreover, the importance of exports to the economy in terms of employment and income is greater than their share in volume.

China imports only very small amounts of vegetables. However, its imports of fruits grew over the decade from a low level to 1.6 percent of world imports in value and 2.4 percent in volume, indicating that China is becoming a net importer of fruits.

Export Destinations

Japan is the dominant export destination for China's vegetable exports, providing approximately 25 percent of their volume and 40 percent of their value. [9] The combined EU countries are China's second trading partner in volume and value, followed by the United States, South Korea, and Hong Kong (table 4). China is diversifying its exports. Japan's and Hong Kong's shares are declining, whereas the shares of most other countries, especially Russia, Malaysia, South Korea, and the EU, are increasing. China's export unit values in US$ have decreased by almost half. Declines were strongest in its main Asian export markets, especially Hong Kong, Malaysia, and South Korea**.** Unit values in Japan, the US, and the EU also declined, but less steeply.

Table 4. China's vegetable export growth by selected destination

Destinations	*Share 1995*		*Share 2003*		*Unit value (US$/MT)*			*Index 2003 (1995=100)*	
	Volume	*Value*	*Volume*	*Value*	*1995*	*2000*	*2003*	*Volume*	*Value*
Total	*100*	*100*	*100*	*100*	*1,013*	*650*	*555*	*259*	*142*
Japan	39.1	46	24.8	39.8	41,193	983	891	164	123
EU	9.3	11.2	12	15.5	1,223	759	720	334	197
United States	4.9	5.6	4.3	6.9	1,147	788	888	227	176
South Korea	2.8	3.6	8	6.5	1,275	595	452	727	258
Hong Kong	20	15.8	9.5	5.3	800	223	313	123	48
Malaysia	1.3	1.5	7.6	4.3	1,160	317	313	1,540	415
Russia	3.2	0.8	5.6	3.2	256	204	321	451	565
Indonesia	1.7	1.1	5.4	2.8	653	309	283	833	362
Absolute total[a]	**2,134,909**	**2,164**	**5,526,897**	**3,068**					

Source: Table A8.5.

Note: a. Absolute total = the value is expressed in millions US$/volume expressed in MT.

For fruits, Japan also is China's first export destination, followed by the US, the EU, South Korea, and Hong Kong (table 5). Several other countries in the region also are significant importers from China. For fruits the main traditional markets in the region, such as Hong Kong and Singapore, have declined, or stagnated, such as Germany, South Korea, Japan and Spain. Rapidly growing markets are the United States, the EU, Malaysia, and many other markets in the Asia Pacific area. In US$ terms, unit values for most countries have declined approximately one-third.

[8] *China Statistical Yearbook* and Customs of China, which include also banana and citrus.

[9] *China Statistical Yearbook*; Customs of China.

Table 5. China's fruit export growth by selected destination

Destinations	*Share 1995*		*Share 2003*		*Unit value (US$/MT)*			*Index 2003 (1995=100)*	
	Volume	*Value*	*Volume*	*Value*	*1995*	*2000*	*2003*	*Volume*	*Value*
Total in all	*100*	*100*	*100*	*100*	*797*	*532*	*514*	*385*	*248*
Japan	21.2	30.7	11.2	21.6	1,155	1,018	993	204	175
United States	3.1	4	13.2	17.8	1,020	736	698	1,610	1,102
EU	4.7	5.7	14.8	17.5	963	688	607	1,206	760
South Korea	19	10.1	9.1	6.9	421	280	385	185	169
Hong Kong	1.9	2.2	5.7	6.9	916	664	618	1,135	765
Malaysia	0.7	0.9	4.4	4.8	1,108	731	556	2,570	1,288
Russia	3.8	1.2	7.2	3.4	246	289	239	739	717
Indonesia	2.7	1.8	4.3	3	530	291	361	615	418
Abs. total[a]	**692,327**	**552**	**2,667,569**	**1,372**					

Source: Table A8.6.
Note: a. Absolute total = value is expressed in millions US$/volume is expressed in MT.

China has a strongly diversified export of vegetables (table 6). Almost 30 percent of the export value of its vegetables is fresh product; 10 percent is frozen; and the rest is processed and dried. Most fresh export products are temperate products, and oriental products such as mushrooms and bamboo shoots. Speaking relatively, the share of fresh product is increasing, mainly because of the rapid growth of garlic exports. About 40 percent of all of China's vegetable exports go to Japan. Japan's share of China's fresh exports is only 30 percent, whereas it takes more than 60 percent of China's frozen vegetable products.

Table 6. China's vegetable exports by product, total and to Japan

Units: Value in million US$	*Total*			*Of which Japan*		
	1995	*2001*	*2003*	*1995*	*2001*	*2003*
Vegetables	2,164	2,339	3,068	995	1,203	1,220
1. Fresh or chilled, frozen	659	947	1,205	375	548	488
• Fresh or chilled	424	541	852	199	239	262
• Frozen	176	345	299	135	259	185
• Other vegetables	60	60	54	41	51	41
2. Processed, prepared, preserved	926	977	1,301	433	467	530
3. Dried	578	416	562	187	189	202

Source: Table A8.7.

Japan's vegetable import statistics show a declining import value in US$ after the year 2000 (table 7). One-third of the value is fresh; one-third is frozen; and the remainder is preserved, dried, and processed. China's share of these imports is increasing and in 2003 was more than 50 percent.

Table 7. Japan's vegetable imports by product, total and from China

Units: Value in million US$	*Total*			*Of which China*		
	1995	*2000*	*2003*	*1995*	*2000*	*2003*
Fresh	1,114	1,062	909	272	367	338
Frozen	764	924	849	250	391	352
In brine	212	160	136	176	138	118
Dried	247	261	240	183	221	201
Vinegar-preserved	31	30	44	16	19	35
Tomato products	164	150	144	18	15	18
Prepared vegetables	582	586	589	235	243	309
Others	0	3	10	0	3	10
Total	3,114	3,176	2,921	1,150	1,397	1,381

Source: Table A8.8.

China's fruit exports also are diversified (table 8). Of the value of fruit exports, almost 40 percent is fresh,

chilled, or frozen; 20 percent is fruit juices; and the remainder is processed. China exports relatively little fresh fruit to Japan, mainly because of phytosanitary restrictions. Apples and pears, China's main exports, are not allowed for the same reason. Japan imports large amounts of processed fruits and juices. A source of Japanese fruit imports comparable to the one for vegetables is not available.

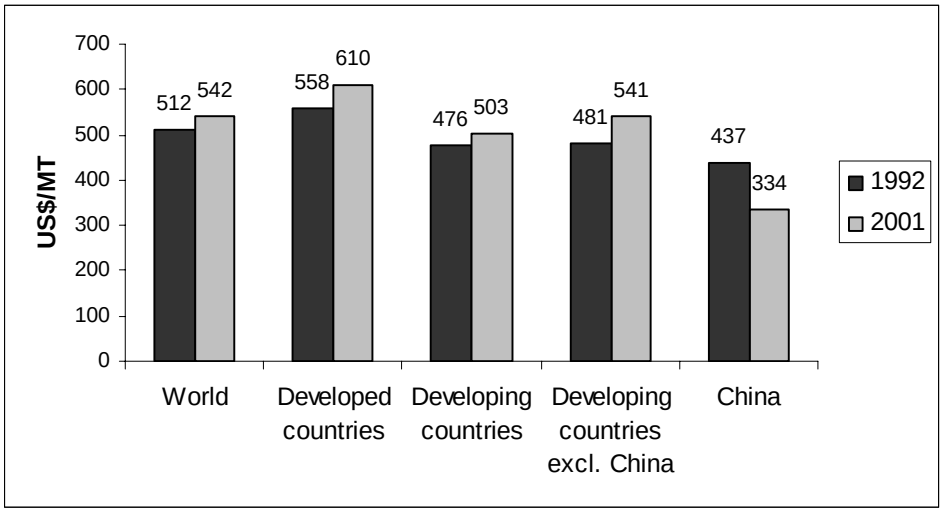
Table 8. China's fruit exports by product, total, and to Japan

Units: Value in million US$	*Total*			*Of which Japan*		
	1995	*2001*	*2003*	*1995*	*2001*	*2003*
Fruits[a]	552	793	1,372	169	265	297
1. Fresh or chilled, frozen	184	243	502	9	34	29
2. Fruit juice	34	168	279	18	38	36
3. Fruit, in airtight containers	139	178	269	85	70	67
4. Other fruits, processed, prepared, preserved	195	204	322	57	122	165

Source: A8.9.
Notes: EU includes 25 countries.
a. Fruits = Fresh or chilled, frozen + Fruit juice + Fruit, in airtight containers + Other fruits, processed, prepared, preserved.

1. 3 Unit Values

In general, the unit values for exported fruits and vegetables are more than two times higher than the retail prices.[10] This disparity exists despite the fact that, over the past decade, unit values for Chinese exports have declined significantly. This decline is shown for vegetables in figure 4.

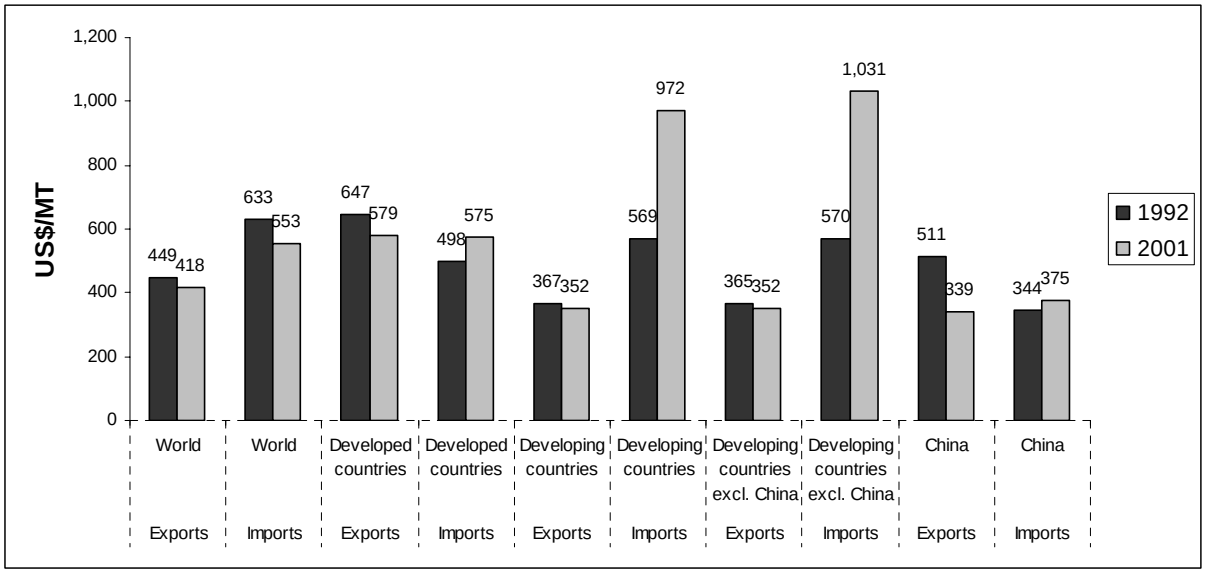


Source: Table A8.2.

Figure 4. Unit value of export of vegetables

Similarly, the exported prices for fruits have declined substantially (figure 5). Caution is needed when interpreting trends. The main reasons for changes in unit values can be weather-related shortages and excesses in supply, and shifts in currency exchange rates among trading partners. Differences in levels of unit values for individual products and export markets also will reflect price differences between seasons, different qualities, and differences among varieties, such as between apples and grapes. Aggregate unit values can be based on products of highly differing prices, such as voluminous commodities (carrots and onions) and expensive specialties (sungmo/matsutake and other mushrooms).[11]

[10] This ratio can be derived from the unit values in tables 6 and 7 and the retail price reported in the previous section. See n. 5.
[11] The common Chinese name for matsutake is *sungrong* or *sungxun*; however, statistical sources refer to *sungmo*.



Source: Tables A8.3 and Table A8.4.

Figure 5. Unit values of import and export of fruits

China's unit values for total vegetable exports and for fruit exports to Japan, expressed in US$, both have fallen significantly (table 9). Unit values in US$ for vegetable imports in Japan in total and from China show some decline as well (A8.12). Some of the trends can be explained by changes in the exchange rates (figures A8.1A and A8.1B). The Chinese RMB strongly depreciated against the US$ between 1990 and 1994 and thereafter was pegged to the US$. The Japanese yen appreciated from 1990 to 1995, followed by an almost 40 percent depreciation, a recovery, and another depreciation. Thus, trade between China and Japan has been greatly affected by exchange rate fluctuations.

Table 9. China's unit value of vegetable and fruit exports by product, total, and to Japan

Units: US$/MT	*Total*			*Of which Japan*		
	1995	*2001*	*2003*	*1995*	*2001*	*2003*
Vegetables*	**1,013**	**594**	**555**	**1,193**	**894**	**891**
1. Fresh or chilled, frozen**	664	442	364	1,173	783	737
(1) Fresh or chilled	581	325	300	1,565	645	653
(2) Frozen	938	905	832	958	968	979
(3) Other vegetables	784	632	473	797	804	568
2. Processed, prepared, preserved	954	648	694	922	789	813
3. Dried	3,366	1,447	1,667	4,196	3,503	3,675
Fruits***	**797**	**536**	**514**	**1,155**	**1,019**	**993**
1. Fresh or chilled, frozen	456	313	338	895	1,256	1,136
2. Fruit juice	1,270	672	621	1,260	828	810
3. Fruit, in airtight containers	929	691	629	990	831	754
4. Other fruits, processed, prep., pres.	1,731	1,036	1,057	1,569	1,196	1,178

Source: Tables A8.10 and A8.11.

* Vegetables = 1. Fresh or chilled, frozen + 2. Processed, prepared, preserved + 3. Dried.

** Fresh or chilled, frozen = Fresh or chilled + Frozen + Other vegetables.

*** Fruits = Fresh or chilled, frozen + Fruit juice + Fruit in airtight containers + Other fruits, processed, prepared, preserved.

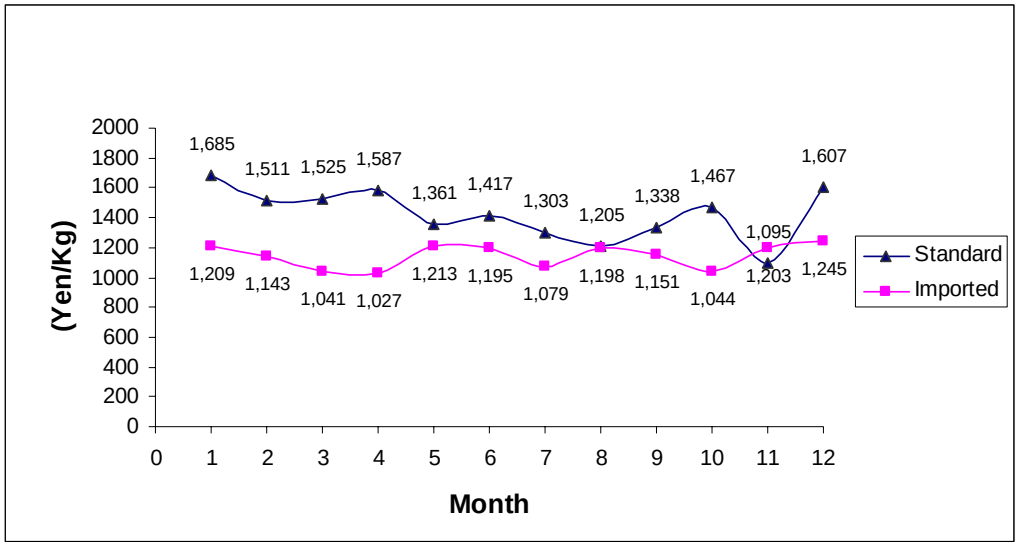
In comparison with the other main vegetable exporters to Japan–the United States, New Zealand, Thailand, Taiwan, and Mexico–China's unit values in 2003–not an extreme year–tend to be relatively low (table A8.13). The high-value matsutake is an exception. From a Chinese export perspective, the Japanese market offers relatively good prices for most products, and it also is the market that absorbs most of China's high-value

specialties (tables A8.14 and A8.15). Russia, South Korea, and Malaysia are market destinations for China's relatively low-value products.

Retail prices within the Japanese market

Since Japan is China's most important market, it is interesting to see the position of Chinese products in that market. Within the Japanese market, imported fruits and vegetables usually bring lower prices than domestic products. Figures 5–7 illustrate this pattern with the retail prices of asparagus, broccoli, and burdock (*gobo* in Japanese). The differences in price between Chinese and Japanese domestic products on the Japanese market often range between 25 percent and 50 percent. These price differentials can be caused by differences in quality and variety, and in trust in the safety and image of the product.

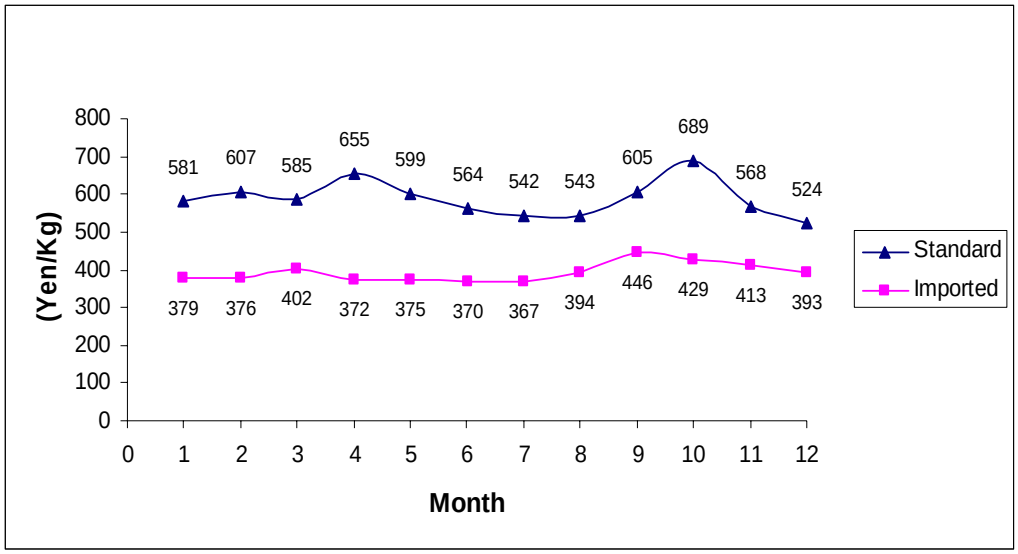
Generally, Japanese consumers considered domestic food products better and safer than foreign products. Trust is particularly low for products from China and other developing countries. Problems with spinach and other products that carry high residues of agrochemicals have added to this perception. This lack of trust results in significant price discounts in retail and wholesale markets. According to interviews with persons in Japan well informed about food markets, prices for Chinese products of the same intrinsic quality often are 20 percent–40 percent lower. Furthermore, top-end retailers, such as department stores, and top restaurants avoid buying these products. This consumer response is enabled by the compulsory labeling of the country of origin for products sold in supermarkets. Since such a labeling obligation does not exist for products sold in food services, Chinese products are favored by the low-end restaurants and canteens.



Source: Table A8.16.

Note: Ministry of Agriculture, Forestry and Fisheries survey of retail shops equipped with the POP (Point of Purchase) system that employ more than 10 employees in the 7 major cities: Fukuoka, Hiroshima, Nagoya, Osaka, Sapporo, Sendai, and Tokyo.

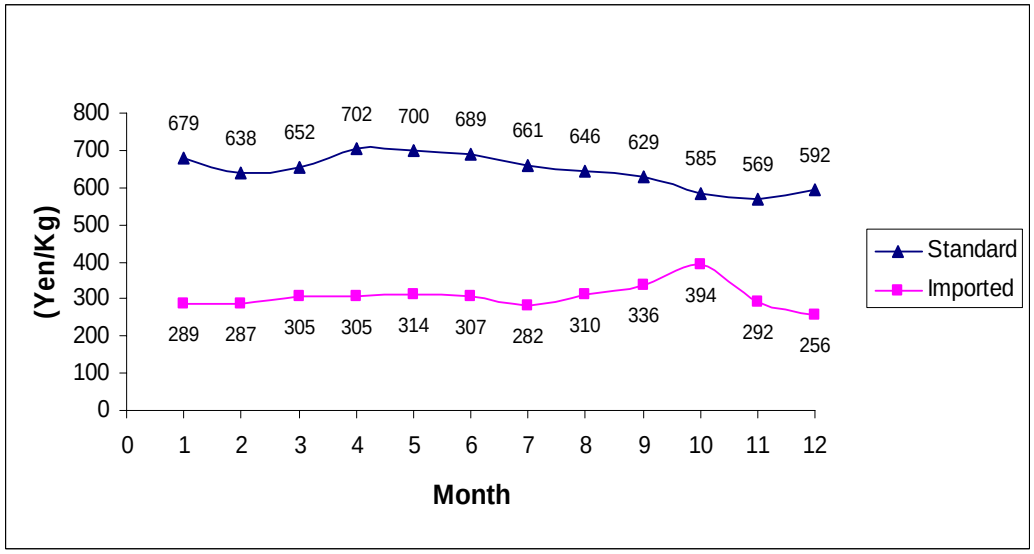
Figure 6. Retail price of asparagus, 2004



Source: Table A8.16.

Note: Ministry of Agriculture, Forestry and Fisheries survey of retail shops equipped with the POP (Point of Purchase) system that employ more than 10 employees in the 7 major cities: Fukuoka, Hiroshima, Nagoya, Osaka, Sapporo, Sendai, and Tokyo.

Figure 7. Retail price of broccoli, 2004



Source: Table A8.16.

Note: Ministry of Agriculture, Forestry and Fisheries survey of retail shops equipped with the POP (Point of Purchase) system that employ more than 10 employees in the 7 major cities: Fukuoka, Hiroshima, Nagoya, Osaka, Sapporo, Sendai, and Tokyo.

Figure 8. Retail price of burdock, 2004

1．4 Competitiveness

Competitiveness can be defined as the ability to earn attractive remuneration, compared to available alternatives, for employed factors of production: land, labor, capital, and entrepreneurship. Attractive remuneration will occur if the cost of production is low, productivity high, and prices attractive; and it will usually result in a supply response. By various measures, China's vegetable and fruit sectors have strong

competitive performance in foreign markets. The main evidence is provided by their high growth of production and exports. Sources cite China's relatively low producers' prices for vegetables and its low cost of production (Chen and others 2004, Editorial Group 2002, An Yufa and others 2002, Liu Yuman and others 2004). Calculations by the Editorial Group also found high revealed comparative advantages (RCA) for several products, and Liu Yuman and others found low domestic resource cost coefficients (DRCC).

China unleashed the competitive strength of its vegetable and fruit sectors by privatizing the economy, giving preferential support to the "dragon head" export companies, improving infrastructure, attracting foreign direct investment (FDI), and supporting farmers, mainly through agricultural technology. Nevertheless, China's major competitive strength so far has been based on its abundant supply of cheap labor. These factors combined have made China a very strong price competitor with a high supply response.

Compared with the rapid growth of these two sectors, quality and food safety have been relatively lagging and are the weak elements in China's competitive performance. As a result, Chinese exporters have been strong competitors in markets in which prices count more than quality and safety. It is for this reason that unit values of Chinese products in export markets have been relatively low.

Until now, the more developed coastal areas have been the source of most of China's exports because these areas had better access to export markets and services. Areas in western and northern China had less competitive strength because of their poor infrastructure, lower public support, and higher cost of transportation. However, now a major shift in comparative strength and growth seems to be taking place from the developed coastal areas to western and northern China. The main push factors of this change are the increasing wage rates and scarcity of pollution-free land in the developed areas. The main pull factors in the West and North are better agro-climatic conditions, improved infrastructure, and increased public support. This issue is elaborated in chapters 4 and 5.

Production in East and North China takes place in the same season as in Europe, Japan, and the United States. In this season, prices are relatively low, and for many products there are tariffs and quotas in the importing industrial countries. These simultaneous growing seasons are probably the main reason for the large concentration of processed fruits and vegetables in China. Another reason, undoubtedly, is the phytosanitary constraints in the importing countries (box 4).

1．5 Poverty Relevance

Fruit and vegetable production offers opportunities to poor farm families who have abundant labor but limited land, since these crops allow for far higher production value, income, and employment per ha than do grains and soybeans. Compared with rice, labor input per mu was 3 times greater for apple, over 5 times for tomato, and 5 times for cucumber. Net value added in RMB per mu was 185 for maize, 115 for wheat, 279 for rice, 985 for apple, 1,717 for tomato, and 1,172 for cucumber.[12] Moreover, production of some vegetables, such as leek, offers employment over a longer period during the year due to the necessity to plan for a regular supply over a larger number of months. In the case of greenhouses, production is possible over much of the year. In all cases, high-quality production for demanding foreign and domestic buyers requires much care and employment in the post-harvest stage of sorting, cleaning, and packing. This kind of employment is particularly important to women, the elderly, and others who otherwise are underemployed.

In general, poor households can participate in traditional forms of fruit and vegetable production for local markets. However, to serve more demanding markets, they may face obstacles because of lack of access to infrastructure, capital, information, and technology. Markets for high-quality and safe fruits and vegetables are demand driven. In other words, the development of production for exports and the high-end domestic market depends greatly on the interest of buyers who know their markets' demand. These buyers' role is to specify what varieties and qualities are demanded and to help upgrade traditional vegetable production. Production for this market segment will develop in areas with good investment climates, especially infrastructure and transport links to urban centers, ports, and airports. Thus, the poverty impact is localized and affects the people living in such areas and the migrant labor from isolated areas.

[12] *China Rural Statistical Yearbook*, 2004, table 10. MOA data for tomato and cucumber are for Shaanxi.

Pesticides

The use of pesticides entails health risks for farmers, consumers, and the environment. An estimated 500,000 people suffer from pesticide poisoning every year, and the death toll may be in excess to 500 (DRC 2004). There is abundant evidence in China and abroad of the negative impacts of the use of pesticides for farmers, consumers, and environment (DRC 2004). The particular risks differ widely by crop and product used. Improved food safety is important not only to consumers. It also will have positive impacts on the health of farm families, workers, and the environment since it requires safer use of pesticides.

2 Emerging Marketing Patterns

The present production and supply of fruits and vegetables consists of three market segments with distinct characteristics in production, marketing, quality and safety management, and value added. These market segments are (a) the traditional local fruit and vegetable markets, (b) markets in industrial countries, and (c) the emerging modern urban domestic markets. Each segment includes processed and fresh products. Because of their distinct characteristics, each segment needs tailored government support.

2．1 Traditional Local Fruit and Vegetable Markets

Millions of small-scale farmers produce some vegetables and fruits for their own consumption and for local markets. Increasingly, small-scale farmers have specialized in certain products, and their products are collected by traders and transported large distances to serve rapidly increasing urban demand. These products are sold primarily in markets that combine wholesale and retail functions. Many small-scale market sellers collect some supplies from these markets for resale in street markets[13] and restaurants. Significant amounts of product undergo some form of processing before being consumed.

Weaknesses of the fruit and vegetable subsectors are their highly fragmented production structures of millions of farmers each of whom has, on average, less than 0.5 ha of cultivable land. In most cases, traders and local markets can provide little guidance for taste, appearance, and period of demand. There is insufficient control over use of pesticides, often limited technical support, and little control of quantities produced. Hence, markets at collection spots and wholesale markets are characterized by heterogeneous quality, unreliable food safety, fluctuating supply, and uncertain demand. Nonetheless, this market segment–including direct consumption–constitutes more than 90 percent of the volume of output.

2．2 Markets in Industrial Countries

In the past decades, with the advent of privatization and economic liberalization, producers in China increasingly were able to respond to foreign demand. It was relatively easy to respond to demand in Hong Kong, Japan, Korea, and the large Chinese ethnic markets in Southeast Asia and North America because of cultural closeness and similarities in food consumption and crops grown. Yet, early exports also met with many deficiencies in a number of products because of differences in taste, crop varieties used, and quality standards. FDI from Japan, Taiwan, and Hong Kong-based companies helped speed up adjustment in the organization, quality, and safety achievements of the fruits and vegetables sector, especially after the revaluation of the Japanese yen in the early 1990s and the devaluation of the RMB. In a relatively short period, much has been achieved in upgrading the production lines and broadening the product assortment. In the past 10 years, food safety standards have emerged more and more as a major, or even the decisive, factor in export markets. Requirements by large-scale buyers, especially for supermarkets, have become a major factor in markets for fresh exports. Export markets in general are more demanding than domestic markets. Yet, there are major differences among countries and even among buyers within countries. Markets in the UK are more demanding than those in Russia and the Middle East. Supermarkets have higher demands for appearance, sorting, and packing than do most other forms of retail, and they require regular shipping schedules for product. Managing supplies for most food services–restaurants and canteens, for example–is relatively easy. In some ways, production for processing also is less demanding than fresh supply for supermarkets. Liberalization of wholesale markets in Japan will lead to more efficiency in distribution and shorter supply chains. Dominant consumer trends emphasize freshness and safety, smaller packages, value added and tracking and tracing throughout the supply chain (appendix 5). The export markets in transition economies and middle-income countries seem to follow the same trends.

At present, the export market segment probably constitutes not more than 2 percent of the volume of fresh production of fruits and vegetables, and perhaps twice this share in value added. Yet, it plays a dynamic role within the sector through its diffusion of technology, logistic services, and market development. Growth of

[13] These markets often are called wet markets.

exports also will depend on improvement of technology, quality, and safety; as well as broadening the assortment and supply base in China to meet opportunities and requirements in different export markets. In several cases, market access also may be obtained or expanded through negotiation on SPS measures, quota, and tariffs. The export sector may well double in share of total production over the next 10 to 20 years.

2．3 Emerging Modern Domestic Markets

Rapid development has taken place in food retailing in China during the past 10 years (Hu and others; Reardon and others 2005). The present market share of supermarkets is estimated at approximately 30 percent of urban markets and growth rates are still some 30 percent per year. The main factors in this expansion have been the attractiveness of supermarkets to modern consumers, and the technical and logistic advantages of modern retailing over traditional retail systems. Nonetheless, it is difficult to generalize about the impact of modern retailing since it differs highly by product group. Particularly for fresh fruits and vegetables, the market share is still limited, quality and safety management are difficult, and profitability low. Supermarkets are better able to handle processed foods and fresh products with a longer shelf life, but they have major difficulties in handling leafy vegetables (Shepherd 2005, Chen 2005, Tschirley and Ayieko 2005).

In Shanghai, the country's biggest and wealthiest city, the total share of supermarkets in the sales of fresh vegetables is perhaps 5 percent, or somewhere between 3 percent and 8 percent.[14] It is somewhat higher for fruits than for vegetables because fruits are better graded, and they include significant amounts of imported fruits. For the country as a whole, the share is still much lower, perhaps some 2–3 percent of the volume of fresh products. More importantly, the impact of many supermarkets in Shanghai is still limited since they still accept relatively low standards in quality and food safety and still source fruits and vegetables from wholesale markets and from companies that cannot meet export requirements. In other words, there is still a major gap in quality and safety standards between supermarkets in China and in industrial countries.

All supermarket respondents to our 2004 study indicated that they have a fresh fruits and vegetables section because that is necessary for their image as one-stop shopping for consumers to buy every product they need. However, most of these supermarkets readily admitted that this section is not very profitable.[15] The main competitors are not other supermarkets but the wet-markets. Profitability of supermarkets' fresh fruits and vegetables business reportedly depends foremost on two factors: (1) whether there is a wet-market nearby and (2) the level of income of the population surrounding the supermarket.

Several supermarkets in China rent out floor space for fruits and vegetables to private companies that source from wholesale markets or their own production base. This strategy is characterized as one in which the supermarket can reduce risk and avoid building up an expensive sales staff and related back-office staff for administration and quality control.[16]

Although many supermarkets try to attract consumers with various forms of food safety certification and by showing their efforts in testing and tracking and tracing, their efforts have had limited impact on food safety in the fresh fruits and vegetables sector. These efforts in general are still haphazard and weak, and the market share on which they focus is very small, even in Shanghai.

The better qualified companies that produce and trade fruits and vegetables still show little interest in the domestic supermarket segment. Prices in the export market generally are much better. Top supermarket buyers in China confirm this by indicating that they cannot compete with Japanese buyers for better qualities and higher food safety standards. Given the competition of wet markets, their market segment is still too price sensitive. Exporting companies are aware of the growth of supermarkets, and several reported some attention, especially in processed food. However, most of them do not yet see fresh fruits and vegetables in domestic

[14] These findings are based on a series of interviews in August 2004 with specialists in supermarkets, a wholesale market, and local government.

[15] In an interview with the author in September 2004, a buyer from a South African retail chain described a similar situation for supermarkets in Sub-Saharan Africa. Such a situation of low profitability contrasts with Northwestern Europe, for which some experts believe that the fresh fruit and vegetable segments are highly profitable for retailers.

[16] This is not a sign of high profitability of the fresh fruit and vegetable segments.

supermarkets as a commercial priority. This view is not unique to China.[17]

Despite the modest size and impact of the modern urban market for fresh fruits and vegetables, this market segment certainly will grow rapidly. It may double its share within a couple of years. In addition, with respect to quality and food safety, the impact of the urban market will increase. The pace of change will depend partly on government incentives and requirements, and demand for food safety among Chinese consumers.

2．4 Emergence of Coordinated Supply Chains

Exporters and processors for export markets in industrial countries no longer buy in traditional wholesale markets. They organize their own supply under strong supervision by the China Entry/Exit Inspection and Quarantine Bureau (CIQ). The requirements of quality, safety, volume, consistency, and delivery schedules are high. Increasingly, buyers require tracking and tracing of food safety throughout the supply chain with independent certification. As a result of these trends, coordinated and integrated supply chains have become the dominant institution in sourcing perishable products.[18] Partners in the supply chain have durable relations. Many foreign buyers also maintain durable relations with their suppliers. They frequently exchange information, consult each other, provide technical support, and sometimes these buyers co-invest with their suppliers (box 2).

Prices and requirements in fruit and vegetable markets of industrial high-income countries are higher than in China and other developing and transition economies. For high-income markets, coordinated supply chains are commercially superior over traditional supply chains and increasingly are a minimum requirement. Investment in the formation of these supply chains is profitable, because the higher costs are usually covered by higher prices. Hence, sophisticated coordinated supply chains are becoming important tools for competitiveness,

Box 2. What are coordinated supply chains?

Coordinated supply chains are durable arrangements among producers, traders, processors, and buyers about what and how much to produce, time of delivery, quality and safety conditions, and price. These chains often involve exchanges of information and sometimes assistance with technology and finance. The chains usually are initiated by investments by private traders and food companies, which act as chain leaders. The chains have characteristics of partnerships and joint interest. In contrast, relations in open supply chains usually are limited to transactions only. There are hardly any contractual relations and little clear loyalty between buyers and sellers. At the other end of the spectrum, in fully integrated supply chains, one company performs all activities from production to processing and wholesaling on its own account without partnering with other entities. In this case, the intrafirm handling has replaced market transactions. As an institution, coordinated supply chains must compete with atomistic markets on the one hand and with the firm that completely controls its supply chain on the other.

Coordinated supply chains fit well the logistics requirements of modern food markets, especially those for fresh and processed perishable foods. These chains can be used for process control of safety and quality. This arrangement is more effective and efficient than control only at the end of the supply chain. Companies cannot control each single package that is sold; in addition, they need total quality and safety management. Companies also use coordinated supply chains as tools in competitive strategies, such as for sales promotion, labeling, and branding.

Source: Van der Meer 2004.

especially in markets that are sensitive to controlling quality, safety, and risk.[19] Moreover, individual

[17] The aforementioned buyer from the South African retailer reported that, in Africa, exporters to the European market generally have no interest in selling to local supermarkets. Interview, September 2004.

[18] Transnational companies in the fruit and vegetable sectors that are involved in production and trade are examples of integrated supply chains. In this study, the focus is on cooperation among private entities in the supply chain. These are called coordinated supply chains. Some studies, such as World Bank 2004b, use “integrated” for both types.

[19] In such regions all over the world, coordinated supply chains are being strengthened (World Bank 2005). This process in Japan is documented in appendix 5 and in Jonker and others 2005. For European countries, this process is documented by Willems and others 2005; and for the United States by Lamb and others 2005.

companies with solid brand names have embarked on corporate social responsibility programs, which further raise market demands.[20]

In China, as in other developing and transition economies, urban citizens with increased income are becoming more demanding, but at the same time they are still quite price sensitive**.** To respond, supermarkets and domestic processors try to get increasingly more control over their supply. Big traders that want to supply these two groups try to acquire their own farms, or work with large-scale farms, or with farmer organizations and local traders in specialized production areas. However, the price they can pay for such separately organized sourcing is under heavy competitive pressure. As a result, the formation of coordinated supply chains for domestic supermarkets and processors is much slower and more erratic than for export markets. In turn, the impact of these domestic supply chains, while rapidly increasing, is still low.

The earlier mentioned analysis of supply chains in Southwest China by the World Bank (2004b) found that, with few exceptions, local farmers and small and medium enterprises are not part of coordinated (integrated) supply chains so as yet are unable to supply modern retailers in Eastern China. For the low-end of the domestic consumer markets, coordinated supply chains tend to have higher costs than returns so traditional wet markets remain the dominant form of market organization. Of course, there is a continuum among these three market segments. Some export markets are more demanding than others, and some supermarkets aim at higher standards, whereas others follow a low price strategy. In sum, the three market segments have profoundly different characteristics; and their needs for government support to boost competitiveness, growth, poverty reduction, and food safety differ significantly (table 10).

Table 10. Characteristics of three types of markets

Type of market / *Market characteristics*	*Traditional local fruit and vegetable markets*	*Emerging modern urban domestic markets (supermarkets, tourist hotels/restaurants, educated affluent consumers)*	*Export markets in industrial countries (retail markets, modern food services)*
Participation			
Participation of small-scale producers	No constraints	Emerging constraints in meeting requirements of quality, safety, consistency of product, regular supply	Only if well organized in out-grower schemes and able to guarantee safety and uniform quality
Organization			
Chain leader/ coordinator	Usually none	Large producer or buyer, sometimes producer organization	Processing company or exporter; sometimes importer on behalf of retailer; rarely the retailer directly
Potential role of producer cooperative	Countervailing power, economies of scale in acquiring inputs and market access	Economies of scale, finding and developing markets, scaling-up volume with consistent quality	Reduce transaction and information costs in supply chain; trust-worthy partner for planning and coordination
Supply-chain organization	Supply-driven Transaction-based Little or no net benefit from coordination Little durability in relation among private actors No technical cooperation	Efforts by retailers to control quality, safety, and reliability of supply Net financial benefits from coordination still fragile Emerging coordination, occasional technical support	Strongly demand driven Durable relations within supply chain, often on contractual basis Cooperation among buyers, exporters, growers on technology, information, sometimes finance
Trust between buyers and sellers	Not very important	Of emerging importance	Crucial factor for long-term successful relations
Results			
Competitiveness depends mainly on	Supply at low cost	Sufficient quantity Improved quality	Large quantity Efficient, effective coordinated supply chains Flexible response to changing demand Market and product innovation
Price level for	Relatively low	Moderate	Relatively high

[20] See a recent example from Marks and Spencer in the UK in http://www.marksandspencer.com/csr.

grower and consumer	Limited willingness to pay for quality and safety	Moderate willingness to pay for quality and safety	High willingness to pay for quality and safety
Value added	Very low	Low/moderate	Moderate/high
Standardization, grading, supply	Virtually absent Irregular supply	Emerging importance of grading, stable supply	High requirements of grading, consistency, supply schedule
Food safety control	Unreliable Little consumer awareness, concern Little private effort, limited government control	Improving Emerging consumer awareness, concern Retailers try to control and sell "safety"	Effective High consumer concern High retailer requirements imposed on suppliers

Source: Authors.

3 Status of China's Food Safety for Fruits and Vegetables

Food safety problems in fruits and vegetables are related mainly to residues of pesticides. There also can be contamination by other toxic substances, such as heavy metals and other industrial waste, and pathogens from contaminated water. In canned fruits and vegetables, botulism is a risk. [21]

3．1 Domestic Food Safety

From the perspective of a supermarket manager, formal domestic food safety requirements in China are not much different from those in Europe, but in China there are major problems with enforcement.[22] In a recent internet announcement, the China Chain Store and Franchise Association (CCFA) spoke of "terrible food safety in China."[23] Much of the discussion of official statistics centers on the adequacy of standards used for measuring. Many of the standards used have no scientific basis; and for many possible hazards, no standards are available or the standards are less demanding than international standards (DRC 2004). Moreover, it is sometimes unclear against which standards samples are tested.

Statistics from the State Ministry of Health (MOH) show that the ratio of national food that met GB[24] standards in inspection sampling according has increased over the past 21 years from 61.5 percent in 1982 to 88.6 percent in 2001 to 90.5 percent in 2003.[25] MOH surveys on food safety show significant increases in compliance with food safety standards over the past 20 years, indicating improvement in the overall food safety situation in China. There also has been evidence of less food poisoning events and improving safety compliance of exported food. Most food poisoning that is reported is from animal and fish products and the food service industry. Data on fruits and vegetables is not yet collected at a national, comprehensive level (DRC 2004).

A total of 200,000–400,000 cases of food poisoning may occur annually, extrapolated from cases that are actually reported. However, as discussed below, this official record is based on weak methodology. Reports from different public and private sources–although often based on unspecified or different sampling methodologies and coverage–confirm that food safety is still a major issue in China for fruits and vegetables. In interviews, managers of domestic supermarkets and food industries express difficulties in obtaining produce that meets all safety requirements and indicate relatively high levels of noncompliance.

Urban consumers in China, just as elsewhere, are becoming more conscious about food safety with increased income and increased information. Zhejiang Statistic Bureau has finished a questionnaire survey in which most concern is expressed on food safety issues. There are 74.4 percent answers related to pesticide residue of fruits and vegetables.[26] Research in Tianjin by Zhang (2004) reveals also much concern among consumers about food safety of vegetables and dairy product. Domestic retailers, especially supermarkets, respond to consumer concerns by trying to control food safety and advertising their efforts to consumers as part of their commercial strategies. The willingness to pay for more safety is growing but still limited.

Food safety compliance testing in vegetables

The Ministry of Agriculture (MOA) has a monitoring program of vegetable pesticide residue for urban consumer markets.[27] In total, 3988 samples were tested, which covered 51 varieties of vegetables from 37

[21] Botulism is related to a potential bacterial hazard (*Clostridium* botulinum) in canned food that produces a dangerous toxin.
[22] Interview with a manager of a foreign-owned supermarket chain.
[23] http://www.ccfa.org.cn/english/news_show_2005.jsp?id=15175.
[24] The Guo Biao system of standards.
[25] http://www.china.org.cn/chinese/PI-c/705580.htm.
[26] Reported by Dai Xiaowu at the 3rd National HACCP Seminar in Beijing November 2004. Original source: http://www.agri.gov.cn/ztzl/spaq/dtxx/t20040909_242300.htm.
[27] So far, there is no special national monitoring program in place for fruit. Very few monitoring results for fruit are published by central government. Because they show no breakdowns in the system, these published results cannot

cities all over the country. These samples were from wet markets, low-end, and high-end supermarkets. The noncompliance rates for July 2003 were 19 percent. They dropped in the cool season to approximately 4 percent and were up to 9 percent in 2004 (table 11).

Table 11. Results of MOA monitoring of pesticide residue

Date	*Noncompliance rate (%)*
July 2003	19.2
January 2004	4.1
April 2004	3.6
July 2004	9.2

Source: http://www.agri.gov.cn/ztzl/spaq/dtxx/ http://www.agri.gov.cn/gjdt/.

The noncompliance rates obtained from supermarkets, wholesale markets, and some vegetable companies (both for domestic and international markets) often are higher, and range from 20–25 percent. The Shanghai Cao'an Vegetable Wholesale Market has since 1999 a pesticide residue analysis laboratory equipped with gas chromatograph and a monitoring program. The laboratory tests approximately 50 samples daily, mainly for leaf vegetables, which have high risk on pesticide residues. At the end of 2002, the laboratory started to make their testing results available to the public. In 2004 it published the monitoring results almost every month. The average noncompliance rates of leaf vegetables with pesticide residue norms from November 2003 to October 2004 are 34 percent (table A8.17). Findings from some other municipal monitoring programs show noncompliance rates between 10 and 22 percent (table A8.18).

The survey by the Ministry of Agriculture has apparently the widest coverage, but the survey methodology has not been released and could not be obtained for this research.[28] One would like to know which standards have been used; and which products are covered, divided, for example, in categories of "low-risk," "medium-risk," and "high-risk" products groups, sample sizes, and choice of points of measurement. The other sources add interesting data, but most of them do not have a scientifically designed program to monitor the products they handle. Wholesale markets and supermarkets do a great deal of sampling and inspection to guarantee food safety in their marketplaces. It is possible that they focus their tests especially on high -risk products and sources so find higher noncompliance rates than monitoring programs that aims at random coverage. Box 3 gives details on the possible impact of methodology. Although conclusions are difficult to draw because of methodological questions, in general the trend seems to be improving. Nevertheless, the data still show worrying high rates of 10 percent–50 percent noncompliance.

be used to analyze the current fruit safety situation.

[28] According to Liu Su, the standing director general of MOA Vegetable Quality Monitoring Center at the stakeholder workshop on May 9, 2005, the program started in 2001 and takes approximately 100 samples for each city, 4,000 samples in total. Thirteen varieties of pesticide residues are tested, using modified American testing methods. The compliance reportedly is determined in accordance with Codex standards. Up to 98% compliance rate is achieved right now.

Box 3. Possible methodological reasons for the differences in monitoring results

Different vegetables are likely to show different results. MOA normally samples 50–52 vegetable categories for testing, and the noncompliance rate is the average result for all vegetables. For high-risk leaf vegetables, such as Chinese leek or spinach, the noncompliance rate could be much higher.

Sampling sites can make a difference. The MOA program samples from 37 large or medium c, and supermarkets.

Pesticides covered may differ among monitoring programs. China bans (makes illegal) 18 pesticides, including DDT, BHC, Aldrin, and Dieldrin. Nineteen pesticides are forbidden for use on fruit and vegetables, such as Methamidofos and Parathion. For many pesticides, China as yet has no scientific standards. The questions, therefore, are which pesticides are included and which standards are being used. The same lack of standards and questions apply to coverage of heavy metals and other chemical pollutants.

The different methods and equipment also vary monitoring results. The limit of detection depends on the testing method and equipment. The quality of the management of the laboratories also is very important to ensure reliable and precise results, especially for the pesticide-residue testing.

Source: This report.

Various reasons can explain the current noncompliance of pesticide regulations for fruits and vegetables.

Use of illegal pesticides. Monitoring results and communications by specialists show the application of illegal pesticides on fruits and vegetables. Pesticides that are illegal in China nevertheless are produced there and sold there. Frequently, the commercial name of the illegal pesticide is changed, or it is sold in a mix with legal pesticides. Prices of illegal products are low, and farmers buy them because they are effective against the pests. There are many reasons for the circulation and use of illegal pesticides, but most are due to lack of law enforcement. Traders often are difficult to trace. Local governments are not held sufficiently accountable and may protect local producers of illegal pesticides. Similarly, the jurisdiction may lack independence or enforcement capability.[29]

Use of pesticides forbidden for fruits and vegetables. Some 70 percent of all pesticides are the organic phosphorus pesticides, and 70 percent of these are highly toxic. Most monitoring results show that methamidofos (one of the organic phosphorus pesticides) is the main noncompliance item. This pesticide is used very frequently for cotton and tree plantations and can contaminate fruit and vegetable grown on neighboring plots. When choosing their plots for fruits and vegetables, farmers often lack the knowledge or simple concern about the issue, or lack alternate plots.

Misuse or overuse of pesticides. Most Chinese small-scale farmers lack the education and technical training to identify the risks of pests or diseases. Some farmers are not able to follow the instructions for pesticide use, resulting in misuse. For example, they apply too much pesticide or apply it too late before the harvest.

Testing at the farming level is extremely rare, especially for small-scale farmers. Some of the reasons are lack of awareness and lack of training and technical support available to farmers. However, of greater concern is that *many agrotechnical extension agents responsible for providing information on safe pesticide use also receive part of their income from sale of pesticides.*

Quality of pesticides. The quality of pesticides sold in the markets is sometimes poor. According to data published by the PRC's General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), the compliance rate of pesticides with quality requirements was only 80 percent in 2003 and 86 percent in 2004. Some pesticides are adulterated, which makes them difficult for farmers to find.

3．2 Food Safety Compliance in Foreign Markets

Without doubt, the food safety of fruits and vegetables produced for export, especially those destined for

[29] Some residues of illegal pesticides or industry effluents remaining in the soil or irrigation water could be the reason why some testing results show noncompliance due to the heavy metal lead (Pb).

industrial countries, is better than for the domestic market. Nevertheless, there have been many small and major incidents. Some clearly are related to increased surveillance by trading partners. Japan has intensified and broadened the testing of pesticide residues to cover a wider range of pesticides and other chemical contaminants.

In late 2002, due to an excess of residues of agricultural chemicals detected in imported Chinese vegetables, Japan's Ministry of Health, Labor and Welfare of Japan reinforced the safety inspection of Chinese vegetables at the border and promulgated an import ban on frozen spinach from China. With the efforts of AQSIQ and the Chinese spinach industry, in July 2004 MHLW lifted the import ban on frozen spinach processed by 27 authorized Chinese companies.

The ban had a major disruptive impact on trade from China to Japan, not only for spinach but for vegetables and fruits in general. Many Japanese and Chinese companies incurred heavy financial losses on stocks of product and on current contracts. The ban resulted in increased commercial risks for importers and food retailers. Moreover, it had a lasting negative impact on the trust of Japanese consumers in the safety and quality of Chinese vegetable products, and negatively affected their buying attitudes. Consequently, prices of imported Chinese products relatively declined and imported quantities for several products stagnated or declined.

Problems with residues of agrochemicals occur occasionally with other products as well. Table A6.2 provides typical examples of noncompliance with food safety in the Japan market that show that most of the noncompliance cases are related to pesticide residues. Although major efforts are made by Japanese importers, Chinese exporters, and Chinese government services, there are still recent cases of noncompliance, as shown for June 2004 in table A6.3.

A feature of Japan's agricultural import control system is that MHWL can urge importers themselves to conduct controls on products from sources that are deemed risky. Moreover, MHWL makes noncompliance cases available to the public ("name and blame"). These policies have a preventive impact and certainly reduce the number of cases that do not comply.

A related concern that constrains China's access to foreign markets is that of phytosanitary requirements (box 4 and appendix 7).

Box 4. Phytosanitary constraints to market access

Phytosanitary constraints are an important factor in China's market access for fresh fruits and vegetables, especially to the markets in Australia, Japan, and the United States. China's fresh fruit and vegetable exports face many phytosanitary constraints, which in most cases are country specific. Each country has a list of products banned for import because of presumed risks of importing plant pest organisms with the product. Other products may be imported only under restrictions, such as inspection and certification by the exporting country, or after disinfection treatment (vaporization, fumigation). In many cases, countries have bilateral agreements (such as a Memorandum of Understanding) on procedures to be followed and conditional exceptions granted on general restrictions.

Phytosanitary restrictions often are the subject of bilateral negotiations and formal complaints at the World Trade Organization Sanitary and Phytosanitary Standards (WTO-SPS) Committee. If there is insufficient scientific evidence for the presumed risks or if the risks are very small, exporting countries see some of the restrictions as protective barriers. Sometimes concerns of the importing country about risks can be properly addressed by better and more transparent controls by the exporting country. In the case of new members in the international trade system, such as China, there is scope for reducing market restrictions through bilateral talks and joint risk assessment. See appendix 7 for phytosanitary issues for China's exports to Japan.

3．3 Food Safety Control System

The *Food Hygiene Law of the People's Republic of China* is the most important framework for food safety control. A basic Food Safety Law is still being considered. Other main relevant laws concerning food safety include:

- *Product Quality Law of the People's Republic of China*
- *Agriculture Law of the People's Republic of China*
- *Law of the People's Republic of China on Animal Disease Prevention.*

China's food safety system is managed by seven agencies (appendix 1):

（1）*State Food and Drug Administration*. Created in 2003, SFDA is responsible for the supervision of food safety, and the coordination and handling following serious violations of food safety requirements. SFDA has a mandate to coordinate, but lacks the capacity and resources to do so effectively.

（2）*General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China*. AQSIQ is responsible for the supervision of food production and processing, including quality and food safety issues.

（3）*Ministry of Agriculture*. MOA is responsible for the supervision of primary agricultural production, including food safety and plant health protection. MOA also oversees production and marketing of pesticides and veterinary drugs, and animal health, animal disease and phytosanitary regulation and enforcement in China except that AQSIQ is in charge of quarantine at entry and exit stage.

（4）*State Administration on Industry and Commerce*. SAIC is responsible for the supervision of food circulation. It monitors and manages all market places, including wholesale and retail market places.

（5）*Certification and Accreditation Administration of the People's Republic of China*. CNCA is responsible for the supervision of national certification and accreditation by formulating regulations and policies on certification and accreditation in relation to food hygiene and safety; for reviewing, inspecting, and approving certification institutions; and for registering certification staff and institutions (appendix 2).

（6）*Ministry of Health*. MOH is responsible for the supervision of food services, including canteens and restaurants. MOH also is responsible for drafting laws and regulations and formulating policies on food hygiene issues, and establishing food hygiene standards. It is in charge of setting food sanitary standards, including MRLs of some hazards such as heavy metals, pesticide residue according to risk assessment, but MOA also sets MRLs for pesticide residues for agro-food products.

（7）*State Environment Protection Agency*. SEPA has some responsibilities on such issues as air pollution, water pollution and soil pollution. It also houses the Organic Food Development Center and promotes and popularizes organic food in China.

All of these ministries and agencies have branches in local government in charge of local food safety, and capacities differ widely among local jurisdictions. The legal and institutional framework for China's food safety control system is summarized in appendix 1.

3．4 Food Safety Monitoring and Testing Capacities

Monitoring and testing are tools to verify the effectiveness of the food safety control system. To enhance the safety of fruits and vegetables and to respond to concerns about pesticide residues, the Chinese authorities established many laboratories at different levels of government. However, the critical issue is how to utilize these available resources efficiently and effectively. Many agencies at the state and local levels are engaged in monitoring. In many cases, the same testing is repeated for one product by various agencies, which causes serious waste of time and resources. Because there is little coordination among these agencies, the returns from their efforts are much lower than desirable.

There is a great focus on testing for exports, because the government and exporting companies face strict requirements from importing countries. In contrast, very few services are available for the primary production stage, especially to test soil, water, and farm inputs. Very few companies or farmers who sell fruits and vegetables for the domestic market have their own laboratories. There is little capacity for designing and verification of Good Agriculture Practice (GAP). An overview of testing capacities is given in appendix 3.

To date, the lack of availability of qualified technicians and relevant expertise is more constraining than the lack of advanced testing equipments and facilities. Equipment and facilities can be acquired immediately, but to train staff for testing takes a long time. Furthermore, staff will take even a longer time to become qualified through their working experience. For experienced staff, additional training programs are needed to update analysis technology and methods and to learn how to operate new instruments.

Pesticide residue control measures based on HACCP are more important and useful than laboratory testing capacity. It would be more effective for the industry to give priority to establish verification laboratories for process control instead of analyses or testing laboratories similar to the analyses and laboratories in government, universities, and research institutes.

Many enterprises and farmers are too small to own their own well-equipped laboratory and hire technical experts to guide food safety management. A competitive industry that complies with food safety requirements needs fee-for-service food safety testing laboratories and related technical services. Public policy should support these to avoid disincentives from unfair competition from public-sector-owned labs.

3．5 Toward a New National Food Safety Strategy

A major study was conducted for the preparation of a national food safety strategy (DRC 2004). This study synthesizes current information and statistics on China's food safety status and gives advice for policy preparation, revision of the institutional framework, and responsibilities of the various agencies. The report recommends a strategic focus on the establishment and optimization of technical systems, standardization systems, management systems, monitoring systems, certification systems, emergency reaction systems, and the legal system. To these ends, the report calls for supporting measures that guarantee and facilitate safe use of agricultural inputs; improving market access for those that meet standards; improving traceability, certification, and logo systems; developing coordinated supply chains; strengthening demonstration, education, and information release; promoting the role of the private sector, and appropriately utilizing international cooperation. The report also draws attention to the lack of comprehensive food-safety monitoring, an important area for future research and integration into the national strategy.

The study is a valuable source of information for policy preparation, and for revision of the institutional framework and agency responsibilities. However, the translation into a full strategy will require the most effort. To date, policy decisions, including action plans that set priorities and sequence implementation, still must be made. Further work also might delve into specific roles of the public and private sectors in the Chinese context. With funding from the ADB, the WHO is assisting the government through SFDA in preparing the overall food safety strategy. Several international organizations, including the World Bank, are providing support to the government in specific areas.

4 Food Safety and Supply Chain Performance

The market segments with coordinated supply chain organization and management, whether for exports or demanding urban domestic markets, make up only a small part of China's fruit and vegetable market (chapter 2). This small portion suggests that the government needs to put substantial emphasis on ensuring food safety and promoting competitiveness in *traditional markets*–which is the relevant venue for the vast majority of consumers and producers, and all of the poor.

At the same time, adequately assessing the risks and potentials of these rapidly growing market segments and promoting integrated supply chains to improve competitiveness and access to more demanding and better paying market segments can reduce poverty through the creation of more productive employment and income for the poor. If small-scale farmers can become part of such supply chains, this is another way to open opportunities and reduce poverty. Because of the potential and dynamics of these market segments, this chapter looks specifically at supply chain performance in competitiveness and food safety management.

4. 1 Small-Scale Farmer Involvement in Supply Chains

No doubt, in many cases, small-scale farmers are efficient low-cost producers, especially for labor-intensive products such as fruits and vegetables. In fact, the main strength of small-scale farmers, which comes up frequently in interviews and in the professional literature (interviews by the author and, for example, Baumann 2000, 31) is that their production costs for labor-intensive products are often 20–40 percent lower than those of large-scale commercial farms. The latter have high overhead and supervision costs, and paid farm workers generally are less motivated than are self-employed farmers. In addition, in some contexts, lack of access to land impedes the emergence of commercial farms, but not small-scale farmers, giving the latter competitive strength.

There are many well-documented cases of coordinated supply chains that successfully include small-scale farmers. A recent World Bank study documents many examples of successful coordinated supply chains between small-scale farmers and agribusinesses in transitional economies in Central and Eastern Europe (Swinnen 2005, World Bank forthcoming). In several cases, entrepreneurs have been able to serve the top end of markets while contracting small-scale farmers. In a recently launched website, FAO provides 24 examples from many countries with a wide range of conditions in which small-scale farmers are linked to markets through traders, leading farmers, companies, and cooperatives (box 5).

Box 5. Linking farmers to markets

Farmers can be linked to markets in many ways. FAO provides a range of case studies of successful linkages through traders, leading farmers, companies, and cooperatives.

For all five examples of farmer-to-trader linkages, mutual trust is an essential feature. In three cases, the linkage developed without public support, whereas two cases show the important role external support can play.

In two case studies, leading farmers have developed as trader and coordinator for linking small-scale farmers to their supply chain. Here again, trust plays an important role. In one case, support was obtained from an aid organization. Of the 8 case studies in which private companies are the chain leaders, 2 linkages developed with external support and 6 without. In some cases, problems are reported in getting suitable contract farming arrangements. Nine case studies show examples of cooperatives that have developed agribusiness lines, with and without external support. Although several cooperatives encountered problems in dealing with market risks and contract enforcement, farmers got many positive results in gaining access to new and higher-priced market opportunities.

Source: http://www.fao.org/ag/ags/subjects/en/agmarket/linkages/index.html.

Box 6 shows the history of a Thai enterprise that established a profitable supply chain system. A recent IFPRI

study shows that involvement in coordinated supply chains can be profitable for small-scale producers (Birthal and others 2005). The study did not find examples in which firms exploited their monopsonistic position by paying lower prices. On the contrary, contract producers were found enjoying the benefits of assured procurement of their produce and higher prices. These are crucial factors for maintaining loyalty among the contract farmers.

Box 6. Example of a rewarding cooperation

A Thai packing house that collected horticultural products from small-scale producers and delivered packaged products for export to an exporter received strong signals in the late 1990s from buyers in the UK that it had to upgrade to the new retail standards, British Retail Consortium (BRC)[1] and EUREPGAP. The company decided to pursue a proactive and offensive strategy. The company acquired land on which to establish good agricultural practice. It upgraded all of its facilities, introduced HACCP and ISO 9001 with external certification, and was BRC accredited in 2003. Its farm is EUREPGAP accredited. It has heavily invested in training its staff. The company shortened the supply chain by exporting directly and leaving out the exporter. The company has long-term daily delivery schedules with buyers, which enabled the company to negotiate low air-freight rates.

In 2003 the company produced approximately 35 percent of the value of its shipping on its own farms, but that share is declining. The rest it buys from small-scale farmers through a system of contract arrangements through brokers with farmers' groups and its individual members. The brokers provide technology and ensure compliance with delivery requirements. For vegetables, Good Agricultural Practice (GAP) is prescribed, and growers receive training, seeds, pesticides and other inputs. The inputs are repaid in kind. Use of inputs and production is registered daily. The farmer groups have first responsibility to control compliance with GAP requirements themselves. Farmers receive prices 20 percent higher than in local markets. At the end of 2003, the number of contract farmers was approximately 900 and increasing. The company's sales increased from US$3.3 million in 1999 to US$8.5 million in 2003 to an estimated US$11.5 million in 2004.

Source: Interviews by Sompop Manarungsan and Kees van der Meer in May and November 2004.
Note: Work on the British Retail Consortium Global Standard first began in 1996 when UK retailers realized that, on the issue of food safety, there were many advantages to sharing experience and developing robust systems. The first issue of the BRC Global Standard–Food was published in 1998. See http://www.brc.org.uk/standards/about_food.htm.

On the other hand, there are significant weaknesses of small-scale farmers such as frequent lack of knowledge about modern markets, modern technology, and proper use of modern inputs. Access to capital can be an obstacle for upgrading production for more demanding markets. Working with small-scale farmers is difficult for trading and processing companies. The product quantities are small and heterogeneous in quality; supply can be haphazard; and bulking up volume to a steady stream of product of consistent quality difficult to realize. In addition, in many cases, the organization of small-scale farmers is not easy. The culture of existing cooperatives and organizations may be an obstacle rather than an asset. Enterprises interested in stepping in to help with the organization of production and marketing face initially high transaction costs.

Because of this high risk and high transaction costs of working with small-scale farmers, exporters often prefer working with large-scale farmers or self-managed farms even though they have higher costs of production. Consequently, there is a widespread concern among development specialists that the world's small-scale farmers are excluded from coordinated supply chains.[30] The important question is whether coordinated supply chains that include small-scale farmers can compete successfully with chains that rely more on large commercial farms (Van der Meer 2004).

In fact, the involvement of small-scale farmers in China's export industry is rather limited to date. In interviews, although exporters of fresh and processed products recognized that small-scale farmers are cheap producers, they indicated that the risks and costs of working with small-scale farmers were too high. The main

[30] This fear has been borne out by a series of studies on the rapid growth of supermarkets in developing countries. These studies point to the drastic impacts of the exclusion of small-scale farmers from supermarket supply chains (Reardon and Berdegue 2002, Chen 2004, Chen 2005, Shepherd 2005).

problem that the exporters cited was lack of control of the use of pesticides. Since one non-compliant farmer can damage the shipment of a large number of other farmers, many exporters will not take the risk.

Apparently with this in mind, as mentioned above, AQSIQ and CIQ allow exports of some high-risk vegetables (such as spinach for Japanese market) only from companies that grow them on their own farms. For these crops, small-scale farmers are explicitly excluded. For other crops, the cost of working with many small-scale farmers has increased since their buyers abroad are asking for tracking and tracing. Export permits can be obtained from CIQ only for approved production plots. Since large plots are required, approval often can only be achieved through land consolidation and may effectively exclude small-scale farmers when consolidation cannot be achieved.

A second problem is that contract farming schemes are difficult to manage. Several of the interviewed companies reported problems with discipline and loyalty, and consequent financial losses. Contract farmers sometimes do not follow the prescribed technology and use of inputs, and, at harvest time, side-selling can be a major problem. Problems with managing contract farming systems can be caused by technical reasons, and by weaknesses on the farmers' part as well as on the companies' part. For some low-value products, the benefits of organizing out-growers schemes are low compared to the costs. For these products, companies have little room to offer prices sufficiently attractive to keep farmers loyal.

Experiences in Thailand and many other countries suggest that often some form of producer organization is needed for successful out-growers schemes (Van der Meer 2004, Eaton and Shepherd 2001). Such organizations play important roles in reducing the transaction costs between company and farmers and in self-surveillance of the use of inputs and delivery of product. In China, farmer-based organizations are still relatively rare. Existing government-led or enterprise-led farmer organizations (so-called "dragonheads") function well in some cases. In others, they can be obstacles to the formation of new forms of farmer-based cooperation. Regulations do not provide much scope for bottom-up initiatives. In particular, a farmer cooperative law is still under preparation.[31] Policies and entrenched views of local governments can form major disincentives. Trust between farmers and company is an important success factor, and often missing. Often, companies have no experience in working with farmers and little knowledge about different contractual arrangements that could be used. Competent, independent, and experienced facilitators who could help put together sustainable contract farming arrangements are not available.

For supplying processors and retailers in the domestic market, the food safety requirements in practice often are less strict. However, the problems of loyalty and group discipline are much the same.

Despite the general difficulties in China of including small-scale farmers in coordinated supply chains through contract farming, interviews for this report revealed a limited number of fairly successful out-grower schemes (box 7). Sometimes the conditions underlying success were very specific, such as leadership among farmers, companies and local government. Nevertheless, the examples show that, as in other countries, there are possibilities in China for including small-scale producers in modern coordinated supply chains for fruits and vegetables, provided that the policy environment is conducive and adequate support is provided. As found in other countries,[32] successful participation and loyalty require prices some 15 percent higher than prices in the open market.

Box 7. Examples of successful small-scale farmer participation in coordinated supply chains

Jinan Yinlong Foods Co., Ltd.

The company exported 8,000 MT of fresh onions to Japan in 2003 and 10,000 MT in 2004. It has contracted 500 families with an average 4 mu (0.25 ha) of land each at fixed contract prices. The harvest period is from May to June. Part of the crop is kept in cold storage and exported during the other 11 months of the year. The company receives support from government services.

Xiaotangshan Company and the informal Taoli Vegetable Growers' Association

[31] Zhejiang recently became the first province in China to promulgate a farmers' economic cooperative law.
[32] Birthal and others 2005, Van der Meer 2004.

The company provides supermarkets in Beijing with fresh vegetables. To complement its own production and with the help of the township government, the company established four associations. In August each year, the company signs a contract with specifications for variety, volume, and quality with the Taoli association. The association then goes back to its individual farmer members and signs contracts with them. The contracted price will move with the wholesale market price and is usually 10-15 percent higher. The contract also gives some flexibility in volume: the company can buy 20 percent more or less than the stated volume for any vegetable variety. This arrangement helps the company reduce the risk of oversupply. The 80 farmers grow on average 0.1 ha of greenhouse vegetables. The bottlenecks are that the association cannot be registered and that there is too much political interference.

Zhangqiu City Leek Industry Association

Zhangqiu leek (brand name Wan Xin) is famous in the Chinese market, but its export to Japan is not so successful because of the taste. In 2001 the product was certified as Organic Food by the China Green Food Development Center. In 1997 Zhangqiu City Leek Industry Association was established as a producers' organization with the support of the Agriculture Bureau of Zhangqiu (local government). The cultivated area of this association is close to 4,000 ha. Each family cultivates 0.07 ha. This association is a nonprofit organization. Its members are farmers, sales companies, and agricultural input companies. There is no capitalized relationship with this association; the members pay a fee. The main functions of the association are to provide technical information and to manage the Zhangqui Health Leek Institute.

Sanfeng Fruit Storage and Transportation Co.

Sanfeng supplies Yantai apples to Southeast Asian and European markets through Carrefour's Global Purchasing System.* Sanfeng Co. has its own 5,000-mu production base and contracts with over 2,000 farmers. Carrefour has strict quality requirements and its own quality verification system. Sanfeng's soil, water, and air quality meet Carrefour standards. The company sends technicians to help the farmers and supplies all pesticides. The farmers must follow the technicians' guidance. In the harvesting season, the company sends technicians to supervise grading. To meet EU safety standards, the company has a contract with a European company that supplies pesticides that are registered in the EU. Since the price of these pesticides is higher than domestic pesticides, apples are purchased at prices RMB 0.2–0.3 above the regular market price.

Source: Interviews by the Study Team in September 2004 and January 2005.
Note: * www.carrefour.com/english/homepage/index.jsp.

4．*2 Transport, Logistics, and Services*

In China's main production areas near the coast, road connections are relatively good, and main harbors can be reached within half a day. Handling at the harbor is generally fast and efficient. The main harbors have excellent connections with Japan and other countries.

As a result lead time for fresh produce to be delivered in supermarkets in Japan is 5–7 days. Many of the fresh products shipped to Japan–onion, leek, garlic, broccoli, and burdock–are not very sensitive, so this 5–7 day lead time is in the acceptable range. Containers with cooling are available from the shipping companies and save transshipment from trucks at the harbor. Although there is room for improvement of cold chains, road transport, and port handling, the present system for export is pretty well developed. The Shandong provincial and local governments have introduced internet-based application forms to facilitate swift export-handling procedures. Recently, there also is an increase in the availability of private services for product testing and certification.[33]

The above infrastructure means that, in the coastal provinces, individual new investors can make use of existing infrastructure and services. However, in many inland areas with good potential for growing crops for export, such facilities are still deficient and are obstacles to investors who are organizing production for export.

There is very little export of fresh products from China by air since most of their unit values are too low for

[33] Examples of recently established services with reported international accreditation are the Qingdao Cheng Yu Research Institute Food-Safety and Sino Analytica, also in Qingdao.

this to be profitable. Only Beijing, Shanghai, and Guangzhou are well equipped to handle fresh product efficiently. Airfreight cost is high. To date, the freight from Shanghai to Narita in Japan is US$2.10/kg, which is affordable only for high-value products such as matsutake mushrooms and some off-season products with wholesale unit values in Japan of at least US$6/kg.[34] Prospects for expanding export by air are limited to high-value products, mostly off-season, which require a short lead time. Prospects also depend on reduced freight rates and improved handling facilities at airports. Since Europe and Japan are importing large amounts of fresh vegetables by air, mainly off-season products, there may be opportunities for areas in China, especially the Southern provinces, to participate in this trade.

Post-harvest handling for the domestic market is far less favorable than for the export market. Cold chain operations for the latter have been developed only by some large manufacturers and distributors. For long-distance transport, trucks and trains with cooling facilities are the best options, but availability is still limited. Recently, some newly established distribution companies have started professional services for retailers and manufacturing companies in big cities. Rapid transport and cost reduction, accompanied by appropriate packaging and technology for preserving freshness, are very important for the domestic distribution system. Shelf-life for most fresh vegetables in supermarkets in China is only 1 day, compared to 2 days in Europe.[35] This lower shelf-life affects the profitability of fresh sections in Chinese supermarkets. However, distribution services in inland areas are still inadequate, and it takes time to establish a certain level of services needed to meet new market needs. In particular, supply chains from inland areas would become more competitive if infrastructural bottlenecks were removed. If cold chains were promoted, competitiveness of supply chains to modern retailers would increase their competitiveness *vis-à-vis* wet markets.

4．3 Food Safety Control Capacity in Coordinated Supply Chains

Food safety outcomes depend greatly on the adequacy of facilities throughout the supply chain from farm to table. Increasingly, the adequacy of such facilities is an important factor for buyers. In addition, government agencies, especially CIQ, set minimum conditions for providing export permits. With this in mind, six Japanese leek supply chains for the Japanese market were investigated to assess their food safety control capacity and effectiveness according to the HACCP principles applied to these products. The control capacity was evaluated at the farming and packing house (processing plant) stages of six export companies. Transport, wholesale market, and supermarket stages were not included in this survey.

Investigation and assessment results

The HACCP principles applied and findings for each of the supply chains are discussed in appendix 4. Table A4.1 summarizes the results from auditing the six supply chains. Scores were used for comparative purposes, but they cannot be used for quantitative purposes. General observations and conclusions are:

a. The Good Manufacturing Practice (GMP) and Sanitary Standard Operating Procedures (SSOP) applications show various deficiencies. The necessary sanitation facilities and hygiene operation procedures at the farming bases, which are preventive measures to minimize the microbial hazards, generally have not been built and developed. In many case, the packing rooms for fresh Japanese leek are poor. Some GMP/SSOP requirements are not complied with, including hand-washing, food-contact surface cleaning and sterilization, facility and equipment maintenance, temperature control, and pest control. In many cases, the packing plant and cold storage for the fresh fruits and vegetables should be upgraded. The capacities for managing food safety and plant health of private companies are different. At the level of processing, companies for exporting to the international market have the highest capacities, and they are basically able to control the safety of their products. However, at the farming level, especially among self-operating farmers and some domestic private companies, there are insufficient capacities to develop and implement a food safety system based on HACCP.

b. There is no “best” model for all supply chains, because the situation of each company and the location of its supply chain are quite different. Therefore, the food safety control systems will differ among companies.

[34] Figures are based on experts in the industry.
[35] Interview with supermarket manager in Shanghai, August 2004.

However, HACCP should be integrated in the food safety control system at all the stages throughout every supply chain.

c. Even in companies that process for export, the professional skills for food safety control (HACCP) are still insufficient, especially for plant pest prevention and control. In many cases, CIQ and other agencies have given support to establish a plan and measures for food safety control. However, sometimes the plan and measures are not suitable for the specific situations. Therefore, the company needs its own professionals to develop and implement food safety control systems throughout the supply chain.

4．4 Public Sector Roles in Food Safety Control

After food safety requirements in foreign markets became critical for market access, and in a number of cases, noncompliance led to bans on Chinese products, the government focused much of its efforts on controlling hazards and preventing trade bans. Since domestic food safety standards were lower than requirements in international markets and difficult to elevate rapidly, the government gave priority to upgrading and controlling SPS requirements for the export sector. Production bases needed to meet preconditions with regard to soil, water, and environment for obtaining export permits. Packing houses and processing facilities also became subject to export permission. Products are now tightly controlled to meet phytosanitary and sanitary requirements before being cleared for export. Individual crops can be tested for pesticide residues before and after harvesting. In case of sensitive products and markets, each lot can be tested. In many cases, CIQ even tests quality grades applicable in the country of destination. Accession to the WTO in 2002 also contributed to an urgency to implement international standards and procedures that comply with WTO requirements.

In terms of safeguarding access to foreign markets, China has achieved much in a relatively short time. However, the present control system still has several weaknesses. Further improvement deserves consideration as follows:

1. Compliance with tightening food safety requirements in international markets needs further improvement, in terms both of meeting technical and sanitary preconditions for producing and exporting entities, and of broadening the range of chemical and sanitary criteria for testing. A main finding from the World Bank study is that proactive strategies tend to give better results than reactive strategies (World Bank 2005). Proactive strategies will help to prevent additional food incidents and will boost the safety and quality image of Chinese fruits and vegetables abroad.

2. The present food control system is strongly focused on testing the safety of products at the end of the pipeline. However, this orientation is not always the most cost-effective means to secure food safety. Experiences in China and abroad show that more prevention and process control throughout the supply chain based on HACCP principles are better than heavy testing of only the end results. Many successful companies apply HACCP- based quality and safety management tools and rarely have compliance problems, regardless of what the importing countries' government agencies do.

3. The present system is strongly dominated by the government, which is understandable given the urgency it faced and the general transition to a market economy. In a more mature market economy, the private sector must take the first responsibility. At this stage, the government's role becomes more focused on (1) creating conditions under which private companies and farms can and will assume their responsibilities, (2) monitoring, and (3) inspection. Too much control raises cost and can stifle innovation. Delegating more responsibility to private companies provides flexibility to minimize costs and to innovate.

4. The relatively strong food safety controls in the export sector have resulted in a dualistic system in which the export sector is almost sealed off from the rest of the economy. Relatively few small-scale farmers have been able to participate in the export sector. This dualism can be reduced by upgrading food safety management in the domestic agricultural sector, especially in the parts that cater to the modern domestic retail and processing segments.

5. Present practices in pesticides production and marketing pose serious risks for food safety. Since small-scale farmers are more vulnerable to the sale of inexpensive but forbidden and unsafe products

and to the inappropriate use of pesticides, exporters consider them more risky partners so often exclude them. In interviews, respondents from private enterprises as well as from local government expressed concern over the situation. They felt that more could be done at the state level to enforce the laws and prosecute illegal activities.

5 Strategic Options and Recommendations to Increase Food Safety and Competitiveness and Reduce Poverty

Improvement of food safety, health of crops, and safe use of pesticides directly affect the environment and the health and livelihood of China's consumers and farmers, and therefore deserve high priority. Increased growth in the fruit and vegetable sector can contribute significantly to poverty reduction since growth creates employment and provides more income to self-employed farmers. This growth can be achieved through boosting quality and safety in the export and domestic markets. Often the export market is more dynamic and more advanced, and it provides significant spillovers to the domestic market in technology, and organizational and marketing skills. Higher quality and safety standards in export markets will enhance the image and competitiveness of Chinese products and provide better access to markets, particularly, the higher-end markets. The higher-end domestic and export markets ask for more value added and pay better prices. A significant part of this needed growth can be realized in inland provinces, which have higher poverty rates and lower wage rates than the coastal areas.

Possible trade-offs in supply

There are major potential synergies among improved food safety control, competitiveness, and poverty reduction (chapters 1 and 4). Improved food safety and value added lead to greater competitiveness, more exports, and increased income and employment throughout the supply chains. This increased employment and income will occur in locations that have good investment climate and comparative advantage for growing good-quality products. In principle, small commercial farmers in the right locations can participate. Those in isolated areas cannot, except as migrant laborers. The extent to which the poor will benefit from the synergies depends in part on how policies will deal with challenges and opportunities.

Possible trade-offs for consumers

Better food safety management will protect the population from health hazards and improve the livelihoods of the poor. Food safety control depends crucially on the way it is managed. The best effects will be realized by giving priority to high-risk hazards and avoiding costly interventions for low-risk issues. Control of pesticide use and environmental pollution are high-risk-high-benefit interventions. Abolition of wet markets and replacing them with modern market facilities may address low risks at high cost, especially for the poorer consumer. Increased end-of-pipeline inspections also may add more to cost than to food safety outcomes. Opportunities, risks, costs, and benefits do matter. Therefore, for major interventions, thorough impact assessments and cost-benefit analyses are strongly recommended.

Chapter 5 discusses options for moving in desirable directions. The private sector, including the farm sector, has the first responsibility for producing and selling safe food. However, the government sets the framework within which the private sector operates. The first section discusses the organization of public services. The second section focuses on strategic priorities in promoting food safety that typically only government can perform. The third section discusses public support for enhancing private sector capacities for achieving food safety and competitiveness. Public-private cooperation is an important option. The fourth and last section outlines particular needs for support for smallholder agriculture.

5．1 Improved Organization and Coordination of Public Services

China has a multi-agency system for food safety control. For exports the system functions effectively since one agency, AQSIQ, has a leading mandate. The system could be improved by increasing the emphasis in control to prevention through total quality management by private enterprises. In addition, it is questionable whether controlling compliance of exported products via the quality criteria of the importing country is a proper public role in a market economy. In most cases, controlling compliance could be left to the private sector, as is common practice in market economies.

For the domestic market, there seems to be much considerable overlap in the mandates of various agencies. A lack of coordination among agencies leads to administration that is costly to both government and private

enterprises because of multiple inspections and lack of effectiveness. Moreover, there often are conflicts *among* governments at various levels. It is recommended that the government strengthen coordination and reduce overlap. It is obvious, including to the government agencies concerned, that the newly established SFDA is currently too weak to perform this task.

One of the weak elements in China's public control system is conflicts of interest *within* agencies, because of potentially conflicting roles that must be performed. For instance, such conflicts exist in MOA, in which boosting production and increasing farmers' incomes can be at odds with protecting consumers' health. It is recommended that responsibilities for risk assessment, monitoring, and risk management be separated, so that they are carried out as independent activities without potential intra-agency conflicts of interest.

Such principles suggest that the Ministry of Health or SFDA are best suited to be given final responsibility to coordinate monitoring activities of food safety in fruit and vegetable markets. MOA would have the first responsibility for controlling pesticide markets and promoting GAP at the farm level. Enforcement of food safety regulations at the farm level and activities in promoting GAP for safety labels would be MOA's responsibilities. The present system with three food safety labels–hazard-free, green, and organic–is confusing to the general public and might not be optimal for the long term. One green label and one organic label, both primarily managed with technical support by MOA and the Agricultural Bureaus, would be better. In addition, there is room for various voluntary private labels that may be officially registered if requested by private entities. All labels should be independently certified by third parties under the supervision of CNCA.

5．2 Public Sector Roles in Promoting Food Safety

Improving Awareness of Food Safety among Producers and Consumers

Awareness is the fundamental factor for promoting food safety. Workers in the food industry who are not aware of the importance of hygiene will not discipline themselves and one another to meet high standards in food safety. Farmers who are not aware of the health and food safety risks of pesticides may be hard to convince to apply safe use principles. Regarding the application of pesticides, there should be awareness that improper use is dangerous and has moral aspects as well. Consumers who are not aware of the importance of safe food may not demand it from their suppliers nor be willing to pay a higher price for food safety guarantees. Farmers and enterprises that are not aware of the changes taking place in markets as a result of food safety requirements may make the wrong decisions for improving their own future.

While the awareness of food safety in China certainly has increased over the last few years, most awareness has arisen from food scandals and is limited to urban consumers. Much more can be done. The mass media can play an even more important role than they do already today. The government has important roles in educating the public about hygiene in the work place, the farm, and households; and in educating farmers about safe use of pesticides, integrated pest management (IPM), and GAP. Web-based information about food safety in general, preferably maintained by not-for-profit organizations, can bolster government's educational roles. Rapid alert systems and databases about possible health hazards can be very useful for prevention and control by the industry.

Monitoring Food Safety in Fruits and Vegetables

Monitoring is of critical importance in preparing policies, setting targets, and prioritizing supervision and enforcement measures. Reliable information about the status of food safety through the publication of monitoring results is important for public confidence in the food system. In many countries, governments hesitate to release information on food safety, especially information about undesirable results. However, lack of transparency may hamper the public's correct awareness of the situation, and, in the case of calamities and food scares, the population may lose its confidence. Transparency is another important requirement for boosting trust and image of products abroad. In the domestic market, transparency can strengthen the competitiveness of suppliers and retailers that meet food safety requirements.

The present data-gathering by the government does not provide sufficient information. There are several relevant activities by different state, provincial and local government agencies, but, unfortunately, many of these efforts lack transparency, scientific bases, comparability, and, hence, credibility. With the same effort

much more could be achieved. It is recommended that the government evaluate the sampling frames, range of items covered, referent standards, testing methods, data analyses, laboratory capacities, and management and personnel skills of these various ongoing efforts. Based on the analyses, it can develop an improved monitoring network by better integrating the efforts of different departments, and central and local laboratories, for both domestic and export markets. Monitoring activities will differ by purpose, that is, surveillance (sampling on a random basis), control (sampling on a target basis), and intensive control (fields of repeated violation). When monitoring results are sufficiently reliable, they should be made available to the public.

Strengthening Pest Management and Enforcement of Pesticide Regulations

Better control of pesticides is an important element in improving the image and safety of Chinese products in domestic and foreign markets. Effective pesticide control has substantial human health and economic benefits. It also is an important factor for market access and poverty reduction for small-scale farmers. It is recommended that the government further strengthen legislation and enforcement of production and marketing of pesticides. It also is recommended that the agrofood safety laws and regulations make it a criminal offense for companies, traders, and farmers to produce, sell, or apply agrochemical-products not approved for food production.

Enforcement will require more effort at the central level, elimination of conflicts of interest at the local level, and incentives for enforcement and prosecution. Agrotechnical extension agents often sell pesticides and other agricultural inputs, and generating "self-financing" from these activities often takes precedence over providing neutral advice to farmers. Enforcement of pesticide laws and regulations is problematic when local government officers are involved in production and trade. In many cases, local enforcement officers can do little since the sources of illegal products are in other parts of the country. It is recommended that the government implement control via tracking and tracing throughout the pesticide supply chain from production to retail.

Improving Infrastructure

The spread of fruit and vegetable growing in Southern, Western, and Northern China is important for promoting competitiveness, food safety, and poverty reduction. Many areas in Western and Northern China have agroclimatic conditions that allow for better qualities and –because of fewer incidences of plant pests–require less use of pesticides for certain crops than coastal areas. For apples, production sites in the West and North offer better qualities than the traditional production sites in Shandong because of greater differences between day and night temperatures.

The optimal location for production of particular vegetable products changes with the seasons. For example, the Inner Mongolian Autonomous Region and Heilongjiang and Jilin provinces are ideal for cultivation of summer vegetables; while Sichuan, Yunnan, and Guizhou provinces are fit for winter vegetable cultivation. Domestic and foreign retailers and food services demand year-round supply of certain products, and shifting production with the seasons from South to West and North increases competitiveness. This geographic diversification pattern follows similar developments in Africa, the Americas, Europe, and the Mediterranean.

A better spread of production over the country also is bringing more employment to areas with fewer opportunities and lower wages. In 2002 wages in various farming, forestry, animal husbandry, and fisheries employment units ranged from approximately 5,000–6,000 Yuan in Hubei, Anhui, Henan, Jilin, Liaoning, and Heilongjiang. In comparison, wage levels in similar enterprises in Shandong and Guangdong were approximately 30-100 percent higher; and in Beijing, Shanghai, Tianjin, and Zhejiang, 200–300 percent higher (*China Labor Statistical Yearbook* 2003).

In 2005 there have been newspaper reports of rapid growth of industrial wages in coastal provinces.[36] This wage growth certainly will affect the competitiveness of agriculture in these areas negatively, as was the case in Japan during its rapid economic growth of the 1960s (Van der Meer and Yamada 1990). A shift in production need not harm the old production areas in coastal provinces. These areas may lose out in competition for growing certain labor-intensive products because of their rapid increase of wages. However,

[36] The April 3, 2005 *New York Times* reports increasing labor shortages in coastal areas in the Southeast with wages for factory workers increasing to US$150 per month and free or subsidized food and housing for workers.

these areas have an advanced position in technical knowledge and experience in logistics and international trade, and they may strengthen this core role by providing services to other regions.[37]

China still has many infrastructural obstacles to *market access,* which discourage expanding the production of fruits and vegetables in the Western and Northern parts of the country. It is recommended that the government, in consultation with the private sector, identify the areas that have comparative advantage and target them for investments in priority infrastructure and services needed to develop fruits and vegetables for export. In particular, transport, cold chains and business services deserve attention. To date, there have been large losses of product and missed opportunities, especially for leaf vegetables, because of the lack of cold chain facilities. Crop and post-harvest technologies that work well in the coastal areas will need refinement in the inland areas. Since taste and demand in buyer markets are the driving factors, specific adjustments will be needed for product-market combinations. In many cases, applied technological research can best be led by the private sector. Principles followed in China Agricultural Technology Transfer Project financed by the World Bank could be applied.[38]

Efforts to solve phytosanitary constraints

The review of pending phytosanitary issues with Japan suggests that China has possibilities for expanding its *market access* (box 4 and appendix 7). The long-term amount of additional trade made possible by removal of bans on imports could amount to hundreds of millions of US$. These possibilities are not limited to Japan. Opening more markets will require a joint effort by China's public and private sectors, successful management of phytosanitary risks, cooperation with other countries, and multilateral and bilateral negotiations.

Education and training

More skilled staff are needed to manage food safety and supply chains, especially in the private sector. This need could be met by establishing a number of specialized centers and training programs in universities and research institutions. One or a few expertise centers could be effective in promoting the formation and strengthening of coordinated supply chains. The role of a center would be to provide intermediating services, collect and disseminate information on good practice, and coordinate applied research. Partnerships with institutions in industrial countries will accelerate these efforts and contribute to the quality of work.

5．3 Support for Building Private Sector Capacities

Principles for supporting the private sector

Private sector capacities are crucial for the development of production and export of fruits and vegetables. Ultimately, many services to the private sector can be provided by specialized private enterprises. However, China is at the initial phase of supply chain development, and such services, generally called business development services, are still weak. Strengthening private sector capacities is important for the healthy functioning of private enterprise, but the Chinese government still competes with emerging market services (World Bank 2004b). It is recommended that the government provide its support in such a way that service delivery and development of market services occur simultaneously.[39] This recommendation implies that support is given in ways that do enhance the functioning of markets, often in the form of matching grants[40] to the investing enterprises rather than through public sector delivery at subsidized rates.[41] Support for private enterprises also should be of limited duration, for example, an upfront, one-time investment cost rather than regular inputs such as credit and agricultural inputs. Provision of goods and services with public goods characteristics that have spillover effects to other enterprises deserves priority (World Bank 2004a, *Agriculture*

[37] The experience of the Netherlands in the European context provides useful lessons. Under increased competition from producers in Southern Europe, vegetable production in the Netherlands had to adjust its product mix, but it has been able to maintain its core role in technology, logistics, and international trade.

[38] See World Bank, China Agricultural Technology Transfer Project, Project Appraisal Document 2005b.

[39] The principles for such support are elaborated in Committee of Donor Agencies for Small Enterprise Development 2001 and Phillips 2001.

[40] A matching grant is a subsidy for a percentage of the investment cost.

[41] Van der Meer and Noordam 2004.

Investment Sourcebook, Module 6). The World Bank's China Agricultural Technology Project provides good examples of targeted grant support.

Targeted support in the form of matching grants can be given to train specialist staff in new areas of expertise, improve GAP and GMP, introduce HACCP in targeted areas throughout the supply chain, introduce private accreditation and certification schemes, and perhaps develop private laboratories and advisory services. The India spices case provides an example (box 8).

Box 8. Private sector support for food safety and quality of spices in India

India is the world's largest producer and consumer of spices as well as a lead exporter. The Indian spice trade has earned a reputation for product quality and marketing services and faces evolving regulatory and market changes. The public sector plays a role in research, testing, food safety enhancement, training, and awareness-raising. The government has implemented many changes in production and processing for export in response to rejection of exports by importing countries.

The Spices Board of India, a Government agency, has used small grants to accelerate companies' food safety compliance capacities. Between 1998 and 2001, the board provided 16 companies with 50 percent of the cost associated with ISO 9000 or HACCP accreditation. Between 1997–98 and 2001–02, the Spices Board also provided grants to some 49 companies, covering up to 50 percent of the costs for setting up or improving laboratory facilities. These grants were approximately $7,000 per company. The matching grants are most effective if they are given to the investor, who then can decide where to buy the service.

Support also is given to improve the quality of smallholder output. For example, in the late 1990s/early 2000s, the Government distributed improved drying mats at two-thirds cost to 68,000 farmers and cement drying mats were constructed in other areas. Private sector investment in food safety is significant and was much higher than public sector investment: from the mid-1990s to 2003, the private sector was estimated to invest 78 percent of a total of US$14.5 million investments in enhanced food safety and testing.

Changes continue to be made in production, post-harvest, and processing practices and technologies; in quality assurance and supply chain management systems; and in monitoring and testing products. The industry—via effective private and public sector collaboration—also is actively engaged in discussions at the international level to influence the "rules of the game" for the trade in spices.

Source: Jaffee, "Delivering and Taking the Heat: Indian Spices and Evolving Product and Process Standards," 2004.

Upgrading quality and image

Most of China's food products must compete on low price. Their international image is generally weak, resulting in price discounts. Discounted prices certainly are the case for most fruits and vegetables. Food scares and bans for Chinese products have contributed to image problems for Chinese products and to relatively low prices. Foreign markets will remain highly sensitive to food safety, and international requirements are likely to proliferate. In addition, wage rates—the basis for the present low-cost strategy—will likely rise significantly in coming years.[42]

Hence, China's low-cost strategy deserves modification, at least for the more developed coastal areas. Kenya and Thailand provide interesting examples. Faced with relatively high costs for its horticultural exports to Europe, Kenyan exporters successfully upgraded the quality and value added of their products (Jaffee 2003). Coping with tightening food safety requirements and higher labor costs, Thai exporters did the same with their exports to Europe and Japan (Manarungsan 2005). Peru shows an interesting example of public-private cooperation in boosting quality and technology of asparagus production (box 9). Globally, public-private-led institutions have played a successful role in boosting quality and image in export markets.

[42] Wage rates can rise nominally or through an appreciation of the RMB. Either route would have the same effect.

Box 9. Public-private cooperation a main factor of success of Peruvian asparagus exports

From 1994 to 2003, the exports of asparagus in Peru doubled to US$200 million, and Peru has become one of the leading global asparagus exporters. Climatic conditions allow for year-round production, which is an important competitive strength. However, cost of air transport for fresh asparagus to markets in North America and Europe are high, and high cost implies that only good-quality asparagus can compete in these markets.

Public-private cooperation has been an important factor of success for the sector through the establishment of two institutions: the Peruvian Asparagus and Vegetable Institute and the Air Cold-Chain Association (Frio Aero Asociación Civil). The cold chain association has played a major role in quality control, especially for smaller exporters, through investment in modern facilities and developing and introducing quality standards. Its quality standards are partly voluntary but are well correlated to international standards such as those of the CODEX Alimentarius. The Asparagus and Vegetable Institute has promoted applied technology such as Good Agricultural Practice, variety improvement, and pest control through integrated pest management (IPM). All of the factors that have contributed to the success of Peru's asparagus industry have promoted public-private alliances. These include the creation of private sector associations, capital investments, and the introduction of modern technology and quality assurance. Strong leadership roles in the private and public sectors have been critical in generating consensus-building mechanisms among producers, processors, exporters, and the government. At present, many companies have introduced quality management systems such as HACCP and ISO 9000, and EUREPGAP is applied by many growers.

Source: O'Brien and Diaz Rodrigues, 2004.

A consistent strategy of improving quality and reliability that will gradually result in trust and higher prices is the cornerstone for improving long-term competitiveness. If China could increase its export prices for fresh and processed fruits and vegetables by 5 percent, it would earn an additional US$225 million per year. Crucial for this strategy is preventing additional food incidents. Prevention will require higher technical and sanitary preconditions for producing and exporting entities and proactively broadening the range of chemical and sanitary criteria for testing. After these control measures succeed, they could be followed by targeted promotion campaigns abroad. Subsequently, the stronger, well-performing companies may develop successful commercial brands with good quality and safety images in international markets.

Supply-chain organization and management

International and Chinese experiences show that *coordinated and integrated supply chains are crucial for participation in modern food markets.* The more sensitively products are controlled for quantity, quality, and safety, the higher the returns for supply chain coordination. Higher returns are particularly the case for top-end perishable products for export. Hence, the ability to organize and manage coordinated supply chains effectively and efficiently is an important determinant of competitiveness in these markets. In the global fruit and vegetable markets, increased competitiveness generally will result in better market access, more value added, and more employment.[43]

In industrial countries also, coordinated supply chains are the most important tool for food safety control in markets for high-value fruits and vegetables (World Bank 2005; Willems, Roth, and Van Roekel 2005; Jonker, Ito, and Fujishima 2005). The well-established supply chains with independent accreditation and certification, such as under BRC, EUREPGAP, and many other food safety management schemes of global buyers, are able to meet high food safety standards with limited direct public sector interference. Therefore, it is recommended that the Chinese government enhance the formation and functioning of coordinated supply chains.

To date, in China, a relatively small percentage of the volume of fruits and vegetables is handled by coordinated supply chains, but in value the share is bigger. In the years ahead, the share in volume and value will increase rapidly. Coordinated supply chains and safety management programs are the primary responsibilities of private enterprises and their partners who set them up and manage them. Proper government support should focus first on a good investment climate for coordinated supply chains, especially legal and

[43] The World Bank (2005) found that upgrading quality and safety management generally results in more employment and better employment conditions.

regulatory issues, infrastructure, a skilled labor force, and relevant business services. In a recent report, the World Bank (2004b) listed various weaknesses in the investment climate that are of direct relevance to the performance of coordinated supply chains:

- Local governments conduct too many inspections of businesses.
- Transportation and logistics are high in cost and poor in services.
- In some cases, too much involvement of local governments has hindered the development of coordinated supply chains and business development services.
- Farmers' associations are underdeveloped.

The present study found that China has shortages of skilled laboratory staff, food safety technicians with relevant knowledge of HACCP, and pest management technicians for on-farm work. There is also a shortage of specialists with knowledge and experience in setting up coordinated supply chains, developing sustainable arrangements among partners in the chain, and making suitable arrangements for contract farming. In cases in which small-scale farmer participation is wanted, special expertise is needed to work with producer organizations. At present, there is insufficient information-gathering of good experiences and obstacles with coordinated supply chains in the fruit and vegetable sector in China. In many cases, there is a role for independent professional experts to facilitate the formation of coordinated supply chains by bringing in experience from elsewhere and creating trust among the partners.

It is recommended that China fill its gaps in skills and knowledge by strengthening special training and research programs.[44] A center in the field of coordinated supply chains could play an important role in supporting projects to form and improve the performance of coordinated supply chains, and gathering and disseminating information from experiences. It could specialize in this kind of work as well as play an important role in coordinating efforts in research and education. A good option would be to seek strategic cooperation and partnering with a few specialized institutions in industrial countries. Partnering would speed up the efforts to fill gaps in capacities and bring in high-quality expertise and international experience.

Support for formation of coordinated supply chains

Although the formation and strengthening of coordinated supply chains is basically a private responsibility, there are several reasons for the government to enhance the process. In China's export sector, integrated and coordinated supply chains are already common practice. Many of them receive valuable support from foreign commercial partners, but many also need public support to optimize their competitiveness in international markets. Currently, information about possible supply chains arrangements and good practice in this field is limited in China. It is recommended that the government step up its support of training, facilitation, and dissemination of experiences. The government could give priority to strengthening the participation of small-scale farmers in coordinated supply chains and to upgrade successful supply chains in the domestic market for export.

West Thailand offers an interesting example of public-private support for expanding export horticulture through coordinated supply chains and contract farming. Several private companies had been able to set up export of horticultural products to high-end markets in Europe and Japan. These companies entered into a partnership with Thailand's agricultural university and local government to share information and technology and to reduce cost (box 10). Another company in the same area—foreign owned—has a strategic partnership with the Department of Agricultural Extension for provision of technical support for its contract farming.[45]

Box 10. Thailand Western Region GAP Cluster

In 2002, after several Thai companies had shown that small-scale farmers under contract-farming arrangements can succeed in being included in supply chains for exports of vegetables such as asparagus, baby corn, and okra, stakeholders set up a partnership to expand this model. The partnership, named Western Region GAP (Good

[44] Some institutes have already made efforts to strengthen their capacities in this area. Personal communication from Professor Huang Zuhui, Zhejiang University's MBA program.

[45] Interview by Kees van der Meer and others, May 2005.

Agricultural Practice) Cluster, includes private exporters, distributors, private input companies, farmers, government services, and Kasaetsart University. The objective of the GAP Cluster is to seek synergy in ensuring safety and quality production from farm to table. Kasaetsart University helps in identifying Good Agriculture Practice; solving problems in the field; and developing training courses for farmers, farm advisers, and farm inspectors.

Companies take the lead in initiating training courses, since expanding contract farming schemes depends on their ability to identify markets. Company staff, university staff, and officers of government services jointly provide the training courses, which are financially supported by government grants. Training facilities are provided by the university. With the grant funding from government, the cluster provides synergy among the cooperating stakeholders by reducing high costs and technical limitations that individual companies otherwise would face. In this way, more small-scale farmers have access to profitable supply chains.

Source: Based on interviews during a study tour in May 2005 by Kees van der Meer, Sushma Ganguly, and Gajan Pathmanathan.

Most coordinated supply chains for the domestic market are still emerging and weak. Support could be given to set up coordinated supply chains. Box 11 provides an example of approaches to supply chain formation. Other elements deserving of support would be successful management of food safety, quality, and shelf life, and organization of small-scale producers. By taking these actions, the domestic coordinated supply chains can become an important means to improve food safety in cities. Furthermore, because of the increased value added, the supply chains will create more income and employment than the traditional wet-markets they replace.

The public sector can enhance the formation of coordinated supply chains in four ways:

1. Cost for investors in setting up and operating coordinated supply chains will be reduced if the investment climate is good–infrastructure, contract enforcement, public and commercial services–and if there is public support for high set-up costs for training and for the development of applied technology (World Bank 2004b). There is a need for adequate laws, regulation, and enforcement necessary to do business, in particular, in food supply chains in which small-scale producers are involved. As stated before, important areas of attention are regulation of markets for pesticides. However, property rights and contract enforcement also deserve attention.
2. Independent facilitators—honest brokers—have a role to help overcome lack of experience and lack of trust among enterprises and farmers. Experience and trust can be facilitated by contributing well-documented information about arrangements and experiences that have worked elsewhere, and tailoring arrangements to specific needs.
3. Revision of legislation and regulation is needed to allow and promote independent producer organizations. Support for independent producers' organizations, training in leadership, and education about modern markets can be helpful.
4. Support can be given for the development of good agricultural practice (GAP), good manufacturing practice, improved technology, and training. Since the results are directly correlated with market success, it often may be a good strategy to let the chain leader take the initiative and share the part of the cost, which otherwise would fall completely on the farmers.

Box 11. Approach for support of the development of coordinated supply chains

The World Bank has developed and is piloting an approach to supporting the development of coordinated supply chains. A team responsible for such support in a given country usually consists of international and national specialist(s) in agricultural supply chain development, agribusiness, and marketing. The team's work starts with a general preparatory assessment of the feasibility of coordinated supply chains, given strategic factors such as development of the export and national consumer markets, value added that can be gained for different products and market segments, feasibility of creating producer organizations, trust, and loyalty (Van der Meer 2004).

Based on this assessment, the following steps are taken:

- Identify a number of opportunities for selected products to develop profitable coordinated supply chains based on market opportunity and competitiveness.
- Prepare supply chain development strategies for these products and estimate the institutional and investment requirements for farmers and processors to compete effectively in the domestic and/or international markets for the products.
- Identify private businesses with good reputations and interest in investing in the development of coordinated supply chains involving smallholders to serve the top end of export and domestic markets directly or through agro-processing companies.
- Check the qualifications of these businesses in terms of business experience, access to markets, reputation, technology and capitalization.
- Discuss with private businesses how supplies could be regularly procured and explore the possibilities of forming producer groups to work with processors and traders to ensure reliable supplies.
- Evaluate the opportunities and risks for the identified supply chain options by using an analytical framework for screening (as suggested in Van der Meer 2004)
- Identify activities eligible for project grants.
- Prepare criteria for evaluation of proposals.
- Identify (an) independent facilitator(s) to help make suitable contractual arrangements among private businesses, producer groups, individual producers, and other public and private parties involved in the supply-chain arrangement. The facilitators will provide support over 1–1.5 years.

Normally, the output is a report detailing the planning for the development of the selected agricultural supply chain options (in line with the responsibilities listed above) and describing the recommended strategy to help small producers participate in these supply chains.

Source: Derived from Terms of Reference for the World Bank's coordinated supply chain pilot in Bosnia.

Business development services

The industry needs fee-for-service food safety testing laboratories and technical services. Such laboratories preferably should not be operated by government organizations, universities, or institutions for scientific research, but by private enterprises or industry associations. These services can help the industry to meet regulatory requirements from farm to table. These kinds of services also could supply technical advice to assist the industry and farmers, and facilitate cooperation throughout the supply chain. They might apply knowledge from various public and private sources. The government could provide some support to speed the establishment of these kinds of services. However, government laboratories that provide similar services to enterprises on a fee-for-service basis can undermine the development of private service providers if they use public resources to compete with private labs.

Private certification services are an important part of business development services. Certification commonly is requested by private clients, who need independent judgment about compliance. These kinds of certification services differ from private technical advice. Certification services may not be qualified to provide technical assistance, and they also may have conflicting roles in advice and certification. Government can encourage the development of legitimate private certifiers.

Roles for trade and industry associations

The World Bank (2005) found that public-private cooperation is one factor of success in managing food safety. Therefore, a special area of importance is the development of professional trade and industrial associations, which can provide support to their members and serve as sources of information for their members and the government. It is recommended that the government organize periodic consultations with such associations on issues of food safety and competitiveness. Targeted grants can be provided for certain activities carried out by private associations in the fields of training, market development, and promotion of food safety.[46]

[46] Regarding the wider role of traders' associations, see Shepherd 2005b.

5. 4 Support for Smallholder Agriculture

More than 90 percent of the volume of fruits and vegetables in China is produced for *traditional local markets*, largely by small-scale producers. This segment is characterized by low safety standards, little grading, irregular heterogeneous supply, and low prices. It employs large numbers of poor farmers and workers and, because of its low prices, plays a unique and essential role for poor consumers. Ultimately, in the process of economic development, this segment will disappear. However, for many years to come, it will remain the biggest domestic supplier of fruits and vegetables. In the interim, what can be done to promote food safety and reduce poverty? Transformation of the traditional sector can be accelerated by improving its standards and by enhancing the shift of suppliers from this segment to the *modern urban domestic markets.* Actions in four fields can improve the situation and narrow the gap between traditional and modern markets.

1. Better protection against illegal and improper use of pesticides is of particular importance to the traditional market segment. Detecting improper and illegal use of pesticides will require improved enforcement of regulations and more surveillance on farms and in local markets. Farmers need assistance in the proper use of pesticides. IPM training approaches such as those introduced in China by FAO are successful examples.
2. Local market facilities can be improved and hygiene promoted. However, the abolition of wet markets, or expensive modernization could harm poor producers and consumers.
3. Support can be given for applied research to improve technology and establish GAP for local conditions. Universities; research stations; the county-, township-, or village-level technical service, and private providers can help farmers adopt GAP and solve technical problems.
4. Support in the form of training and technical assistance through facilitators could be given to producer organizations that aim at better handling their crop, promoting quality and safety, and improving marketing links. Finally, there will be cases in which the modern domestic or export sector is looking for opportunities to expand and seek to engage small-scale farmers. The approach for this kind of assistance is described in box 11. There are successful models in China. However, the majority of farmer associations in China still depends on local governments or are led by agroprocessors rather than farmer-based organizations. A World Bank project in Colombia is providing support to link farmer groups to private enterprises (box 12). Many of the participating farmers are close to subsistence. Yet, the linkage has proven possible in many cases.

Box 12. Productive partnerships: Colombia

In 2000 the Colombian Ministry of Agriculture and Rural Development (MARD) created the *Proyecto Apoyo Alianzas Productivas* to establish productive partnerships between organized small-scale farmers and the private sector with the support of public entities, and NGOs.

During 1999–2000, 6 prototype partnerships were developed, including approximately 400 small-scale farmers and 6 agribusiness firms, and a variety of products. The experiences generated through the prototype partnerships provided the building blocks for the project design.

The objective of the project is to generate income, create employment, and promote social cohesion of poor rural communities in an economic and environmentally sustainable manner.

The project has two components. The first component finances technical assistance (TA) and training for activities associated with information sharing, mobilization and screening of interest, pre-investments, ex-ante evaluation of detailed productive partnership subproject proposals, and studies. The second component supports the implementation of productive partnerships through financial incentives for participating small-scale farmers' producer organizations and TA and training to productive partnership participants.

A productive partnership is any collaborative arrangement between a small-scale farmer-producer organization and an agribusiness firm that aims to create a win-win situation for all participating parties. Members of producer organizations obtain access to markets, critical inputs, and/or working capital. Typical advantages for agribusiness firms include opportunities to expand food processing activities by securing supplies from small producers that meet certain predetermined quality standards. The role of the public sector is focused on providing incentives in the form

of seed capital to build the asset base of the participating producer organizations.

Lessons learned from the Columbia project have been:

1. The characteristics of the production chain determine the complexity of the agreements.
2. Management arrangements and conflict resolution mechanisms must be clearly defined.
3. The quality of the pre-investment studies and the monitoring are important for success.
4. Commercial partners participate actively when (a) the partnership is relevant to their current activities; (b) they perceive a win-win situation; (c) they can fulfill their social responsibility; and (4) they can access new productive areas that, without the partnership, would not be available.

This project, which will finish in 2007, so far has made the following main achievements:

1. By mid-2005, close to 12,500 small-scale farmers are participating in productive partnerships.
2. The concept has gained regional and national credibility.
3. The concept has gained an image of transparency and technical capability.
4. Some regional governments have adopted the model.
5. Small-scale farmers have changed their attitude toward government and have learned a new business language.

Sources: World Bank and MARD 2004.

Appendix 1. China's Food Safety Control System

Current Laws and Regulations

In 1982 the *Food Hygiene Law of the People's Republic of China* was formulated (for trial implementation). The law was adopted at the 16th Meeting of the Standing Committee of the Eighth National People's Congress on October 30, 1995. A basic *Food Safety Law* is still being considered. The aforesaid law established the system of China's domestic and import and export food administration and supervision. It also brought food safety within the orbit of legislation. At present, relevant laws concerning food safety mainly include:

- *Food Hygiene Law of the People's Republic of China*
- *Product Quality Law of the People's Republic of China*
- *Agriculture Law of the People's Republic of China*
- *Law of the People's Republic of China on Animal Disease Prevention.*

Current regulations concerning food safety mainly include the following:

- *Administrative Regulations of the People's Republic of China on Veterinary Medicine*
- *Administrative Regulations of the People's Republic of China on Feeding Fodder*
- *Administrative Regulations of the People's Republic of China on Pesticides*
- *Administrative Regulations of the People's Republic of China on Breeding Stock and Poultry*
- *Administrative Regulations of the People's Republic of China on Foodstuff Circulation*
- *Administrative Regulations of the People's Republic of China on Safety of Agricultural Genetic Modified Organism*
- *Administrative Regulations of the People's Republic of China on Pig Slaughter.*

Government Administrative System

According to relevant Chinese laws and regulations, seven governmental organizations are involved in animal and plant health protection and food safety control:

1 .*State Food and Drug Administration.* SFDA is responsible for supervising and coordinating food safety, and handling serious violations of China's food safety requirements. SFDA was recently created from the former State Drugs Administration. This new entity represents the State Council on the safety of food, health products, cosmetics, medicines, and drugs. Through this agency, the Chinese central government aims to achieve better management and control of food safety in China. Under SFDA, there are three departments related to food safety: the Policy, Law and Regulation Department, the Food Safety Coordination Department, and the Food Safety Supervision and Inspection Department. SFDA's general responsibilities in relation to food safety are to organize the relevant government departments to draft laws and regulations; develop safety control policies and working plans; and supervise the enforcement of the laws, regulations, policies, and working plans. SFDA is authorized by the State Council to investigate and penalize any food safety incidents, to perform food safety examinations and evaluations, and to disseminate food safety information.

2. *General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China.* AQSIQ is responsible for the supervision of food production and processing, including quality and food safety issues. There are several departments/bureaus under AQSIQ. The most relevant to food safety are the Bureau of Food Safety for Imports and Exports, the Department of Quality Supervision, and the Committee of Standardization. In addition, the Administration of Certification and Accreditation (CNCA) (see 6. below) is affiliated to AQSIQ. AQSIQ is responsible for:

    - Drafting and enforcing laws, regulations, and policies concerning food hygiene and safety
    - Reviewing, approving, and issuing the national food hygiene standards for all foodstuffs, including fruits and vegetables

- Coordinating and guiding the formulation of the state and local/provincial standards, and managing and registering state and local standards.

See Appendix 2 for additional details.

3. *Ministry of Agriculture*. MOA is responsible for the supervision of primary agricultural production, including food safety and plant health protection. The departments involved in safety of fruits and vegetables are the Department of Agricultural Regulations and Policies, the Department of Market and Economic Information, the Department of Crop Farming Management, and the Environmental/Green Food Development Center. MOA has responsibilities for drafting and enforcing laws, regulations, and policies related to food hygiene and safety. In recent years, MOA has taken the following concrete measures to improve food safety:

   - Issued a number of policies on the administration of food safety, including the establishment of a market-entry permit system, development of green/environment-friendly food, and administration of hazard-free agricultural products.
   - Invested in infrastructure for food safety testing and inspection and developed methods for rapid testing and inspection.
   - Tightened control over the use of agricultural inputs. For instance, it has forbidden the application of highly toxic and high-residue pesticides to vegetables and has abolished some highly toxic and high-residue pesticides.
   - Formulated over 400 state-level standards for agricultural products and over 1,000 ministry-level standards, including 73 for hazard-free agricultural products.

   MOA also oversees the production and marketing of pesticides and veterinary drugs according to the *Administrative Regulations of the People's Republic of China on Pesticides*. The Agricultural Bureaus of local governments are responsible for enforcement of this regulation. MOA is the agency responsible for the animal health, animal disease, and phytosanitary regulation and enforcement in China, with the exception of quarantine at the entry and exit stages, for which AQSIQ is responsible.

4. *State Administration on Industry and Commerce.* SAIC is responsible for the supervision of food circulation. It monitors and manages all market places, both wholesale and retail. SAIC has relatively little technical capacity in food safety, and it is possible that its role might phase out as China's market economy matures.

5. *Ministry of Health*. MOH is responsible for the supervision of food services including canteens and restaurants. MOH also is responsible for drafting laws and regulations and formulating policies on food hygiene issues and establishing food hygiene standards at the ministry level. It is the department in charge of setting food sanitary standards, including MRLs of some hazards such as heavy metals; pesticide residue levels according to risk assessment; and MRLs for pesticide residues in agrifoods. At present, an Agri-Product Safety Law is under preparation; the Ministry of Agriculture is taking the lead. It is being considered that MOA might take the responsibility of setting MRLs of pesticide residues with the collaboration of MOH.

6. *Certification and Accreditation Administration of the People's Republic of China*. CNCA is responsible for the supervision of national certification and accreditation by formulating regulations and policies on certification and accreditation in relation to food hygiene and safety; for reviewing, inspecting, and approving certification institutions; and for registering certification staff and institutions (appendix 2).

7. *State Environment Protection Agency*. SEPA has some responsibilities related to food safety. It is responsible for drafting laws and regulations on behalf of the State Council and for formulating policies and development plans on pollutants, such as in the air, water, and soil, that might contaminate fruits and vegetables during production, processing, and marketing. In 1994, as part of an environmental protection movement, SEPA established the Organic Food Development Center to promote and popularize organic food in China. Acting on behalf of the government, the center certifies state-owned enterprises, private

companies, and individuals as organic food producers, processors, and/or marketers. The center is a member of the International Federation of Organic Agricultural Movements (IFOAM) and adheres to IFOAM's standards. From the beginning of 2005, CNCA supervises organic food certification activity. Under CNCA, any qualified certification body in addition to this center can conduct this activity. CNCA decides whether an agency/center is qualified and supervises its certification.

Regarding the food safety issues for fruits and vegetables, in addition to the key institutions mentioned above, the National Development and Reform Commission (NDRC), Ministry of Finance (MOF), Ministry of Science and Technology (MOST), Ministry of Public Security, and Ministry of Education all are involved.

China's MOH and MOA are the focal points for the CODEX Alimentarius. The MOA is the focal point for IPPC and OIE. The Ministry of Commerce coordinates with WTO. AQSIQ houses the technical barriers to trade (TBT)/SPS notification and Enquiry Point.

Enforcements and Actions

On March 15, 2002, the National Development and Reform Commission, the State Economic and Trade Commission, and the Ministry of Agriculture jointly issued *The National Development Plan for Food Industry during the Tenth Five-Year Period*. This plan proposes to ensure quality and safety in food production and processing by means of a market-entry permit, which includes practice audit, quality and safety license, compulsory inspection, and affixing labels.

After a trial implementation in 4 municipal areas in 2001, in 2002 MOA implemented a nationwide *"Hazard-free food action."* Its main purpose is to improve the safety level of agricultural products by developing hazard-free food standards and supervising the entire food chain. This action actually involves a kind of voluntary certification, which can be made only by MOA's agencies.

In accordance with the recommendation made by WHO, in August 2003 MOH issued the *"Food Safety Action Plan."* This plan is designed to establish a relatively complete food safety legal framework and standardization system in the next 5 years and to effectively improve monitoring and warning networks for food contamination.

In 2003, with cooperative efforts from eight other departments, the State Food and Drug Administration implemented a *"Plan of Constructing Food Safety Reputation Credit System"* and *"Food Safety Reassurance Project."*

In 1999 the Ministry of Commerce and 10 other departments launched the *"Three-Green Project,"* which is the short form of advocating green consumption, cultivating green markets, and facilitating transportation of perishable agrofood products.

On July 18, 2003, AQSIQ issued "*Regulations of Quality and Safety Supervision and Control of Food Production and Processing Enterprises*."

"Qualified and Safe" (QS) certification is a market-entry permission system formulated by AQSIQ in 2003, following the regulations above issued by AQSIQ. China officially started to use Quality Safety (QS) label for its food quality and safety in January 2004. Production and processing will be prohibited without food production licenses for the following 5 categories of food: rice, flour, vegetable oil, soy sauce, and vinegar.[47] In 2005 the market entry system is being extended to another 10 kinds of foods, including canned foods and cooked meat.[48]Any product from these categories without a QS label is not allowed to be removed from the factories nor sold into the marketplace.

This food quality and safety program has three dimensions: (1) implementation of the inspection system, (2) implementation of a food production licensing system that is necessary to guarantee the quality and safety for food manufacturers and food processing firms, and (3) implementation of a compulsory inspection system for foods. The last dimension is to implement the market entry permit system to food in conformity with QS requirements. A QS label must be placed on foods that satisfy the inspection requirements. Before October

[47] This regulation does not yet apply to fruits and vegetables.
[48] See < http://news.xinhuanet.com/english/2005-02/22/content_2602733.htm>.

2003, the department under AQSIQ responsible for these QS marks had issued food licenses to 11,260 different manufacturers.

Standard System

Currently, China has in operation approximately 3,000 food quality, hygiene, and safety standards. Approximately half of these are international standards. To closely parallel international standards and WTO principles, the Chinese government is endeavoring to expedite re-evaluating and reducing the number of the present standards based on the principles of unification, and scientific, advanced, and logical methods. The Ministry of Health has invited experts to revise systematically 464 national standards concerning food hygiene and the inspection method. Among these, 237 revised food hygiene inspection methods were released in 2003, and 77 standards were released in 2003, for a total reduction of 150 regulations.

Private Sector

Food establishments have the first legal responsibility for food safety. Many large and medium establishments have successfully executed controls of raw materials and ensured the safety of final products. Most establishments set up their own food safety management system according to *Sanitation criteria for food establishments* (GB1488-94) and 16 other sanitation criteria for food establishments**.** Full-time and part-time food safety and quality inspectors are employed to ensure safety across the production chain. Many enterprises, especially large ones, actively establish and implement GMP and HACCP management systems for total quality control in food production and handling. Almost all of these establishments already have built microbiology examination laboratories and are equipped with pesticide-residue testing instruments, either fast-test kit or gas chromatograph/high-performance liquid chromatograph (GC/HPLC) for quantitative analysis.

Some leading fruit and vegetable exporting companies set up their Farm-Base Department to manage and control the raw material safety at the farming, harvesting, and collecting stages.

At the on-farm stage, AQSIQ and CIQ require that some high-risk vegetable (such as spinach for Japanese market) packers and processors have own farming bases (managed by themselves) to control pesticide residues effectively. These farming bases are registered by CIQ just as plants or packing establishments are.

The contracted farming bases also could be registered with CIQ according to the relevant standard as specified in "*The Details for Registration of Vegetable Planting Bases for Export***".** Companies or packers are required to collect raw materials only from registered farming bases. However, this system can be used only for relatively lower risk vegetables.

The control pattern in small enterprises rests primarily on inspection of final products. Some family businesses have not realized the significance of safety and hygiene control. The safety and hygiene levels in enterprises in cities are much higher than those in towns and counties. According to a survey carried out in 35 enterprises in Heilongjiang Province, Zhejiang Province, and Inner Mongolia, 31 have set up a HACCP system. Twenty-one set up according to the national criteria, and 10 enterprises have obtained certification. Twenty-two enterprises also have gotten ISO 9001 certification.[49]

Farmers commonly receive the knowledge and skills to manage production to comply with exporting requirements from companies or packers. At present, the possibilities for HACCP-based GAP systems are under consideration. GAP implementation by farmers in China has a long way to go, even for the exporting sector.

Certification System

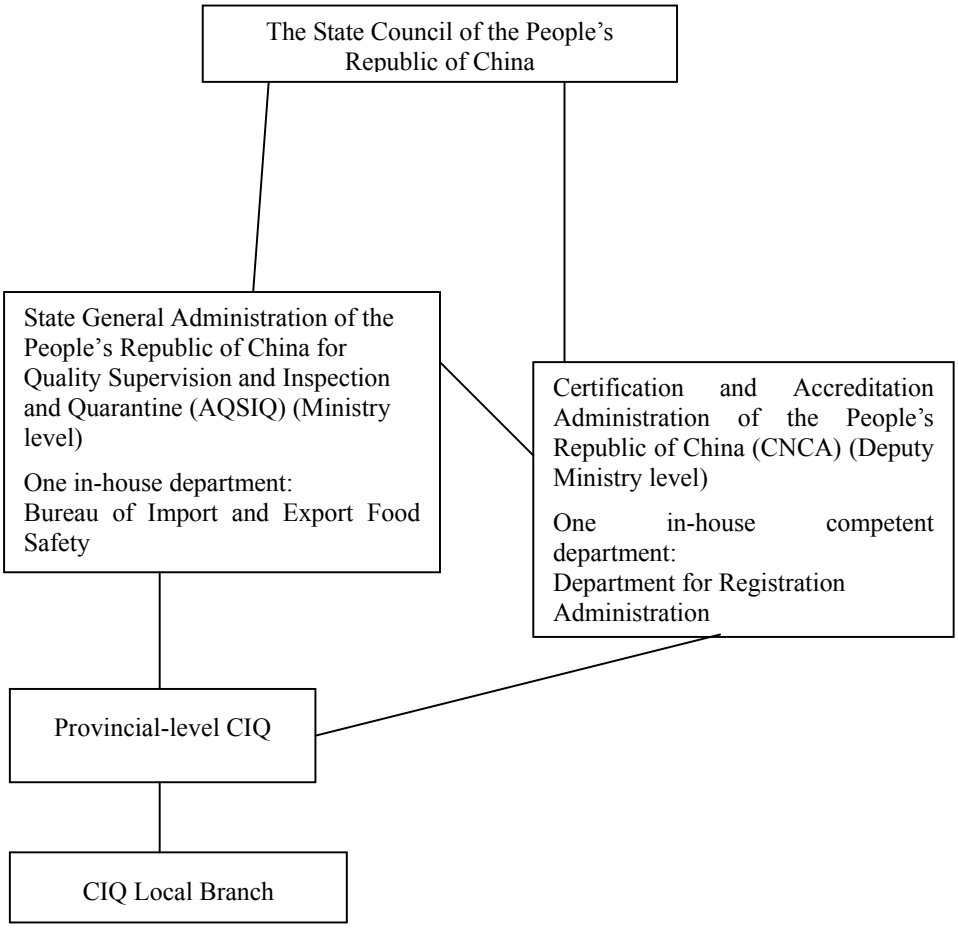
Certification by an independent third party, an internationally accepted common practice, is an effective

[49] Information provided by Dai Xiaowu at HACCP seminar, Beijing, November 2004.

method to evaluate whether an enterprise's system or product is rational and viable. While adopting international certification patterns such as ISO 9000 and HACCP, China's food certification system took its own unique circumstances into consideration and also implemented *Green Food* certification, *Organic Food* certification, and *Hazard-free Food* certification.

Appendix 2. Administrative System of Registration, Supervision, Inspection, and Quarantine for Export of Chinese Fruits and Vegetables

Organization. The following are the Chinese government's competent authorities involved in exporting foods, including fruits and vegetables.



The State General Administration of the People's Republic of China for Quality Supervision and Inspection and Quarantine (AQSIQ) is in charge of national quality, metrology, entry and exit commodities inspection, border health quarantine, border animal and plant quarantine, certification, accreditation, and standardization.

The Certification and Accreditation Administration of the People's Republic of China (CNCA) is responsible for supervision and overall coordination of certification and accreditation activities across the country. It is a deputy-ministry administrative organization under the management of AQSIQ. The Department for Registration under CNCA is responsible for supervision and administration of the whole country's sanitary registration of export and import food and cosmetic production and processing manufactories.

There are 35 Entry-Exit Inspection and Quarantine Authorities (CIQ). Its branches are established in every province, autonomous region, municipality, and main port. CIQ functions directly under the supervision of AQSIQ. Branches are set up at the seaports and goods collection and

distribution centers all over China. The CIQ performs sanitary registration, inspection, and quarantine; issues certificates for import and export products; and supervises food and cosmetics processing factories for import and export.

Laws and Regulations. Since 1980, the Chinese government has formulated a series of laws and regulations on the export food industry. The laws, regulations, and rules that cover foods for export include primarily:

- *Food Sanitation Law of the People's Republic of China* (revised Oct. 30, 1995, trial implementation Jul. 1, 1983)
- *Import and Export Commodity Inspection Law of the People's Republic of China* (revised Oct. 1, 2002, 1st implementation Aug. 1, 1989, draft trial implementation 1984)
- *Entry and Exit Animals and Plants Quarantine Law of the People's Republic of China* (issued Oct. 30, 1991, implementation Apr. 1, 1992)
- *Regulations on Import and Export Commodity Inspection Law of the People's Republic of China* (under revision, 1st implementation Oct. 23, 1992)
- *Regulation on Administration of Sanitary Registration for Export Food Manufactories* (2nd revision May 20, 2002, 1st revision Nov. 14, 1994, 1st implementation Oct. 15, 1984)
- *Sanitary Requirements for Export Food Manufactories* (originally an independent document, now appendix of Regulations mentioned under fourth bullet above. (2nd revision May 20, 2002, 1st revision Nov. 14, 1994, 1st implementation Oct. 15, 1984)
- *Import and Export Vegetable Inspection and Quarantine Method* (trial, Aug. 2002)
- *The Details for Registration of Vegetable Planting Bases for Export* (Aug. 2002)

According to international practice, Chinese government competent authorities require the packers of fruits and vegetables for export to conform not only to the above laws and regulations but also to the requirements of the importing countries.

Requirements and Procedures of Inspection and Quarantine for Exported Vegetables. There are five requirements and procedures of inspection and quarantine for vegetables for export[50]:

1. The vegetable farming lands shall be registered with the local CIQ. The basic condition and management must be in terms of the requirements.
2. The establishments of processing or packing vegetables shall be registered with CIQ as well. The establishment must meet the *Sanitary Requirements for Export Food Manufactories.*
3. CIQ routinely will inspect the registered establishments and farm bases. All activities of these entities are under CIQ's supervision.
4. Prior to shipment for export, the products shall be checked lot by lot and also sampled for testing physically according to the requirements of the importing country or bilateral agreement (MOU).
5. CIQ will issue relevant certificates for qualified cargo.

Private Sector Self-Control Systems. According to the "Regulation on Administration of Sanitary Registration for Export Food Manufactories" and the "Sanitary Requirements for Export Food Manufactories," the establishments for processing or packing vegetables and fruits should develop their own self-control systems based on HACCP and GMPs. A HACCP system is the mandatory requirement for the frozen vegetable and fruit processing plants.

[50] For exported fruits, there is no inspection and quarantine method as for vegetables. CIQ inspects exported fruits according to the specific standards. Those standards give the detailed sampling and inspecting procedures for inspectors to follow.

Appendix 3. Testing Capacities for Food Safety Control

AQSIQ/CIQ Monitoring and Testing Capacity at Export Level

China's authority for testing food safety on exports, AQSIQ, has invested much in laboratories on pesticide residue testing for monitoring and also for providing testing services for exporting companies. Some items of pesticide residues must be tested lot by lot before the vegetable and fruit products are shipped for export.

In September 2004, AQSIQ started a new residues (unauthorized substances) monitoring program for processed food exports. This program focuses mainly on:

- Substances unauthorized and restricted by the main importing countries, including the European Union, Japan, Korea, Singapore, and the United States
- Pesticides unauthorized and restricted by China
- Pesticides often used in vegetable farming.

The program requires that approximately 3,000 samples must be tested each year by CIQ laboratories in 22 cities or areas. The tests include but are not limited to spinach, green soy bean, garlic, peanut, and tea. The MRL methods and standards used in the program are nearly equivalent to those of importing countries The program also encourages local CIQ laboratories to test soil and inputs if possible, so that they can investigate the conditions at the production stage. The monitoring output is expected to be submitted quarterly, but these results might not be published.

Monitoring and Testing Capacities of Private Enterprises at Export Level

Private sector entities also invest in their own pesticide residue testing labs. Almost all of the packing companies for fruit and vegetable exports have basic testing capacities. For more in-depth quantity analysis, normally the official laboratories (mainly CIQ labs) can provide the relevant testing service. However, the CIQ testing service takes relatively great cost and time, because the main task for CIQ laboratories is official inspection. Most of the time, they run at full capacity, and the testing service for society and industry has to wait for the labs' spare time.

For this reason, some of leading companies established advanced laboratories to fulfill all of the tasks by themselves. For example, Shandong Longda Foods Group Company, one of the leading vegetable exporting companies, has invested more than RMB10 million to equip its laboratory with a staff of 25. Another leading vegetable exporting company in Shandong, Anqiu Foreign Trade Foods Co., Ltd. has established a testing center with a total staff of 40 and has equipped it with 80 sets of instruments. For most packers, even the above-mentioned two leading companies, the availability of qualified personnel is the main constraint. Currently, CIQ helps the private companies with training.

Testing capacity plays quite an important role in international trade. Chloropyriphos residues were the critical barrier to the export of Chinese spinach to the Japanese market. The differences in testing methods and instruments between China and Japan were one of the problems. Therefore, Shandong CIQ and relevant packers did much of the work, including improving the testing capacity to comply with the strict Japanese MRL requirements. By June 2004, Japan announced that 27 Chinese spinach plants had been approved for importing.

MOA Monitoring and Testing Capacity for Domestic Market

For the domestic market, MOA and local agriculture authorities established many testing laboratories. There are 280 testing centers at the national or MOA level. One-third of the counties all over the country have fast testing stations for pesticide residues. However, most local laboratories are neither equipped nor managed very well. Some can carry out only simple fast examinations with kit methods. Lack of qualified testing staff is another constraint.

Monitoring programs normally are used to investigate the actual safety conditions for fruits and vegetables. Several years ago, MOA launched a vegetable pesticide-residue-monitoring program. The samples are taken

from wet markets and low-end and high-end supermarkets.

Monitoring and Testing Capacities at Local Government Level

Some municipal monitoring programs are developed and funded by local financing. For example, some local technical surveillance, health, and vegetable office authorities often monitor by sampling and testing vegetable products. However, the results often are not reliable due to the lack of scientifically designed monitoring programs, professional staff, proper testing methods, laboratory management, and consistent finance support. Currently, CNCA has an accreditation program to manage and supervises laboratory resources all over China according to the ISO 17025 guideline. In spite of this, the pesticide residue testing laboratories still face many difficulties in accepting one another's methods, reference materials, and testing results.

Capacities at Production, Wholesale, and Consumer Levels

Some big wholesale markets and supermarkets built fast testing laboratories to inspect the products entering into trade. For example, in 1999 Shanghai Cao'an Wholesale Market built a laboratory. Approximately 50 samples are tested daily, mainly of leaf vegetables, which are at high risk for pesticide residue.

Third-Party Private Laboratory and Other Resources

At present, China has very few third-party private laboratories for pesticide testing of fruits and vegetables. A Sino-Japanese joint venture laboratory named Qingdao Chengyu Food Safety Research and Development Institute opened in 2003 in Chengyang, Qingdao. Recently, the Qingdao Cheng Yu Research Institute Food-Safety also was established. Both services reported international accreditation. Some universities and research institutes also provide testing services for industry. However, their capacities are limited, and costs often are too high.

Appendix 4. HACCP-Based Food Safety Control Elements Used in Assessing the Control, Capacity, and Effectiveness of Japanese Leek Supply Chains

This appendix contains a general framework for testing food safety control (part A) and applications observed from six case studies (part B).

A. General Framework

1. Principles and Definitions of a HACCP-based food safety control system

a. *Hazard Analysis:* The potential hazards, including biological, chemical, and physical hazards, must be identified according to the results of risk analysis on the specific product. The preventive measure(s) aiming at the specific potential hazard must be identified and evaluated. The significant hazard(s) that is/are likely to occur and likely to result in illness or injury to consumers must be controlled effectively.

b. *Critical Control Points (CCPs):* The point, step, or procedure in a food chain at which the control measure can be applied and at which control is essential to reduce the identified significant hazard(s) to an acceptable level.

c. *Critical Limits:* The maximum and/or minimum value to which a biological, chemical, or physical parameter must be controlled at a CCP to prevent, eliminate, or reduce to an acceptable level the occurrence of the identified significant hazard(s).

d. *Monitoring:* A planned sequence of observations or measurements to assess whether a process, point, or procedure is under control and to produce an accurate record for future use in verification.

e. *Corrective Actions:* The procedures to be followed when a deviation occurs.

f. *Verification:* Use some measures other than monitoring to validate the control plan and guarantee that the system is operating according to the plan.

g. *Record-keeping and Documentation:* The control system shall be documented, and the accurate records shall be produced and kept for future use in verification and audit.

2. HACCP-Based Good Agricultural Practice (GAP)

Primary production should be managed to ensure that food is safe and suitable for its intended use. When necessary, measures will include:

- Avoiding the use of areas whose environments pose a threat to the safety of food;
- Controlling contaminants, pests, and diseases of animals and plants in a way that protects food safety;
- Adopting practices and measures to ensure that food is produced under appropriately hygienic conditions;
- Reducing the likelihood of introducing a hazard that may adversely affect the safety of food, or its suitability for consumption, at later stages in the food chain.

Environmental hygiene. Potential sources of contamination from the environment should be considered. In particular, primary food production should not be carried out in areas in which the presence of potentially harmful substances would lead to an unacceptable level of such substances in food.

Hygienic production of food sources. The potential effects of primary production activities on the safety and suitability of food should be considered at all times. In particular, such vigilance includes identifying any specific points in such activities in which a high probability of contamination may exist and taking specific measures to minimize this probability. The HACCP-based approach may assist in taking such measures. As far as practicable, producers should implement measures to:

- Control contamination from air, soil, water, feedstuffs, fertilizers (including natural fertilizers), pesticides, veterinary drugs, or any other agent used in primary production
- Control plant and animal health so that it does not pose a threat to human health through food consumption or adversely affect the suitability of the product
- Protect food sources from fecal and other contaminants.

In particular, care should be taken to manage wastes and store harmful substances appropriately. On-farm programs that achieve specific food safety goals are becoming an important part of primary production and should be encouraged.

Handling, storage, and transport. Procedures should be put in place to:

- Sort food and food ingredients to segregate materials that obviously are unfit for human consumption.
- Dispose of any rejected materials hygienically.
- Protect food and food ingredients from contamination by pests; or by chemical, physical, or microbiological contaminants or other objectionable substances during handling, storage, and transport.

As far as reasonably practicable, deterioration and spoilage should be prevented through appropriate measures, which may include controlling temperature or humidity.

Cleaning, maintenance, and personnel hygiene in primary production. Appropriate facilities and procedures should be put in place to ensure that all necessary cleaning and maintenance is carried out effectively and that an appropriate degree of personal hygiene is maintained.

Microbial food hazards of fresh fruits and vegetables. To produce safe and sanitary fresh fruits and vegetables, good practices should be followed to minimize microbial food safety hazards. In 1998 the US FDA issued a "Guide to Minimize Microbial Food Hazards for Fruits and Vegetables." This guidance discusses the recommended good agricultural practice (GAP) and good manufacturing practices (GMPs) that growers, packers, and shippers can use to address common risk factors in their operations and thereby minimize food safety hazards potentially associated with fresh produce.

Pesticide residue control of fresh fruits and vegetables. Pesticide residues are potential hazards of fresh fruit and vegetable farming, and must be prevented and/or controlled by farmers. The control system should be designed scientifically and operated effectively.

3. Good Manufacturing Practices (GMPs)

During the food packing and/or processing, the facility and sanitary condition should be met in terms of relevant regulations or standards. Codex Standard (CAC/RCP 1-1969, Rev. 4-2003) gives the basic requirements as follows[51]:

- Depending on the nature of the operations, and the risks associated with them, premises, equipment, and facilities should be located, designed, and constructed to ensure that:
- Contamination is minimized
- Design and layout permit appropriate maintenance, cleaning, and disinfections and minimize air-borne contamination
- Surfaces and materials, particularly those in contact with food, are nontoxic in intended use and, when necessary, suitably durable and easy to maintain and clean
- When appropriate, suitable facilities are available for temperature, humidity, and other controls

[51] These General Principles lay a firm foundation for ensuring food hygiene and, as appropriate, should be used in conjunction with each specific code of hygienic practice and the guidelines on microbiological criteria. The document follows the food chain from primary production through final consumption, highlighting the key hygiene controls at each stage. Wherever possible, it recommends an HACCP-based approach to enhance food safety as described in its Appendix on "Hazard Analysis and Critical Control Point (HACCP) System and Guidelines for its Application."

- There is effective protection against pest access and harborage
- Attention to good hygienic design and construction, appropriate location, and the provision of adequate facilities necessary to effectively control hazards.

For detailed requirements, refer to CAC/RCP 1-1969, Rev. 4-2003.

4. Sanitation Standard Operation Procedures

To comply with GMP requirements and sanitation conditions, packers or processors are advised to develop and implement Sanitation Standard Operation Procedures (SSOPs). The following elements should be included in SSOPs:

- Safety of water used for processing or packing
- Condition and cleanliness of food-contact surface
- Prevention of cross-contamination
- Maintenance of hand-washing, hand-sanitizing, and toilet facilities
- Protection from adulterants
- Labeling, storage, and proper use of toxic compounds
- Employee health conditions
- Exclusion of pests
- Waste or flotsam treatment.

5. Laboratory Testing

The laboratory testing facility is used for monitoring and verifying the effectiveness of the food safety control system, including HACCP and SSOP implementation. It is very helpful for the packers or processors to control the pesticide residue of raw materials while receiving them and to supervise their farm bases by monitoring.

B. Detailed Results from Supply Chain Audits of Six Companies

Six supply chains were analyzed. The results are discussed below. Table A4.1 at the end of this section provides the assessment scores of HACCP-Based Food Safety Control System on Japanese leek for these six supply chains.

Supply chain A

Supply chain A links a vegetable processing company in Anqiu. The company, with gross sales of about RMB30 million in 2004 and a workforce of about 300, has 4 production bases—in Shandong, Inner Mongolia, Hebei, and Xiamen—with a total of 1,500 mu, including 500 mu for Japanese leek. Fresh leek can be produced around the year. The company's cold storage capacity is 2,400 tons, including frozen cold storage (minus 18 degree Celsius) of 400 tons. The processing workshop is approximately 1500 m^2.

All Japanese leek is produced in the company's own production bases and exclusively for Japanese and Korean markets. Part of the production base appliess the Japanese Agricultural Standards (JAS) certification for organic foods. The farming bases for exporting are registered with, and supervised by the local CIQs. The processing plant for frozen vegetables is also registered with CIQ for export. The facilities are audited by CIQ annually.

The company, including its farming stage, has a documented food safety management system. The effectiveness of controlling food safety for the export of Japanese leek is sound due to production on own farming bases. However, the deficiencies of the system are:

- There is insufficient professional staff, especially for plant illness and pest prevention and prediction, and food safety control (HACCP). Although developed and implemented with the instruction of CIQ and other agencies, the plan and measures are not always suitable for the specific and actual situations, and additional professional staff is crucial to fully develop and implement a food safety control system

for the different production stages.

- The necessary sanitation facilities and hygiene operation procedures at the production bases are still missing. These are preventive measures to minimize the microbial hazards.
- The packing room for fresh Japanese leek is inadequate. Some GMP/SSOP requirements are not complied with, such as hand-washing, food-contact surface cleaning and sterilization, facility and equipment maintenance, temperature control, and pest control.
- The labeling and tracking and tracing system is rough and should be improved throughout the supply chain; the farmers planting the vegetables should be identifiable.
- The laboratory is equipped only with a fast-testing kit for qualitative determination. The quantitative analysis cannot be done.

The company now faces problems in expanding its production because managing its own farming bases is expensive compared to the cost of contracting small-scale farmers.

Supply chain B

The company central to supply chain B is a foreign-capital-invested processing plant that combines farming, packing and processing, and trading. It uses two models to organize production: on its own farming base; and through a "company base plus farmers" model. The size of the company's own bases is 3,000 mu; the contractual bases are 8,000 mu. In total, 10,000 households are involved. In 2004 gross sales were approximately RMB45 million. The company's bases are applying JAS certification. For Japanese leek farmers, the company has developed a second base in Zhejiang province to obtain fresh product throughout the year. Japanese leek is mainly for Japanese and Korean markets and comes mainly from the company's own farming bases.

The farming bases and processing plants are registered and supervised annually by CIQ. The company supplies vegetables directly to JUSCO (Hong Kong) General Merchandize Stores (GMS) in Japan. The company has an excellent labeling, tracking, and tracing system that meets the requirements of Japanese supermarkets. The company has developed and implemented a food safety control system for Japanese leek. However, several deficiencies were found in the system:

- Weak food safety control system for contracted production. The company provides the farmers with pesticides and supervises the farmers' operations during production. However, the farmers simply follow the company's requirements; the challenge is how to develop a customized control system at the farmers' level – either developed directly by the company itself or by the farmers themselves. The company's technical support to the contractual farmers was assessed to be insufficient.
- Conditions in the packing room for fresh Japanese leek are inadequate. Most GMP/SSOP requirements are not complied with, such as hand-washing, food-contact surface cleaning and sterilization, facility and equipment maintenance, temperature control, and pest control.
- The laboratory is equipped only with a fast-testing kit for qualitative determination. Quantitative analysis cannot be done.

Supply chain C

The company central to supply chain C has established a packing plant in Anqiu/Shandong with 1,000 tons of cold storage and 1,000 m^2 of processing workshop. It also developed its own 200-mu farming base in Anqiu supplying Japanese leek for export. The base is registered with CIQ and certified for organic foods production.

A food safety control system has been developed and implemented. The company cannot expand its own production base because of lack of access to more land and fears to use contract farming will make it difficult to control pesticide residues. Deficiencies observed for the supply chain were virtually the same as for supply chain A.

Supply chain D

The company central to supply chain D is a joint venture with a Japanese company with a workforce of about 560 employees. Its own farming base is approximately 2,000 mu, of which approximately 600 mu is used to produce Japanese leek. The size of the processing plant for frozen vegetables and fruits is approximately 5,000 m^2 and it has a 7,000 tons capacity of cold storage (2,000 tons for frozen storage of minus 18 degree Celsius below). MOA has certified the base as 'hazard-free' and CIQ has registered the production base for export.

With the help of CIQ, the company has developed and implemented a food safety control system based on HACCP principles. The problems with professional staff, laboratory equipment and testing capacity, packing room, and GAP are almost the same as in the above-mentioned supply chains. In addition, the following GMP deficiencies exist in the processing plant:

- The layout of clothes-changing room, primary processing room, intensive processing room, and packing room are not proper for minimizing the likelihood of cross-contamination.
- The cleaning and sterilization facilities are not all installed. The SSOP might not run properly.
- In monitoring the sanitation and safety conditions of the Japanese leek packing operation, the laboratory did not test for E. coli.
- The pest control program is not designed correctly.

Supply chain E

The company central to supply chain E is a province-level "dragonhead" enterprise and was established in 1976. The fixed assets are approximately RMB500 million; it has 6,000 employees; and total annual sales are approximately RMB560 million. The export turnover is US$64.4 million. The company has a 5,000-mu own production base. The land is acquired through village committees on a 15-year contract, and the annual rent is RMB500/mu. In addition, the company has a total of 20,000 mu "external bases" contracted with farmers.

The hardware and software in the company are quite good. The management ensures the food safety of its products, including Japanese leek exported to the Japanese market. The company provides the farmers with all seeds, pesticides and chemical fertilizer, as well as instructions and advice on plant diseases, pest prediction and control, and it guides and supervises the harvest.

To meet the requirements of foreign customers and the government, the company has established a testing center with 40 employees and 80 sets of testing equipment. However, the qualifications of these employees are a big concern for the firm. CIQ assists with the training. All Japanese leeks for export are from the company's own base so as to guarantee product compliance.

Supply chain F

The company central to supply chain D is a subsidiary of a Japanese business group that consists of a fertilizer company, a bioengineering company, farms, and processing plants. This structure enables it to integrate production, processing, and trading. The company controls a total of 22,000 mu of land in Shandong, Hebei, Jilin, Fujian, and Xinjiang. The company contracts only with large-scale farmers (farm sizes 30–50 mu), and has more than 40 staff who provide the farmers with technical support. The whole production process on farms is tracked and supervised by the company. They call this system "Integrated Management."

The company did a good job in managing the food safety control system. Its farming bases and packing and processing establishments are registered by CIQ for exporting foods.

Table A4.1. Assessment scores of HACCP-based food safety control system for Japanese leek for six supply chains

Supply chains	*Programs*	*A*	*B*	*C*	*D*	*E*	*F*
GAPs	Water and Soil	2	2	2	2	3	3
	Hygiene Facilities	0	0	0	0	0	0
	Pesticide Residue Control	3	2	3	3	3	3
	Microbial Hazard Control	1	1	1	1	2	1
	Other Chemical Hazards	1	1	2	1	2	2
	Other Inputs Control	2	2	2	2	2	3
	Other Measures to Control Illness and Pest	2	2	2	2	2	2
	Technical Training	2	2	2	2	2	3
GMPs & SSOP	Labeling and Traceability	2	3	2	2	2	3
	Maintenance Plan	2	1	2	1	3	2
	Water Safety	3	3	3	3	3	3
	Facilities and Equipments	2	1	2	1	2	2
	Cross-Contamination Control	2	2	2	1	2	3
	Food Contact Surface Control	2	1	2	1	2	2
	Chemicals and Adulterants Control	2	1	2	2	3	3
	Pest Control	1	1	2	2	3	2
	Waste Disposal	1	1	1	2	1	1
	Cold Storage	3	2	3	3	3	3
	Sanitation Operation and Condition	2	1	1	2	2	2
Lab testing	Qualitative Determination of PR	3	3	3	3	3	3
	Quantitative Analysis of PR	0	0	0	0	3	2
	Microbiological Test	1	1	1	0	3	2
Internal audit	Validation and Verification	2	2	2	2	2	3
	Internal Audit Activity	2	1	2	3	3	2

Note: Ranking codes: 0= No evidence of a food safety system
1= Basic elements of food safety; little implementation
2= Basic elements of food safety; some implementation, but effectiveness is not good
3= Basic elements of food safety with implementation; good effectiveness and documentation

Appendix 5. Markets for Fresh Produce in Japan

This Annex discusses the various different stakeholders in the marketing of fresh produce in Japan.. Figure A5.1 provides an overview of the different marketing channels.

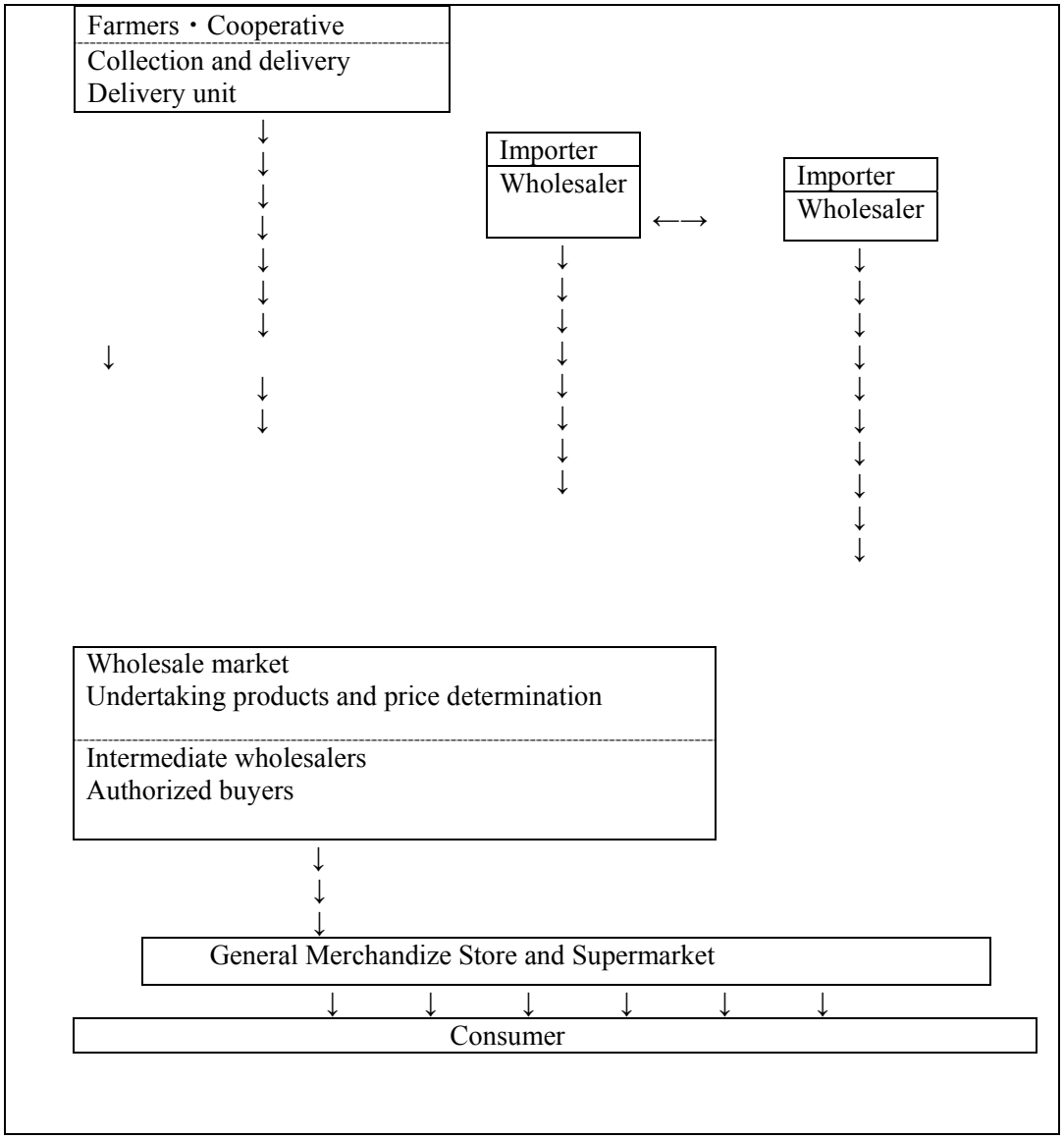


Figure A5.1 Major flow channel of fresh produce

Farmers in Japan

Japanese consumers favor locally grown products. Due to the close cooperation between growers and distributors, fresh-harvested vegetables often are delivered from nearby production sites to retail stores and the General Merchandize Stores in the big cities.

Cooperative groups or farmers' organizations have established standard specifications for quality, grading, and packaging of Japanese vegetables and fruits; these are now are widely accepted as national standards. Recently, a farmers' organization has made efforts to (1) review the present standards and (2) create new standards under which value-added products can be produced by distinguishing the characteristics of product features such as

nutritional aspects, variety, and quality.

Wholesale Market

There are approximately 110 Central Wholesale Markets and 1,351 local markets in Japan, established under the Wholesale Market law. Wholesale markets perform the following functions:

- *Collection:* A wide variety in vast quantities is collected from domestic and overseas sources.
- *Fair pricing:* The price is reasonably determined as the highest bid price in the auction reflecting the daily supply and demand.
- *Distribution:* Fresh produce is divided in small lots for purchase by authorized buyers.
- *Settlement:* Payment to the suppliers is made quickly after deducting the sales commission, which is 8.5 percent for vegetables and 7 percent for fruits.
- *Reduction of delivery cost:* Purchasing many kinds of goods at one time reduces the transportation cost.
- *Providing information:* Sales information on the day is available.
- *Supervising and hygiene inspection:* Inspections are conducted by the Sanitary Inspection Station.

Recently, retailers such as General Merchandize Stores and supermarkets have developed direct transactions with growers. As a result, business management for wholesale markets and intermediate wholesalers has become very difficult. Accordingly, in June 2004 the market law was revised to deregulate the system and improve market distribution in Japan. The sales commission charge will be set free within five years. Because this revision permits direct transactions both from growers to intermediate wholesalers, and from wholesalers to retailers, intense competition and reorganization among the wholesale markets are expected. Tight alliances with growers to collect stable and high-grade produce are crucial to the wholesale markets.

Intermediate Wholesalers

Under the deregulation accompanying the revision of the Wholesale Market law, direct deals between wholesalers and retailers became possible. The functions and business lines for intermediate wholesalers, who used to be between wholesaler and retailer, were totally changed. Their main functions today are to:

- Collect adequate goods with the necessary data about harvest conditions and forecasting in close relationship with growers and cooperatives
- Align goods with customer demand through appropriate packing and frequent delivery via tight relationships with retailers such as GMS and supermarkets
- Handle specialized items such as foreign commodities and high-value products for top-end restaurants.

Retailers Such as General Merchandize Stores and Supermarkets

In the retail shops such as GMS and supermarkets, the commercial strategy used to be determined by factors such as location, store size, and clientele, which would guide decisions about assortment, quantity, retail price, and packaging. However, the following trends are now common at every outlet:

- *Freshness:* The most important element for goods quality. Accordingly, buyers put top priority on stable supply and local production sources.
- *Safety:* Achieved through appropriate cultivation methods and periodic inspection.
- *Convenience* (quantity and packaging): Recent purchasing trends among 20- to 40-somethings are (1) convenient purchases of small quantities for 1 or 2 persons and (2) plastic packaging, even though these features cost 15 percent to 25 percent more. Examples are precut mixed vegetables with dressing packed net 100–200g, Daikon (radish) cut into 3 or 4 portions, and sliced Negi (leek) for seasoning miso soup packed 30g, and cut fruit such as pineapple and grapefruits. These new consumer preferences create value-added products and new items for retailers, and the ratio of small-quantity packaged fresh produce is rapidly increasing.

To meet these market trends systematically, IY Group recently started using some processing facilities,

renamed “Productive Area Support Centers,” as a new model of purchasing, processing, and delivering fresh produce to its outlets.

In January 2003 VEGETECH Co., Ltd. (Akishima City, Saitama Prefecture) established the Productive Area Support Center in Chiba Prefecture. The center functions as a processing plant and delivery center in the productive area. The center supplies the processed and packed vegetables to IY Group outlets located in Chiba by purchasing fresh raw materials from farmers' fields adjacent to the center under individual contracts. After being washed, cut, packed, and cooled at the center, the products are delivered to the outlets of not only IY Group but also other major GMS and supermarkets.

Additionally, this center has established a Quality Control Center equipped with testing equipment for residual agricultural chemicals and for soil inspection with full-time staff for supporting farmers in safe vegetables cultivation. VEGETECH Co., Ltd. has a plan to establish similar facilities in Saitama and Ibaragi prefecture, for fulfilling needs by major GMS and supermarket chains.

Importers

Importers dealing with fresh produce can be divided in four categories by their business structure and product lines:

1. *Subsidiary trading company of GMS or supermarkets*: Imports are determined mostly by mother and group companies. Sales are to mother and group companies. Wide range of items; fresh produce is one item**.**
   Examples: AIC Co., Ltd. (AEON Group); TENDAI Co., Ltd. (Daiei Group）
2. *Specialized trading company dealing with fresh produce at own risk*: Imports products from several countries for several markets. Sales are to many channels, including wholesale markets. Items are mainly fresh produce.
   Examples: Dole Co., Ltd.; SAUCON Co., Ltd.; WATARI Co., Ltd.
3. *Trading company dealing with* specific *countries*: Import is limited to China. Sales are to wholesalers and processing companies. Items are mainly fresh produce.
   Examples: Nicchu Trade Co., Ltd.; ST Agri-Products Co., Ltd.
4. *General trading company:* Imports all kinds of general items; fresh produce is only one of its items. Sales are to every market.
   Examples: Mitsubishi Corporation (http://www.mitsubishicorp.com/), ITOCHU Corporation (http://www.itochu.co.jp/), Sumitomo Corporation (http://www.sumitomocorp.co.jp/) Sojitz Corporation (http://www.sojitz.com/)

Importer management of food safety of Chinese fresh produce

Japanese importers, wholesalers, intermediate wholesalers, retailers, and consumers are very cautious about food safety and also show high interest in Chinese fresh produce.

Since the incidents with imported Chinese frozen spinach in 2002, most Japanese consumers are very sensitive about the safety of Chinese fresh produce. Consequently, the Japanese Ministry of Health, Labor and Welfare provides public guidance to importers to check the safety of imported Chinese products.

Advanced importers have developed stable businesses by solving the safety problem and image of Chinese products. When these importers begin a direct business with Chinese companies, they dispatch professional staff to the cultivation site to provide the necessary guidance for the cultivating cycle and technical guidelines for applying agricultural chemicals and fertilizers. The importers obtain the relevant documents of the cultivation history recorded by growers and the inspection certificates for residual agricultural chemicals by the exporter; and try to ensure the traceability of imported vegetables.

The cases of two companies present relevant examples.

1. ***ST Agri-products Co., Ltd.***

- In 2004 this company imported 2,300 tons of Shitake mushroom, 1,500 tons of Negi leek, and 1,500

tons of garlic through a subsidiary company in Shanghai, China.

- Staff of this Chinese company have been trained as JAS Organic Produce Cultivation Process Managers. In addition, they have completed the trainee course for grading and the JAS Organic Inspector trainee course managed by AFAS Certification Center Co., Ltd. (Tokyo).
- Furthermore, approximately 20 employees working for the import section in the Tokyo headquarters have completed this JAS Organic Produce Cultivation Process Management course. The Chinese management staff of the subsidiary company have received the similar trainee course that AFAS Certification Co., Ltd. provided in China.
- Their main system is to check the cultivation field; to record the cultivation history, mainly concerning the usage of agricultural chemicals and fertilizers; and to approve the farming land.
- When being sold in the Japanese outlets, their products have bar code labels. Thus, the consumer can obtain information related to cultivation history through the internet by accessing the company website.
- The company has conducted research on organic cultivation and special cultivation with reduced, or no, use of chemicals.

2. **AEON Group**

- An association named Agricultural Practice Standards Study Group, managed by the AEON group, promotes "AEON Produce Suppliers-Quality Management Standards Good Agricultural Practice" (A-QGAP). A-Q GAP consists of 101 practices in three areas: AEON Agricultural Customer Standards, AEON Agricultural Proper Production Practice, and AEON Agricultural Proper Distribution Practice.[52]
- Japan has developed safety standards for every agricultural product as its version of EUROGAP to reduce agricultural mischief.
- AEON commenced GAP in 2002 cooperating with farmers under "Top Value Green Eye," which is AEON PB's brand of fresh produce. Presently, more than 3,000 farm families participate in the production under this GAP.

To date, these standards have been developed primarily for domestic products.

Changes in the GMS distribution system

Evolutionary stages in the distribution system:

- *GMS processing and packing facility inside the outlet*: This facility was used mainly to store goods; processing, and packaging treatments for fresh produce such as vegetables, fruits, meats and fishes; and cooking prepared goods for sale. For these activities, the store employed full-time workers for processing and packaging; the appropriate machinery and tools; and wide-ranging materials for packaging such as labels, tapes, and bags. Consequently, the operational costs became high and decreased profit.
- *GMS received all items from its main distribution center*: As all merchandise is delivered directly to each store less frequently, the costs for transportation, storage and other preparation procedures can be cut. However, there are some issues relating to temperature management between fresh produce and sundries, delivery frequency, and matching goods to each shop.
- *Productive Area Support Center:* In this new distribution system, GMS can prepare very fresh vegetables to be ready to deliver to the nearest stores to waiting customers. The Center can make regular frequent deliveries. Consumers prefer familiar products that are very fresh and grown locally.

Merchandizing and purchasing policies of GMS and supermarkets

1. *Merchandising policies:* The basic merchandising strategy of GMS and supermarkets is determined through analysis of the following elements:

[52] In 2004, AEON's Agricultural Practice Standards Study Group was selected as one of the implementing associations of the Food Traceability Development and Verification Project, **supported by the Ministry** of Agricultural, Forestry and Fisheries.

- Clientele characteristics (age, occupation, income, family size)
- Location (residential area, commercial or industrial zone)
- Public facilities (school, hospital) or not
- Business activities by competitors.

A. Domestic products:

- Fresh produce is purchased directly from the production area through an alliance with a specified intermediate wholesaler.
- In case of no supply from the contracted growers due to weather conditions, occasional supply through other wholesalers has been prepared as a contingency.

B. Imported products:

- Accompanying information on documents and/or certificates is indispensable when purchasing products from overseas.
- Even when purchasing directly certain items from overseas, the occasional supply is always set in advance. Never purchase through only one buying channel.
- To enable quick response for urgent purchasing, consistently collect necessary cultivation and harvesting information.

Consumer trends in fresh foods

- Individual consumption as cut and packed vegetables. (Size, quantity, and packaging are for individual use only.)
- Intermediate and convenient food prepared at department store and catering shop. Not similar to fast food and take-out food. The concept is prepared food whose quality is between inexpensive restaurant and home-cooked.
- Vegetables consumed at the peak of their harvesting season
- Locally harvested vegetables.

Appendix 6. Food Safety Inspection and Quarantine by the Ministry of Health, Labor and Welfare of Japan.

Import Procedures under the Food Sanitation Law

To ensure the safety of imported foods, the 27th article of Japan's Food Sanitation Law requires importers to submit the official Import Notification form to the quarantine station at which the application is made for the import clearance. The 27th article of Food Sanitation Law states:

> "Those who wish to import food, food additives, apparatuses, or containers/packages for sale purpose or for use in business, shall notify the import to MHLW on occasion, as stipulated by the Ministerial Ordinance."

At the quarantine station, food sanitation inspectors execute document examination and inspection to see whether the foods comply with the standards of the Food Sanitation Law.

Document examination of form of Import Notification and inspection at quarantine station

After filing the submitted Import Notification, the food sanitation inspectors examine whether the products meet the standards of the relevant Food Sanitation Law regulations. The food sanitation inspectors' judgment will depend on information such as export country, product name, manufacturer, manufacture location, ingredients, and materials listed in the Import Notification form. Specific points are:

1. Whether the food complies with the Food Sanitation Law regulations' manufacturing standards:
   - Whether the food contains poisonous or hazardous substances
   - Whether the manufacturer or manufacture location has a record of past sanitation problems.

2. Inspection results:
   - When the inspectors rule that the food can be inspected, the inspection order will be executed to confirm compliance with the relevant laws.
   - When the inspectors judge that the food complies with the relevant laws, a Certificate of Notification will be issued to the importer. Then the import procedure will proceed to next stage.
   - Food that does not comply with the relevant laws cannot be imported. The quarantine station will inform the importer of the violating reason, and the importer must take the necessary measures following instruction by the quarantine station.

Table A6.1 summarizes the inspection results in 2003. For all kinds of reasons, 448 lots were rejected, or 1.4 percent of the total submitted, compared to 0.8 percent of products from other destinations. Table A6.2 provides an overview of typical examples of noncompliance in recent times. Table A6.3 shows some Chinese agricultural products rejected by Japan in June 2004.

Table A6.1. Japan's imported foods sanitation inspection result, 2003

Remarks	*Import notifications*	*Inspections*	*Rejections*
Total number of cases	1,683,176	170,872	1,430[a]
Prepared vegetables	122,179	13,803	102[b]
Fresh vegetables	98,577	21,200	78[c]
China	409,899	70,999	448

Source: URL of Ministry of Health, Labour and Welfare of Japan.
Notes: a of which 725 cases were fresh vegetables and prepared vegetables. b of which 102 were related to ingredient standards violation. c of which 78 were related to residual agricultural chemicals.

Table A6.2 Recent examples Chinese fruits and vegetables noncompliance with the Japanese Food Sanitation Law at import

No.	*Product*	*Noncompliance*	*Standard*	*Remark*
1	Fresh cabbage	Spoilage		
2	Fresh Chinese Flowering Cabbage	Violation of element standard (Fenvalerate)	0.5 ppm	Fenvalerate: residual agricultural chemical
3	Fresh snap pea	Violation of element standard (Cypermethrin)	0.05 ppm	Cypermethrin: Residual agricultural chemical
4	Fresh snap pea	Spoiled, decomposed		
5	Fresh celery	Violation of element standard (Chlorpyrifos)	0.05 ppm	Chlorpyrifos: residual agricultural chemical
6	Fresh bamboo shoot	Rottenness, spoilage, and mold		
7	Fresh beefsteak plant leaf	Violation of element standard (Chlorpyrifos)	0.01 ppm	Chlorpyrifos: Residual agricultural chemical
8	Fresh immature pea	Violation of element standard (Cypermethrin)	0.05 ppm	Cypermethrin: Residual agricultural chemical
9	Fresh immature pea	Rottenness, spoilage and mold		
10	Fresh immature pea (kinusaya)	Rottenness, spoilage and mold		
11	Fresh immature pea (kinusaya)	Violation of element standard (Cypermethrin)	0.05 ppm	Cypermethrin: Residual agricultural chemical
12	Fresh immature pea (kinusaya)	Violation of element standard (Fenvalerate)	0.10 ppm	Fenvalerate: Residual agricultural chemical
13	Fresh immature pea (kinusaya)	Violation of element standard (Cypermethrin)	0.05 ppm	Cypermethrin: Residual agricultural chemical
14	Large-sized peanut	Aflatoxin (Mycotoxin) detected		
15	Large-sized peanut	Violation of element standard (Daminozide)	Should not be detected	Daminozide: Residual agricultural chemical
16	Large-sized peanut (shelled)	Aflatoxin (Mycotoxin) detected		
17	Hot pepper	Aflatoxin-ositive （22ppb,19ppb）	Poor management	

Source: Ministry of Health, Labor and Welfare of Japan, http://www.mhlw.go.jp/english/topics/importedfoods/index.html.

Table A6.3 Chinese fruits and vegetables detained by MHLW of Japan, June 2004

No.	*Product*	*Noncompliance*	*Results*	*Remark*
1	Frozen lychee	Violation of element standard (Benzedrine-Methyl)	0.17 ppm	MRL: Negative, not permitted to use
7	Fresh beefsteak plant leaf	Violation of element standard (Chlorpyrifos)	0.2 ppm	MRL: 0.01 ppm, not permitted to use
13	Fresh immature pea (Kinusaya)	Violation of element standard (Cypermethrin)	0.06ppm -0.08 ppm	MRL: 0.05 ppm, not permitted to use
14	Large-sized peanut	Aflatoxin (Mycotoxin) detected	52.9 ppb	MRL: 10 ppb (as aflatoxin B1), not detected

Source: Ministry of Health, Labor and Welfare of Japan, http://www.mhlw.go.jp/.

Of special interest are the 2004 noncompliance cases of imported Chinese bean products (table A6.4). The background and circumstances were:

- There is a strong and stable demand for these bean products, especially during the peak season in Japan.

- Bean products such as snap bean and snow pea normally require labor-intensive cultivation.
- Presently, the supply is not sufficient to cover demand due to the high cost and the shortage of labor in Japanese agriculture.
- Consequently, Japanese importers commenced cultivation in China for import to the Japanese market.

Present circumstances:

- All fresh bean products are inspected upon arrival at Japanese ports. These products regularly have violated the Food Sanitation Law due to their high residual agricultural chemicals.
- The average inspection fee is at least Japanese Yen 200,000, and the importer bears the cost. The goods are held in bonded storage for approximately seven days during the inspections.
- Japanese importers have informed the residual agricultural chemicals issue to the exporters, farmers, and relevant governmental parties in China.

Table A6.4 Examples of noncompliance of Chinese bean products imported with requirements of Japan's Food Sanitation Law, 2004

Products	*Content of violation*	*Background*
Big peanuts	Aflatoxin-positive (12.5ppb)	Poor management; mold by rain just before harvesting
Immature string bean	Unconformity of Agricultural chemical (Cypermethrin 0.06ppm)	Poor management of agricultural chemicals
Fresh snap bean	Unconformity of Agricultural chemical Cypermethrin 0.13ppm)	Contamination by verged field
Big peanuts	Unconformity of Agricultural chemical (Daminozide 0.1ppm)	Poor management Mixed with polluted peanuts
Big peanuts	Aflatoxin-positive (100.1ppb)	Poor selecting of moldy products
Fresh snap bean	Unconformity of Agricultural chemical (Cypermethrin 0.07ppm)	Contamination by verged field
Immature string bean	Unconformity of Agricultural chemical (Cypermethrin 0.06ppm)	Poor management of agricultural chemicals

Source: Ministry of Health, Labour and Welfare of Japan, http://www.mhlw.go.jp/english/topics/importedfoods/index.html.

Monitoring Inspection

This inspection system focuses on food that has less likelihood of violating regulations of the Food Sanitation Law and that is scheduled under a yearly import plan in which the food sanitation inspectors check the products under a public inspection system. The importer can proceed with the necessary import procedures without an inspection result and without keeping the goods in the storage while inspection proceeds**.**

Table A6.5 Results of Japan's monitoring inspections, 2003

1	Number of objects to be examined for inspection	58,658
2	Total number of inspections	75,758
3	Of which: number of vegetable inspections	14,267
4	Number of inspections for residual agricultural chemicals	12,606
5	Total number of violations	182
6	Number of violations for residual agricultural chemicals	28

Source: MHLW of Japan.

The purpose of the monitoring inspections is to examine the following contaminants: ingredient standards, food additives, residual agricultural chemicals, toxic and harmful substances, and microbe and residual antibacterial substances.

Appendix 7. Import Plant Quarantine Inspection Managed by Japanese Ministry of Agriculture, Forestry and Fisheries

Under its *Plant Protection Law*, Japan stipulates 16 types of plant pests and diseases in foreign countries that are major quarantine concerns. The 5 types relevant for trade with China are:

1. Oriental fruit fly (*Bactrocera dorsalis* species complex). Prohibited plants are fresh fruits of citrus, cherry, avocado, apricot, fig, strawberry, olive, Indian laurel, pomegranate, santol, plum, tahiti chestnut, tomato, pear, papaya, loquat, grape, peach, apple, Capsicum, coffee, and mature banana.
2. Melon fly (*Dacus cucurbitae*). Prohibited plants are live vines, leaves and fresh fruits of the family *Cucurbitaceae*, and fresh fruits of kidney bean, pepper, tomato, and eggplant.
3. Codling moth (*Cydia pomoella*). Prohibited plants are fresh fruits of apple, apricot, cherry, plum, pear, quince and walnut nuts in shell.
4. Sweet potato weevil. Prohibited plants are live vines, leaves, tuberous roots and other underground portions of plants of the genera *Ipomoea*.
5. Rice stem nematode. Prohibited are rice plants, rice straw, unhulled rice, and rice hull.

If fully applied, this list implies restrictions for many of the main products that China could export to Japan. For example, Japan's restrictions on apple imports are very tight.[53] Apples are China's leading fruit export, but do not have access to the Japanese market. Other important Chinese products that Japan has banned are pear, citrus, apricot, tomato, melon, and eggplant. Access to the Japanese market for these products could, after the necessary adjustments to Japanese taste and quality standards, lead to significant additional Chinese exports worth possibly several hundreds of millions of dollars. For this reason, the Chinese government has negotiated lifting restrictions for some products, and since its WTO accession, has stepped up these efforts.

To date, three Chinese products have had theirs bans lifted through bilateral negotiations with Japan:

- Fresh Litchi (April 1994)
- Rice straw mat (February 1996)
- Fresh melons from Xinjiang Uighur Autonomous Region (February 1988).

Several products are currently on the table for bilateral negotiations between China and Japan, including Ponkan orange, cherry, strawberry, kidney bean, eggplant, capsicum, tomato, and cucurbitaceous (cucumber, water melon, pumpkin). The status of discussions is appears in table A7.1.

[53] Products, such as apple, that can be affected by codling moth are banned from import. Countries and continents that have codling moth are Afghanistan, Africa, Argentina, Australia, Bolivia, Brazil, Canada, Chile, China, Colombia, Cyprus, Europe, Former Soviet Union, Iran, Iraq, India, Israel, Jordan, Lebanon, Myanmar, New Zealand, Pakistan, Peru, Syria, Turkey, United States of America (except Hawaiian Islands), and Uruguay.

Table A7.1 Phytosanitary negotiations for Chinese agricultural exports to Japan, 2004

Main fruits and vegetables with good export potential	*Presently banned*		
			Negotiation stage
	Reason	*Possibility of being solved*	*Might be solved through investment /negotiations*
Ponkan Orange	Oriental fruit fly	Possible.	Negotiation (under petition for lifting prohibition at step 2)[1]
Cherry	Codling moth (Cydia pomoella)	Possible. Commonwealth Agriculture Bureau (CAB) and FAO revised the pest and disease report in 1995 to approve most areas in China except nearby Sinkiang.	Negotiation (under petition for lifting prohibition at step 1)
Strawberry	Melon fly (Dacus cucurbitae)	Possible.	Negotiation (under petition for lifting prohibition at step 1)
Kidney bean		Possible.	
Red pepper	Melon fly (Dacus cucurbitae)	Possible, especially in some northern parts of China, such as Shandong.	Negotiation (under petition for lifting prohibition at step 1)
Pumpkin, cucumber, Cap capsicums, tomato	Oriental fruit fly	Possible.	Negotiation
Mango	Oriental fruit fly, melon fly (Dacus cucurbitae)	Possible.	Negotiation
Loquat	Oriental fruit fly	Possible.	Negotiation

Source: Agricultural Production Bureau, Ministry of Agriculture, Forestry and Fisheries, Japan, http://www.maff.go.jp/.
Note: The 5 steps required by the Japanese government to authorize lifting the ban are: (1) Exporting country petitions ban-lifted authorization; (2) Japanese government determines the plan for the necessary examination or investigation; (3) Japanese government completes verification of examination data or investigation data; (4) Japanese government determines the plan for verification test or confirmation test at site; and (5) completion of verification of verification test or confirmation test at site.

Fumigation and vaporization. Fresh products entering Japan are inspected for possible harmful organisms that may travel with the imported product. If inspectors find such organisms or consider the product too risky, they may decide that the shipment needs to be disinfected through fumigation or vaporization. In 2004 almost half of the imported leek, a quarter of the onions, and 13 percent of the garlic was treated (table A7.2). After disinfection, nearly all products could pass. The treatment is much disliked by traders since it involves costs, delays, and loss of product quality. The use of vaporization and fumigation is much debated in cases in which phytosanitary risks are small. It affects competitiveness and is an issue for international negotiations.

Table A7.2 Plant inspection result of three imported Chinese vegetables by Japanese plant quarantine stations, 2004

	Leek	*Onion*	*Garlic*
Total imported quantity (MT)	70,163	274,015	28,804
Inspected quantity (MT)	65,835	258,225	26,567
Passed quantity (MT)	35,736	195,561	23,090
Passed rate (%)	54.3%	75.7%	86.9%
Disinfected quantity (MT)	29,970	62,664	3,477
Quantity of discard (MT)	129	0	0
Discard rate (%)	0.2	0	0

Source: Ministry of Agriculture, Forestry and Fisheries, http://www.maff.go.jp/.

Appendix 8. Tables and Figures

Table A8.1 Total area sown with crops, vegetables and with orchards by region, 2003

Region	*Total area*		*Of which*			
			Vegetables		*Orchards*	
	Sown crops and orchards	*Share of national total*	*Area of vegetables sown*	*Share of total area in region*	*Area of orchards*	*Share of total area in region*
	(1,000 ha)	*(%)*	*(1,000 ha)*	*(%)*	*(1,000 ha)*	*(%)*
National total	**161,852**	**100**	**17,954**	**11**	**9,437**	**6**
Beijing	396	0.2	116	29	88	22
Tianjin	543	0.3	135	25	41	8
Hebei	9,714	5.7	1,069	11	1,075	11
Shanxi	3,986	2.4	279	7	278	7
Inner Mongolia	5,801	3.8	192	3	48	1
Liaoning	4,037	2.4	469	12	318	8
Jilin	4,812	3.1	269	6	95	2
Heilongjiang	9,844	6.4	400	4	41	0
Shanghai	444	0.3	150	34	25	6
Jiangsu	7,860	5.0	1,342	17	178	2
Zhejiang	3,121	1.9	701	22	287	9
Anhui	9,225	6.0	655	7	101	1
Fujian	3,073	1.7	614	20	554	18
Jiangxi	5,260	3.3	548	10	262	5
Shandong	11,682	7.1	2,027	17	797	7
Henan	14,059	9.0	1,526	11	374	3
Hubei	7,366	4.7	1,087	15	228	3
Hunan	8,110	5.1	964	12	378	5
Guangdong	5,801	3.2	1,195	21	917	16
Guangxi	7,100	4.1	1,007	14	821	12
Hainan	1,066	0.6	162	15	159	15
Chongqing	3,531	2.2	387	11	165	5
Sichuan	9,803	6.2	1,006	10	418	4
Guizhou	4,737	3.0	415	9	103	2
Yunnan	5,974	3.8	438	7	218	4
Tibet	235	*0.2*	14	6	1	0
Shaanxi	4,806	2.7	277	6	751	16
Gansu	3,941	2.4	269	7	320	8
Qinghai	472	0.3	24	5	5	1
Ningxia	1,174	0.7	56	5	45	4
Xinjiang	3,879	2.3	164	4	344	9

Source: China Agriculture Yearbook 2004.

Table A8.2 Exports of vegetables: Volume, Value and Unit Value

	1992		*2001*		*Index*
Volume	*(mill. US$)*	*(%)*	*(mill. US$)*	*(%)*	*2001 (1992=100)*
World	7,557	100	13,942	100	184
Developed	3,302	43.7	5,142	36.9	156
Developing countries	4,255	56.3	8,800	63.1	207
Excl China	3,793	50.2	7,204	51.7	190
China	462	6.1	1,596	11.4	345
Value	*(mill. US$)*	*(%)*	*(mill. US$)*	*(%)*	*2001 (1992=100)*
World	3,867	100	7,563	100	196
Developed	1,842	47.6	3,136	41.5	170
Developing countries	2,025	52.4	4,427	58.5	219
Excl. China	1,823	47.1	3,894	51.5	214
China	202	5.2	533	7.0	264
Unit Value	*US$/MT*		*US$/MT*		*2001 (1992 =100)*
World	512		542		106
Developed	558		610		109
Developing countries	476		503		106
Excl China	481		541		112
China	437		334		76

Source: FAOSTAT, 2004.

Table A8.3 Exports of fruits: Volume, Value and Unit Value

	1992		*2001*		*Index*
Volume	*(mill. US$)*	*(%)*	*(mill. US$)*	*(%)*	*2001 (1992=100)*
World	23,774	100	33,104	100	139
Developed	6,982	29.4	9,621	29.1	138
Developing countries	16,792	70.6	23,483	70.9	140
Excl China	16,618	69.9	22,767	68.8	137
China	174	0.7	716	2.2	411
Value	*(mill. US$)*	*(%)*	*(mill. US$)*	*(%)*	*2001 (1992=100)*
World	10,673	100	13,826	100	130
Developed	4,516	42.3	5,569	40.3	123
Developing countries	6,158	57.7	8,257	59.7	134
Excl China	6,069	56.9	8,014	58.0	132
China	89	0.8	243	1.8	273
Unit value	*US$/MT*		*US$/MT*		*2001 (1992=100)*
World	449		418		93
Developed	647		579		89
Developing countries	367		352		96
Excl China	365		352		96
China	511		339		66

Source: FAOSTAT, 2004.

Table A8.4 Imports of fruits: Volume, Value and Unit Value

	1992		2001		Index
Volume	*(1000 MT)*	*(%)*	*(1000 MT)*	*(%)*	*2001 (1992=100)*
World	24,665	100	32,308	100	131
Developed	20,122	81.6	23,815	73.7	118
Developing countries	4,543	18.4	8,493	26.3	187
Excl China	4,511	18.3	7,733	23.9	171
China	32	0.1	760	2.4	2,375
Japan	1,532	6.2	1,744	5.4	114
Value	*(mill. US$)*	*(%)*	*(mill. US$)*	*(%)*	*2001 (1992=100)*
World	15,610	100	17,875	100	115
Developed	10,027	64.2	13,692	76.6	137
Developing countries	2,583	16.5	8,257	46.2	320
Excl China	2,572	16.5	7,972	44.6	310
China	11	0.1	285	1.6	2,591
Japan	1,399	9.0	1,346	7.5	96
Unit Value	*US$/MT*		*US$/MT*		*2001 (1992=100)*
World	633		553		87
Developed	498		575		115
Developing countries	569		972		171
Excl China	570		1,031		181
China	344		375		109
Japan	913		772		85

Source: FAOSTAT, 2004.

Table A8.5 China's vegetable export growth by destination

Destinations	*Share 1995*		*Share 2003*		*Unit value (US$/MT)*			*Index 2003 (1995=100)*	
	Volume	*Value*	*Volume*	*Value*	*1995*	*2000*	*2003*	*Volume*	*Value*
Total in all	**100**	**100**	**100**	**100**	**1,013**	**650**	**555**	**259**	**142**
Japan	39.1	46	24.8	39.8	1,193	983	891	164	123
United States	4.9	5.6	4.3	6.9	1,147	788	888	227	176
South Korea	2.8	3.6	8	6.5	1,275	595	452	727	258
Hong Kong	20	15.8	9.5	5.3	800	223	313	123	48
Malaysia	1.3	1.5	7.6	4.3	1,160	317	313	1,540	415
Italy	1.2	1.6	3.4	3.9	1,385	749	651	741	349
Germany	3.9	4.9	2.2	3.6	1,281	828	898	149	105
Russia	3.2	0.8	5.6	3.2	256	204	321	451	565
Indonesia	1.7	1.1	5.4	2.8	653	309	283	833	362
Netherlands	1.6	1.7	2.6	2.6	1,107	640	566	416	213
Spain	0.3	0.4	0.8	1.4	1,280	842	927	611	443
France	0.7	0.9	0.6	1.3	1,299	1,349	1,162	229	205
Canada	1.2	1.4	0.9	1.1	1,186	719	706	192	114
Singapore	4.3	4	1.4	1.1	929	301	424	84	38
Vietnam	0.8	0.2	3.6	1	289	152	162	1,134	635
Thailand	0.4	0.7	1.2	1	1,746	791	428	851	208
EU	9.3	11.2	12	15.5	1,223	759	720	334	197
Others	6.8	5.2	10.9	8.3	774	475	423	159	159
Absolute total[a]	**2,134,909**	**2,164**	**5,526,897**	**3,068**					

Source: Customs of China.
Note: EU includes 25 countries.
a. Absolute total = the value is expressed in millions US$/volume expressed in MT.

Table A8.6 China's fruit export growth by destination

Destinations	*Share 1995*		*Share 2003*		*Unit value (US$/MT)*			*Index 2003 (1995=100)*	
	Volume	*Value*	*Volume*	*Value*	*1995*	*2000*	*2003*	*Volume*	*Value*
Total in all	**100**	**100**	**100**	**100**	**797**	**532**	**514**	**385**	**248**
Japan	21.2	30.7	11.2	21.6	1,155	1,018	993	204	175
United States	3.1	4	13.2	17.8	1,020	736	698	1,610	1,102
South Korea	19	10.1	9.1	6.9	421	280	385	185	169
Hong Kong	1.9	2.2	5.7	6.9	916	664	618	1,135	765
Malaysia	0.7	0.9	4.4	4.8	1,108	731	556	2,570	1,288
Italy	5.2	4.3	6.3	4.3	661	317	352	471	251
Germany	17.4	19.6	8.3	4.3	897	289	268	183	55
Russia	3.8	1.2	7.2	3.4	246	289	239	739	717
Indonesia	2.7	1.8	4.3	3	530	291	361	615	418
Netherlands	2.2	1.7	2.6	2.8	610	568	553	464	420
Spain	9.7	9.3	3.2	2.7	762	407	436	126	72
France	0.2	0.3	3	2.4	971	446	410	5,209	2,200
Canada	2.3	1.4	3.9	2.4	477	284	317	658	438
Singapore	2.8	3	1.7	2.3	856	775	696	237	193
Vietnam	0.3	0.6	1.4	1.6	1,395	779	607	1,617	703
Thailand	1.2	1.2	1.2	1.6	821	632	677	411	339
EU	4.7	5.7	14.8	17.5	963	688	607	1,206	760
Others	2.6	4.8	8.5	7.3	1,456	416	439	324	151
Absolute total[a]	**692,327**	**552**	**2,667,569**	**1,372**					

Source: Customs of China.
Note: EU includes 25 countries.
a. Absolute total = value expressed in millions US$/volume expressed in MT.

Table A8.7 China's vegetable exports by product, total and to Japan

Units: value in mill. US$	*Total*			*Of which Japan*		
	1995	*2001*	*2003*	*1995*	*2001*	*2003*
Vegetables[a]	**2,164**	**2,339**	**3,068**	**995**	**1,203**	**1,220**
1.Fresh or chilled, frozen[b]	**659**	**947**	**1,205**	**375**	**548**	**488**
(a) Fresh or chilled	**424**	**541**	**852**	**199**	**239**	**262**
Onions and shallots	13	58	85	5	39	35
Garlic	80	207	355	7	24	23
Cauliflowers and headed broccoli	3	21	16	0	18	8
Carrots and turnips	12	17	45	7	9	12
Other edible roots	19	21	64	14	13	45
Peas	5	8	11	4	7	8
Sungmo/Matsutake	-	36	44	-	35	43
Shiitake (2003 and after)	-	-	39	-	-	34
Other mushrooms	-	67	19	-	57	11
Bamboo shoots	8	5	6	8	4	5
Other vegetables	83	49	58	14	15	11
（b）Frozen	**176**	**345**	**299**	**135**	**259**	**185**
（c）Other vegetables	**60**	**60**	**54**	**41**	**51**	**41**
2. Processed, prepared, preserved	**926**	**977**	**1,301**	**433**	**467**	**530**
3. Dried	**578**	**416**	**562**	**187**	**189**	**202**

Source: Customs of China.
Notes:
a. Vegetables = 1. Fresh or chilled, frozen + 2. Processed, prepared, preserved + 3. Dried.
b. Fresh or chilled, frozen = Fresh or chilled + Frozen + Other vegetables.

Table A8.8 Japan's vegetable imports by product, total and from China

Units: Value mill. US$	*Total*			*Of which China*		
	1995	*2000*	*2003*	*1995*	*2000*	*2003*
Fresh	**1,114**	**1,062**	**909**	**272**	**367**	**338**
Onions	135	72	82	3	7	34
Garlic	12	20	19	12	20	18
Japanese leek	-	-	33	-	-	33
Alliac eous vegetables	13	36	9	11	34	7
Cabbages (excl. broccoli)	7	8	15	1	7	14
Carrots and turnips	34	21	22	7	7	15
Edible burdock	-	45	53	-	35	47
Peas	26	35	18	25	34	17
Sungmo/Matsutake	197	135	96	56	63	48
Shiitake	94	93	48	93	93	48
Taros	21	10	11	21	10	11
Ginger	28	28	24	27	24	22
Frozen	**764**	**924**	**849**	**250**	**391**	**352**
In brine	**212**	**160**	**136**	**176**	**138**	**118**
Dried	**247**	**261**	**240**	**183**	**221**	**201**
Vinegar-preserved	**31**	**30**	**44**	**16**	**19**	**35**
Tomato-products	**164**	**150**	**144**	**18**	**15**	**18**
Prepared-vegetables	**582**	**586**	**589**	**235**	**243**	**309**
Others	**0**	**3**	**10**	**0**	**3**	**10**
Total	**3,114**	**3,176**	**2,921**	**1,150**	**1,397**	**1,381**

Sources: Vegetable Supply Stabilization Fund "VINAS." Origin: Ministry of Finance, "Japan Exports and Imports." 2004 IMF. Exchange rates used for conversion: for year 1995 = 94.0; 2000 = 107.7; 2003 =115.9.
Note: Total = Fresh + Frozen + In brine + Dried + Vinegar-preserved + Tomato-products + Prepared-vegetables + Others.

Table A8.9 China's fruit exports by product, total, and to Japan

Units: Value in mill. US$	*Total*			*Of which Japan*		
	1995	*2001*	*2003*	*1995*	*2001*	*2003*
Fruits[a]	**552**	**793**	**1,372**	**169**	**265**	**297**
1. Fresh or chilled, frozen	**184**	**243**	**502**	**9**	**34**	**29**
Bananas, including plantains, fresh or dried	2	5	7	1	3	2
Oranges, fresh or dried	4	0	8	-	0	-
Other mandarins; clementines, wilkings and similar citrus hybrids, fresh or dried	-	34	61	-	0	-
Grapefruit, fresh or dried	3	1	2	-	-	-
Grapes, fresh	1	0	6	0	0	-
Watermelons, fresh	8	2	4	-	-	-
Hami melons, fresh	4	1	3	0	0	-
Apples, fresh	45	101	210	0	0	0
Ya pears, Hsueh pears, fresh	-	21	39	-	-	-
Xiang pears, fresh	-	3	5	-	-	-
Other pears, fresh	16	16	36	0	0	-
Other fruits, fresh	1	4	5	0	0	0
Strawberries, frozen	8	15	55	6	9	13
Raspberries, blackberries, mulberries, frozen	0	1	5	0	0	3
Other fruits, frozen	-	28	41	-	20	10
2. Fruit juice	**34**	**168**	**279**	**18**	**38**	**36**
3. Fruit, in airtight containers	**139**	**178**	**269**	**85**	**70**	**67**
4. Other fruits, processed, prepared, preserved	**195**	**204**	**322**	**57**	**122**	**165**

Source: Customs of China.
Note: EU includes 25 countries.
a. Fruits = Fresh or chilled, frozen + Fruit juice + Fruit in airtight containers + Other fruits, processed, prepared, preserved.

Table A8.10 China's unit value of vegetable exports by product, total, and to Japan

Units: US$/MT	*Total*			*Of which Japan*		
	1995	*2001*	*2003*	*1995*	*2001*	*2003*
Vegetables[a]	**1,013**	**594**	**555**	**1,193**	**894**	**891**
1. Fresh or chilled, frozen[b]	**664**	**442**	**364**	**1,173**	**783**	**737**
(a) Fresh or chilled	**581**	**325**	**300**	**1,565**	**645**	**653**
Onions and shallots	304	198	187	462	306	260
Garlic	567	379	311	772	670	690
Cauliflowers and headed broccoli	220	414	293	1,154	524	420
Carrots and turnips	313	198	220	376	276	257
Other edible roots	693	395	696	687	474	762
Peas	887	646	625	873	685	874
Sungmo/Matsutake	-	28,478	44,529	-	28,524	44,729
Shiitake (2003 and after)	-	-	1,604	-	-	1,732
Other mushrooms	-	1,374	1,287	-	1,625	1,680
Bamboo shoots	1,583	1,049	1,185	1,691	1,230	1,453
Other vegetables	331	170	197	904	514	528
（b）Frozen	**938**	**905**	**832**	**958**	**968**	**979**
（c）Other vegetables	**784**	**632**	**473**	**797**	**804**	**568**
2. Processed, prepared, preserved	**954**	**648**	**694**	**922**	**789**	**813**
3. Dried	**3,366**	**1,447**	**1,667**	**4,196**	**3,503**	**3,675**

Source: Customs of China.

Notes:

a. Vegetables = 1. Fresh or chilled, frozen + 2. Processed, prepared, preserved + 3. Dried.

b. Fresh or chilled, frozen = Fresh or chilled + Frozen + Other vegetables.

Table A8.11 Unit value of China's fruit exports by product, total, and to Japan

Units: US$/MT	*Total*			*Of which Japan*		
	1995	*2001*	*2003*	*1995*	*2001*	*2003*
Fruits[a]	**797**	**536**	**514**	**1,155**	**1,019**	**993**
1. Fresh or chilled, frozen	**456**	**313**	**338**	**895**	**1,256**	**1,136**
Bananas, including plantains, fresh or dried	376	332	343	647	515	584
Oranges, fresh or dried	251	155	367	-	937	-
Other mandarins; clementines, wilkings and similar citrus hybrids, fresh or dried	-	249	256	-	400	-
Grapefruit, fresh or dried	344	180	169	-	-	-
Grapes, fresh	570	413	434	1,000	750	-
Watermelons, fresh	321	130	128	-	-	-
Hami melons, fresh	662	240	182	900	1,871	-
Apples, fresh	416	332	344	1,648	432	372
Ya pears, Hsueh pears, fresh	-	210	247	-	-	-
Xiang pears, fresh	-	258	416	-	-	-
Other pears, fresh	399	239	283	652	331	-
Other fruits, fresh	226	135	184	2,402	1,182	1,214
Strawberries, frozen	922	702	702	969	959	999
Raspberries, blackberries, mulberries, etc, frozen	2,657	645	1,158	2,657	1,517	1,557
Other fruits, frozen	-	1,187	841	-	1,867	1,567
2. Fruit juice	**1,270**	**672**	**621**	**1,260**	**828**	**810**
3. Fruit, in airtight containers	**929**	**691**	**629**	**990**	**831**	**754**
4. Other fruits, processed, prepared, preserved	**1,731**	**1,036**	**1,057**	**1,569**	**1,196**	**1,178**

Source: Customs of China.

Note:

a. Fruits = Fresh or chilled, frozen + Fruit juice + Fruit, in airtight containers + Other fruits, processed, prepared, preserved.

Table A8.12 Unit value of Japan's vegetable imports by product, total, and from China

Units: US$/MT	*Total*			*Of which China*		
	1995	*2000*	*2003*	*1995*	*2000*	*2003*
Fresh	**1,510**	**1,094**	**981**	**1,783**	**1,009**	**723**
Onions	550	274	337	441	258	283
Garlic	948	689	673	931	684	668
Japanese leek	-	-	736	-	-	736
Alliaceous vegetables	1,683	854	1,497	1,468	816	1,229
Cabbages (excl. broccoli)	572	359	389	685	350	385
Carrots and turnips	603	483	410	443	353	349
Edible burdock	-	553	843	-	512	829
Peas	2,646	1,661	1,382	2,609	1,649	1,376
Sungmo/Matsutake	56,155	39,158	43,385	46,853	48,209	42,982
Shiitake	3,580	2,221	1,916	3,566	2,222	1,916
Taros	786	474	374	781	474	374
Ginger	782	578	506	764	527	490
Frozen	**1,322**	**1,196**	**1,197**	**1,319**	**1,232**	**1,203**
In brine	**833**	**727**	**669**	**806**	**731**	**686**
Dried	**5,427**	**4,862**	**4,419**	**5,101**	**4,793**	**4,249**
Vinegar-preserved	**1,169**	**1,163**	**1,282**	**1,224**	**1,083**	**1,255**
Tomato products	**974**	**775**	**809**	**773**	**642**	**592**
Prepared vegetables	**1,864**	**1,611**	**1,451**	**1,511**	**1,133**	**1,154**
Others	**344**	**682**	**742**	**261**	**677**	**739**
Total[a]	**1,468**	**1,220**	**1,191**	**1,770**	**1,189**	**1,047**

Source: Vegetable Supply Stabilization Fund "VINAS." Origin: Ministry of Finance, "Japan Exports and Imports", 2004
Notes:
IMF Exchange rates used for conversion: for years 1995 = 94.0, 2000 =107.7, 2003 =115.9.
a. Total = Fresh + Frozen + In brine + Dried + Vinegar-preserved + Tomato-products + Prepared-vegetables + Others.

Table A8.13 Unit value of Japan's most important vegetable imports by country, 2003

Units: US$/MT	*China*	*United States*	*New Zealand*	*Thailand*	*Taiwan*	*Mexico*
Fresh	**723**	**1,194**	**643**	**3,209**	**964**	**1,017**
Onions	283	326	450	776	638	-
Garlic	668	3,399	-	-	-	-
Japanese leek	736	-	-	665	-	-
Alliaceous vegetables	1,229	-	-	-	3,643	-
Cabbages (excl. broccoli)	385	-	-	-	425	-
Carrots and turnips	349	1,834	611	-	455	-
Edible burdock	829	-	-	1,086	969	-
Peas	1,376	-	-	3,892	-	-
Matsutake	42,982	35,626	-	-	-	-
Shiitake	1,916	-	-	-	-	-
Taros	374	-	-	-	-	-
Ginger	490	-	-	1,077	-	-
Frozen	**1,203**	**1,024**	**1,189**	**1,704**	**1,777**	**1,725**
In brine	**686**	**1,355**	**-**	**537**	**1,723**	**-**
Dried	**4,249**	**4,171**	**6,600**	**8,842**	**8,134**	**-**
Vinegar-preserved	**1,255**	**1,809**	**-**	**743**	**3,182**	**2,418**
Tomato products	**592**	**858**	**1,536**	**738**	**1,732**	**1,187**
Prepared vegetables	**1,154**	**1,505**	**2,284**	**1,189**	**2,166**	**-**
Others	**739**	**-**	**-**	**-**	**-**	**-**
Total[a]	**1,047**	**1,154**	**788**	**1,389**	**1,613**	**1,095**

Source: Vegetable Supply Stabilization Fund "VINAS." Origin: Ministry of Finance, "Japan Exports and Imports." 2004.
Notes:
IMF Exchange rates used for conversion: for years 1995 = 94.0, 2000 =107.7, 2003 =115.9
a. Total = Fresh + Frozen + In brine + Dried + Vinegar-preserved + Tomato-products + Prepared-vegetables + Others.

Table A8.14 Unit value of China's most important vegetable exports by commodity and country, 2003

Units: US$/MT	*Japan*	*EU*	*U.S.A.*	*South Korea*	*Malaysia*
Vegetables[a]	**891**	**720**	**888**	**452**	**313**
1. Fresh or chilled, frozen[b]	**737**	**563**	**744**	**342**	**199**
(a) Fresh or chilled	**653**	**431**	**770**	**308**	**200**
Onions and shallots	260	288	258	121	117
Garlic	690	348	729	471	241
Cauliflowers and headed broccoli	420	461	451	205	237
Carrots and turnips	257	633	754	280	243
Other edible roots	762	263	810	573	291
Peas	874	405	751	-	185
Sungmo/Matsutake	44,729	-	-	37,679	-
Shiitake (2003 and after)	1,732	1,961	1,784	1,009	213
Other mushrooms	1,680	1,696	1,722	1,432	199
Bamboo shoots	1,453	701	895	468	208
Other vegetables	528	1,115	763	189	210
(b) Frozen	**979**	**835**	**806**	**452**	**465**
(c) Other vegetables	**568**	**600**	**460**	**731**	**163**
2. Processed, prepared, preserved	**813**	**690**	**690**	**356**	**669**
3. Dried	**3,675**	**1,548**	**1,472**	**1,530**	**847**

Source: Customs of China.
Notes: EU includes 25 countries.
a. Vegetables = Fresh or chilled, frozen + Processed, prepared, preserved + Dried.
b. Fresh or chilled, frozen = Fresh or chilled + Frozen + Other vegetables.

Table A8.15 Unit value of China's most important fruit exports by commodity and country, 2003

Units: US$/MT	*Japan*	*United States.*	*EU*	*Russia*	*Germany*	*Nether-lands*
Fruits[a]	**993**	**698**	**607**	**385**	**618**	**556**
1.Fresh or chilled, frozen	**1,136**	**657**	**603**	**308**	**712**	**510**
Bananas, including plantains, fresh or dried	584	-	-	528	-	-
Oranges, fresh or dried	-	-	100	283	-	100
Other mandarins; clementines, wilkings and similar citrus hybrids, fresh or dried	-	368	370	301	-	-
Grapes, fresh	-	769	1,193	303	-	1,251
Watermelons, fresh	-	-	-	260	-	-
Hami melons, fresh	-	-	-	371	-	-
Apples, fresh	372	423	568	290	509	463
Ya pears, Hsueh pears, fresh	-	606	291	218	368	281
Xiang pears, fresh	-	-	895	-	-	1,059
Other pears, fresh	-	450	403	327	272	373
Other fruits, fresh	1,214	2,561	1,569	251	-	425
Strawberries, frozen	999	628	635	611	675	567
Raspberries, blackberries, mulberries, frozen	1,557	896	911	773	1,016	750
Other fruits, frozen	1,567	924	752	367	784	720
2. Fruit juice	**810**	**635**	**562**	**559**	**549**	**559**
3. Fruit, in airtight containers	**754**	**622**	**574**	**599**	**575**	**602**
4..Other fruits, processed, prepared, preserved	**1,178**	**1,735**	**847**	**848**	**812**	**975**

Source: Customs of China.
Note: EU includes 25 countries.
a. Fruits = Fresh or chilled, frozen + Fruit juice + Fruit, in airtight containers + Other fruits, processed, prepared, preserved.

Table A8.16 Retail prices (in Yen/kg) of asparagus, broccoli, and burdock from different sources in 7 major Japanese cities, 2004

Month	*Asparagus*		*Broccoli*		*Burdock (gobo)*	
	Standard Domestic	*Imported*	*Standard Domestic*	*Imported*	*Standard Domestic*	*Imported*
1	1,685[a]	1,209[b]	581[a]	379[b]	679[a]	289[b]
2	1,511	1,143	607	376	638	287
3	1,525	1,041	585	402	652	305
4	1,587	1,027	655	372	702	305
5	1,361	1,213	599	375	700	314
6	1,417	1,195	564	370	689	307
7	1,303	1,079	542	367	661	282
8	1,205	1,198	543	394	646	310
9	1,338	1,151	605	446	629	336
10	1,467	1,044	689	429	585	394
11	1,095	1,203	568	413	569	292
12	1,607	1,245	524	393	592	256

Source: Ministry of Agriculture, Forestry and Fisheries, 2004**.**
Notes: Survey at retail shops equipped with POP system and employed more than 10 employees in the 7 major cities: Sapporo, Sendai, Tokyo, Nagoya, Osaka, Hiroshima, and Fukuoka.
Definitions: a. The product is domestic and distributed through the normal channels; b. The product is imported.

Table A8.17 Noncompliance rates of pesticide residues at Shanghai Cao'an Vegetable Market, November 2003–October 2004

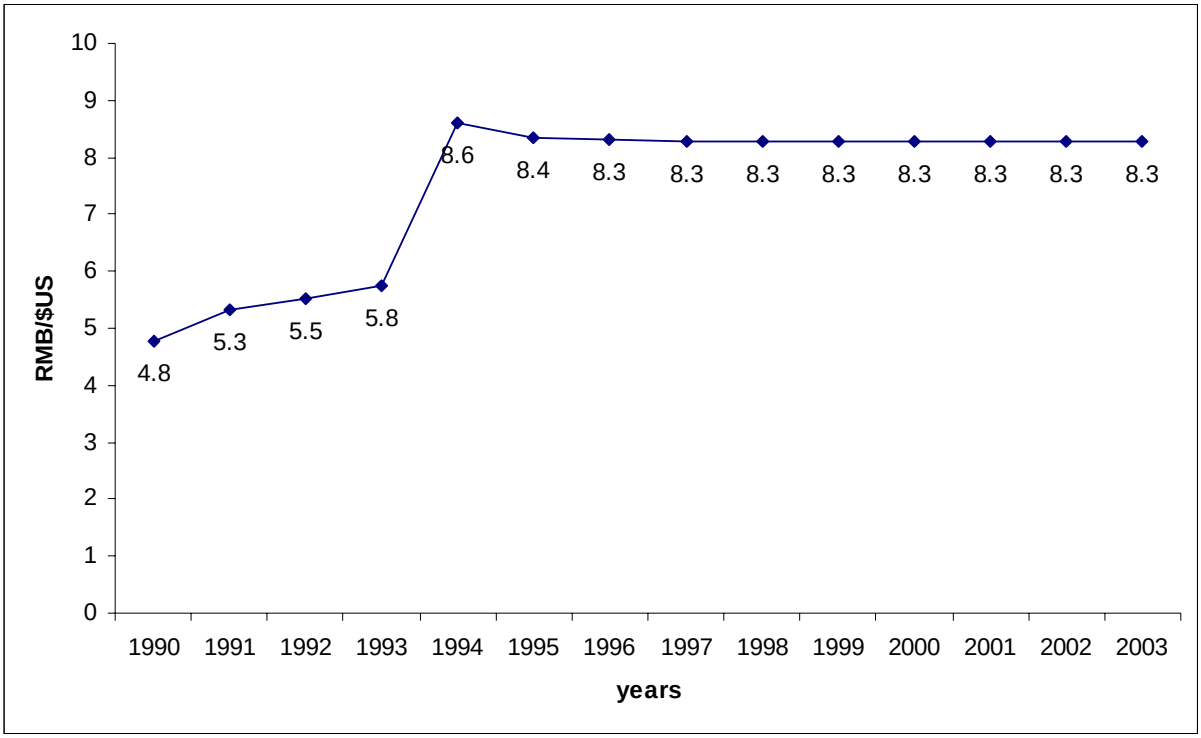
Testing Time	*Noncompliance rate*	*Main problems*
Early May	1 / 11	Methamidofos
Early June	2 / 10	Methamidofos, fenpropathrin
Mid June	1 / 7	Phorate, methamidofos, deltamethrin and dimethoate
End June	0 / 8	None
Early July	3 / 7	Acephate, cypernethrin, phorate, dimethoate, and methamidofos
End July	7 / 15	All the above and chlorpyriphos
Early August	4 / 10	All the above, cypermethrin, fenvalerate, and chlorathalonil
Mid August	5 / 10	Same as the above
End August	5 / 10	All the above, parathion and parathion-methyl
Early September	5 / 10	Same as above
Mid October	4 / 10	Same as above
Average	37/108 = 34%	

Source: http://www.shclz.com.cn/yj/jj.htm [2004].

Table A8.18 Noncompliance with pesticide residue requirements in various municipalities

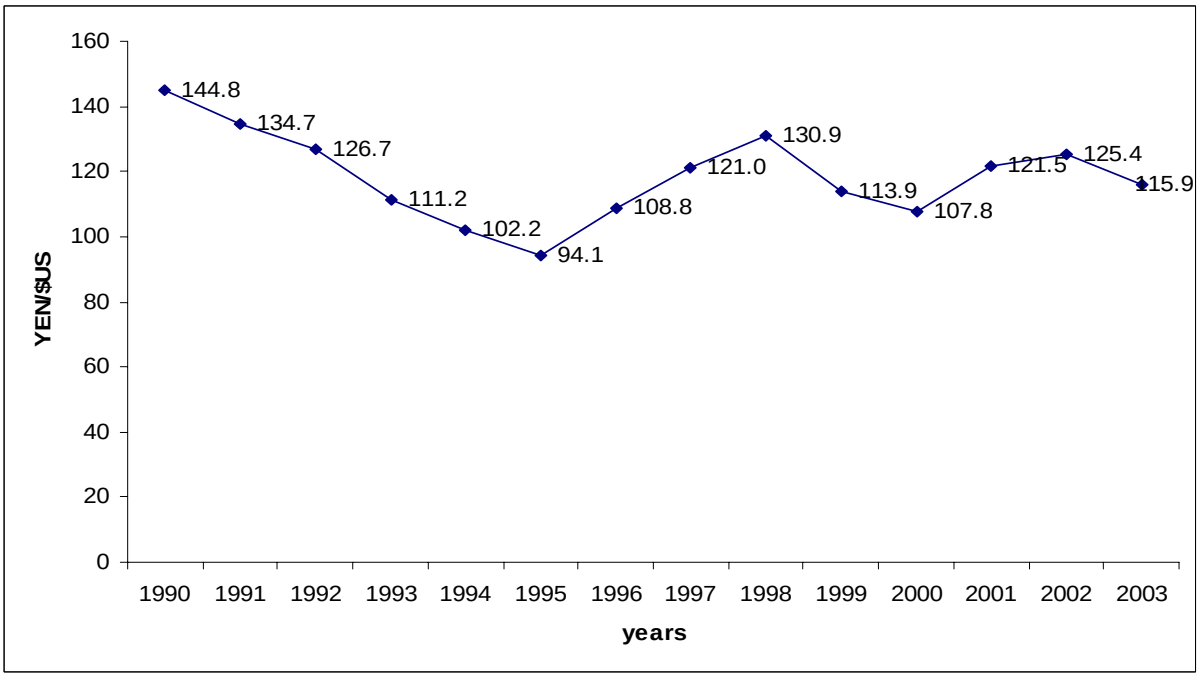
Monitoring agency	*Time*	*Noncompliance rate (%)*
Shenzhen Health Surveillance Station	June-September 2003	Average 12, 10.2 (methamidofos)
Shan'xi Health Authority	April 2004	Spinach 100 (Pb/lead) 7–14 (pesticide residue)
Beijing Agriculture Bureau and Commerce Bureau	Aug. 2004	10.6
Chongqing Agriculture Bureau	October 2004	22
Taiyuan Agriculture Anthority[a]	January 2004	Average 16; 100 samples of vegetable
	April 2004	Average 16.5; 100 samples of vegetable
	June 2004	Average 15, more than 20 in supermarkets and wholesale markets

Source: http://www.agri.gov.cn [2004].
Note: a. There are 42 MOA-designated monitoring points for vegetable farming bases, wholesale markets, and supermarkets in Taiyuan, Shanxi province,



Source: IMF, various years. IMF, International Financial Statistics.

Figure A8.1A Exchange rates RMB:US$, 1990–2003



Source: IMF, various years. IMF, International Financial Statistics.

Figure A8.1B Exchange rates Yen:US$, 1990–2003

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