

RAP PUBLICATION 2006/15

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and safety in the traditional horticultural
marketing chains of Asia**

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**Edited by
Elda B. Esguerra, Jean-Joseph Cadilhon and Andrew W. Shepherd**

**FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC**

AGRICULTURAL AND FOOD MARKETING ASSOCIATION FOR ASIA AND THE PACIFIC

Bangkok, 2006

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Cover photos: O. Argenti and J.-J. Cadilhon.

Acknowledgements: This workshop and the publication of the proceedings were funded by the FAO programme on "Enhancing Food Quality and Safety by Strengthening Handling, Processing and Marketing in the Food Chain". Project MTF/RAS/212/FRA contributed in funding the editing of this publication.

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Foreword

In the recommendations of the last publication on agricultural marketing published by the Regional Office for Asia and the Pacific (RAP),¹ FAO was encouraged to help Asian countries develop their agricultural marketing systems with a view to reducing poverty and achieving food security. Five years on, the situation has changed. While FAO is striving to make its contribution to reduce poverty in order to meet the Millennium Development Goals, food insecurity is less of a problem in many Asian countries thanks to increased production and better marketing facilities. On the other hand, the 28th session of the Regional Conference for Asia and Pacific held in Jakarta in May 2006 highlighted a new preoccupation of member countries: quality and safety. Indeed, the Conference requested FAO to continue assisting countries in enhancing capacity to meet international food quality and sanitary and phyto-sanitary standards to facilitate trade and safeguard plant, animal and human health, and assist in establishing and maintaining appropriate regulations, monitoring and surveillance to ensure food quality and safety.

FAO has been working to improve quality and safety in Asian countries through a wide range of interventions. One of these has been the programme entitled “Enhancing Food Quality and Safety by Strengthening Handling, Processing and Marketing in the Food Chain”. The FAO/AFMA Regional Workshop on Quality and Safety in the Traditional Horticultural Marketing Chains of Asia was carried out under the auspices of this programme and was convened in Bangkok from 7 to 10 November 2005. Emphasis of the papers and country case studies presented was on identifying ways of overcoming constraints to improvements in traditional marketing channels.

The conclusions from the workshop are striking. Many countries in the region have been regulating safety and quality of their fresh produce. However, in many cases the regulations fail to be implemented because of a lack of resources or because farmers and traders lack a financial incentive to comply with the rules. Consumers remain suspicious of the safety and quality of the produce they buy; in some cases despite official quality labelling. The workshop recommended FAO and member countries to work closely with the private sector and all stakeholders in the marketing chains to address those factors constraining development of improved quality and safety for fresh produce. It is hoped these proceedings will be of use to all those with an interest to improve quality and safety in the Asian horticultural marketing chains.



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¹ Proceedings of the mini roundtable meeting on agricultural marketing and food security, 1 to 2 November 2001, Bangkok, Thailand. RAP publication 2003/02.

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Introduction

The FAO/AFMA Workshop on Quality and Safety in the Traditional Horticultural Marketing Chains of Asia was convened in Bangkok, Thailand from 7 to 10 November 2005. The workshop was attended by 31 participants representing various fields of discipline. Participants included:

- representatives from AFMA member agencies from five countries;
- academics;
- researchers;
- representatives from government departments that are closely involved with horticulture and food safety issues;
- expert consultants from seven countries;
- representatives of private sector marketing entities such as fruits and vegetable traders associations;
- officers from FAO and AFMA.

The workshop agenda and the list of participants are attached as Annexes 1 and 2.

The workshop was opened by Andrew W. Shepherd, Senior marketing economist at FAO Rome, who briefly presented FAO's involvement in developing and strengthening the capacities of governments and farmers on quality and safety issues: *Codex alimentarius*, integrated pest management (IPM), good agricultural practices (GAP), etc. This workshop was the first attempt by FAO to approach quality and safety issues through a marketing system perspective. What are the constraints faced by farmers and traders in the traditional horticultural supply chains to bring safe and quality produce to markets? This was the main issue to be discussed during the workshop.²

A second introductory speech was given by Nelson C. Buenaflor, Chairperson of AFMA, who suggested government departments that are members of AFMA identify the issues and topics deemed of importance by agribusinesses in their respective country. This would enable AFMA to organize its next international seminar in line with the needs of the industry, which would hopefully encourage private companies to join the association.

Altogether, 21 presentations were submitted for discussion:

- Seven case studies carried out by expert consultants from India, Myanmar, Nepal, Pakistan, the Philippines, Thailand and Viet Nam. These dealt with quality and safety issues in traditional horticultural marketing chains of Asia.³
- A review of the country case studies and a case study of collaborative lettuce trading in Ho Chi Minh City by two FAO experts.
- Steps taken by Bangkok's Talaad Thai wholesale market to improve fruits and vegetable quality and safety, presented by an executive of the market authority.
- Nine country papers from Cambodia, India, Indonesia, the Lao People's Democratic Republic, Malaysia, Pakistan, the People's Republic of China, the

² The two complete opening addresses are published as Annex 3.

³ The complete case studies are published as Annexes 4 to 10.

Republic of Korea and Sri Lanka. These papers reviewed problems with quality and safety in the respective country's horticulture sector.

- A study on consumer perceptions of quality by a Filipino expert.
- A case study on improving quality in the Indian apple trade by the Chairperson of the Apple Trading Association.
- A trader's perspective of improving quality and safety in the Thai fruit and vegetable trade by a Thai expert.

A field visit was made to Talaad Thai – the largest fruit and vegetable wholesale market in Thailand, privately owned by the Thai Agro Exchange Co. Ltd. This field trip was organized for workshop participants to observe overall market management practices and discuss steps taken to improve the quality and safety of the product on sale. An account of this visit is published as Annex 11.

Conclusions and recommendations

Andrew W. Shepherd, FAO, Rome
Jean-Joseph Cadilhon, FAORAP, Bangkok

Conclusions

There are many ways in which quality and safety of fresh produce can be negatively affected, ranging from the soil used to cultivate the crop to the handling by consumers and retailers at the time of sale. At the production level, soils can contain excess heavy metals, while water used for irrigation and for washing harvested produce can be, and frequently is, polluted. The choice of variety can affect the attractiveness of a product to consumers and can also have an impact on the shelf life of the product. Use of untreated manure can spread pathogens. Harvesting practices can have a major impact on both quality and safety, with fruits and vegetables often being harvested immature, too soon after pesticide application, or at the wrong time of the day. Diseases and pests are widespread and can have a major impact on quality. However, countering such problems by using pesticides has major implications for food safety, particularly when they are not applied in accordance with recommendations or when banned chemicals continue to be used.

Problems relating to quality and safety do not, however, stop at the farm. Poor packaging and the tendency to squeeze too much produce into a container or vehicle can have a significant impact on quality. Exposure to the elements while awaiting transport can reduce quality, as can poor handling. Dirty packaging materials and dirty vehicles can introduce physical and microbial contamination as can washing during marketing or the watering of leafy vegetables using dirty water. Poor storage practices may damage produce and reduce its shelf life. Chemicals used for ripening and for surface decontamination, often not recommended for that purpose, can affect safety of fruits and vegetables, as can the use of some waxes, colouring agents and insecticides applied during the marketing process. Marketing infrastructure is often inadequate and unhygienic; produce is frequently exposed to ambient conditions and stored, trimmed and sold while placed on bare earth. Finally, produce quality can be seriously affected by the practice of allowing consumers to pick their own fruits and vegetables from a retail display and microbial contamination can also result from this.

Several countries have quality standards for fruits and vegetables but these are usually voluntary and not applied by marketing channels, which set their own standards normally on the basis of size grades. All countries have pesticide legislation and agencies responsible for registering and controlling the use of agrochemicals. However, in many countries enforcement remains inadequate. Controls appear to be largely ineffective due to poor coordination between the agencies involved with food safety and quality and those charged with controlling pesticide use and other aspects of production, combined with a lack of resources and a general lack of compliance with laws and regulations, which makes enforcement of regulations next to impossible. Many countries report significant illnesses and deaths resulting from consumption of

fruits and vegetables contaminated with either microbes or pesticide residues and these reports possibly understate the true picture. Local agencies are generally ill-equipped to monitor microbial contamination and little advice appears to be available for farmers and traders about ways of avoiding such contamination.

Farmers rarely undertake actions to improve quality or safety. Factors explaining this are market-related, socio-economic, and awareness-related. For many consumers in Asia price is seen as the most important factor influencing a purchasing decision, followed by the location of the retailer. There is a reluctance to pay more for quality and a general lack of awareness of safety issues. Where there is a perception of quality it is largely related to the physical appearance of the produce, with the result that traders put pressure on farmers to produce blemish-free fruits and vegetables, which may involve using large amounts of pesticide. Increased demand for fruits and vegetables, together with land and labour shortages, has led to intensification, involving higher levels of pesticide use, as has the growing demand for out-of-season production.

Although traders do reject produce as unacceptable, fruits and vegetables meeting minimum standards are generally purchased at the same price regardless of quality or safety characteristics. Farmers thus have no incentive to improve quality beyond the minimum necessary to make a sale. There may be a disincentive to reduce pesticide usage if, as a consequence, fruits and vegetables become blemished and fail to meet minimum standards. Unreliable marketing channels and uncertainty about the price similarly discourage investment. Marketing channel practices, such as buying the field or orchard or providing finance to farmers in advance of the harvest, may also have implications for produce quality. Seeking to maximize their income, farmers often sell unripe produce in order to take advantage of higher prices. Where marketing channels are unreliable farmers may sell immature produce because they cannot be sure that a trader will be buying when the produce is ready.

Risk-averse farmers frequently believe that reducing use of pesticides would significantly reduce their yields. In some countries this propensity to use agrochemicals is enhanced by policies that exempt pesticides from taxes or duties or by credit programmes that include the cost of pesticides as part of a loan package. Banned chemicals continue to be used, in part because farmers are unaware that they are illegal but also because they are cheaper. Concern to maximize income often leads farmers to sell produce that has only recently been sprayed, ignoring recommended pre-harvest intervals. Use of pesticides is also promoted by social pressure: no farmer wants to be seen as the cause of a local infestation. Overuse and misuse is promoted by some agrochemical retailers, often the only source of information available to farmers, and by illiterate farmers not knowing when to apply pesticide, and being unaware of the correct product or dose. Knowledge at farm level of factors contributing to microbial contamination is negligible.

Traders seeking to improve produce quality are constrained by the purchasing power of consumers. In general, consumers make quality choices within an affordable price range. Limited surveys indicate a willingness to pay slightly more for “safe” food but the premium consumers are willing to pay may not compensate for the higher production costs. Amongst the middle class there is an increasing demand for better quality and safety but traditional marketing channels face problems in supplying such

demand as they seem to have limited capacity to handle more than one quality grade of a particular fruit or vegetable. Some sorting of produce does take place in marketing channels but this is usually on the basis of size, or to remove unsaleable items. Traders are further constrained by poor market infrastructure, poor storage facilities, an inability to control the quality of transport and handling, and a lack of knowledge of post-harvest techniques.

Several countries have introduced programmes to promote “safe” vegetable production, most notably the People’s Republic of China, Thailand and Viet Nam. Progress is reportedly fairly slow and the case studies reported that most produce sold still fails to meet minimum standards. Lack of resources for implementation appears to be a major constraint. Nevertheless, the programmes do suggest future developmental approaches. Similarly, several countries have introduced IPM programmes but these are only slowly expanding their coverage due to constraints in funding and available extension staff.

Working group recommendations

During the workshop, participants divided into three working groups. The working group dealing with health hazards acknowledged that the efforts of governments to introduce and implement quality and safety regulations for horticultural products were not being followed by industry stakeholders. The proposed scenario described how consumers would continue to rely on identified private traders whom they trusted to provide them with quality produce. The working group recommended that FAO should be the lead agent to create and raise awareness on food quality and safety issues in order to correct certain existing misconceptions; indeed many consumers still think that washing produce will eliminate pesticide residues and microbiological contaminants, some consumers also believe that buying produce from supermarkets guarantees safe quality. FAO and other donors also had a leading role to play in building capacity in the public and private sectors on food safety and quality. It was also suggested that an inventory be compiled of country programmes dealing with food quality and safety.

The working group tackling the issue of production structure envisaged a relatively pessimistic scenario whereby over the next decade the majority of producers in the region would stay isolated, uninformed and vulnerable to strong market instability. General recommendations were made to improve quality and safety in the fruit and vegetable supply chains in the region; the generalization of good agricultural practices (GAP) initiatives was particularly recommended so that all supply chain stakeholders could be covered.

The working group discussing capacity building of stakeholders proposed a development scenario emphasizing the leading role of public-private partnerships in building stakeholders’ capacities on food safety and quality. An appropriate policy environment first needed to be devised by governments in consultation with the industry. FAO could play a role in identifying existing food laws that are being implemented with success in the region and help in harmonizing laws and monitoring systems in the region. Greater cooperation was recommended between public and private sectors in order to break down wariness currently existing between the two.

FAO could play a supportive role to these public-private partnerships in suggesting appropriate market infrastructure, finance and information systems.

Presentation summaries

Food quality and safety issues in the fresh produce production and marketing chain in India

G.H. Dhankar, Agricultural Marketing Consultant, Pune

Fruits and vegetables have become an integral part of food security in India due to their nutritional and functional properties. As such, fruits and vegetables should be of good quality and safe.

Microbial contamination of the produce may come from improperly treated or undecomposed manure, ground water used for irrigation and cleaning fresh produce, and unhygienic practices of workers. Chemical contaminants include pesticide residues, dyes used in the textile or printing industries, which find their way in the irrigation water. Equipment, tools, packaging materials, storage rooms and transport vehicles are other sources of contamination. Poor handling practices during and after harvest lead to quality decline.

The constraints to improving produce safety are the decline in production and income, the lack of marketing credit, long marketing channels, inadequate infrastructure, the absence of any price premium for quality and safe produce, and the lack of awareness of the hazards and their sources. Multiple agencies implement existing standards with little coordination.

Quality and safety risks can be minimized if good agricultural practices are promoted and religiously observed. Moreover, integrated pest management (IPM) should be popularized to reach the grass roots level. The implementation of the Insecticide Act and Prevention of Food Adulteration Act should be streamlined with effective communication between agencies involved by these acts. An Integrated Food Law, which harmonizes and rationalizes the existing food laws, should make it easier for the industry to comply. Produce marketing legislation should promote the integrated marketing chain with regular market-matching of producers and buyers to increase awareness of consumers' quality and safety needs. For international and donor organizations, it is recommended that funding should be provided for infrastructure support projects.

Discussions on Mr Dhankar's presentation focused on the extent of farmers' adoption of GAP and the strategies to promote GAP considering their limited resources. Adoption of GAP at the farmers' level in India is nil. Currently, it is popularized at the university level and is slowly being introduced in extension agencies. Another strategy is the establishment of agriclinc and agribusiness centres, of which 300 are operational and financially viable. These centres provide soil and water testing services as well as technical advice to farmers. A sound recommendation which the workshop should consider is the privatization of extension services. At the farming level, the trend towards contract farming is seen as one way of assuring safety. The cooperative and state-implemented marketing systems which were introduced to

compete with the traditional marketing system are heavily subsidized and may not be that effective.

Quality and safety in the fresh produce marketing chain in Myanmar

Kyaw Mint, Myanmar Agricultural Service, Yangon

Several factors constrain the supply of safe produce, such as lack of awareness, inadequate infrastructure (cold storage, transport and laboratory facilities for testing) and the capability of consumers to pay a higher price for safe produce. Moreover, farmers are not organized; hence their knowledge of GAP is almost non-existent. Use of unprocessed animal manure and misuse of pesticides are common. Banned pesticides proliferate due to availability of large stocks at low prices. Farmers do not consider the high residue level to be their marketing problem. Post-harvest practices that contribute to quality decline include harvesting immature produce to take advantage of high prices, use of dirty containers, tight packing and stacking of containers in vehicles. Most farmers are resource-poor, hence interventions to ensure safety that will entail added cost are not within their reach.

In the survey of consumers in Myanmar, most (68 percent) responded that if tomatoes were priced higher to reflect quality and safety they could not afford to purchase them for daily consumption. Consumers' choice of fresh produce was highly related to size, shape, maturity, absence of blemish and freshness. Suppliers therefore do not endeavour to supply safe produce. Also, consumers cannot identify safe produce.

The government should pursue vigorous training and extension activities as well as enhanced consumer awareness on food safety. Technical assistance on GAP and IPM should be provided to farmers, traders and agrochemical suppliers to reduce chemical hazards. The country's Pesticide Registration Board, formed in 1992 should control the marketing of illegal pesticides. The National Food Law of 1997 covered regulations on food additives, licensing, quality assurance, labelling and laboratory analyses. Together with this law and the food safety certification programme, the National Food and Drug Administration is expected to play a vital role in promoting food safety.

Since the proliferation of banned pesticides was also a problem in other countries, workshop participants asked how Myanmar enforces regulations regarding pesticide usage. While rules have been established, banned pesticides can readily cross the borders, which are difficult to control. Moreover, with the banning of monocrotophos, large stocks are still available and are sold at low price hence enforcement is still a problem. In relation to consumers' willingness to pay a higher price for safe food, questions were raised as to whether a new marketing channel is required for this produce to reach the consumer, and how the benefit of higher prices can filter down to the farmers. With changing lifestyles, some consumers buy at supermarkets. However, wholesalers supply the supermarkets and traditional marketing channels are still used. The farmers do not get any benefit from this increased price of produce in supermarkets. The ASEAN GAP for fruits and vegetables, which will be implemented in 2006, will compliment the national standards which are not yet fully established.

A study of food quality and safety issues in the fresh produce production and marketing chain in Nepal

Rajendra P. Singh, Consultant, Kathmandu

In Nepal, the culture of standards is in a very early stage and fruits and vegetables are not included in the list of food items covered by the Bureau of Standards. Few controls are currently exercised and contaminants have been found in food sold in markets. Consumers are concerned about the safety of both imported and locally produced food. The lack of standards results in complaints relating to food safety being transferred to the production system. Moreover, existing standards do not embody developments in international standards. Certification as an assurance of safety is beset by the lack of inspectors and the absence of a certifying agency.

Since the country is in transition from traditional to commercial agriculture, production practices that lead to biological, chemical and physical contamination are still prevalent. These include heavy reliance on pesticides as farmers cannot afford crop loss or market rejection. Use of agro-chemicals as a post-harvest technique to enhance consumer appeal, rough handling, poor packaging and storage environments all contribute to create safety risks.

Consumers' perception of quality is based primarily on visual appearance and physical condition, with safety ranking second. Traders are concerned only with supplying what their consumers want. Most consumers in Nepal think that fresh fruits and vegetables are safe since they are grown locally and they are not familiar with signs of unsafe food.

Other factors that constrain the supply of safe produce are the predominance of small farms and resource-poor farmers. Traders provide loans, hence farmers need to follow their requirements. While there are many assembly markets, marketing facilities and road networks are limited. Marketing channels are not organized and the lack of designated retail market places for fruits and vegetables forces consumers to make purchases in unhygienic retail shops or from hawkers.

There appears to be a serious gap between enforcement mechanisms and the need for immediate intervention. Relevant policies related to food safety such as the Pesticide Act, the Food Act, the Consumer Protection Act and the Nepal Standards need to be reviewed. In the enactment of GAP, integrated efforts of agricultural, commercial, health, educational and development agencies are essential.

In response to questions regarding the dissemination of information on safety and quality, Mr Singh indicated that extension people are aware of the issues but the problem is the strict enforcement of existing rules.

Innovating on quality: the Case of Mr. Van's lettuce supply chain to Ho Chi Minh City (Viet Nam)

Jean-Joseph Cadilhon, FAORAP, Bangkok

A case study was presented as to how traditional traders like the wholesaler Mr Van in Viet Nam can help in improving quality by becoming market-oriented. For Ho Chi Minh City (HCMC) consumers, a good quality butterhead lettuce possesses the following qualities: small and round like a bud, with no spots or marks, inside leaves are clear-coloured and thin. For them, fresh lettuce is also a source of vitamins and fibers. As to usage quality, lettuce must be very fresh to be eaten raw together with cooked foods at every meal. Hygienic quality of lettuce, however, is taken for granted.

Mr Van, a trader who specializes in butterhead lettuce, supplies five tonnes per day in one of HCMC's wholesale markets at higher prices, also achieving less waste, and higher profits than competitors. To realize this, Mr Van collaborates with several collectors. Knowing the requirements of the consumers, the collectors train the farmers on how to grow, harvest and pack lettuce as per Mr Van's specifications of a good quality lettuce.

The collectors pay the farmers 15 days in advance. Mr Van carefully coordinates his distribution activities with his collectors and orders lettuce five days in advance of the expected delivery, hence the collectors can look for the required quality, unlike the other traders who order only on the same day.

Lessons learned from this case study showed that traditional traders can help improve quality in the fruit and vegetable supply chain through the following strategies:

- market orientation,
- quality focus,
- supplier training,
- specific investments,
- collaboration and joint planning.

In return, the following advantages to all supply chain stakeholders can be obtained:

- better quality produce,
- higher value of sales,
- lower waste,
- higher profits,
- increased interdependency of stakeholders and increased satisfaction.

Several questions were raised in discussions relating to price information, price differences, benefits to farmers, and strategies to retain the collectors. In the case of Mr Van, there is a vertical flow of price information where collectors share their information with farmers and other wholesalers. The farmers' network is dense so they can compare farm prices. Mr Van invests in his collectors, lends them money without interest to purchase motorbikes, and closely collaborates with them. He is thus able to retain them. Mr Van distributes the value throughout the supply chain while still making a profit himself. As commented, the benefit of this scheme to the farmers may not be direct in terms of price but in terms of an assured market.

Regarding the involvement of extension workers, the case of Mr Van is an example of a private-driven supply chain without government involvement and also an example of privatization of extension.

Quality and safety in the traditional horticultural marketing chains of Pakistan

Muhammad Iqbal, Pakistan Horticulture Development and Export Board, Karachi

Factors affecting food quality and safety start during production and continue throughout the marketing chain. During production, use of contaminated water and raw farmyard manure, indiscriminate use of pesticides brought about by the strong marketing campaign of pesticide companies, and poor crop sanitation result in chemical and microbial contamination. While IPM has been successfully demonstrated through farmers' field schools (FFS), slow adoption has been due to farmers' perception of lower yields, lack of access to alternative control measures, lack of financial resources, weak extension services and lack of coordination among research and extension institutions.

Harvesting and post-harvest practices leading to unsafe food include use of contaminated harvesting and trimming aids, washing in contaminated water, surface decontamination with unregistered chemicals, use of non-food grade waxes, improper use of calcium carbide for ripening and unhygienic conditions. Other practices that affect quality and safety are poor packaging, absence of official standards, contaminated and inefficient transport carriers, poor on-farm storage structures and poor level of technology when it comes to cold storage. Wholesale and retail markets are poorly designed and maintained.

Pesticide residue testing facilities are lacking and cost of analysis is high. Legislation related to food safety is inadequate since existing laws focus on adulteration of food. The traditional marketing system hardly offers incentives for safe produce.

For the consumers, good quality is what they can see. Hence for them, maturity and ripeness, appearance (shape, size and colour), absence of mechanical damage and good flavour constitute quality. Safety appears not to be a prime consideration.

Public monitoring of food safety law implementation, increased tariffs on pesticides, a vigorous pesticide monitoring system, strengthening the national IPM programme, promoting GAP, good manufacturing practices (GMP) and hazard analysis critical control point (HACCP), and improving marketing infrastructure are the programmes that need to be implemented in coordination with different institutions.

During discussions, the point was raised that increased tariffs on pesticides may precipitate increased smuggling. As to the question on the role of the private sector in producing good quality produce, the case of citrus exports from Pakistan was cited wherein fruits are sourced directly from the farmers. In relation to standards as a way of ensuring quality and safety, it was clarified that official standards are not actually absent. They are available but are not implemented. Standards apply only for export crops.

A study of food quality and safety issues in the fresh produce production and marketing chain in China

Longbao Wei, Zhejiang University, Hangzhou

The People's Republic of China has several national programmes on food quality and safety, with each province wanting to implement its own programme. The quality certification systems include: pollution-free food certified by the Agricultural Product Quality Safety Centre; green food by the Green Food Development Centre (GFDC); organic food by the Organic Food Development and Certification Centre as approved by the International Federation of Organic Agriculture Movement (IFOAM) and then taken over by GFDC; healthy food under the Ministry of Health; and genetically modified food certified by the Ministry of Agriculture. Food management systems include GAP, GMP, HACCP, ISO 9000 and 14000, sanitation and standard operating procedures (SSOP) and quality standards (QS) with one hundred institutions carrying out certification.

Currently there are about 1 050 national and more than 1 000 local food standards. Suppliers should meet these local standards to enter the local market. There are also private enterprise standards that are stricter than the national standards, hence the move to harmonize public and private standards. Quality and safety inspection and monitoring is carried out by almost 5 000 institutions.

Food safety plans promoted by the national government in cooperation with local government units include the Three Greens (consumer, market and production system) Project, Pollution-free Food Plan, where the grower of special products gets certification, and Action Plan for Food Safety. Food safety technology programmes involve research and development on detection, monitoring and appraisal, and on a food technology data base for the establishment of a food safety control network.

Case studies of wild rice stem and peach showed that the current market-oriented production system encourages farmers to pay more attention to quality. However, perceived problems of consumers relating to safety include excessive pesticide usage, heavy metals and nitric acid salt content, overuse of growth hormones and contamination from water and soil. In marketing, sellers both in supermarkets and in local markets trust the safety of produce bought from wholesale markets, for they believe that the government keeps close watch over the quality of produce.

Recommendations for policy makers in relation to food safety are as follows:

- delineating government functions and strengthening their supervisory skills,
- strengthening and unification of certification standards and monitoring systems,
- establishing technical support, market access and credit systems.

At the marketing level, wholesale markets need to be constructed. At the farmers' level, there is a need to change the production management systems to develop new varieties in order to reduce farmers' risk and encourage farmers to market their own produce. Awareness on food safety needs to be enhanced through various forms of media.

Some clarifications were sought during discussions regarding pollution-free vegetables and wholesale markets having separate channels for green food and safe food. It was reiterated that pollution-free vegetables are the national standards that should be met by farmers although they are not at present being met. The proliferation of quality labels hinders effective certification.

Quality and safety issues in the fresh fruit and vegetable production and marketing chain in the Philippines

Flordeliza A. Lantican and Elda B. Esguerra, University of the Philippines Los Baños, College

National standards have been developed for sixteen fruits and vegetables, including sections on pesticide residue, contaminants and hygiene, to harmonize them with Codex standards. However, all these approved standards are voluntary and no enforcement is done. Thus, the current marketing system follows arbitrary sorting based on physical appearance and size.

Most growers are not familiar with GAP and the Codes of Practice for Hygienic Production of Fruits and Vegetables developed by Codex. In vegetable production, unprocessed chicken manure is heavily used, with the likelihood of microbial contamination. The predominantly small-scale farming sector provides no incentive to farmers who are financed by traders to adopt food safety measures. Where external appearance is the basis of pricing, farmers resort to heavy pesticide spray. Although pesticide residue analysis is conducted, results are seldom fed back to farmers. Inadequate collection centres, packinghouses, transport and cold storage facilities, poor post-harvest practices and unhygienic conditions in the wholesale and retail markets lead to quality decline and increase the likelihood of chemical and microbial contamination.

Consumers have a moderate degree of awareness and sensitivity on product safety. In surveys of consumer concerns, pesticide residues ranked first followed by microbial contamination. However, only middle- and high-income consumers are willing to pay for quality and safe fruits and vegetables. Low-income consumers rank affordability and availability over good quality to determine their purchase. Fresh produce bought from supermarkets is perceived to be of good quality and safe although most consumers cannot recognize which produce is safe.

An agenda for action includes strengthening the Bureau of Agriculture and Fisheries Product Standards to carry out its mandate better. The assistance of local government units should be sought in the enforcement of standards. Adequate infrastructure and support systems should be in place together with strong research and development support. Capacity building should include training on GAP and a nationwide programme on IPM through the FFS. At the farmers' level, there is a need to strengthen fresh produce associations or clusters. The provision of consumer education on food safety will see a shift from the concept of "producer-push" to "consumer-pull", necessitating shorter and more collaborative supply chains.

During discussions a question was raised regarding non-enforcement of standards. This applies to grades and standards for fresh fruits and vegetables. However, for

pesticide residues, the Fertilizer and Pesticide Authority is the regulatory agency. Regarding transport problems that are encountered considering the archipelagic nature of the country, it was pointed out that while this may be true, if a quality assurance plan is in place, quality can still be maintained despite several transit points, as demonstrated by a lettuce growers' cluster which ships lettuce from northern Mindanao to Manila.

Quality and safety issues in the fresh fruit and vegetable production and marketing chain in Thailand

Christopher Oates, Agro-Food Resources (Thailand) Co., Ltd., Bangkok

Existing standards of food safety in Thailand are embodied in the Food Act of 1979, which was amended in 2003: it is illegal to sell fresh fruits and vegetables containing unsafe levels of chemicals. Agricultural inputs are controlled by the Hazardous Substance Act of 1992. Farm-level accreditation for pesticide-safe and hygienic vegetables can be distinguished with the "Q Mark" system composed of: "Q GAP", "Q GMP" and "Q Food Safety", which encompasses Q GAP + Q GMP. The GAP codes cover 31 food crops and focus on chemical contaminants with minimal guidance on hygiene and microbial hazards. Standards are strictly enforced for export crops with 100 percent testing for pesticides and recently also for microbes. Recent data from 2005 showed that residues were detected on 43 percent of fresh produce with the Hygiene Mark, with 6 percent exceeding maximum residue levels (MRLs). Residues were detected on 42 percent of fresh produce without the Hygienic Mark, with 7 percent exceeding MRLs. In comparison, residues were only detected on 26.7 percent of Q GAP products, with only 4 percent exceeding MRLs.

Grading and packing establishments should be GMP and HACCP certified. Some retailers require suppliers to comply with food safety legislation as embodied in the Thai Public Health Act and the Thai Food Act. They can also have their own supplier standards and they often require suppliers to be part of a voluntary scheme.

Factors that constrain change at the farmers' level include the socio-economic status of the farmer, land tenure, previous investment and commitment, social pressure, labour shortage and increased cost of change. There are several participants in the marketing chain, hence traceability is difficult. Packinghouses and storage facilities are inadequate. While there is a Q GMP for packhouses, there is none for collection points, leading to an unregulated link in the supply chain.

A survey of consumers showed that 75 percent were concerned about buying safe fruits and vegetables. However, for most Thais, price of fresh produce will remain the key factor. Consumers are more confident of the safety of fresh produce from retail chains than the quality certification of the government.

Recommendations to ensure safety include greater involvement of local communities and farmer organizations in education, training and provision of information, and technical support on the production system, including correct implementation of GAP. Improving market access, efficiency and integration should be done to enable farmers to realize market potential for higher quality products.

During the discussion it was pointed out that the national GAP developed by the Department of Agriculture has been discussed with the private sector but it is not clear that it has reached the farmers' level. Accordingly, there is a need to train and work with farmers to tackle the hurdles of implementing GAP, such as the required documentation, considering the level of literacy of farmers.

Steps taken by Talaad Thai Wholesale Market to improve fruit and vegetable quality and safety

Udomluck Pongsuphan, Thai Agro Exchange Co., Ltd., Pathumtani

Agricultural wholesale markets serve as centres of trade for quality food, an essential link between production and consumption, and aim to minimize intermediaries between the farmer and the consumer. Currently there are 17 wholesale markets for fruits and vegetables in Thailand. Talaad Thai is the largest such market, operating 24 hours a day. Dubbed as the gateway to Bangkok, it is strategically located about 15 km from Bangkok's Don Muang international airport. Talaad Thai was established in 1992 and is privately owned by Thai Agro Exchange Co., Ltd. It has a registered capital of Baht 2 000 million and employs 200 people. The value of transaction is B400–600 million per day with a vehicle flow of 30 000 per day.

There are 20 markets, as follows: the orange market which handles 70 percent of oranges consumed in Bangkok, the mixed fruit market for tropical and temperate fruits, the seasonal fruit market where farmers can sell their produce, a coconut market, a watermelon market, a farm-crops market, a fresh water fish market for day or night operations, flower and ornamental plant markets, and a grocery centre. The Perishable One Stop Service Export Center (POSSEC) is a service facility for exporters. The private sector and the government collaborate with POSSEC.

The Ministry of Public Health indicated that every fresh fruit market should be a healthy market. A team from Talaad Thai Market visits the farmers to discuss improvements in production and postproduction practices with them. Other steps taken are cooperation with government policy on food safety, developing the market into a healthy or a quality product market place, provision of training courses and information dissemination to farmers and traders, and provision of facilities such as laboratories for hygiene control and residue testing.

The market has a special distribution centre for Q products ("Q" is the government quality certification scheme). It is envisaged in the future that there will be no special zone as all products will be Q-certified.

During the open forum, questions were centered on the role of Talaad Thai Market in ensuring quality, safety and traceability. Talaad Thai Market does not act as an intermediary since negotiations between the buyer and seller are on a one-to-one basis. Farmers can sell directly their produce in the market but need to pay an entrance fee. With regard to quality and safety, currently the special market for selling "quality" products and laboratory facilities are only for exported produce. Traceability is still a problem since exporters also get produce for export from wholesale markets. On the question on promotion of the Talaad Thai Market, strategies being pursued are coordination with different agencies and through various forms of media.

Food quality and safety issues in the fresh produce production and marketing chain – the case of cabbage in Viet Nam

Phan Thi Giac Tam, Nong Lam University, Ho Chi Minh City

The increased availability and low price of pesticides has led to their overuse. Food poisoning cases due to consumption of fruits and vegetables contaminated with chemicals, mainly pesticide residues, were reported to be high, particularly in the Mekong Delta. Other identified causes of food poisoning were microbial contamination and natural toxins present in food. In response to this food safety concern, the government issued the “Temporary Regulations on Safe Vegetable Production.” IPM was adopted with pilot production sites at the provincial level. Development of supermarkets and safe vegetable outlets was encouraged. Safe vegetable certification and inspection were carried out by the Plant Protection Department, with samples taken at market places and other outlets. However, weaknesses in the certification and inspection system include the small number of samples taken and the different testing methods yielding differing results.

There is a very limited market for safe vegetables. Based on a consumer survey, no more than 17 percent of households buy vegetables in supermarkets due to their inconvenient location, less choice, higher price and consumers’ mistrust of produce safety. This is due to lack of transparency in the safe vegetable supply chain. Consumers likewise had no clear indications as to signs of safe vegetables.

In the case of cabbage, the demand for out-of-season production resulted in heavy use of untreated manure and growth hormones and intensive pesticide application reaching 13 to 15 sprays at 10-day intervals. Poor transport conditions result in 15 percent losses. In the case of dragon fruit, the year-round supply necessitates heavy fertilization and use of pesticides.

Most farmers have a low level of education. They have low access to IPM training and have inadequate knowledge on pesticide use. Traders and neighbours are the sources of information. Mistrust among the stakeholders in the value chain prevails. The traders’ role in the supply chain is not well recognized.

Government plans to ensure safe food include upgrading wholesale market facilities and laboratories, promotion of hygienic practices, training of traders and certification of market channels.

During discussions, it was asked why Viet Nam was able to report specific cases of poisoning due to consumption of fruits and vegetables compared with other countries which had limited information on this. This was probably because the government was brave enough to publish these cases and that reports were provided by government hospitals.

Quality and safety in the traditional horticultural marketing chains of Asia

Andrew W. Shepherd, FAO, Rome

Factors influencing quality and safety from production, post-harvest handling and marketing were summarized. Production factors include wrong choice of variety, contaminated irrigation water, heavy fertilization of unprocessed manure, and heavy reliance on pesticides. Harvest factors include immaturity and poor method of harvesting. Market preparations such as washing in dirty water, use of non-food grade waxes and dyes for colouring, dipping in fungicides after harvest, improper use of ripening agents such as calcium carbide, packaging using poor quality and dirty containers all contribute to quality losses and unsafe food. Lack of adequate storage facilities and unsanitary conditions in wholesale and retail markets further aggravate the problem of quality and safety. In most of the cases presented, pesticide residue problems were the focus when it came to safety issues and there was less emphasis on microbial contamination. Because of this broad range of factors, there is difficulty in identifying the source of the problem.

While standards are in place in most Asian countries, there is often a lack of coordination among different agencies involved in standards regulation and implementation. Moreover, resources are lacking to enforce these regulations.

Farmers are constrained in their response to these quality and safety issues due to lack of purchasing power of consumers, the need to produce blemish-free fruits and vegetables in greater quantity and to maximize selling price. The existing marketing practices also constrain the traders in responding to safety issues. These include the inability of traders to handle different qualities of produce, lengthy marketing channels, inadequate infrastructure, financing arrangements and prevalence of field contractors. Lack of information and awareness was due to general illiteracy of farmers.

Consumers are concerned with physical appearance of the produce and its concomitant price. Supermarkets are increasingly becoming popular because of convenience and are also considered as suppliers of safe produce.

National programmes to promote safe fruits and vegetables include the pollution-free and green vegetables of China, “Q” mark scheme in Thailand, “safe” vegetables in Viet Nam, and the IPM programme in most countries. In promoting improved practices, the following should be considered: the need to recognize the risks faced by farmers, the need for clear demonstration of economic benefits of improved technologies; the need to overcome shortage of information and the need to re-think how extension work can best be done.

Improvements in the marketing channel can promote safety by promoting higher standards but this should consider the consumers’ sensitiveness to price and the traders’ willingness to pay more for better quality. Improvements are needed throughout the chain and there should be a mechanism as to how traders can advise farmers. A parallel channel within the traditional marketing system should be considered and this involves farmers working in groups. The role of wholesale

markets in facilitating parallel channels should be considered. Another consideration is the development of new channels such as supplying supermarkets and other stores directly or having farmers' markets. Brand name development is another assurance of quality and safety. However, the risk is high and there is downward price pressure.

Issues and challenges in quality and safety in the Malaysian horticultural sector and steps to overcome them

**Norma Mohd Salleh, Federal Agricultural Marketing Authority (FAMA),
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The Malaysian horticultural sector is characterized by availability of supply all year round, most coming from small farms. Poor agricultural practices, such as misuse of pesticides, low quality planting material and poor farm records are prevalent. This is aggravated by poor post-harvest practices leading to 15 to 30 percent losses. The middle- and high-income groups demand quality and safe food and shop in supermarkets. International retailers follow their standards in their procurement procedures. However, at the farm level, there is no premium for high quality produce. At the wholesale level, quality is not the main basis for trading.

Safety standards are enforced through the Malaysian Food Act and Regulations but compliance to quality standards is on a voluntary basis (e.g. Malaysian GAP, halal and Malaysian Standard specifications). Several measures were introduced to address quality and safety issues such as branding known as "Malaysia's Best (MB)." This umbrella brand guarantees quality and safety in accordance with the Malaysian Standards (MS) and Malaysian GAP. The requirements of the Malaysian GAP standard (SALM) are similar to EUREPGAP but satisfy only 70 to 80 percent of the protocols. Other measures to address quality and safety issues include the accreditation scheme for Malaysian GAP, the organic food certification scheme and the Veterinary Health mark. A self-regulated grading scheme for export is carried out at farmers' and exporters' packinghouses, under the surveillance of FAMA.

Capacity building programmes include training of all actors in the supply chain on post-harvest handling and GAP. Quality and safety are also promoted through the Ministry of Agriculture's (MOA) Business Development Centre, focusing on Malaysian and Codex standards and the regulations of importing countries. The proposed National Food Terminal will be a modern food supply centre linking production and consumption with an effective pricing mechanism. Food disease surveillance, development of new varieties and advanced post-harvest technologies are also being carried out.

A contract farming scheme undertaken by MOA with FAMA as the intermediary between producers and retailers has had several benefits. These include assurance of consistent quality, increased production through organized farming and technology transfer, and a guaranteed market. As part of the contract farming scheme, supermarkets are linked to farmers entitled to use the "MB" brand.

Crops for contract farming are presently red chillies, pumpkins, honeydew melons and cantaloupes. Farmers are assured of the market and they get a stable price. FAMA does monitoring to ensure that safety measures are followed and fees are not charged.

Only MB should be used for all commodities and has been initiated for carambola, papaya, pineapple, mango and watermelon, to be extended to processed food. As for MS, no logo is required but there is a certification that the standards are followed. Compliance to MS is checked every six months and yearly for Malaysian GAP, especially pesticide residues.

Problems and solutions with quality and safety in the Korean horticultural sector

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Fruits and vegetables are increasingly being consumed in the Republic of Korea. Since 70 percent of agricultural produce is imported, food safety and quality are critical issues. The government plays an important role in regulation through the Food Sanitation Act of 1962, which aims to protect consumers. Other systems in place are the recently introduced HACCP, the Recall System which guarantees corporations freedom from compensation and the Product Liability System, an *ex post facto* regulation that punishes manufacturers of defective food. Environment-friendly agricultural products are differentiated from other products through different seals. Since Korea exports a small volume of horticultural products, GAP is being introduced for fruits and vegetables to be exported in compliance with international norms.

The agricultural marketing business of Korean agricultural cooperatives consists of agricultural marketing, processing, farm input supply, export, consumer goods and food safety and consumer protection. Activities include analysis of pesticide residues in designated food safety centres, education on food safety issues and use of pesticides, dispatch of inspectors to marketing facilities and GAP or HACCP implementation for traceability. GAP was introduced just recently and is being implemented for export crops although this has not yet been disseminated nationwide to cover crops for domestic consumption.

Problems with quality and safety include confusion among industry stakeholders since there are eight different institutions and ministries involved in implementation and regulation with no clear delineation of responsibilities. When there are violations of law, punishments are light and the most severe form of penalty is a 6-month suspension of business. The Food and Drug Safety Administration (FDSA) is constrained by limited funds.

Solutions to food quality and safety problems include systematic unification and integration of the government quarantine system, strengthening of the traceability system, widespread promotion of HACCP certification and restructuring of FDSA. In the wholesale markets, promotion of food quality and safety involves direct contracting of wholesalers to farmers, with the former implementing their own inspection system.

Quality and safety in the traditional horticultural marketing chains of India

B.K Paty, National Institute of Agricultural Marketing, Jaipur

India produces about 10 percent of the world's fruits and 13 percent of the world's vegetables. Most of these crops are produced on small farms and farmers are inhibited from investing in agricultural inputs. Harvesting of fresh produce is governed by market price. Quality and safety considerations at the farm and market levels are conspicuously absent. Sorting is based on size, colour and other physical characteristics due to the lack of standards and mechanism for implementing these standards. This is despite the current fifteen laws that deal with quality of produce in the domestic market which are implemented by 4-5 ministries. Eventually, these will be replaced by an Integrated Food Law to be handled by only one authority.

Long channels characterize the traditional marketing of fresh produce, with more than 7 000 wholesale markets and nearly 28 000 rural weekly markets. Transactions are not fully transparent and prices are not linked to quality standards. Other market-related constraints are the lack of crop-specific cooperatives with linkage to markets, lack of awareness on quality produce, absence of forward and backward linkages and poor market infrastructure. The earlier efforts to address these concerns through an FAO-UNDP project (1978–1983) “Market Planning and Design Centre” received mixed response from the private sector, and the government could not pursue the efforts to improve traditional markets after the project completion. Market committees were lukewarm to the concept of transparent transactions, need-based and cost-effective economics.

The National Horticulture Mission (NHM), set up recently during the current Five-Year Plan, envisages improvements in marketing channels. The markets will be managed professionally and market fees will be levied commensurate with services provided. Market-led and need-based extension programmes will be promoted in conjunction with IT-based marketing information. Growers will be educated on quality and safety of produce both for domestic and export trade. Cold chains will be developed. This will be supported by crop-specific research and development for market-driven production. Since traders act as purchasers, financiers and advisers during the production and marketing of fresh produce, they will be tapped as active promoters of quality and safety. As such, traders' associations should be recognized and trained as authorized agencies and supported financially in setting up mechanisms to supervise, check and certify the quality and safety of fresh produce.

In response to a query regarding the role of NHM in markets, it was pointed out that the plan is to develop parallel markets, particularly private markets where direct marketing and contract farming will be encouraged. Follow-up questions on the privatization of markets focused on how this system will improve quality and safety, and how farmers can benefit from this scheme. It was reiterated that contract farming is envisioned to link farmers directly to the market.

Quality and safety in the traditional horticultural marketing chains in Pakistan

Itrat Rasool Malhi, Department of Agricultural and Livestock Products Marketing and Grading, Karachi

Pakistan is a major producer of fruits and vegetables with most of the produce consumed in the domestic market. Problems besetting agricultural production include high cost of inputs, lack of varietal development, poor management practices, emerging diseases, lack of value-addition, inadequate transport and storage facilities, and poor strategic planning.

Marketing-related concerns include the number of intermediaries involved, with the produce distribution system varying from one region to the other and among farmers. Preharvest contractors are common and they have established their credibility with the agents. The agents harvest and market the crops thus relieving the farmer of these burdens. Commission agents who sell to wholesalers and retailers are also the dominant force in marketing and act like banks. Only large-scale farmers sell directly to wholesale markets.

Concern about food safety has risen due to increased awareness of nutrition and food-borne illnesses. The adoption and enforcement of the Agricultural Produce Act empowers the federal government to implement grading and marking of produce for export. The provincial governments on the other hand are mandated to implement local grading of produce. The Plant Protection Department at the federal level performs protection and quarantine activities and has recently put up a pesticide testing laboratory. The Federal Department of Seed Certification implements the Seed Act which involves control and certification of seed quality and registration of varieties. The Pakistan Horticulture Development and Export Board promotes exports together with the establishment of improved infrastructures and agro-allied support systems.

An Asian Development Bank project on “Agribusiness Diversification and Development”, which will be implemented for five years, will concentrate on improving marketing, developing market intelligence, improving product quality and shelf life, achieving international compliance and promoting processing plants. Farmer groups will be formed for effective marketing and bargaining with provision of an agribusiness support fund on cost-sharing arrangement. A National Horticultural Policy will be formulated and the provincial government will be encouraged to form policies at their level. The establishment of the National Animal and Plant Health Inspection Services envisages capacity building with reference to food safety and quality, addressing sanitary and phytosanitary (SPS) and technical barriers to trade (TBT) issues. Grades and standards are harmonized with international standards. Strengthening of inspection and certification systems including updating of laboratory facilities is carried out in support of the food safety programmes.

Discussions centered on the prevailing preharvest contracting scheme. It was pointed out that in the case of mango and citrus, almost 100 percent is handled by contractors and the government does not play any role in marketing. There is a social dimension

involved since the contractors pay the resource-poor farmers 15 days in advance. Thus, the suggestion that this scheme should be discouraged may not be acceptable.

Quality and safety of fruit and vegetables in the Lao People's Democratic Republic

Bounchanh Kombounyasith, Department of Agriculture, Vientiane

The main agencies responsible for food safety are the Ministry of Health and the Ministry of Agriculture and Forestry. Upland fallow rotation (slash-and-burn) system dominates agricultural production. Fruits are produced without any external inputs. Because of these dominant systems, crops are considered “organically-grown” although they are not certified as organic due to the absence of an organic certification system in the Lao People's Democratic Republic. The rules stipulated by the target markets of organic products are followed and in some cases, target consumer groups certify the products. In other cases, an agreement was made between farmers and buyers that chemicals should not be applied in their production system. Because of this situation, there is a need to liaise among institutions and non-governmental organizations (NGOs) to introduce an enabling environment for organic agriculture. Standards and legislation for organic agriculture need to be developed with certification done by internationally accredited bodies, although a local certification system also needs to be developed.

Agriculture in the Lao People's Democratic Republic has much potential, particularly organic agriculture since farmers perceive this as easily possible with minimal or no yield loss and no extra cost is involved. Moreover, consumers in the Lao People's Democratic Republic and even in other countries have more confidence in Lao products because of their reputation of having no or low pesticide residue levels. Furthermore, the hilly environment of the Lao People's Democratic Republic offers opportunities for out-of-season production of fruits and vegetables with high market potential.

Measures undertaken to ensure quality and safety in fresh produce include pesticide residue testing and removal of subsidies in plant protection chemicals. With this strategy, chemicals will be made less available or more expensive, hence reducing their usage. With government support on green agriculture, use of biopesticides and adoption of IPM and Integrated Crop Management are promoted. Moreover, the government has selected three production zones that must remain free of pesticides and chemicals. Reduction in synthetic chemical usage is also achieved through setting up factories of biofertilizers in various parts of the country. Besides the government, NGOs, producers and traders are also advocating organic agriculture, sustainable agriculture and the use of biofertilizers and biopesticides. With so much focus on production, the marketing component is often neglected.

Since the slash-and-burn farming system was mentioned in the presentation, there was a question as to whether vegetables for export are produced using this system. Vegetables exported to Thailand such as ginger, lemon and other ingredients used in pork sausage are produced using the upland fallow rotation system. Another question related to the extent of usage of laboratory testing facilities; the workshop was

informed that while testing is done, this does not necessarily address the problem of food safety.

Quality and safety in the traditional horticultural marketing chains of Cambodia

Phat Leng, Ministry of Agriculture, Forestry and Fisheries, Phnom Penh

Agriculture in Cambodia contributes 40 percent of total GDP but farmers receive less income from their agricultural production activities. This has prompted migration to the major cities where jobs abound, hence the increasing demand for food in the cities, particularly fruits and vegetables.

The basic supply chain of fruits and vegetables is from farmers to collectors or wholesalers then retailers and consumers. The production system does not adhere to safety standards as evident from the use of contaminated irrigation water and misuse of pesticides. The demand for high quality and safe food cannot be met because of several constraints at the farming level. These include lack of input supplies, no price premium for safe produce, resulting in fruits and vegetables produced under GAP having the same price as non-GAP production, and lack of knowledge on implementing GAP. Moreover, a certification scheme for safe food is lacking. In addition, infrastructure such as cold storage facilities, packinghouses and wholesale markets is inadequate.

Studies on consumer preferences and behaviour with regard to food safety showed that consumers are confident of the safety of the fruits and vegetables they buy. Local vegetables, such as watermelon, water spinach, pumpkin, banana, mango and papaya are preferred. For the consumers, safe vegetables show insect damage and in the case of fruits, seasonal ones are perceived to be safe. However, while safe fresh produce is desirable, few consumers are likely to pay a higher price for this type of produce.

Various ministries in Cambodia share the responsibility for food quality and safety, resulting in duplication of regulatory functions, fragmented surveillance and lack of coordination. Because of this, the government has implemented the law on Management of Quality and Safe Products and Services to protect consumers' health and to promote nutrition programmes. A sub-decree on Food Safety of Agricultural Commodities was also promulgated focusing on the following: property of the agricultural production stage, property of the primary processing stage, and management and quality control of food and agricultural commodities and penalties. Appendices related to the implementation of this sub-decree include a list of banned, restricted and permitted pesticides, chemicals banned for use as food preservative, and maximum residue limits for pesticides, following the Codex standards.

Participants asked questions on the level of awareness of consumers on food safety and whether there was a wide consumer campaign. In Cambodia, consumers generally lack knowledge on food safety due to the lack of consumer campaign or awareness programmes on food safety.

Mindanao consumers' perception of quality for vegetables

Sylvia B. Concepcion, University of the Philippines Mindanao, Davao City

Household consumers in Mindanao purchase vegetables primarily from the traditional wet markets. However, changing consumer needs lead to changes in the way the industry produces, harvests, packs, delivers and retails fresh produce. Market information needed by upstream and downstream members of the vegetable supply chain includes the preferences of the end market.

This study determines the consumers' preferences for vegetables and the extent of knowledge of members of the traditional supply chain on the preferences of the end market. Sources of data consisted of 384 consumer households, 135 market intermediaries and 207 farmers. Among the desired quality attributes, physical appearance such as freshness, freedom from physical injury and pest and disease damage ranked highest and freedom from chemical residues ranked sixth. The main criterion of purchase was price, followed by quality in use. The latter refers to vegetables that are firm, good-tasting, can cook and store well. Organic vegetables were also purchased but these were not certified. Reasons given by consumers to clean vegetables after purchase include "to remove dirt and dust" (48 percent) and "to wash off chemicals" (17 percent).

The survey further revealed differences in perception of vegetable farmers and their market intermediaries, reflecting poor awareness of the market needs. Comparing the quality preferences of the market intermediaries themselves with the farmers' perceptions about their buyers' preferences shows similar inconsistencies. Farmers often rely on their immediate (downstream) buyers for information, but the downstream buyers' preferences are different from the consumers. Their divergent, often erroneous, ideas and concepts about vegetable quality and the market contributed to waste and inefficiency in the Mindanao vegetable supply chain, highlighting that change has to be demand driven.

Furthermore, the study pointed out the need for industry boards to strengthen their role in providing market information, and to determine preferences at the consumer end and not from intermediaries. The government should build consumer awareness on food safety and quality and provide a mechanism for the supply chain to respond to consumer preferences.

Clarifications were sought as to the profile of respondents and the specific locations where the survey was conducted. Respondents cut across different socio-economic classes taken from urban and rural areas of Mindanao. The study was done in cooperation with wholesalers in major distribution centers, ten supermarkets and four hotels in Davao City. Farmers' response is closer to the consumers with regard to desired attributes because farmers put themselves in the place of the consumers. It was highlighted in the presentation that change has to be demand-driven; hence it was pointed out that this should be considered in the workshop discussion, particularly on how consumers can be informed and how this message can get through to the farmers.

Improving quality and safety in the Thai fruit and vegetable trade – the traders' perception

**Sing Ching Tongdee, Thai Fresh Fruit Traders and Exporters Association,
Tambol Tasai**

Quality perception changes through time with consumers changing their perception. During the late 1970s, price was the determining factor. This was followed by visual quality in the early 1980s and later changed to convenient food. The years 1990 to 2000 saw an increased awareness of food safety to include pesticide residues, microbial contaminants and hygienic practices. From 2000 to the present, the focus has been on nutritious and healthy food, functional food, environmental concern, labour issues and fair trade. Critical control points need to be identified in the case of safety hazards and these points need to be crop-specific. Pesticide residues have been the foremost problem encountered with farmers, hence the need to establish maximum residue limits (MRL). This should be coupled with safety regulatory requirements or enforcement, extension services, farm monitoring, end-product inspection for MRL compliance at different points in the chain, a traceability system and GAP, GMP and HACCP compliance and certification.

A comparison of the traditional marketing chain and modern trade shows distinct differences in their features. The traditional marketing chain, which is highly fragmented, is further characterized by specialization, production-push, cost value (operation cost) and informal transactions. The quality and safety responsibilities rest with the suppliers so it is difficult to pinpoint who is responsible. In contrast, the modern trade is characterized by a structured supply chain, demand-pull, price value (much higher price structure), diversification and formal transactions. The quality and safety responsibilities rest with the store or manufacturer, and these are passed on to the supplier or producer through certification. As to production trend, small-scale farming is being phased out in traditional marketing channels and there is a shifting bargaining power. In modern trade, contract farming prevails and there is product differentiation. Moreover, buyers' bargaining power dominates.

Myths about the traditional marketing chain and the modern trade, such as poor quality, low price, high waste and low efficiency in the former and the reverse in the latter should be erased. Realities are that in the traditional marketing chain, produce is of high quality but at low price, wastage is low since prices can be lowered, competitive prices are paid to suppliers (growers), there is high efficiency hence profit filters down to chain members. In contrast, in modern trade, produce is of poor quality and at high price to consumers, there is high wastage, a lower price is paid to suppliers, there is low efficiency and high profit is enjoyed only by the store.

The speaker pointed out that there is no fixed concept of "quality". This depends on the supply. When there is an abundant supply consumers will demand a higher quality than when there is a shortage.

Improvement of quality in the Indian apple trade

Metha Ram Kripalani, Chamber of Azadpur Fruit and Vegetable Traders, Delhi

India ranks tenth among apple producing countries with 250 000 hectares. There are weaknesses in the apple production and marketing system as shown by the high proportion (10 percent) of non-marketable fruits at harvest and 35 percent only reaching processing grade.

A 10-point programme was proposed to improve production efficiency and quality of apples produced in India, as follows:

1. Improvement of production and post-harvest handling practices with emphasis on choice of variety, appropriate fertilization and pesticide management and adherence to GAP.
2. Provision of financial support to farmers. Financial institutions and the government should provide lending schemes with low interest rates, if not interest-free.
3. Development of more markets and establishment of apple research centres.
4. Promoting consumption of apples to boost sales. Per capita consumption of apple in India is low (1.13 kg per year) compared to 21.4 kg per year in Italy and 7.3 kg per year in the United States of America. Increased consumption can be achieved through enhanced awareness of the nutritive value of apples, and by providing apples that are properly graded and packed.
5. Provision of cold stores and controlled atmosphere (CA) storage facilities near the production areas. These facilities were available until 1997 but with the repeal of the Controlled Atmosphere Storage Act, problems arose.
6. Establishment of processing facilities considering the high proportion of processing-grade apples. Farmers will get additional income from apples sold to these processing plants.
7. Promotion of good packaging and branding by putting an Indian Standards Institute or Bureau of Indian Standards seal in every package of apples as an assurance of quality. Standards for apples should conform to international standards with regard to size, weight and colour.
8. Improvement in transport conditions. The current transport system is very poor, characterized by delays, poor roads and inadequate transport facilities. More farm-to-market roads should be constructed. Refrigerated trucks should be made readily available at reduced cost.
9. Liberalization of export policy to encourage growers to export.
10. Advertisements on the usefulness of apples to enhance consumer awareness.

When asked whether farmers who consign apples directly to wholesale agents get feedback regarding the quality of fruits delivered, the speaker indicated that a feedback mechanism is in place and that farmers receive guidance as to how apples should be handled and packed. Steps taken to ensure safety include sending apples for residue testing in research centres, since pesticides are commonly used. Since the importance of a CA facility was mentioned, it was inquired as to who should build this facility. There was a comment also that since nothing prevents the building of a CA facility, the private sector is free to construct its own stores. With regard to pricing, there was transparency since apples are sold by auction.

Problems with quality and safety in the Indonesian horticultural sectors and steps taken to overcome these

Winnie Dian Wibawa, Directorate of Fruit Crops, Jakarta

In Indonesia, traders play an important role in supplying produce from farmers to consumers. The long marketing chain, where traders prepare the produce for the market, has resulted in difficulty for farmers in improving quality because of the low price dictated by traders. The farmers' role has been limited to only growing the crop, hence there is lower risk than that faced by traders who face several risks. Ninety percent of produce from traders is distributed in wholesale markets and only ten percent is absorbed by supermarkets. The demand for good quality fresh horticultural produce increases with the growth of supermarkets in big cities. These supermarkets follow their own standards instead of the Indonesian National Standard, which is now being harmonized with the Codex standards.

The government implemented several programmes in response to concern about the lack of price premiums for good quality produce of farmers. Food safety and quality systems that are commodity- and location-specific were established. This consisted in developing GAP and standard operating procedures (SOP) from production until distribution. Certification systems have been implemented with produce labelled as either Prima III, II or I, depending on safety programmes followed. Prima II and III are national programmes, with III including IPM and II with the requirements of Codex and ASEAN standards taken on board. Prima I standard will be for export, taking into account environment, hygiene and labour requirements. Pilot model orchards were established in the main production centres and farmer groups were selected to implement these programmes. Support systems, such as strengthening laboratories and capacity building were put into place.

Market chains are shortened with the implementation of a partnership programme between exporters and farmers. The partnership scheme requires higher efforts on the part of the exporters with respect to the guarantee to farmers of a buffering price scheme. Other programmes envisioned to shorten the marketing chain include having traders as part of the farmers' group, with the farmers doing value-adding activities that are traditionally performed by the traders. These farmers' groups will be provided with managerial skills. Special market chains for quality products and agribusiness subterminals at district level will be established.

With the many labels mentioned in the paper, questions were raised as to how consumers' awareness will be increased with this system and the price difference between these labels. Accordingly, labels are colour-coded for easy recognition of consumers as to the level of safety of the produce and prices are differentiated.

Problems with quality and safety in the Sri Lankan horticultural sector

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Sri Lanka has 24 agro-climatic zones and two major rainfall periods that enable production of a variety of fruits and vegetables. The majority of fruits and vegetables are produced in small landholdings and are intended for the domestic market. Agricultural marketing is a complex process. In recent years, however, a considerable portion of fresh produce has been brought to regional wholesale markets and, from there, commodities are directly supplied to the consumption areas.

Losses amounting to 30–40 percent occur in fruits and vegetables. Preharvest practices, such as the use of poor quality planting materials and misuse of pesticides, affect safety of fresh produce. Harvesting and post-harvest practices affecting quality and safety include improper harvesting techniques, absence of grading, use of dirty water in washing, improper containers and methods of packing, rough handling, poor transport conditions, and use of calcium carbide in ripening.

Technologies to prevent losses and quality deterioration are available. However, the players in the marketing chain lack the resources to invest in such improved technologies. A programme implemented in two areas of Sri Lanka by the Institute of Post-harvest Technology demonstrated that plastic crates introduced to traders can reduce losses from 30 percent to 5 percent and quality and safety can be improved. However, adoption rate is very low due to the high price of the crates. Other impediments to improving quality and safety are as follows: lack of adequate marketing channels, inadequate facilities in the wholesale and retail markets, lack of price incentives for quality products, deficient extension services, particularly in the area of food safety, inadequate facilities for testing and high cost of pesticide residue analysis.

There is an urgent need to introduce appropriate technologies such as proper varieties, improved harvesting, handling, packaging and transport practices. Government assistance to farmers can be in the form of loans, and subsidies are not encouraged. GAP, GMP and HACCP should be developed for individual crops. The Pesticide Act should be strictly enforced and existing food laboratories should be upgraded.

Recommendations on marketing for improving quality and safety include strengthening of existing channels and creation of new markets linking producers and supermarket chains. Facilities in collection centres, wholesale and retail markets should be upgraded and packhouses established in dedicated economic centres. Market information services that can be readily accessed by growers should likewise be provided.

The reported losses appeared high hence participants asked how these were assessed. Actual assessment studies were reportedly undertaken from the point of harvest until the produce reached Colombo market. The 30–35 percent losses represented both quantity and quality loss, of which 25 percent were due to handling, poor packaging and transport. The economic analysis conducted between using plastic crates and polyethylene sacks showed that greater benefits could be obtained with the use of

plastic crates. There are no problems with regard to crate movement since the wholesalers and traders collect the crates.

Conclusions and questions from discussions of the case studies presented

Andrew W. Shepherd, FAO, Rome

The case studies presented and the discussions of the workshop had pointed out the issues that need to be addressed and these are summarized below:

Quality issues

- It is difficult to make improvements through the traditional systems, where there is little opportunity to segregate grades, where most consumers lack the purchasing power to pay for higher quality and where poor post-harvest handling can negate quality improvement at the farm level. What then are the steps that can be taken to address such problems?
- Can improvements be brought about in traditional systems, e.g. through training or infrastructure improvement, or will higher quality have to be marketed through different channels, e.g. through contract production?
- What successful examples of sustainable quality improvement can we identify? What are the factors governing their success?
- What chain improvements are required, e.g. packhouses, assembly points, cold chains?
- What is the role of the wholesale (and retail) market and their management? What is the role of traders' association? How can traders and government work together?
- Are standards required and, if so, who should set them?

Farmer response issues

How do we address:

- (1) the actual or perceived risks that farmers face in changing practices;
- (2) social pressures to conform to prevailing practices;
- (3) pressure to intensify production;
- (4) the need to ensure financial incentives?

Given resource constraints, what are the best ways of getting messages to farmers? What actions can be carried out at community level? What role is there for farmer organizations?

Safety issues

- Lack of coordination between government agencies was clearly identified as a major weakness. How can such problems be best overcome?
- What regional cooperation is required?
- How best can we address ignorance of correct use of pesticides? Do pesticide retailers have a role to play?
- Given resource constraints, how can the message of IPM, GAP, etc. best reach farmers?
- Are promotion campaigns suitable or is on-farm demonstration essential?
- Are there economic benefits? What needs to be done to demonstrate the economic benefits of improved techniques?
- Microbial contamination seems to be a relatively neglected issue. Does awareness of such contamination need to be increased and if so, how?
- What training is needed at the farm level?
- Is more research on the causes of contamination required?

Consumers

- In a market-oriented system, do changes in production practices reflect changes in consumer demand?
- Research suggests that quality and safety are not the prime concerns of less affluent consumers. Is this true? Do campaigns need to be developed to promote an awareness of quality and safety?
- How can consumer demands be transmitted to farmers?

Working groups

Introduction to the working group discussion

Objective

The main objective of the exercise was to give recommendations on public and private actions to be taken in order to help a chosen development scenario to happen.

Mechanics of the working group discussion

Each working group would be assigned a particular issue, that is, health hazards, production structure and stakeholder capacity building together with three propositions for future development scenarios of quality and safety in the traditional horticultural marketing chains of Asia for a 2015 horizon. The three scenarios were to be discussed to determine whether each of these scenarios was possible or impossible, and also whether each of these scenarios was desirable or undesirable. From the discussions, a scenario that was both likely to happen and desirable should be chosen, and policy recommendations as well as public and private actions to be taken in order to help this scenario to happen should be developed. In the recommendations, the existing situations in each country and the potential for regional cooperation and experience-sharing should be considered.

Working group reports

Group I: Health hazards

Proposed scenarios

Scenario 1: Food safety production and marketing regulations remain non-existent or unenforceable, which contributes to endangering the health of producers and consumers.

This is a possible scenario because, to a certain extent, all the developing countries have food safety rules and regulations but not all are enforceable. However, this scenario is undesirable since it will endanger the health of the producers and consumers.

For scenarios 2 and 3, the group decided to divide each of the statement into two parts for ease in discussion.

Scenario 2(a): Consumers do not trust public safety food production and marketing standards.

This is a possible but undesirable scenario since we cannot ignore the role of the public sector.

Scenario 2(b): Consumers rely on supermarket private quality and safety standards or regular suppliers in the traditional marketing chains for some guarantee of food quality.

This is a possible and desirable scenario because consumers should be able to trust their preferred retailer.

Scenario 3(a): Public and private food production and marketing standards ensure appropriate safety levels.

Although desirable, this scenario is impossible because we need to ensure food safety and quality.

Scenario 3(b): Allow marketing chain stakeholders to propose different products according to differing consumer demands.

This is a possible and desirable scenario: a market-driven chain is desired but only if quality aspects and safety are not compromised.

Envisaged scenario

A modified scenario that was possible and most desirable was proposed by the working group:

*Consumers rely on supermarket private quality and safety standards or regular suppliers in the traditional marketing chains for some guarantee of food quality. Marketing chain stakeholders propose different products according to differing consumer demands but **without compromising safety**. The government sector is strengthened to provide and implement minimum food quality and safety standards.*

The actions to be taken by different stakeholders to make this scenario happen include:

- To create and raise awareness on food safety and quality to include GAP and correct certain misconceptions across the chain; FAO should be the lead agent.
- To build capability in public and private sectors on food safety and quality; FAO and donor communities should share this responsibility.
- To make an inventory of past, present and pipeline donors and in-country programmes on food quality and safety.
- To assess the scope of the programmes, determine any commonalities and establish appropriate linkages between and among programmes.

Questions to the working group focused on public-private partnerships. It was indicated that this is possible in certain sectors as in the case of pesticide residue testing facilities that can serve as an income-generating project. The action plan on creating consumer awareness was questioned since consumers cannot identify whether the produce is safe. Furthermore, if consumers buy from the traditional markets how can they be assured that the produce is safe? Accordingly, assurance of safety should start with the growers and all throughout the marketing chain. While external signs of safety are not apparent, consumers need to be informed that safe produce is available. It was suggested that consumers can be made aware through labels. It was also suggested that inventory of programmes on food safety should also include those carried out by the private sector.

Group II: Production structure

Proposed scenarios

Scenario 1: Producers remain numerous, isolated, uninformed and vulnerable to strong market instability and are very dependent in their relations with traders, which is an obstacle to their development.

This scenario was considered impossible for the following reasons:

- It does not reflect the true situation in all countries in Asia.
- Governments, donor agencies including FAO and bilateral agencies have provided technical support.
- Due to new market realities, there have been changes with focus on liberalization and market access within the context of WTO.
- There has been an increased consumer awareness or consciousness.
- This is the base scenario that can be worked on towards 2015.

Scenario 2: Some producers and traditional traders make necessary investments to switch to supplying the modern distribution sector but several become trapped because they become dependent on their designated customer or cannot sell their produce to the traditional market at a satisfactory price, the remaining producers stay in the situation described in Scenario 1.

This scenario was judged to be possible and acceptable for the following reasons:

- This best describes the real situation.
- All the reasons in Scenario 1 are applicable.
- A majority of farmers are still under Scenario 1 although there have been improvements.
- Contract farming provides more links between consumers and farmers.
- There has been an increase in the number of farmers' groups, organizations and clusters, trade associations, and farmer-agroprocessors' groups.
- At the farming level, some producers have invested to capture new markets.
- Dysfunctional aspects of the traditional marketing systems are addressed (e.g., long marketing chain, high marketing cost, low returns to farmers, high post-harvest losses, lack of price incentives, absence of reliable price information system, quality and safety).
- This scenario is feasible by 2015.

Scenario 3: The majority of producers group themselves, which enables them to produce bigger quantities of differentiated products for different and clearly identified customers; their enlarged size enables them to gain negotiation power and improve their produce quality.

This was considered an impossible scenario because of the following reasons:

- It is very ambitious.
- It does not reflect the situation in the majority of Asian countries.
- It represents developed countries like Taiwan Province of China, Japan and the Republic of Korea where farms are big and have good financing capability.

Envisaged scenario

The chosen scenario that was possible and most desirable was Scenario 2 with one slight modification, as follows:

*Some producers and traditional traders make necessary investments to switch to supplying the modern distribution sector but several become trapped because they become dependent on their designated customer or cannot sell their produce to the traditional market at a satisfactory price; **however**, the **majority** of producers stay in the situation described in Scenario 1.*

The action plans were categorized in three levels: farmer, trader and government. The action plans would respond to the following objectives:

- (1) to enhance adoption of GAP,
- (2) to reduce post-harvest losses,
- (3) to increase investment in market infrastructure.

The action plans proposed included:

- to strengthen farmers' groups,
- to support self-help groups for financing,
- to develop market-led extension services,
- to build partnerships with all stakeholders,
- to improve the role of traders,
- to encourage private sector investment in infrastructure,
- to promote standards,
- to disseminate good agricultural practices,
- to build capability of traders, agro-chemical suppliers, and farmers,
- to develop price incentives,
- to implement legal reforms,
- to promote regional cooperation.

A valid point that was raised during the discussion was to encourage collectors to become GAP-certified. This was seen as a way of complementing the good practices implemented by certified farmers. This was supported by the comment that it is easier to introduce innovations through the traders. Regarding the question on investment in facilities, many shared the view that this should be done by the private sector with the government acting as a facilitator by providing incentives such as tax benefits.

Group III: Stakeholder capacity building

Proposed scenarios

Scenario 1: Extension workers, traders and producers have limited funds and limited technical capability to improve food quality and safety.

This was judged a possible scenario because it already exists (general situation already mentioned in previous presentations). However, it was an undesirable scenario because there would be no development from the current situation.

Scenario 2: Some innovative traders and modern distributors take action to improve quality and safety in their private supply chains for a specific consumer segment; such innovations stay confidential.

This was seen as a possible scenario because it already exists. Nonetheless, it was judged undesirable because innovations would remain confidential; information about new practices would stay with the limited number of stakeholders participating in these supply chains.

Scenario 3: Public authorities use innovative and successful farmers and traders as pilot cases to develop a copy-cat effect among traditional stakeholders; widespread dissemination of local, national and regional success stories help traditional stakeholders become aware of improved practices.

This was considered a possible scenario because it already exists in more developed regions of China. Yet, it was deemed undesirable because the role given to government is heavily relied upon in implementing extension work.

Envisaged scenario

The chosen scenario that was both possible and most desirable was a modified one, as follows:

Public-private partnerships become the engines of innovation and capacity building for developing food quality and safety. Governments' active role in capacity building becomes smaller as economic growth happens in the countries of the region.

The recommendations below are aimed at fostering public-private partnerships:

Policy and legislation recommendations:

- Governments should set and enforce minimum quality and safety standards; innovations above these standards are then voluntary.
- The private sector should be involved in discussions towards new policies and in implementing and providing feedback on these policies.
- FAO can help in identifying existing food laws to be adopted in different Asian countries and in harmonizing the laws and monitoring systems in the region.

Recommendations to facilitate marketing – this can be started by the government with the private sector taking off and with FAO support on the following:

- market logistics (physical market infrastructure administration and management, roads, transport, cold chain, laboratories),
- financing (government could start by guaranteeing some private sector loans),
- market information systems (prices, quantity flows, quality standards, trade),
- dissemination of information on success stories,
- information and communication technologies.

Recommendations related to cooperation:

- All stakeholders should try to break down the walls that prevent cooperation (get rid of suspicion, earmark supporting budget, establish framework for cooperation).
- FAO has a role in fostering cooperation within public-private partnerships not only in marketing but also in capacity building.
- FAO should facilitate regional cooperation between different stakeholders.

Several points were raised regarding the issue of harmonization. Notably, that harmonization should be mutually agreed upon, that there are different levels wherein it can be done (as in pesticide residues and microbial levels), that GAP harmonization may not be possible and that approaches to harmonization should be through the same level of confidence. Since the group tackled capacity building, the action plans presented apparently did not specifically indicate how this can be achieved. It was reiterated that the proposed promotion of public-private partnerships for marketing envisages the strengthening of stakeholders' capacity to carry out extension activities.

Annex 1 – Workshop daily agenda

Sunday, 6 November 2005 Arrival of delegates
Check-in at Grand China Princess Hotel

Monday, 7 November 2005

09.00-09.30	Registration
09.30-10.00	Official opening - Welcome Address by Mr. Andrew W. Shepherd, FAO, Rome - Address by Mr. Nelson C. Buenaflor, Chairperson of AFMA
10.00-10.30	Coffee Break
10.30-10.45	Purpose of the workshop by Mr. Andrew Shepherd, FAO, Rome
10.45-11.15	India Case Study by Mr. G.H. Dhankar
11.15-11.45	Myanmar Case Study by Mr. Kyaw Myint
11.45-12.15	Nepal Case Study by Mr. Rajendra Singh
12.15-12.30	Collaborative lettuce trading in Ho Chi Minh City to improve quality by Mr. Jean-Joseph Cadilhon
12.30-14.00	Lunch
14.00-14.30	Pakistan Case Study by Mr. Mohammed Iqbal
14.30-15.00	Peoples' Republic of China Case Study by Dr. Longbao Wei
15.00-15.30	Philippines Case Study by Ms. Flordeliza A. Lantican
15.30-16.00	Thailand Case Study by Mr. Christopher Oates
16.00-16.30	Coffee Break

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| 16.30-17.45 | Steps taken by Bangkok's Talaad Thai wholesale market to improve fruit and vegetable quality and safety by Ms. Udomluck Pongsuphan |
| 18.00 | Welcome Reception/Dinner |

Tuesday, 8 November 2005

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| 09.00-09.30 | Vietnam Case Study by Ms. Phan Thi Giac Tam |
| 09.30-10.00 | Quality and safety in the traditional horticultural marketing chains of Asia – Review of Country Case Studies by Mr. Andrew W. Shepherd |
| | Discussion |
| 10.00-10.30 | Problems with quality and safety in the Malaysian horticultural sector and steps taken to overcome these by Ms. Norma Mohd Salleh, Federal Agricultural Marketing Authority |
| 10.30-11.00 | Coffee Break |
| 11.00-11.30 | Problems with quality and safety in the Korean horticultural sector and steps taken to overcome these by Mr. Young-Ho Lee, National Agricultural Cooperative Federation |
| 11.30-12.00 | Problems with quality and safety in the Indian horticultural sector and steps taken to overcome these by Dr. B.K. Paty, National Institute of Agricultural Marketing |
| 12.00-12.30 | Problems with quality and safety in the Pakistani horticultural sector and steps taken to overcome these by Mr. Itrat Rasool Malhi, Department of Agricultural and Livestock Products Marketing and Grading |
| 12.30-13.30 | Lunch |
| 13.30-14.00 | Problems with quality and safety in the Laos horticultural sector and steps taken to overcome these by Mr. Bounchanh Kombounyasith |
| 14.00-14.30 | Problems with quality and safety in the Cambodian horticultural sector and steps taken to overcome these by Mr. Phat Leng |

14.30-15.00	Consumer perceptions of quality by Ms. Sylvia B. Concepcion
15.00-15.30	Improving quality and safety in the Thai fruit and vegetable trade – the traders’ perception, by Ms. Sing Ching Tongdee
15.30-16.00	Improving quality in the Indian apple trade, Mr. M.R. Kripalani
16.00-16.30	Coffee Break
16.30-17.00	Problems with quality and safety in the Indonesian horticultural sector and steps taken to overcome these by Mr. Winny Dian Wibawa
17.00-17.30	Problems with quality and safety in the Sri Lankan horticultural sector and steps taken to overcome these by Dr. K.B. Palipane

Wednesday, 9 November 2005

09.00-17.00	Visit to Talaad Thai market and lunch Visit to MBK Centre River Cruise and dinner
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Thursday, 10 November 2005

09.00-09.30	Main recommendations of the country papers and discussions so far, by Mr. Andrew W. Shepherd
09.30-09.45	Formation of three working groups. Introduction by Mr. Jean-Joseph Cadilhon
09.45-10.15	Coffee Break
10.15-12.30	Working groups meetings
12.30-13.30	Lunch
13.30-15.00	Reporting back by working groups and discussion
15.00-16.00	Conclusions and recommendations by Mr. Andrew W. Shepherd
	Developing a work programme for FAO by Mr. Jean-Joseph Cadilhon

Final comments from participants

16.00

Closing of workshop

Friday, 11 November 2005 Departure of delegates

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Annex 3 – Workshop opening addresses

Welcome address

Andrew W. Shepherd, FAO, Rome

It is my pleasure to welcome you to this meeting which is jointly organized by FAO and AFMA. For those of you who are unfamiliar with AFMA, it stands for the Association of Food and Agricultural Marketing Agencies in Asia and the Pacific. Mr. Mukul Satyal, with whom you have all been in e-mail contact, is the Executive Director of the Association. I am delighted that the Chairperson of AFMA, Mr. Nelson Buenaflor, is able to be with us to give the welcome speech and to contribute his considerable experience of the Philippine agricultural sector.

This meeting is a particular pleasure for me as it provides the opportunity to meet many friends once again. Several of you have collaborated with me on FAO projects, others I have met at various meetings. In planning this workshop, we have tried to bring together a mix of skills and experiences. Together with Mr. Buenaflor, we have AFMA members from India, the Republic of Korea, Malaysia, Pakistan and Thailand. We have academics from the People's Republic of China, the Philippines and Vietnam. There are government officials closely involved with horticulture and food safety issues from Cambodia, Indonesia, the Lao People's Democratic Republic and Myanmar. Expert consultants in marketing come from India, Myanmar, Pakistan and Thailand. Last, but most certainly not least, we have representatives from the private sectors of India and Thailand. So, we have the ingredients for an excellent meeting. The rest is up to you.

FAO has, of course, done much work in the past on the topics of food safety and quality. To mention just a few areas of our involvement: we have joint responsibility with WHO for *Codex Alimentarius*; our Nutrition Division has been very active in safety issues and in looking at the subject of street foods; our Plant Protection Service has worked for many years promoting the safer use of pesticides and has been a pioneer in the field of integrated pest management (IPM); and we have been working closely with member countries in the area of good agricultural practices (GAP). Indeed, only a few weeks ago, FAO organized a national workshop for Thailand on that topic.

However, to my knowledge, this is the first time that FAO has tried to address quality and safety issues from the perspective of the marketing system. What are the constraints experienced by traders in making improvements? What incentives does the marketing system provide to farmers to make improvements, if any? What are the skills and knowledge gaps that need to be addressed? How can marketing systems respond to demands for better quality? These are just a few issues that need to be looked at.

The workshop starts from the assumption that standard approaches to improving quality and safety in traditional marketing chains have not been too successful. Farmers are not necessarily delivering good quality produce. The marketing systems continue to exhibit extremely poor handling practices. Unsafe pesticide application practices continue to be followed by farmers. Unhygienic practices remain widespread, and there are dangers of microbial contamination.

It is therefore necessary to examine the constraints experienced by farmers and traders in making improvements. Are the constraints due to: (1) lack of knowledge? (2) lack of resources to implement training and regulation? (3) is there a lack of incentive for farmers and traders to implement change? The question that needs to be answered is: can improvements in safety and quality be brought about within the framework of traditional marketing chains or is it necessary to entirely by-pass such chains?

The workshop therefore, aims to discuss the above-mentioned concerns and issues, and develop practical recommendations for governments, their agencies, markets and traders on ways to improve quality and safety. The second objective of the workshop is to provide further materials and well-argued recommendations for the finalization of FAO background paper on the topic, and provide guidance for future FAO activities in this area.

I very much look forward to your contributions over the next few days.

Opening message

Nelson C. Buenaflor, AFMA, Manila

First, allow me to welcome you to this FAO/AFMA workshop on Quality and Safety in the Traditional Horticultural Marketing Chains of Asia. It is with deep pride and honour that I join you today in this yet another memorable milestone of FAO/AFMA. Our continuing resolve to deliver important studies, viable research and innovative breakthroughs gather and bind us again for the development of various agricultural marketing systems across Asia and the Pacific.

Today's assembly of different sectoral heads and government representatives in the region is no less significant as each of us will continue to do our share in visualizing better and workable strategies to achieve our very common goal. But foremost, my visit here in this beautiful city of Bangkok is filled with excitement as I get to see familiar faces in FAO/AFMA, my colleagues from other member-countries who have been around for quite some time, who continue devoting time and energy to strengthen the groundwork for cooperation. I definitely appreciate and honor those who remain steadfast in their respective resolve. Likewise, I wish to convey my country's commitment to break new grounds to make FAO/AFMA more responsive, credible, creative and dependable in the pursuit of economic progress, particularly agricultural marketing.

My conferment as Chairperson of FAO/AFMA last year was among the highlights of my career as a public servant. I regard it as a humbling achievement to be a leader of this dynamic organization. I take it as a huge opportunity to be able to draw out positive outcome in the implementation of marketing programmes and initiatives that

may be beneficial to the entire organization. I always give credit to the remarkable contribution of each member, specifically in scouring the wide market for diverse trading prospects in the region. It is therefore deemed imperative that while we establish a clear parameter on how to address different situations in marketing systems in Asia and the Pacific, we first have a mature understanding of the nature and viability of our respective markets. There may be differing views at the end of this workshop on the quality and safety in the traditional horticultural marketing chains in Asia, but the bottom line will always see us immersed in our determination to find healthier solutions to issues of common concern.

A survey which I recently conducted in the Philippines showed that there are a number of issues and topics which the agribusiness companies in my country would wish FAO/AFMA to consider as the subject of its next international workshop or study. Based on the preferences of 46 respondents, fruits and vegetables were their priority crops with special interest on top three subjects namely: product standards for export and import, business policy and environment, post-harvest facility, and transport and logistics. May I suggest that a similar survey be conducted in your respective countries so that FAO/AFMA may be able to prepare priority listing on these issues for study or workshop purposes. These international workshops or conferences could be the avenue where we can attract more active participation of both the public and private institutions to FAO/AFMA activities.

My well-cherished post as chair of FAO/AFMA will conclude next year. But there are lots of things yet to be accomplished. Our obligation as responsible members of FAO/AFMA, representing the various sectors in our respective countries, becomes an inherent aspect that will lead us to a more conscientious task to beat the odds while working on common grounds of mutual understanding and cooperation.

I wish everyone a memorable and productive stay here in Bangkok. Mabuhay! Thank you.

Annex 4 – Food quality and safety issues in the fresh produce production and marketing chain in India

G. H. Dhankar¹

Introduction

India produces 43 million tonnes of fruits and 88 million tonnes of vegetables. The National Horticulture Mission forecasts annual production growth at 8.8 percent for fruits and 10.9 percent for vegetables. But the concept that food quality and safety begins at the farm through good agricultural practices (GAP) and workers' hygiene has yet to take root. The domestic market services more than 90 million tonnes of fresh produce through 7 300 wholesale assembly markets and 27 294 rural weekly markets.

Production and marketing

The domestic market is characterized by long marketing channels, which rarely bring producer and purchaser face to face. Producers seldom know the requirements of buyers in the market. They grow fresh produce to the best of their abilities under given production circumstances to obtain prices as high as they can. Specific demand for quality and safe produce is uncommon. Prices are more linked to supply and demand than quality and safety of produce. Farm-level sorting or grading based on standards is generally not practised. Gunny cloth or sacks commonly used in packaging and transportation are recycled. Damage caused to fresh produce by bruises or iron hooks during loading-unloading and subsequent spoilage on account of microbial activities is accepted as routine.

Physical markets handling fresh produce are, by and large, unhygienic and quality and safety do not have importance in market transactions. Both the producers and retailers are disorganized. Cold chains, refrigerated transport and scientific post-harvest handling are inadequate. Regulated markets planned to develop efficient marketing in favour of growers, do not play any role in supply and sale of quality and safe produce. They concentrate more on revenue generation.

Multiple handling of fresh produce in long marketing channels and resultant handling losses at various levels are a major problem. Estimates of qualitative and quantitative losses at different levels are shown in Table 1 below.

¹ Agricultural Marketing Consultant, Pune, Maharashtra State, India

Table 1: Average post-harvest loss in fresh produce marketing chains in India

Type of stakeholder	Loss in percentage of production being distributed
Farmer	15
Trader	3
Local trader	1
Wholesaler 1	1
Agent	2
Retailer	8
Total	30

Agricultural marketing reforms being introduced in the country provide for direct marketing, farmers' markets and private sector ownership, operation and management of physical markets. Around 50 percent of the states have adopted reforms to pave the way for shortened marketing channels and the promotion of direct marketing by farmers to consumers after proper sorting, grading, and packaging. Until recently such direct sales were illegal as all produce had to go through official markets.

Quality and safety

Standards and grades

Multiple standards and grades, coupled with multiple prescribing and implementing agencies, have been common in the Indian fresh produce marketing system. The Agricultural Produce (Grading and Marking) Act 1937 (known as Agmark), the Prevention of Food Adulteration Act (PFA Act), 1954, the Fruit Products Order 1965, the Export (Quality control and Inspection) Act 1963, the Consumer Protection Act 1980, the Bureau of Indian Standards Act 1986 are implemented by different ministries.

Standards for fresh produce for the domestic market were introduced, through wholesale assembly markets, under Agmark in the early 1940s. These standards were based on size and physical characteristics. Produce markets were advised to grade fresh produce, such as citrus fruits, onions, potatoes and other fruits, before sale, as per these standards. The standards were voluntary and traders did not accept them on the grounds that good and homogeneous quality fresh produce was not available. The industry transacted on the basis of mutually-accepted standards. Neither government nor traders educated growers about prevailing standards and their importance in marketing.

An increasing number of food consignments being rejected on the world market has brought the standards available in India into focus. But, these were found unacceptable in today's market because:

- Most of these standards were framed during the time when the country's focus was on control, not on value addition.
- Traders, producers, industry, and consumers were unaware of the local standards both on national and international markets.
- Quality fresh produce suitable for processing was not available due to policy on land holding.

- Scientific harvesting and post-harvest handling of fresh produce from growers to consumers were at low levels of mechanization and technological innovation.
- Infrastructure support was lacking; inadequacies of rural roads and rail network, research and development laboratories, quality and safety norms with a mechanism for certification, cold storage and cold chain.

Quality and safety issues are traditionally dealt with separately by the Ministries of Agriculture and Health. While quality standards were prescribed and promoted by the Ministry of Agriculture, ensuring safety and health in the domestic market had been the responsibility of the Health and Family Welfare Ministry. The PFA Act, which is mandatory for the domestic market, is enforced by the Health Ministry throughout the country.

As a member of WTO and WHO, the country had to respond to new challenges by reorganizing food safety as an essential public health function. The Health Ministry amended the PFA Act and Rules to provide for tolerances in respect of pesticide residues in edible products, including fresh produce. The Act is implemented through local bodies and municipalities. Food inspectors draw samples of edible products from a market, test for adulteration in the laboratories and take offenders to the court of law. It succeeded in intimidating unscrupulous trade to some extent but failed in implementing quality and safety standards. The multiplicity of legislation and administering authorities at the state and central government levels has often culminated into unnecessary harassment and an “inspector regime”.

Ground realities

Poisonous chemicals are commonly used to impart gloss to fruit and vegetables and for ripening. Calcium carbide, although banned, is used for ripening mangoes. A poisonous plant growth regulator called fruiton, is used for ripening bananas during transport and to impart a yellow gloss to the fruits. Most farmers in the mango belt use the banned and hazardous methyl parathion as a pesticide to kill “mango hoppers”. The residual toxicity of this pesticide is very high and lasts for months as opposed to the recommended chemical, dimethonate, the residual effects of which last only for a week. Parathion immediately kills the insect while diamethonate takes longer and hence appears ineffective as a decimator of the hoppers. In the long run, as the spraying season begins in the last week of January and ends in the last week of March, the fruit, though looking delicious, remains unfit for consumption owing to the harmful effects of parathion.

Tomatoes have been found to be the most contaminated vegetables among the samples analyzed by Rajasthan University during 1996-1999. Quite high residues were detected during all stages of the season, i.e., in the beginning of season (10.738 PPM), in the middle of season (13.239ppm), and at the end of the season (17.046 ppm). The organochlorine pesticide (OCP) residues detected from the vegetables at different seasonal stages for cabbage, tomato and cauliflower were maximum during the end of season as compared with the beginning and middle of the season.

Among the pesticides detected, heptachlor and heptachlor epoxide were found to be more common than DDT, HCH and aldrin. A few samples were contaminated with aldrin and most of these samples were collected at the beginning of the season. OCP

residue levels in the majority of samples were above the maximum Accepted Daily Intake (ADI).

The colouring of aubergines with the highly dangerous furadan chemical to give them an appealing glossy deep purple colour is common among vegetable vendors. Capsicum, lady's finger and cucumbers are dyed green with artificial dyes, while tomatoes and certain fruits are given a sparkling shine using petroleum jelly. Vegetable samples analyzed for OCP residues revealed that almost 75 percent of samples were contaminated with pesticides.

In spinach, higher residue levels were found at the beginning of the season. Potatoes and lady's fingers were also found to be contaminated by pesticides in various seasons. The study concluded that the pesticides used by farmers are persistent in the environment, in the crops and crop products.

Although some 23 pesticides have been banned and ten others are prohibited, these continue to be freely available and used. Despite availability of inexpensive alternatives, in an attempt to make vegetables and fruits appear fresh and wholesome, farmers resort to use of pesticides beyond the prescribed 'economic threshold', which recommends that pesticides be used only when a certain limit of pathogens or insects is crossed. Some of the deadly pesticides like aluminium phosphite, DDT, EDG, BHC, ethyl mercury chloride and heptachlor are available off the shelf. The machinery to control the indiscriminate sale and use of pesticides is ineffective.

During field visit in Karnataka a progressive farmer and major grower of tomato and cabbage frankly admitted that although truckloads of cabbage grown by him are sold at Kolkata market in West Bengal – some 2 000 km away – at a good price, he never consumes his cabbages because of the heavy dose of pesticides used during growing.

Points where quality and safety issues arise

While harvesting is generally done by improved harvesters recommended for the purpose, due regard is often not given to maturity. Standardization and grading at farm level is common for export varieties, while for others it is optional, depending on the producers. For example, while for the export market de-sapping of mango is done to protect quality and appearance, the majority of the mango farmers supplying the domestic market are not particular about this small but important post-harvest operation.

Proper packaging is often neglected. Gunnybags are commonly used for packaging and transport of fruits, spoiling them further due to bruises and harbouring of microbial contamination. Owing to the number of intermediaries, produce is handled and rehandled at least four to five times from farm to the retailer. Handling and rehandling to remove spoiled fruits and subsequent repacking is common at primary, secondary as well as terminal market level, from where major markets are serviced.

The produce is also subjected to sun, rain, etc. in many markets for want of proper infrastructure. It is exposed to contamination at various stages, in the absence of sanitary or hygienic regulations. Irregular garbage disposal forces market transactions in unhygienic atmosphere. Scattered spoiled fruits and vegetables on internal roads or nearby open drains is a common site at rural or urban markets. Fruit boxes are

displayed in the open during selling, inviting flies and bees to swarm around. The market users commonly spit or blow their nose while moving in the market unmindful of their contribution to contamination.

Constraints to improving produce safety

Various constraints to improving product safety are:

- possible decline in production and subsequent income if chemical use is reduced,
- lack of marketing credit,
- long marketing channels,
- no specific demand for quality and safe produce in the domestic market.

In the Delhi terminal market commission agents finance farmers in advance of the harvest. A total amount of Rs300 million is estimated to be financed by Delhi traders every season for mango alone. Farmers will not be inclined to observe such requirements unless these financiers prescribe quality and safety norms. Moreover, their produce gets sold 'as is where is'. There are no economic incentives or disincentives for increasing product safety or neglecting it. The reduced production owing to non-use of pesticides is not compensated by higher prices for safe produce.

Producers' insight into buyers' needs

Marketing extension, with regard to buyers' needs, is not available in a user-friendly manner. Long marketing channels prohibit contact between the producers and buyers. Farmers who are aware about quality and safety aspects, especially about pesticide hazards, have become complacent about the situation because:

- safe produce has no different marketing channel to assure higher prices,
- the agency to propagate and ensure safety of produce is absent.
- mechanisms to produce and certify quality and safe produce are not in place,
- no difficulty in selling unsafe produce,
- no deterring punishment witnessed to any producer, commission agent or trader for handling unsafe fruit and vegetables in the market.

Integrated pest management (IPM)

Government efforts have brought down consumption of pesticides from 56 114 tonnes (technical grade) in 1996–1997 to 41 020 tonnes in 2003–2004. Some of the pesticide formulations have been banned for import, manufacture and use. Some others are banned for use but their manufacture is allowed for export. Despite considerable success, IPM has not percolated to the grass roots level. The IPM package of practices has been developed for 77 crops. The fruit and vegetables covered include potato, onion, tomato, cruciferous vegetables, aubergine, lady's finger, chilies, citrus, pineapple, sapota, pomegranate, grapes, apple, mango, guava, banana, litchi, papaya, apricot, peach, cherry, custard apple and watermelon.

Biological control being a major component of IPM, the government provides financial support for the construction of bio-control laboratories and for procurement of equipment and vehicles. So far, 409 such laboratories have been set up, including 130 in the private sector. Financial assistance has been released for setting up 29 additional state bio-control laboratories.

The safety evaluation of protection schedules on agricultural crops has been done in India. Over 550 schedules have been evaluated on fruits, vegetables, cereals, pulses, oilseeds and cash crops. The safe schedules have been identified for adoption. Safe waiting periods have been worked out for insecticides, fungicides, herbicides, etc. All the scientific evolutions have been widely circulated through various training and extension activities of state and central governments.

The legal anomaly of the mandate on safety

The two regulations responsible for regulating pesticides in India are the Insecticide Act, 1968, under the Union Ministry of Agriculture and the PFA Act, 1954, under the Union Ministry of Health and Family Welfare. There is no legislative provision to link pesticide registration to setting of maximum residue levels (MRLs). The Insecticide Act mandates registration while the PFA Act mandates MRLs. Because of this anomaly, MRLs have only been prescribed for 71 of the 180 pesticides currently registered.

Thus, lack of effective communication between the two nodal regulatory agencies leads to a mismatch between the pesticides the Central Insecticide Board recommends for use on a food commodity and those for which MRLs have been set under the PFA Act for the same commodity. In the case of mango for example, 44 percent of the recommended pesticides have no MRLs. A farmer must use a “recommended” pesticide for a particular crop following the Insecticides Act. However, if there is no MRL for that pesticide under the PFA Act, that crop can not legally contain any residue for that pesticide.

Examples of authorities taking samples of fresh fruit and vegetables to check pesticide residues are rare. The onus of responsibility lies on the traders to follow the rules under PFA and prove that the food articles they sell are safe. Facilities to test pesticide residues in fresh produce sold in the domestic market are also lacking.

Integrated food law

The unwieldy number of laws covering the disciplines of food microbiology, food chemistry and food technology are being brought under a single umbrella for effective implementation in the food sector. The government has constituted a group of Ministers under the leadership of the Food and Agriculture Minister to suggest new legislation (Integrated Food Law). It will:

- harmonize and rationalize existing food laws;
- simplify the rules and procedures to make it easy for the industry to comply with them;
- take into account requirements of sanitary and phytosanitary measures as per international standards and practices.

Recommendations

At government level

The implementation of the insecticide and PFA Acts should be streamlined and strengthened. Requisite manpower, testing facilities, logistics, etc. have to be provided. The private sector should be taken into confidence to set up mechanisms to ensure safety and quality at the production stage, during marketing and at the retail

stage. Safety standards languishing in rulebooks should be implemented for domestic markets where they are relevant or repealed if not. The casual approach towards food safety should change.

The government should ensure effective participation of all stakeholders: producers, processors, traders, and research and development organizations in setting standards and guides for food safety initiatives that are acceptable to domestic and international markets.

Pesticides should be registered for use only when estimations of the intake and exposure have been completed and established to be safe. For this, MRLs need to be fixed at the time of registration.

Contract farming should be promoted to encourage producers to produce quality and safe goods for both domestic and overseas markets. Land reforms are needed to facilitate large-scale production planning for the market.

Marketing level

Market authorities should propagate and promote the sale of certified quality and safe fresh produce. They should meticulously maintain sanitation and hygiene.

Farmers need to be educated on quality and safety issues. Regular meetings between stakeholders would be useful to enable farmers to get insights into buyers' quality and safety needs.

Farming level

Extension education about GAP, good horticultural practices, and IPM packages should be carried out. A network of laboratories to test soil, water, pesticide residues as near to the farm as possible should be established. Contract farming to ensure quality inputs to produce quality and safe crops, and organic horticulture should also be encouraged.

Annex 5 – Study on quality and safety in the fresh produce marketing chain in Myanmar

Kyaw Myint¹

Current state of fruit and vegetable quality and safety in the country

Codex alimentarius is not yet used in the country. The government established the National Food Law in March 1997 in which food additives, food differing from standards and other important key points such as licences, unhygienic conditions, quality assurance labelling and primary laboratory are included. With regard to pesticide utilization and marketing, the Pesticide Law and Procedures relating to the pesticide law were established in 1990 and 1991 respectively.

Demand for safe produce

At present, consumers are not aware of safety of fresh produce. To find out consumers' awareness, surveys were conducted in Yangon City, capital of the country and Mandalay City, the second largest city, in central Myanmar. The survey results show that about 50 percent of consumers are not aware of safety issues relating to fresh produce (see Table 1 below).

Table 1: Consumer awareness of safety on highland produce of tomato and grape (percent)

Particular	Highland produce of tomato		Grape	
	Yangon	Mandalay	Yangon	Mandalay
1. Never heard	45	63	50	45
2. Not aware	45	63	40	45
3. Extremely important	28	-	23	-
4. Very important	38	3	27	5
5. Important	65	13	63	20
6. Not important	20	16	3	80

Implications on consumer awareness

For consumer protection, the government broadcasts public health programmes through the mass media. Messages include excess edible oil used in food preparation and consumption of oily food being harmful to health, and food retailer education regarding hygiene. Consumer education programmes for fresh produce, covering

¹ Deputy General Manager, Myanmar Agriculture Service, Ministry of Agriculture and Irrigation, Yangon, Myanmar. He is grateful to his colleagues who have also participated in the preparation of this paper.

chemical and biological hazards are important for consumers but are not presently done.

Factors constraining suppliers

Generally speaking, traders endeavour to cater to consumer needs. Due to lack of consumer awareness, traders do not pay attention to safety of fresh produce. At the same time, traders do not organize farmers to produce safe fruits and vegetables. It is expected that if consumer demand for safe produce increases, suppliers will follow the market opportunity.

Financial cost for safer and higher quality produce

If farmers and traders try to supply safer and higher quality fruits and vegetables, consumers need to pay a higher price. However, if the price of safe and high-quality produce is high in the market, low socio-economic consumers cannot afford it.

Infrastructure constraints

In order to have better quality and safer produce, infrastructure such as cold storage and refrigeration, better transport facilities and laboratory facilities to test for pesticide residues are required. At present, there are no cold storage facilities in urban wholesale markets. Thus, fresh produce supplied from the main surplus-producing areas is sold within one or two days.

Farmer knowledge of good agricultural practices

From the viewpoint of farmers, yield increase, market price increase and reduction of production cost are important to increase profit margins. Some resource-poor farmers use banned pesticides which are cheaper compared with legal pesticides. A few farmers follow good agricultural practices (GAP) but most are not fully aware of pesticide residues issues.

Some farmers use mixtures of pesticides; although the dosage may be sub-lethal initially, mixing several chemicals may double the concentration of noxious components. Even if the extension service organizes tomato farmers to use a new and safer pesticide, only a few innovative farmers adopt it in the main producing areas. Due to a sharp rise in price, some farmers do not follow GAP and sell their tomatoes immediately after pesticide application. To increase yield, farmers often use unprocessed organic manure and are not aware of the potential for biological contamination of produce.

If traders, labourers and transporters do not correctly manage produce supplied by farmers, high-quality and safe produce cannot reach consumers. Thus, present transportation practices need to be improved. Highland tomatoes are normally packed in wooden crates and sent to urban wholesale markets by truck. Tight stacking patterns restrict the movement of air between and through wooden crates. At times, transporters put the wooden crate with tomatoes as a base into the truck and load cabbage and cauliflower on the top, thus increasing damage to the fragile tomatoes.

The awareness and sensitiveness of food safety

Consumers are not aware of food safety. Based on survey results, consumer choice of fresh produce is highly related to size, shape, maturity, blemish, bruise and freshness.

With the exception of supermarkets, wholesale and retail markets have no cold storage facilities. Thus, freshness is an important quality for consumers.

About 92 percent of consumers in the survey would not purchase tomatoes if they were aware that pesticide residues were excessive. However, three-fifths of Yangon consumers interviewed were not aware of pesticide residues being a problem.

Only a few consumers purchase fresh produce in supermarkets instead of retail markets. Daily sale volumes of fruits and vegetables in supermarkets are very low compared with retail markets. Normally, the price of fresh produce in supermarkets is higher than the selling price in retail markets.

All consumers interviewed in supermarkets of Yangon City knew that prices in supermarkets are high compared with retail markets. However, they purchase tomatoes and other vegetables in supermarkets due to handling being perceived as more hygienic.

Generally speaking, consumers cannot decide which fresh produce is safe to purchase. From their viewpoint, the most important thing is that the price of safe fresh produce needs to be reasonable. To find out consumers opinion of price to be paid for safe fresh produce, a survey was conducted in Yangon retail markets and supermarkets. The survey results were:

- About 68 percent of consumers in the sample responded that if safe and higher-quality tomato is high-priced, they cannot afford it for daily consumption.
- About 90 percent of consumers in the sample agreed that consumption of safe produce is highly related to health concerns and safer produce is required.

Socio-economic factors affecting food supply

- Some resource-poor farmers use illegal pesticides. In addition, after selling the first harvest, tomato farmers have sales revenue which they use to purchase additional pesticides.
- Due to a sharp rise in price, some farmers sell green mature tomatoes mixed with immature tomatoes. Thus, traders use ripening agents which limits the shelf life.
- Generally speaking, many consumers in urban areas do not have refrigerators. Consumer behaviour depends on their needs. For example, overripe tomatoes are selected for cooking today and semi-ripe tomatoes are chosen for eating later. The reason is that semi-ripe tomatoes are stored at ambient temperatures.

Food safety and the role of government

The consumption of unsafe food can damage public health, which can increase the cost of medical care. Thus, the government has a crucial role in ensuring that food does not endanger consumer health through chemical, biological and other contaminants. In order to have safe fresh produce, a variety of measures such as laws, regulations and standards, and a system of effective inspection and laboratory analysis are still needed in Myanmar.

Case study of highland produce of tomato

Tomato is demanded by consumers year-round and is consumed as salad, soup, sauce and jam. It is available throughout the year on the local market. In the rainy season,² when there is no lowland production, large quantities are mainly supplied from Southern Shan State, located in the hilly region. Consumers in lowland areas rely on the marketed volume of highland produce. In the cool season, lowland areas produce more than the highlands. Thus, the price of lowland produce is cheaper compared with highland produce.

Case study area

Inle Lake³ in Southern Shan State is the main surplus-producing area. There, tomato is produced on floating farms on the lake. The area planted under tomatoes in 2004–2005 is estimated at 2 173 hectares. Tomato farmers in Inle Lake have farms varying in size from 336 to 4 047 square meters.

Variety

All the farmers interviewed use a hybrid variety supplied from private local seed companies. It has thicker skin compared with the local variety, and is suitable for long-distance transportation.

Cost of production

Among tomato farmers, production cost (variable cost) varies, depending on different levels of fertilizer, pesticide and fungicide used. At the time of the survey, 50 percent of cash costs for production were used on agro-inputs. Agro-chemicals constitute 40 percent of total agro-input cost.

Banned pesticide

Even though tomato farmers are aware that Monocrotophos is a banned pesticide, it continues to be used by about 50 percent of farmers interviewed. The reason is that it is cheaper compared with legal pesticides. At the time of survey, the price of Monocrotophos was 500 kyats per 100 cc while legal pesticides ranged from 1 200 to 3 500 kyats per 100 cc.

Pesticide application

Generally speaking, tomato farmers do not observe the economic threshold level and prefer more frequent application as they are afraid of crop loss and reduction in yield. About 83 percent of farmers in the sample spray pesticide whether pests attack or not.

In addition, farmers are not aware of the minimum time difference between the final spraying of pesticide and harvesting. About 63 percent of farmers interviewed admitted to selling tomatoes immediately after pesticide treatment due to a sharp rise in price and strong demand of local wholesalers.

² The rainy (monsoon season) lasts from mid-May to mid-October and the cool season from mid-October to mid-February.

³ It is located about 900 meters above sea-level and is 14.5 km long from South to North and 5.6 km long from East to West (Encyclopedia, Myanmar Language). It is famous for both specialized production of tomato and ecotourism-business of the country.

Ripening agent

In the local wholesalers' depot, purchased tomatoes are heaped on a bamboo shelf or mat at ambient temperature. To obtain ripe tomatoes, workers wait 7 to 10 days and select full red and yellow tinge colour from stored quantities to be packed in wooden crates. After that, timber planks are used as cover and labourers nail the lid on the wooden crate. At times, this leads to damage during packing.

Local wholesalers endeavour to increase their supplies when quantities of tomatoes demanded by urban markets increase. Thus, a ripening agent is used.

Yangon wholesalers reported that chemically-ripened tomatoes are not better for long-distance transportation. The reason is that the fruit becomes soft and has very limited shelf life. Thus, using a ripening agent causes deterioration of quality, which inevitably leads to a negative profit margin for traders. Large-scale wholesalers in Yangon reported that they are very keen to pay better prices for tomatoes which are free of ripening agent.

Traditional marketing channel

Some farmers sell tomatoes to agents who come to their farm by boat and some deliver directly to the local wholesalers. For collection of green mature tomatoes, an agent receives 4.37 kyats per kilogram from local wholesalers based on their buying quantities. The marketing cost is taken out of his or her commission fee. Trucks are mainly used for long distance transportation to urban wholesale markets. In turn, urban wholesalers sell to retailers in neighbourhood markets and also consign the fruit to other urban markets where there is no lowland production during the rainy season. Urban wholesalers charge ten percent commission on sale value.

Supermarkets

In Yangon City, supermarkets purchase highland tomatoes from large-scale wholesalers. Cleaning, grading and repacking are carried out prior to retailing. Thus, while consumers may feel that produce from supermarkets is safer, its origin is the same as that sold through traditional marketing channels.

Recommendations

Generally speaking, consumers in Myanmar consider that fresh fruits and vegetables are important for daily consumption. Thus, supply of safe fresh produce is required for consumers to improve their health.

Farm level

Farmers and growers in main surplus-producing areas need to follow GAP. By doing this, farmers' supplies should not exceed maximum residue limits (MRLs) of pesticide and marketed fresh produce should be free of ripening agents. In addition, extension workers should advise farmers and growers regarding chemical and biological contamination of fresh produce.

To be widely adopted, a GAP extension education programme needs to be carried out by extension workers and plant protection staff. With regard to pesticide spraying, the

following key points are important to adopt among farmers and orchard growers which are:

- to observe the economic threshold level,
- to avoid frequent pesticide application,
- to follow recommended periods between last pesticide application and harvest,
- to abstain from using banned pesticides,
- to respect dosage recommendations,
- to be aware of incorrect mixing of pesticides.

Marketing level

Traders have an important role in maintaining quality and safety. Thus, traders need to pay attention to the following points:

- To clean storage, handling and packing areas regularly.
- To protect the produce from contamination, labourers need to be trained in personal hygiene.
- To use hygienic wooden crates or cardboard boxes.
- To avoid use of dirty water for cleaning fresh produce.
- To protect the produce from biological contamination, transporters need to clean vehicles before loading.
- To practice correct methods for loading and stacking.
- To transport fresh produce without delay to the urban wholesale markets.
- To protect quality, trucks must be covered during long-distance transportation. Fresh produce should not be directly exposed to the sunlight and rain.
- To display labels certifying the origin of the produce and the fact that it is free of pesticides as a transparent communication effort towards their customers and the final consumer.

Government level

Government needs to motivate consumers regarding the disadvantage of unsafe food: if consumers demand for safe food increases, supermarkets and large-scale wholesalers will identify the market opportunity and supply it.

Some extension workers have limited knowledge of food safety issues and some farmers or growers in main surplus-producing areas are not aware of chemical and biological hazards. Quality Assurance Systems for ASEAN Fruit and Vegetables Project conducted training for extension workers in August 2005 in the country. Extension services should arrange to carry out training for farmers on GAP to manage produce quality and food safety.

Further government action is also needed on the following points:

- As noted earlier, Codex Alimentarius needs to be implemented in Myanmar.
- A working group of representatives⁴ from six ASEAN countries and Australia is currently developing a draft of the ASEAN GAP standard, which will be presented to representatives from all ten ASEAN countries in November 2005.

⁴ See “An introduction to ASEAN good agricultural practice, managing food safety and post harvest quality of fruit and vegetables (Quality Assurance Systems for ASEAN Fruit and Vegetables Project)”, www.aphnet.org

The ASEAN GAP standard is expected to be finalised and released by March 2006.

- Codex maximum residue levels (MRLs) are obtained from the Codex Committee on Pesticide Residue. Laboratory analysis is required to test farmers' produce.
- The country's Pesticide Registration Board (PRB) which was formed in 1992 needs to control marketing of illegal pesticides.
- GAP and Integrated Pest Management (IPM) are able to reduce chemical hazards. Thus, the Extension Service needs to provide technical assistance to producers and agro-chemical suppliers.
- Some extension workers have limited knowledge of safe produce. To improve extension workers' knowledge, training programme is needed.
- A consumer education programme should promote awareness of food safety.
- The country's National Food and Drug Administration (NFDA) has a vital role to play in providing technical assistance to government agencies for food safety.

Annex 6 – A study of food quality and safety issues in the fresh produce production and marketing chain in Nepal

Rajendra P. Singh¹

Introduction

Background

Nepal's economy is dominated by subsistence agriculture employing about 66 percent of the population with an estimated contribution of 38 percent to gross domestic production. Since the mid-1990s, the government has embarked on a series of policy reforms, with main policies and procedures relating to fruit and vegetables development including:

- the establishment of municipal wholesale and retail markets and rural collection centres;
- the launch of commercial vegetable production programmes in pocket areas;
- a focus on off-season market-oriented vegetable production along the north-south highways.

The key elements influencing policy planning in Nepal include the location of the country, its open borders, and geographical diversity.

Overview of Nepalese agriculture with focus on horticulture

Nepal's agricultural system is characterized by an extreme variety of agro-ecological conditions, which allows for production of a broad range of crops and livestock products. However, land is a major limiting resource in Nepal. The Nepalese agricultural development programme has a focus on food security; to assure high yields farmers are encouraged to use increasing amounts of chemicals.

Food standards in Nepal

The culture of standards is at a very early stage in Nepal. No fresh fruit or vegetables are included in the list of standards sets by the Nepal Bureau of Standards and Metrology (NBSM). The Department of Food Technology and Quality Control (DFTQC) has set standards for some processed food products.

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Import of produce

Imported produce comes into the preview of quarantine check post for quality checking. No quarantine check post has ever filed a case against any trader/clearing agent on a charge of violating the Plant Protection Act, and no one has challenged the actions of the check posts (FAO, 2003). Thus, relevant and updated food legislation is essential to the development of a modern food control system. Few controls are currently exercised over food production and importation in the Kingdom. Contaminants have been found in food and drinks sold in supermarkets and markets; restaurants exercise little hygiene controls; and consumers have concerns about the safety of both imported and locally produced foods.

Nepal lacks a fully developed infrastructure in the areas of standards relating to technical regulations, conformity assessment, quality and metrology with the need for an initial focus on infrastructure development and awareness creation. Nepal has, however, been actively participating in regional standardization initiatives through the South Asian Regional Standards Organization since its formation in 1999.

Food safety in production and marketing

Consumer demand for fresh produce safety

The quality perception of the produce by the consumer at the market is based on visual appearance and physical conditions. Damaged or decayed produce are perceived as low quality produce and rejected by the consumer. Consumers in Nepal usually think fresh fruits and vegetables are safe, especially those grown locally. However, when people express concern about chemical hazards in fresh fruits and vegetables, most of the blame is directed towards farmers.

Supplier response to demand for safer food and constraints

Farmers interviewed in all locations stated that the traders tell them about the type of produce required in the market. It was found that the farmers' concern was to provide produce with good visual looks. Furthermore, farmers think that it is not possible to produce attractive fruits and vegetables without using agrochemicals, and they were not ready to accept crop loss or market rejection.

Trader involvement in food quality and safety

The traders' community interviewed during the course of the study indicated having some knowledge on safety issues and mentioned that the produce they carry reflects the demand of consumers and what farmers or wholesalers supply. Wholesalers based at Kalimati Fruit and Vegetable Market in Kathmandu and Pokhara Wholesale Market mentioned that the farmers are specifically asked to bring produce with the best appearance or else the product is not accepted. It was also reported that the farmers use agro-chemicals heavily to protect the crop and preserve the visual appearance of the produce. Furthermore, consumers are concerned with the look of the produce. Farmers mentioned that traders want attractive produce and chemical use cannot be avoided to satisfy their demand.

Pesticide residue levels

An assessment of pesticide residue levels in Nepalese vegetables was conducted on the basis of 230 samples of vegetables. The conclusions of this report were that the

use of organophosphates, pyrethroids and fungicides was found to be dominant in vegetable farming (Source: Department of Food Technology and Quality Control).

Knowledge of quality and safety

A lack of knowledge and information relating to safety issues was observed at all levels including traders, farmers, consumers and government agencies. The area covering food safety issues, especially relating to chemical hazards on imported produce, has remained unattended to in Nepal. Government mechanisms relating to fresh product safety remain limited or non-existent for domestic production or imports. Nepal lacks a fully developed infrastructure in the areas of standards relating to technical regulations, conformity assessment, quality and metrology.

Financial cost of producing safer and higher-quality produce

With about 5 percent of total cultivated area, horticulture is the most important crop after cereals, pulses and oilseeds. Farmers are the primary investors in fresh vegetable and fruit production in Nepal. The scale of commercial farms is small at around 0.5 hectares in hills and mountains and about one hectare in the Terai.² Loans from banks are not sought by farmers, mainly due to long administrative procedures. On the other hand, it is common in Nepal for farmers to take short-term loans from traders.

Infrastructure constraints and their effect on sourcing of safer fresh produce

There are limited agricultural marketing facilities vis-à-vis the road network in Nepal. There are six operational wholesale markets and 29 collection centres. Retail markets are scarce, forcing consumers to make purchases at unhygienic neighbourhood retail shops or from hawkers.

Farmers' knowledge of good agricultural practices

Nepalese agriculture has been in transition from traditional to improved agriculture and is increasingly using technology to raise productivity per unit area. However, based on the limited information available within the extension services and farmers, knowledge about good agricultural practices (GAP) is limited. GAP areas of importance include soil use, water quality data and assessment, shallow water effluents discharge in urban and per-urban areas, inefficient seed quarantine entering the country, hazardous chemical crop protection use, and human welfare, health and safety issues.

Food safety and consumer preferences and behaviour

Awareness and sensitivity of consumers to food safety issues

People usually think fresh fruits and vegetables are safe, especially those grown locally. However, fruits and vegetables have been the source of several cases and outbreaks of food-borne illnesses. Most people think that chemical hazards for fresh fruits and vegetables, such as pesticide poisoning, pose the most serious food safety hazard but more people have been harmed by biological hazards caused by contaminated fruits and vegetables. These may not have originated from farmers,

² Estimation based on interview with farmers from Kathmandu Valley and surroundings, Bharatpur and Sarlahi.

although in most cases all the blame is attached to farmers. The consumer perceives that the fresh fruits or vegetables are always healthy after cleaning and cooking.

A focus group study of consumers from Kathmandu was conducted to acquire information on attitudes to fresh produce safety. The most important findings revealed by consumers relate to wild edible plants and fungi available in the market. The effects of consumption of these items are not seen until consumers show some indication of side effects and in most cases it is fatal, as illustrated by the media. There is an urgent need to look into this matter by a responsible agency and establish a mechanism to forbid entry of such products into the market.

Consumers readiness to pay higher prices for safer produce

An FAO technical assistance project conducted a survey asking 41 consumers to rank the five most important considerations in their decision to purchase produce (Upadhaya, 2000). The majority of the consumers (82 percent) ranked quality first. Health safety concern was ranked second by a majority of consumers (67 percent). Price level, convenience, and transparency in price were ranked third, fourth, and fifth respectively. Although caution should be taken in interpreting the results of such a survey, this nevertheless suggests that consumers are becoming quality conscious.

There is no system of using labels for quality or safety in Nepal. The retailers sell loose produce to consumers. The study mentioned above concludes that “consumer suggestions for improving the marketing system included the development of more organized markets at convenient locations, greater cleanliness and improved management of market waste.”

Cultural and socio-economic factors and beliefs of farmers, intermediaries or consumers affecting food safety issues

Farmers from the surrounding areas of Kathmandu valley prefer to sell produce directly to consumers. Thus the farmers go from house to house selling their produce in a carrier called a *Kharpan*.⁵ Consumers prefer this as they perceive directly-sold produce as fresher and cheaper.

While this appears to be a good custom, there is concern for produce safety as farmers travel eight to ten kilometres selling produce. It is thus exposed to the atmosphere for display during the entire operation, which can last from three to five hours. At each transaction the *Kharpan* is on the roadside exposing produce to environmental hazards, leaving scope for contamination.

Food safety and the government

Challenges in the implementation of public safety standards and control procedures

The traditional domain of inspecting and analyzing the end product is no longer sufficient to attain food safety and quality assurance in the food supply chain.

⁵ A *Kharpan* is a traditional produce-carrying basket used by farmers in Kathmandu Valley. It has two open baskets hanging down from four ropes which can be placed at either end of a bamboo pole carried on the shoulder. Each hanging basket is about 25 to 30 centimetres from the ground. This carrier is also common in different parts of Indochina and mainland China.

Issues, constraints and challenges related to food safety in Nepal are summarized below:

- Food control activities are implemented in an unorganised form, including scanty information on food contamination. This includes weak coordination among Government units responsible for plant quarantine, food control, standards, enforcement and laboratories.
- Food laws and regulations do not embody recent recommendations by international conventions and no domestic standards exist.
- Knowledge of standards, laws/regulations is too low among the producers and consumers and there is a lack of proper enforcement mechanism.
- Compliance costs remain a major concern to policymakers and implementation agencies. Financial resource constraints appear to be the key element in enforcement.
- Small and scattered production areas with small-scale producers pose difficulties for field inspection.
- Produce bundling, shipping of small quantities of produce with no labelling, transportation and transaction in bulk without packaging, makes difficulties for inspection.
- Market area delineation, scattered wholesale and retail markets makes inspection difficult.

Review of relevant policies and programmes related to food safety

Legislative measures for fresh food safety in Nepal

These can be grouped into three broad categories representing different stages from fresh produce production and marketing chain to end-users.

Laws applicable to production

- Plant Protection Act (PPA) 1972. However, no quarantine check post has ever filed a case against any trader or clearing agent on a charge of violating the PPA.
- Pesticide Act (PA) 1991 and Rules 1994. The provisions of the Act and Rules have long been recognized as inadequate and impossible to implement. The use of pesticides was encouraged as a deliberate policy for social and economic policy development. This was complemented by a favourable treatment under the fiscal laws as pesticides were generally exempt from sales tax and custom duty.

Laws applicable to markets and marketing

- Food Act (FA) 1966 and Rules 1979. A weakness in the Act is evident in the definition section as very few items are defined as “foodstuff”, “contaminated foodstuff” and “substandard foodstuff” making implementation and coverage difficult.
- Local Self Governance Act (LGSA) 1999. Apart from the Kathmandu Metropolitan city, no other local government body has a public health unit.

Laws applicable to consumer protection

- The Consumer Protection Act is at the stage of creating awareness amongst consumers about their rights.
- The Nepal Standards (Certification Mark) Act 1980. The Nepal Bureau of Standards and Metrology (NBSM) administers the Act and, to date, no certification scheme or marking in respect to fresh produce is in place.
- The Standard Weights and Measure Act (SWMA) 1968 and Rules 1970. Traders using uncertified scales are very common and no sign of its implementation is seen.

Conclusion

The findings of this study indicate a serious policy gap vis-à-vis enforcement mechanisms. There is need for immediate interventions to preserve the interest of the community at large. Public support systems for agriculture to help growers make the transition to growing safer produce have been identified as a priority area for intervention by the Government. However, dissemination of knowledge on GAP, the farmers understanding of consumers' interests and acting accordingly would require a tremendous effort.

Recommendations

The following recommendations are made on priority works to be undertaken for food safety and quality improvement in Nepal:

- Vegetable vendors should encourage farmers to use appropriate doses of agro-chemicals.
- Hygiene and sanitation should be promoted at the produce handling stage.
- Produce display on the ground should be discouraged.
- Traders should effectively follow policy to hire vehicles authorized for carriage of fresh produce.
- Encourage collaboration between the private sector and government to build farmers' markets.

Government should:

- educate farmers about health hazards caused by agro-chemicals for consumers, farmers and environment;
- establish safety standards and ways to meet the required quality;
- enact effective legislative measures and quarantine to enforce food safety rules;
- allow import and production of approved plant protection materials and establish effective monitoring mechanisms;
- educate farmers on marketing techniques and understanding consumers' needs;
- provide an effective mechanism for delivering marketing information;
- establish a mechanism to test safety standards of produce on arrival at the wholesale market prior to despatch to retail markets;
- develop standards required for the operation of wholesale market;
- take a lead in the establishment of retail markets;
- take a lead in building consumer awareness and strengthen consumer protection measures.

In particular, an integrated effort of public agencies is essential, as detailed below:

- Agricultural agencies should promote GAP through extension agents and with the provision of applicable laws.
- Health agencies should promote awareness among the communities on food safety issues and work jointly with the Ministry of Agriculture and Cooperatives in securing supplies of safe produce to communities at large.
- Commercial agencies should recognize international food safety, standards, guidelines and recommendations and take a lead in establishing a process for adherence by the country.
- Educational agencies should develop school curricula to include safety and hygiene issues in order to build a generation that understands the negative aspects of uncontrolled development.
- Development agencies should assist in strengthening extension services and providing training on GAP. They should also assist in the development of regional standards.

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Annex 7 – Food quality and safety issues in the fresh produce production and marketing chain in Pakistan

Muhammad Iqbal¹

Background

Food quality and safety is becoming a matter of concern as commercialism in fresh produce grows. The quest to satisfy market demand has prompted many practices of production and post-harvest management which directly impact on food quality and safety. Unsafe food can result from inappropriate production practices, such as the misuse of pesticides, together with unsafe practices in the marketing chain, such as the misuse of ripening agents or the unhygienic handling of produce in sub-standard markets. This study focuses on identifying the main food safety and quality issues for fruits and vegetables in Pakistan, on constraints experienced by producers and distributors and on making recommendations for improvement.

Status of fresh produce quality and safety

The agro-ecological diversity found in Pakistan enables production of a wide range of fresh produce almost year-round. Prompted by its demand in the domestic and international markets, fresh produce production in the country has exhibited an increasing trend over time. Current (2003–2004) annual production is estimated at 12.13 million tonnes, with fruits 5.71 million tonnes and vegetables 6.42 million tonnes. Pakistan's annual (2003–2004) exports of fresh produce are estimated at 527 thousand tonnes with a value of US\$134 million.

The quest to satisfy market demand has prompted many changes in production and post-harvest management practices. Production techniques for improving the quality and safety of fruits and vegetables are well known, as are post-harvest handling and storage techniques for maintaining quality once harvested. However, the fact that knowledge of these techniques is widespread does not mean that they are necessarily applied or correctly applied.

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Factors affecting food quality and safety

There are a number of factors that affect food quality and safety throughout the fresh produce production and marketing chain. These are mainly grouped into the following points which are briefly discussed below:

- production;
- harvesting and field handling;
- product preparation for the market;
- packaging, transportation and storage;
- marketing (wholesale and retail).

Production

The use of production inputs like sewerage and water contaminated by industrial effluents, sprays and raw farmyard manure all impact on food quality and safety. In Pakistan crop protection is largely dependent on the heavy use of pesticides. This is due to a number of factors, in particular inadequate knowledge and awareness on the part of users and poor extension services. Since the pesticide business was privatized in 1980, there has been a steady increase in pesticide imports and consumption in the country. At present Pakistan is considered the second largest pesticide consuming country among the twelve Asia and Pacific regional countries. This is causing serious implications for food quality and safety.

It is estimated that of the total pesticides used in Pakistan, 17 percent are used on fruits and vegetables. The data reveal that out of total pesticides used in Balochistan province of Pakistan, which is famous for temperate fruit production as much as 90 percent is used on fruits and vegetables. This percentage is reduced to 55 percent in the North Western Frontier Province (again temperate fruit producer), 48 percent in Sindh and 6 percent in Punjab. The number of sprays on vegetables like cabbage, cauliflower and tomatoes often exceeds the number of applications on cotton.

Responding to market demand, a limited number of farmers have adopted good agricultural practices though to a varying degree. They sell produce to exporters who care to source direct from the farm and offer price premiums.

Harvesting and field handling

Harvesting aids like clippers and collection bins are used for undertaking different farm operations and are hardly cleaned. In many cases, such as with wooden baskets lined with rough cloth or used polypropylene woven bags, cleaning becomes virtually impossible. Different transportation modes including animal carts and tractor trolleys are used for transporting farm inputs like raw farmyard manure (poultry, animal) or synthetic chemicals including pesticides. The same modes of transportation are used without cleaning for transporting fresh produce and they become sources of contamination by pathogens and microorganisms. Cleaning fresh produce like carrots, radishes and potatoes with dirty water can also cause contamination.

Product preparation for the market

Fresh produce generally need treatment before they are ready for the market:

- ripening agents are used to trigger ethylene production in climacteric fruits;

- calcium carbide is commonly used for ripening mangoes in spite of the fact that it has been banned internationally;
- thiabendazole is used for surface decontamination of apples, citrus fruit and mangoes meant for export;
- waxes, along with chemicals, are also applied to improve shelf life and skin shine.

However, these are sometimes applied in excessive doses thinking that this will achieve better results. Cauliflower and cabbages are harvested using knives and sickles. The same tools are used for trimming leaves off cabbage, carrot, radish and turnip. These are hardly cleaned, are unhygienic and may thus contaminate the produce.

Packing, transportation and storage

Crates made out of untreated wood are commonly used for packing fruits. Rice straw and newspaper waste are used as liner. Similarly, second-hand polypropylene fertilizer bags and second-hand jute sacks are used for packing vegetables such as carrot, radish, turnip, cucumber, eggplant and gourds. Such packing material is a direct source of contamination. Grape, peach, plum, cherry, guava and persimmon which are generally eaten without peeling and in many cases without washing are more prone to contamination. Contact damage to such fruit during transportation on bumpy roads further aggravates the situation. The trucks used for transporting fresh produce generally carry all sorts of goods. Their bodies are seldom cleaned and hence are a source of contamination particularly to produce transported loose such as cauliflower and cabbage.

On-farm storage is often used for storing inputs including chemicals, and produce together. Spillage of liquid pesticides out of half-used or empty cans can also be encountered. Similarly, some fresh produce is held in cold storage for supplying the market during lean or off-season. These cold stores are big rooms provided with multi-layer shelves and store all sorts of commodities together. Some rooms are used even for ripening bananas. The premises are unhealthy due to poor maintenance and piles of decayed fruits. Also, they are poorly built without automatic temperature and humidity control. Manual handling makes temperature and humidity control difficult, leads to damage and decay of produce stored inside, which then becomes a source of contamination.

Distribution (wholesale and retail)

Sanitary conditions in wholesale and retail markets are poor. The markets are mostly congested, poorly designed, have bad drainage, lack daily garbage collection, cleanliness and civic amenities, free movement of vehicular traffic and donkey carts causing traffic jams. Many markets become virtually inaccessible during the rainy season. Subletting of front space to non fruit and vegetable vendors further aggravates the situation.

Fresh produce retailers use contaminated packaging such as retail bags made out of empty cement-paper sacks, waste newspaper, crates and baskets for displaying produce. Loose stacking on the ground is common as is the practice of allowing buyers to select the produce of their choice. Damaged and healthy fruit are often mixed together. All these practices cause contamination one way or the other. The

sprinkling of dirty water as a means to maintain produce freshness, poor and unhygienic storage conditions also adversely impact food quality and safety.

Pesticide residues in fresh produce

Studies reveal that farmers give more preference to crop protection than potential health hazards associated with the indiscriminate use of pesticides. Although monitoring of residue in domestically consumed food products is rather irregular, the few available analyses provide a cause for concern. Studies to detect pesticide residues in fruits and vegetables were started in the early 1980s. The National Institute of Health and the Pakistan Agricultural Research Council analyzed 1 059 fruit and vegetable samples during the 1980s and 1990s. They found 422 samples contaminated with pesticides residue and 71 samples that had residue levels exceeding MRLs set by FAO/WHO Codex Alimentarius Commission.

Six to one hundred percent of samples were found to be contaminated. Out of the contaminated samples, five to forty-eight percent of samples exceeded the maximum residue limits (MRLs).

The problem is more serious in areas where cotton is grown and pesticides are intensively used. In a study conducted in Multan Division, samples from four different vegetables were taken: okra, brinjal, gourd and bitter gourd (Ahmad *et al.*, In UNDP *et al.*, 2001). Apple samples were collected from Quetta. Not surprisingly all vegetable samples were found to be contaminated. In 63 percent of the samples, contamination exceeded MRLs. Pesticides found to be above MRLs were carbofuran, dichlorvos, methyl-parathion, fenitrothion and aninphos-methyl. However, pyrethroids such as deltamethrin and cypermethrin, recommended for use on cotton, were not detected in any sample.

The apple samples were collected from Quetta and analyzed for the residues of six pesticides. All five samples were found contaminated. About 60 percent of samples were found with excess MRLs of Carbofuran. The residues of Methamidophos were also found in almost all samples but its MRLs were not available for comparison.

The report further revealed that according to information gathered from the farmers and traders, chemicals specified for cotton were also used on vegetables and fruits. The mandatory precautions to use chemicals safely, a certain number of days before harvesting, were rarely observed. In fact, farmers were found performing harvesting and spraying operations simultaneously. This ignorance on the part of farmers mainly resulted in large numbers of samples being above MRLs.

Externalities of pesticide use

A comprehensive study provides a first assessment of the effects of pesticides on human health, natural resources and the environment (UNDP *et al.*, 2001). Overuse and misuse of pesticides has led to tremendous economic losses and hazards to human health. It is estimated that thousands of farmers and farm workers are poisoned from exposure to pesticides annually (Tahir, In UNDP *et al.*, 2001). Human health costs, production and environmental externalities are the most important factors that must be recognized when designing policies on pesticides.

Integrated pest management

Integrated pest management (IPM) is a safe and eco-friendly way to protect the environment while maximizing crop production. The CABI Bio-sciences Centre in Pakistan has successfully demonstrated IPM as an effective technique for pest management using the farmer field school approach. This has been successfully applied on temperate fruits, mangoes, citrus fruit, guava and tomatoes. Similarly, the Pakistan Agricultural Research Council is implementing a national IPM program with PRs50 million (US\$0.82 million) allocated over the next five years. In view of the large area and variety of crops, this can only be a demonstrational activity. Widespread IPM adoption has yet to be seen.

Lack of access to control material like pheromone traps or mating disrupting coils, lack of funds, poor extension services and lack of coordination among different organizations hamper commercial adoption of IPM. The government is promoting good agricultural practices (GAP) to conform to EUREPGAP requirements imposed by importers sourcing from Pakistan. Though export volumes are small, adoption of EUREPGAP will act as a vehicle for adopting GAP, of which IPM is an integral part.

Food safety, market and production systems

The appreciation for food safety among producers and distributors is minimal. An insignificant proportion of consumers are aware of potential hazards associated with contaminated foods. Hence, the market size, though expanding, is still small. Production of organic fruits and vegetables can be quoted as a typical example in this regard.

As mentioned earlier official standards for fresh produce quality and safety are non-existent. The problem is further compounded by limited market infrastructure like separate shelves, displays and sales counters in wholesale and retail markets. Safety testing facilities are limited and testing is expensive. For instance, the testing fee for residue analysis will cost PRs3 000 to 4 000 (US\$50 to 70) per sample.

Food quality and safety perception

The perception of food quality and safety in the domestic market greatly varies from consumer to consumer. The varying purchasing power among the consumers further complicates this. Only affluent consumers are generally conscious about food quality and safety. However, they make their purchase decisions on the basis of general appearance of the produce and taste.

A rapid opinion survey revealed that consumers applied the following criteria for assessing the quality of fruits and vegetables:

- stage of maturity;
- shape, size and colour;
- visible bruises, sign of rubbing and blemishes;
- cuts, deformity, insect bite and pathogens;
- flavour and taste.

The level of awareness and sensitivity to food safety are interlinked. In the absence of adequate information on food quality and safety, consumers in general have passive attitudes. The cases related to food contamination are seldom reported by the media. There is hardly any labelling and labelling is, of course, impossible when produce is sold unpacked.

Food safety and the role of government

There are certain food laws in Pakistan. However, most of them deal with the control of production, distribution and supply of processed foods, in addition to dealing with profiteering and hoarding. There are four laws that specifically deal with food safety. Three of these laws directly focus on issues related to food safety, while the fourth one, namely the Pakistan Standards and Quality Control Authority Act, is indirectly relevant to food safety. A brief overview of these laws is given below:

- prohibition of manufacturing, preparation or processing of such food, which is likely to be unsafe for human consumption, e.g. any food which can cause food poisoning;
- prohibition of import, export or sale of unsafe food;
- setting out certain hygiene standards;
- provision for inspection and laboratory analysis of food samples according to a set criterion. The ‘local authority’, which is designated by the government, is responsible for enforcing ordinances within its jurisdiction. The law is not uniform in all areas. Even penalties for the same offence vary between provinces. Furthermore, the law is silent on compensations for damages to consumers.

There is no substantial difference between the Pure Food Ordinance of 1960 and the Cantonment Pure Food Act, 1966. Even the implementation procedures are very much similar. The only difference is the area of jurisdiction.

The Pakistan Standards and Quality Control Authority Act of 1996 is a relevant law although it is not classified as a “food law”. This Act provides for the establishment of Pakistan Standards and Quality Control Authority (PSQCA), which is the apex body to formulate standards or adopt international standards. It is also responsible for enforcement of standards in the whole of Pakistan and has the mandate to inspect and test products and services, including food items, for their quality, specifications and characteristics during use, and for import and export purposes.

In addition to the above, the Agriculture Pesticides (Amendment) Act of 1992 and the Agricultural Pesticides (Amendment) Rules of 1993 are meant to rationalize the use of pesticides. The implementation of all these laws is generally poor because of political pressures, weak institutions, no clarity and responsibility for the vested authority, and corruption. The government is trying to improve the overall system and introduce good governance. The local government system introduced recently can be helpful but has so far failed to win adequate political support.

Conclusions and recommendations

Many factors impact quality and safety in the fresh produce production and marketing chain. Many activities adversely impacting food quality and safety exist because of a

lack of awareness of potential hazards associated with them. Indiscriminate use of pesticides is the most serious issue. The results of the analysis suggest that pesticides are being used inefficiently in Pakistan. The current laissez-faire policy approach has led to a rapid increase in pesticides consumption and imports without resulting in higher productivity at the farm level. Instead, Pakistan has experienced a sharp increase in external costs related to agriculture pesticide use.

IPM has been successfully demonstrated in the country. However, its commercial application has yet to be seen. The on-going programmes are small in scale compared with the vast area and crop diversity. Coordination among different organizations is lacking. There is also a dearth of field staff in direct contact with farmers.

In addition, farmers need more information on the latest integrated pest management methods to help them achieve real and lasting improvements in farm productivity. Once pesticides are no longer artificially cheap, farmers will actively seek out this information and develop the skill they need to manage their farms in a more sustainable manner. But the government should take the lead in launching farmer centred IPM programmes to reduce the costs to farmers of learning these new technologies.

Laws on regulating pesticides and ensuring food quality and safety do exist, but their enforcement is weak. Moreover, the existing food laws are more relevant to processed products. Infrastructure and incentives for supplying quality and safe food are lacking.

The following recommendations can be made to address these issues.

Policy and regulatory recommendations

Expand the scope of existing or establish separate laws to cover fresh produce quality and safety, and enforce them in association with the stakeholders.

Review existing mechanisms and strengthen the enforcement of legislation on pesticides for their import, registration, formulation, distribution, advertising, usage and disposal.

Respond more effectively to international quality and safety standards in order to develop sustainable export outlets. International markets are becoming more and more quality conscious and without effectively responding to quality and safety standards, sustainability of fresh produce exports would be at stake.

Set tariffs on the import and sale of pesticides. This would raise pesticide prices and, in turn, directly impact on their inefficient use. It would also generate revenue for funding IPM research and its adoption through farmers' field schools.

Operational recommendations

Establish a well-equipped network for monitoring residues in fruits and vegetables. The creation of an effective integration among research, extension and residue monitoring departments is another important consideration in this respect. There is an urgent need to develop more applied techniques to promote the safe use of chemicals by fruit and vegetable growers.

Sensitize farmers, traders and consumers about food quality and safety through awareness programmes on print and electronic media, seminars and workshops.

Invest in staff training, particularly on participatory group learning approaches. Train farmers in areas where large productivity gains can be made. Develop extension material, especially posters, CDs and videos.

Improve wholesale and retail market management. Efficient disposal of market wastes and maintenance of a minimum level of sanitation and hygiene is essential. Improve produce storage, packaging, presentation and retail displays.

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Annex 8 – Quality and safety issues in the fresh fruit and vegetable production and marketing chain in the Philippines

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Introduction

This paper is divided into four parts: the first provides an overview of the current state of fresh fruit and vegetable quality and safety in the Philippines; the second discusses food safety in the production and marketing chain; the third focuses on food safety and consumer preferences and behaviour; and the last one suggests an agenda for action to improve food quality and safety of fresh fruits and vegetables in the country.

Current state of fresh fruit and vegetable quality and safety

Existing standards for fresh fruits and vegetables

Due to variability in the quality of commodities brought about by the differences in species and cultivars within species, environmental conditions during growth and development, and cultural practices employed, there is a need to classify produce for orderly and successful marketing. Grade standards have been formulated for 20 fruits and vegetables since 1963 and adopted as national standards (Philippine Trade Standards) but these have not been widely disseminated and have never been used by the private sector.

With the implementation of the Agriculture and Fisheries Modernization Act, the Bureau of Agriculture and Fisheries Product Standards (BAFPS) was created with a mandate to develop standards. To date, it has drafted eight standards for vegetable crops and five have been approved by the Secretary of Agriculture for dissemination. These are bulb onion, head lettuce, cabbage, cauliflower and broccoli. In the case of fruit crops, eight standards have been developed and subjected to public consultations and mango has been approved for dissemination. Since BAFPS is harmonizing its standards with that of the Codex, sections on pesticide residue, contaminants and hygiene are included. However, during public consultations, industry stakeholders were more concerned with the external quality attributes and very little attention was given to safety standards such as pesticide residue and contaminants.

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All these approved standards however, are voluntary and no enforcement is done. Hence, the current marketing system still follows the arbitrary sorting of fruits and vegetables according to physical appearance and size. Sorting to ensure quality involves segregating marketable and unmarketable produce. Growers using quality factors as basis for sorting are usually farmers whose buyers have given them instructions about quality preferences.

Pesticide residues and maximum residue level establishment

The Bureau of Plant Industry (BPI)–National Pesticide Analytical Laboratory (NPAL) is tasked to monitor pesticide residues in fruits and vegetables. There are only six regional NPALs in the country and these are not enough to service all the major producing regions. Moreover, they often lack standards for specific active ingredients, considering the wide range of pesticides used in fruits and vegetables. In most instances, pesticide residue levels in fruits and vegetables have no Codex maximum residue level (MRL).

In 2003, a total of 632 samples representing 25 vegetables and seven fruits were analyzed, with 120 (16 percent) samples positive for pesticide residues and seven percent exceeding the MRL set by Codex. The results of these residue analyses were seldom widely disseminated to consumers and concerned farmers.

Production and postproduction practices seldom adhere to food safety requirements of international standard-setting bodies. Most fruit and vegetable growers are not familiar with good agricultural practices (GAP) and the Codes of Practice for Hygienic Production of Fruits and Vegetables developed by Codex. In the case of mango, for example, the most pressing issue concerning safety is the heavy reliance of farmers on pesticides, especially in production areas where there is no distinct wet and dry season. Driven by the desire to produce blemish-free fruits, farmers in Mindanao, which is the source of mangoes during the rainy season, follow a calendar-based pesticide spraying programme to control insect pests and diseases. Spraying becomes frequent, sometimes reaching up to 13 sprays, especially if flowering and fruit development fall during a prolonged wet period. With the high cost of pesticides, which accounts for the biggest share of production inputs, farmers are primarily concerned with reducing pesticide application to reduce cost, and safety comes second.

Another example is the practice of some local traders of dipping bananas in fungicides such as Benlate (benomyl) as a post-harvest treatment against decay of the non-traditional export varieties of bananas coming from Mindanao. Although benomyl has been recalled from the market and its application for post-harvest use has been restricted, it is still widely used.

The Fertilizer and Pesticide Authority (FPA) implemented programmes to address concerns on pesticide usage. These include:

- the provision of scientific advice on establishing MRL and a database on GAP with registered pesticides;
- a clean-up drive of the banned chemicals in the market;
- the organization of dialogue sessions among chemical distributors and supermarkets to inform them on the regulations on selling pesticides;
- implementing a product-stewardship programme to minimize the misuse of chemicals.

Food safety in the production and marketing chain

Constraints affecting producers and marketers in responding to demand for safer fruits and vegetables

Lack of knowledge or information on food safety

Most farmers are not aware of food safety requirements. In a study on farmers' perceptions on vegetable quality and safety, freshness ranked first and freedom from chemical residues ranked twelfth among the thirteen desired attributes (Concepcion *et al.*, 2004). However, some farmers say leafy vegetables, especially those eaten raw like lettuce, should not be completely free from pests as an assurance of safety.

While at least some farmers are already aware of the increasing concern about pesticide residues, microbial hazards associated with the production of fruits and vegetables are seldom heard of. This may be due to the lack of reported cases of food poisoning associated with the consumption of fresh produce. The production practices of some lettuce growers in Benguet affect food safety: heavy fertilization of unprocessed chicken manure increases the probability of contamination from *E. coli* and other food spoilage organisms; the use of surface sewage water for irrigating vegetables is another source of microbial contamination.

Lack of incentives/motivation

Several vegetable and mango growers are already implementing the integrated pest management (IPM) approach learned through training sponsored by government agencies and international organizations such as FAO. They also do their own experiments to save on pesticide use. Some are also aware and concerned about the health hazards associated with an excessive use of pesticides on consumers.

There are still growers who find it difficult to accept that food safety practices are necessary. Farmers cannot see the need to use practices such as GAP, citing that they have never had problems in the past. Moreover, they say that fruits and vegetables are safe compared with other agricultural commodities like meat and dairy products.

The small scale of production and the absence of resources force farmers to rely on traders for inputs and other needs in their production activities. The absence of a marketing linkage and the fact that only a small portion of their produce will fall into a higher grade both lead to the prevailing practice of selling produce in bulk at the farm level. The traders will then implement the value-adding activities such as grading and packaging before selling to the consumers.

Growers also complain about having to implement food safety practices when they see little evidence of safety measures by other businesses downstream in the marketing chain. Food quality and safety have to be appreciated by consumers so that they will be willing to pay for good quality and safer products. Price often predominates in the decision to buy.

Scale of production

The majority of fruits and vegetables are grown in small farms and traded in limited volumes. Farmers still rely on traditional farming systems, partly due to a lack of inputs. Most farmers rely on intermediaries for knowledge about the market. They

rarely look beyond the marketing chain. They seldom get feedback on the quality of their produce that reaches the consumer.

Backyard and small-scale mango growers rely on sprayer-contractors to take care of flower induction until fruit maturation. With the existing revenue-sharing arrangement, which varies from 60 to 70 percent of the harvest for the sprayer-contractor, the main interest of the latter is to increase yield and obtain a higher recovery of fruits.

Because of the predominantly small scale of production, farmers and handlers cannot afford to implement the prerequisite programmes that will ensure safe fruits and vegetables, such as GAP, sanitation and standard operating procedures (SSOP), good manufacturing practices (GMP) and hazard analysis critical control point (HACCP). Even some medium-scale growers who have a credit or marketing tie-up with traders complain of the added cost they have to bear without assurance that they will reap the reward for producing better quality and safer produce. Unless GAP, HACCP and other quality management systems become mandatory and the government provides financial support to small- and medium-scale producers, the latter will be reluctant to pay attention to food safety. They may follow certain recommended practices to produce good quality fruits and vegetables to enhance the market value but not necessarily practices that will ensure safety. Vertically integrated fruit and vegetable farms in southern and northern Mindanao, such as those that cater to institutional buyers and export markets in Japan and the Middle East, have quality management systems in place. However, such farms are rare.

Lack of standard quality management guidelines to produce safe fruits and vegetables

While some farmer-suppliers may be aware of the trends in domestic and international trade regarding food safety, guidelines for on-farm safety are absent or lacking. There may be several guidelines or codes of practice that are in place but these may not be applicable to the existing farming systems in many parts of the country. A standard guideline that is easily understood, written in the vernacular, and can be readily applied should be developed.

Lack of collection centres or packinghouses

Many production sites in the Philippines still lack collection centres or packinghouses where preparatory activities such as sorting, trimming, delatexing, treatment for disease control, cooling, air drying, sizing and grading are usually undertaken. In some areas, packinghouses are located far from production areas. Delays in the application of treatments to control microbial growth especially under the prevailing high temperature and high relative humidity, can lead to proliferation of spoilage and food pathogens.

Inadequate cold chain facilities

Decline in quality and growth of spoilage and food pathogens can be adequately controlled with the adoption of a cold chain system. Many growers and traders think that transporting the produce in refrigerated vans is already a cold chain.

Vegetable growers in Bukidnon who supply quick-serve restaurants and processors in Manila complain of the lack of precooling facilities necessary to make the

temperature of vegetables coming from different production areas uniform before loading them in refrigerated vans for shipment to target market outlets.

Poor containers and transport facilities

For inter-island transport, most fruits, such as bananas, are loaded in bulk in dry vans with poor ventilation and product safety considerations. Vans are usually not cleaned prior to loading so that rotting fruits are commonly found prior to loading bananas. In some instances, animal waste is present in empty vans that are waiting to be loaded with fruits.

Containers used are usually recycled cartons and bamboo or rattan baskets that do not provide adequate protection to the content. More often, to save on transport cost, containers are overpacked, resulting in mechanical damage. There are also occasions when containers are used several times without cleaning. Although liners such as newspapers are used, the possibility of contamination is high especially if the container is used for other commodities.

Poor sanitary conditions in collection centers, trading posts and wholesale markets

Conditions in most trading posts and wholesale markets are unsanitary. Fruits and vegetables are usually piled on dirty floors and sometimes handlers sit on the pile of vegetables. Rubbish heaps, which consist of rotten produce, trimmings and even used containers and liners² are near fresh fruits and vegetables. The likelihood of contamination with pathogens, protozoa and helminths is high.

Where preparatory activities prior to marketing are done in wholesale markets, microbial and chemical contamination is likely to occur. The water used in washing produce such as root crops may be contaminated, recycled or not changed frequently. Mangoes and bananas are generally ripened with calcium carbide, which contains some impurities and should thus be applied with care. Farmers, sorters, packers and handlers are also sources of microbial contamination.

Financial cost of producing safer and higher quality fruits and vegetables

Studies show that mango growers in Luzon who practice IPM produce better quality and safer fruits at a lower production cost than other producers, thus generating higher net returns. In an IPM project on mango, the improved IPM decision tool (IDT) was compared with the farmers' practice of calendar-based pesticide spraying. In the IDT, pesticide sprays depended on pest monitoring and weather condition (need-based). A total of six insecticide sprays and only three fungicide sprays were done following the IDT. Two of these sprays used a combination of fungicide and insecticide. In the farmers' practice, all the six pesticide sprays used a combination of fungicide and insecticide in which three of these spray cocktails further used a combination of two insecticides and a fungicide.

² In packaging of perishables, the term "liner" refers to the use of paper (either newspaper or white sheets of paper), thin polystyrene foams or polyethylene films which cover the walls or bottom portion of the container; sometimes also in between layers of fruits within a container. These liners are used to protect the commodity from mechanical injury brought about by rough handling during transport and distribution.

The cost of pesticide application per tree decreased significantly under the IDT system, due to reduced pesticide sprays compared to the farmers' practice. The cost of pesticides was only p572 per tree compared to p805 per tree depending on the farmers' practice. The reduction in the cost of pesticides decreased the total cost of crop protection and increased the net returns for the IDT. Total production costs amounted to p1 103 per tree for the farmers' practice and only p849 per tree for the IDT. The estimated net returns reached p1 271 per tree or p127 100 per hectare of 100 trees under the IDT system and only p1 054 per tree or p105 400 per hectare for traditional practice (Opina, 2004).

Food safety, consumer preferences and behaviour

Degree of awareness and sensitivity of consumers

Filipino consumers have a moderate degree of awareness and sensitivity to product safety. In a consumer survey in Los Baños, Laguna, 53 percent of the 70 consumer-respondents claimed that they were familiar with hazards associated with vegetable consumption. They ranked chemical contamination as the most critical health hazard followed by microbial contamination and physical contamination.

The government does limited information dissemination on pesticide residues. Hence, consumers rely heavily on mass media as sources of information on the type of fruits and vegetables that are heavily laced with pesticide residues and where these fruits and vegetables are produced.

Willingness to pay

Consumers in the middle and high income brackets are willing to pay for quality and safe fruits and vegetables. About one-third of the 70 consumers interviewed preferred buying organically-grown vegetables from reliable suppliers, even though their prices are about 30 to 50 percent higher than that of the conventionally grown vegetables. Ten of these consumers even went to high-end markets in Metro Manila two to three times a month to buy organic vegetables which generally command higher prices. These markets provide pamphlets about the organic methods of farming and the benefits derived from consuming organic foods.

Low-income consumers on the other hand, are not willing to pay higher prices for safe fruits and vegetables. These consumers mostly patronize public markets and roadside stalls. They consider affordability, availability and good quality as the main basis for buying. They never mentioned food safety concerns when buying fresh produce.

Meanwhile, 55 percent of consumers chose to buy fruits and vegetables in supermarkets located within or outside Laguna because of good quality (66 percent), assurance of safety (55 percent), convenience (32 percent), availability (28 percent) and affordability (20 percent).

Consumers' ability to recognize quality and safety signs of produce

More than half (57 percent) of the consumers interviewed claimed that the fruits and vegetables that they purchased were safe while 43 percent could not ascertain whether they were safe or not. For the former, safe produce is fresh (44 percent), clean (43 percent), packed (33 percent) and labelled (13 percent). Ten consumers also looked for vegetables with small holes, implying that these had not been frequently sprayed with pesticides. Twelve consumers bought fresh fruits and vegetables from the high-end supermarkets, confident that the latter's stringent quality requirements compelled their suppliers to deliver safe products.

Degree of sensitiveness to safety for certain types of produce

The degree of sensitiveness to safety varies by type of fruits and vegetables. Consumers perceive mango and strawberry as having a higher risk of contamination followed by banana and papaya. Pineapple, soursop and calamondin are perceived to have a lower risk of contamination. For vegetables, consumers consider leafy vegetables like lettuce and pechay to have the highest risk of contamination followed by tomato and eggplant. Cucurbits such as melons and cucumber have the least chemical and microbial contamination because of their thick peel.

Agenda for action

Government level

Institutional strengthening of BAFPS

BAFPS is mandated to develop and implement food quality and safety standards, including those for fresh fruits and vegetables. However, since its creation in 1998, it has not been fully operational since it is understaffed and lacks technical personnel.

A greater participation of the private sector in developing product standards and adopting these standards on a voluntary basis should be encouraged by BAFPS. Since the Codex standards are internationally recognized standards (hence are referred to in case of disputes), the support of the private sector is critical in the harmonization of the Philippine National Standards with that of Codex.

Provision of adequate infrastructure and support systems

Laboratory facilities that will offer affordable fees for chemical, microbial and physical analyses of hazards in fresh fruits and vegetables must be in place in strategically located areas for the benefit of fruit and vegetable growers and industry associations. There is a need to upgrade facilities and personnel of analytical laboratories.

To encourage investment in food safety-related laboratories, equipment and certification, the government should provide economic incentives in the form of cost-sharing and granting of partial tax exemptions for laboratory equipment that needs to be imported by small and medium-scale enterprises to conform with plant requirements in HACCP and GMP standards. Other agencies and private laboratories in the country should be accredited so that more fresh fruit and vegetable growers and exporters have access to these laboratories for analysis of pesticide residue, microbial

and other chemical contaminants. Fees to be charged by these agencies must be uniform or standardized.

The establishment of strategically located and equipped packinghouses that can be managed by farmers' or traders' associations, cooperatives or clusters of growers will ensure better quality and safer produce. The government and the farmers' associations should share the costs of construction of the packinghouse and of the required equipment.

The government should also increase research and development support in the following areas of concern:

- development and implementation of a quality assurance programme;
- conduct of studies on modes of contamination of fresh produce during production and post-harvest handling;
- development of effective methods of reducing or eliminating hazards;
- improvement of analytical techniques and development of simple, rapid, objective and economically feasible methods of hazard detection that can be applied at various points in the supply chain.

The nationwide program on IPM through Farmers' Field Schools (FFS) has led to increased awareness. This was accompanied by the publication and dissemination of information on the major insect pests and diseases and the appropriate method of control. Such a program must be replicated, covering other fruits and vegetables in the country.

Manpower capacity building

Fresh fruit and vegetable producers and other players in the handling and distribution chain need training on GAP. A training module on GAP should include the following topics:

- creating awareness of hazards associated with the production and post-harvest handling of vegetables by focusing on the identification of hazards; consequences, and identification of sources of contamination of these food safety hazards;
- production and post-harvest handling process flow and inputs;
- enhancing the decision-making process of growers and handlers in assessing the risks of an identified hazard;
- implementing a system of record keeping, documentation and labelling to trace the origin.

Provision of consumer education on food safety

Consumer education on food safety should involve the development of highly focused strategies and messages targeting the general public. The BPI should inform consumers about the results of its pesticide residue analyses so that consumers become aware of the quality and safety of fruits and vegetables they are consuming. Consumers should also be informed on the method that could be employed in order to reduce pesticide residues in fresh produce.

There are also ways in which chemical and microbial contamination could be reduced or eliminated. Guidelines would be helpful in informing consumers on ways to reduce

exposure to toxins caused by microbial contamination. Consumer education on food safety requires collaboration between the consumers, local and national government and the private sector.

Marketing level

At the marketing level, the suggested agenda for action includes:

- improving the supply chain through adoption of proper production and post-harvest practices;
- investing in strategically-located packinghouses, cold chain facilities, and food safety-related facilities and equipment to meet GMP and HACCP certification;
- enhancing the capacity of the fresh produce industry to participate in and monitor the implementation of food safety regulations nationally, and to participate in educational campaigns;
- collaborating with government and international agencies in the provision of capacity-building work through training, sharing of knowledge and experiences, and participation in the establishment of a database of national standards for high value crops.

Farming level

Shift from the concept of “producer-push” to “consumer-pull”

The fresh fruit and vegetable industry is a dynamic one. There is a shift in focus from the producer to the consumer. Competition is now shifting towards shorter supply chains with increasing consumer power, particularly when it comes to assurance of quality and safety. The Filipino fresh produce industry has not fully appreciated this shift in the supply chain and has yet to value the importance of product standards.

Strengthen fresh produce associations or clusters

Since small growers have little or no control over what happens to the produce as it goes through the distribution chain, an integrated approach whereby growers, handlers and shippers work in partnership with distributors will allow grower/packinghouse facility identification (traceability). This will be better achieved if farmers organize themselves, either as an association or a cluster of five to eight growers. These associations or clusters should be strengthened to adopt GAP, thus ensuring fair returns to farmers for investment in meeting food safety and quality requirements.

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Annex 9 – Quality and safety of fruits and vegetables in Thailand

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Existing standards

Introduction

The most important food safety legislation in Thailand is the Food Act of 1979 which makes it illegal for anybody to produce, import or sell food that is unsafe. Since the enactment of the act, the Ministry of Public Health has issued a number of notifications. The latest notification was issued in 2003. Part of this notification refers to the illegal status of farmers and retailers who sell fruit and vegetables that contain more than the acceptable levels of pesticides.

Production

Agricultural inputs are controlled by the Hazardous Substance Act, 1992. Enforcement is carried out during the pesticide registration process by the Department of Agriculture (DoA) through the Office of Research and Development on Agricultural Production Science and the Office of Agricultural Regulation.

Several farm-level accreditation schemes are operated. Products from these schemes can still be found in retail stores (Oct 2005) despite the government's attempts to promote its new Q mark scheme. The main schemes are "Pesticide Safe Vegetables" (Department of Agriculture) and "Hygienic Vegetables" (Medical Sciences Department). The "Pesticide Safe Vegetables" scheme is the most extensive, involving farm level inspection and crop testing. Farmers can still use pesticides and chemical fertilizers but products should have no pesticide residues or lower than the maximum level set by Codex. All schemes emphasize control of pesticide residues, little or no attention is given to microbial contamination.

Farmers are currently encouraged to comply with good agricultural practices (GAP) codes. Standardized GAP codes for 31 food crops including durian, mango, longan, asparagus and chili peppers have been introduced. As of July 2005, 432 851 farms had registered for "Q GAP" certification, 259 885 had been inspected and 140 351 had obtained "Q GAP".

As an example of the scope of the GAP codes, the standardized GAP for tangerine includes guidance on soil fertility management, varieties, sanitation, water, pest management, harvesting, post-harvest handling, chemical waste management and record-keeping. In terms of pest management, insect counting as the basis for

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spraying is promoted, as is the adoption of IPM techniques. Farmers are also required to have a basic knowledge of how to use chemicals and to read labels before use.

Farmers are required to maintain records, such as weather conditions, during growing and harvest, technical data including variety, dates at each stage, and costs. They are also required to document any problems encountered during production and harvest and to undertake soil analysis every one to two years to assess fertilizer needs.

There is also guidance on how to treat diseased parts of the tree and procedures that must be followed after pruning. For example, product harvested for domestic use may be removed from the tree by hand, but tangerines that will be coated must be individually cut. Preservation techniques are defined, such as chill storage or waxing. Minimal guidance on hygiene and microbial issues is provided. Farmers are required to ensure that when peeling, the product is not cut, and they must keep hands and utensils clean. There is some discussion on water quality. Other hygiene issues are not mentioned.

Grading and packing establishment

In compliance with Thailand's Food Act (1979), any grading or packing establishment categorized as a food industry must receive a permit from the Ministry of Public Health (MoPH) prior to the beginning of the production process. To be eligible for the permit, the grading or packing establishment must pass a hygiene inspection performed by a MoPH's officer. In addition, establishments are encouraged to become GMP certified.

Some establishments are certified to HACCP. The implementation of good manufacturing practices (GMP) and hazard analysis critical control point (HACCP) are based on the Codex standards, particularly the Codex General Principle of Food Hygiene and Codex Code of Hygiene Practice for Production and Handling of Fresh Fruits and Vegetables. Firms can be GMP certified under Thailand's Ministry of Agriculture and Cooperatives GMP certification programme for fresh produce grading establishments.

“Q Mark”

GAP guidelines for fruits and vegetables are now used as the basis for the government's quality label (“Q”), the objective of which is to harmonize the agricultural codes and standards. The government's new “Q” label is intended to supersede previous labels, with the government seeking to “take control to correct and consolidate earlier experience in order to restore clarity, transparency and reliability”. Essentially, the scheme encourages fresh produce grading/packing establishments to create a network with GAP certified farms. The “Q” standard system therefore extends through different steps in the food supply chain: “Q GAP” for farm-level certification; “Q GMP” for handlers and packing plants; and “Q Food Safety” (Q GAP+ Q GMP) for handlers and packing houses sourcing products exclusively from “Q GAP” farmers.

Retail

The hygienic and sanitary practice codes for fresh markets, retailers, restaurants and street food vendors are described in the Thai's Public Health Act (1992). The Thai Food Act (1979) also provides regulations which specify that food, including fresh

fruits and vegetables, sold in the fresh markets or other retailers must be safe from chemical or microbiological contamination that may cause diseases or health risks to the consumers. The Ministry of Public Health (MoPH) is responsible for inspection and enforcement of the hygienic and sanitary codes for fresh markets, retailers and street vendors. The MoPH also has authority to close down, issue an order, or punish by law any business venture that violates the law. The MoPH is also authorized to randomly collect samples of food from businesses to analyze for food contamination that may be harmful to the consumers.

Retailers require their suppliers to comply with prevailing food safety legislation. Some have adopted their own supplier standards, essentially based on chemical testing and requiring certification by the Ministry of Agriculture. The degree of sampling for testing varies between retailers; for tangerine this may be as high as 24 percent. Some retail chains require their suppliers to be part of the “Hygienic Fresh Fruit and Vegetable” programme of the Ministry of Agriculture or the “Q” Scheme. Others have their own global quality programme, usually adjusted for the Thai situation.

Enforcement of standards

Enforcement of domestic food safety standards is weak. For example, despite the banning of 82 pesticides by the Thai Government, some of the banned chemicals are still used, either because old stocks are available, or because the chemicals are illegally imported from neighbouring countries (i.e. Monocrotophos, banned in May 2000, is still widespread among Thai farmers). Some 300 pesticides are still permitted, 200 more than in many countries.

Produce from farms or packing establishments registered under the “Pesticide Safe Vegetables” or “Hygienic Vegetable” schemes are sold with contaminating levels of pesticide. For example, in one study about 40 percent of vegetables labeled chemical-free were found to contain chemical residues. A study by the Food and Drug Administration and Medical Science Department, covering the years 1994–1999, found six percent of “chemical-free” vegetables to contain an excessive level of chemical residue, while 37.5 percent contained some residues.

Food safety and market and production systems

Demand drivers for fresh produce safety

Consumer purchase decisions are primarily based on price and organoleptic quality indicators. Yet for a small proportion of the Thai consumer base there has been an increase in concern over food safety issues, mainly pesticide residues. Microbial contamination has yet to capture the public’s attention. For the vast majority any increase in food safety awareness has yet to translate into a strong influence on buying decisions.

Modern retail stores are the main outlets promoting safe produce, the basic criteria for selecting a vendor by these stores are: (1) reliability to deliver in time and regular frequency, (2) commercial volume of specified quality, (3) traceability of products, and (4) price offered. These criteria imply that vendors supplying to hypermarkets are medium to large scale. In the long term this will drive change in the farming system

as small farmers are consolidated into larger units. Two high-end supermarkets have begun to procure directly from farmer groups.

In general, retailers and food service outlets have yet to realize the importance of food safety in terms of a moral responsibility to their customers and as a marketing advantage. For most, adoption to the minimum standard is perceived as a burden. Larger modern retail outlets have adopted some degree of food safety control (Thai government guidelines), which they promote to their customers.

Factors constraining supplier response to demand for safer food

A number of factors constrain farmers from producing safer produce. These factors restrict the farmers' ability to invest, limit their production decision making, and prevent them from adopting or changing production practices.

For the vast majority of farmers the key impediment to change is the need to address immediate needs. Poverty and a need to repay loans force farmers to adopt unsafe practices. Good market prices have been mentioned to be more important than accepting the required waiting period. Funds for rural credit are limited. Widespread problems of land ownership and tenure, and other institutional arrangements such as short-term rental contracts for land discourage farmers from investing in change and securing loans from official sources.

Previous investment and commitment also restrict the decision making of farmers. A major economic disincentive for tangerine farmers is the sunk cost, initial investment in the orchard and support during the first years until harvest. This commitment limits the farmer's choice. Effectively the farmer must continue tangerine growing until he reaches break even. The original choice of planting stock will have a profound influence on management practices. For example, changing to resistant varieties would reduce chemical inputs but until the orchard has provided sufficient return the farmer is unlikely to change.

Pesticides still represent the cheapest solution for farmers. The pesticide tax structure encourages the use of chemicals, compared to other inputs. Since 1991, pesticides have been exempted from import duty, business and municipal taxes. Thailand's liberal pesticide market has resulted in the presence of a large variety of product names and pesticide companies. Market transparency is lacking and it is difficult for the regulating agency as well as the user to know the products and how to use them.

The physical appearance of fruit and vegetables is a major factor in determining good market price. This also encourages the use of pesticides.

Lack of reliable information and poor education compound the ability of farmers to adopt safe practices. For example, the quality and value of pesticides are judged based on recommendations of retailers, friends, and neighbours. The strong dependence on information from retailers, and salesmen suggests that the given information focuses on pesticide use without much discussion of alternatives. Skewed information sources and a lack of training negatively impact the farmer's decision-making process. Several studies conducted in Thailand during the 1990s concluded that more than half of the farmers applied dosages of pesticide higher than that stated on the label.

In tangerine growing communities the dependence of farmers on the pesticide salesman creates a pesticide-overfriendly environment and convinces farmers of the absolute necessity of pesticide use. Tangerine farmers apply pesticides frequently. Application rates range from 9 to 72 times per year, with an average of 32 applications. For the majority of tangerine farmers, growing this crop is their only enterprise and almost all grow tangerines on their own land. Their conservative attitudes in adopting different practices to overcome pest and disease problems can be understood as they are very concerned about any loss of crop.

Farmers' knowledge about alternative farming practices is weak. In one study, over half the farmers questioned did not know about integrated pest management (IPM). Half the farmers felt that IPM would have a negative effect on yield. In another study, only one IPM-trained farmer practiced pest counting, as recommended by GAP, before spraying while in other farms calendar spraying prevailed. Little or no training is provided in the control of microbial contamination.

The costs of information for a farmer willing to adopt non-chemical methods of control are extremely high. Information is difficult to obtain and successful adaptation to a farmer's particular situation uncertain.

Social pressure is another key issue. In tangerine growing communities farm input shops serve as meeting places, training centers and information sources regarding relevant aspects of production. The social exchange in the shops is not limited to crop protection and pesticide selection. It is also part of the social discourse of the farmers in the area. Thus a farmer who shows a critical attitude towards using chemical pesticides is excluded from important information sources. Farmers fear that if they stop using chemical pesticides, neighbouring orchards may become infected

Labour shortages are becoming an issue as people migrate away from rural areas. This is driving increased consumption of herbicides. In the past, few farmers used herbicides, the main tool for weeding being manual weeding. However, the use of herbicides is on the increase due to labour shortages and increasing wages.

The cost of establishing alternative marketing channels is a consideration, given the dependence on established traders and limited choice for change. For many farmers the existing channels are unlikely to provide a fair return for improved product quality.

Farmers are accused of not being in-tune with the needs of the consumer. Despite bad publicity over chemical residues in tangerines and poisonings to farmers and local communities, which resulted in a fall in price due to consumer concern, only a few farmers have responded by seeking to improve safety. Yet, these farmers and traders claim they have experienced an annual growth in sales of over 30 percent over the last couple of years.

Responsibility for the financial cost of producing safer and higher-quality fruits and vegetables

Indicators suggest that producers absorb the higher cost of producing safe produce. The Thai fresh produce marketing system seems to be operated not on demand-supply principles but on the intermediary's desire for highest profit through large-scale distribution. In real terms, farm gate prices have declined in recent years while the

cost of production has increased. The retail price of safe produce has fallen in recent years as the major retail outlets have aimed to lower their supply costs in an effort to remain competitive. Increasing labour costs in key fresh produce production areas are cited as a key problem.

The price difference between hygienic and conventional vegetables a decade ago was threefold. In August 2001 the average price comparison for 20 vegetables, among conventional, hygienic and organic products were 30.54 baht/kg, 45.90 baht/kg and 51.75 baht/kg respectively. Price comparisons made during December 2004 and January 2005 suggest that hygienic vegetables are now on average 40 percent more expensive than conventional produce.

Despite the desire to obtain quality produce, major retail outlets do not necessarily support their suppliers. Vendors are responsible for shipping back rejected product, prices are negotiated as low as possible and payments may take as long as 60 days.

Infrastructure constraints affecting the sourcing of safer fresh produce

Both the production and the marketing system are characterized by high numbers of participants. At the production level, a broad range of producers exists consisting of landless labourers, sharecroppers, cooperative members and large land owners, spread over a wide geographical area. Wholesalers in both the provinces and Bangkok play a crucial role in matching supply and demand. Additional services are provided by rural packers, transporters and brokers who deal with the physical produce or manage the flow of information.

As a consequence of the small size of farms, the distribution system requires the intervention of assemblers. In remote areas assemblers collect the produce from farmers and sell it in local wholesale markets. Alternatively, assemblers contract merchants who transport produce to the central wholesale markets. There, wholesalers buy their produce directly from the truck and sell it in their stalls to retailers or large customers. Supermarkets and restaurant chains contract merchants who buy vegetables at these central markets and repackage them.

Sourcing products from a myriad of small-scale producers creates innumerable difficulties in terms of safe produce. Traceability and assurance of claims is difficult, at best. Collection points are often on the field or roadside, where conditions are far from hygienic.

Many farmers do not have storage facilities and facilities at collection points and provincial markets are not adequate. Produce is therefore not ideally cooled or processed correctly after harvest and a cold chain from field to terminal market is largely nonexistent. The first stage where hygienic conditions are evident is at the packing shed: this is often some distance from the field.

Food safety and consumer preferences and behaviour

Consumer awareness to food safety issues

A small elite group of Thai consumers is becoming more conscious of the detrimental effects of agro-chemicals and is moving towards residue-free produce or hygienic

vegetables. Unfortunately, consumers have little or no understanding of microbial contamination.

In Bangkok there appears to have been a change to consumption of safe food over the past three to four years. Consumers indicate that they pay more attention to safety of fresh fruit and vegetables than rice. Seventy-five percent claim that they buy “safe” fruit and vegetables while only 21 percent buy “safe” rice regularly. However, the subjects of this study were far from “typical”

Consumers have confidence in certain retail chains rather than quality certification from government agencies or the brand name of producers. Some premium retail stores have implemented strategies to build on this consumer confidence. Consumers must invest to purchase safe produce. Buying chemical free produce appears to raise household expenditure by about 30–40 percent. Lack of information on “safe” produce incurs a knowledge cost.

Consumers are confused when trying to identify safe produce. Safe and conventional products are found side by side on supermarket shelves – unless there is a specific promotion. Many different labels are displayed and unsubstantiated claims made by private firms. Consumers do not know how to recognize quality and safety signs. This is one reason why consumers place confidence on the store rather than quality certification from government agencies or the brand name of producers. In terms of produce safety consumers seek out products which they think are chemical-free, they do not appreciate other dimensions of safety such as microbial contamination

Are consumers ready to pay the higher cost of safer produce?

Although the spending power of urban Thais is reported to be on the increase this is not representative of the country as a whole. There is a huge difference between the spending power of those in Bangkok and the rest of the country. Thailand’s population was around 62.3 million people in the year 2001, of which 78.3 percent lived in rural areas and 21.7 percent lived in urban areas.

Most of the total output of fresh produce is sold through the traditional market outlets, ambulant street trade and the wet markets. Super- and hypermarket chains are mainly found in the urban areas. According to a 2003 ACNielson survey of 1 307 shoppers in Bangkok and the provinces, 85 percent claimed that they shopped at wet markets for their fresh produce, 15 percent shopped for these items at supermarkets and 23 percent at hypermarkets. Eighty-six percent of respondents claimed they shopped at wet markets an average of 13 times per month and 88 percent respondents visited hypermarkets but only three times per month.

Conclusion

Change in food safety is taking place, though still limited in impact. Until more responsibility can be passed through the supply chain, purchasing behaviour at the terminal points of sale changed and consumers educated on the broader issues of food safety, progress will remain slow.

Recommendations

- Assist local communities and farmer organizations on production techniques, management, buying and selling of agricultural inputs and produce. These organizations should be encouraged to function as centres for production and marketing services.
- Encourage local organizations and farmers to be able to analyze and draw up their own farm production systems within a good-practices framework at community level, with technical and information support from relevant parties.
- Promote the formation of agricultural product storage facilities at local level so that the products can be quickly stored under appropriate conditions.
- Encourage purchases and selection of suppliers to be quality-based, not based on reward for the purchasing officer.
- Provide technical assistance in terms of logistics management and sanitary certification.
- Establish fair and equitable financial rewards to encourage the production and supply of safe produce.
- Improve market access, market efficiency and market integration to enable farmers to take advantage of market potentials for higher quality products.
- Encourage the correct implementation of GAP, which should address many of the safety and quality issues evident at the present time.
- Provide farmers with adequate training and support on the requirements of the GAP codes. Emphasis should be placed on hygiene control rather than encouraging wide scale adoption of GAP.
- Include collecting houses into the current Q certificate for GAP. There is a gap in certification from GAP to packing house. As the Q system for farmers is only really workable for “large farmers” it is suggested that the collecting houses be granted Q certificates for GAP (when appropriate), and that the small farmers supplying the collecting house be responsible for providing all the information required for traceability, and auditing. The Government responsibility would then be to audit the information and undertake random checks to ensure that GAP guidelines for Q certification are being maintained.
- Address microbiological hazards in the existing GAP codes.
- Improve the availability of information. Specifically, controls should minimize biased or insufficient information.
- Explore alternative avenues of information dissemination. These may include “on farm” demonstration plots or the development of an information market.

Annex 10 – Food quality and safety issues in the fresh produce production and marketing chain – the case of cabbage in Viet Nam

Phan Thi Giac Tam¹

The current state of fruit and vegetable quality and safety in Viet Nam

Fruit and vegetables production and exports

Despite a rapid annual growth rate, fruit and vegetable production areas in Viet Nam accounted for only a small portion of total cultivated areas. In 1999, shares of total cultivated areas were five percent and four percent for vegetables and fruits respectively (IFPRI, 2002). Exporting of fruits and vegetables has taken off since 1995. It reached 330 million US\$ in 2001, then declined. Quality and safety remain issues in both domestic consumption and exports.

Agrochemical use and its health risks in Viet Nam

In the south of Viet Nam, the use of agrochemicals was totally under government control from 1975 to 1990 with the import of a few types of agrochemicals mainly from the Soviet Union and some other socialist countries. Since 1992, due to the increase in agricultural production, low import taxes levied on agrochemicals and increased supply from domestic agrochemical companies, farmers' use of agrochemicals has increased in quantity and types as these substances became more available and cheaper.

As a result of agrochemical overuse (particularly pesticides), and other factors, the number of food poisoning incidents has increased. Between 1993 and June 1998, thousands of people were poisoned due to consumption of fruits and vegetables, mainly in the Mekong River delta. In 1995 there were 13 000 different cases of poisoning causing 354 deaths in the Delta. From 1999 the figure has decreased, down to 943 cases with 19 540 victims, of which 250 died. One hundred and fifty four cases of mass poisoning (more than 30 victims per case) were reported. The identified causes were micro-organic infected food (33 to 49 percent), contaminated food by chemicals (11 to 27 percent), mainly pesticide residues; natural toxins present in food (6 to 25 percent), and unknown causes (7 to 34 percent).

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Government interventions

In response to public demand for food safety, particularly the crisis in food safety during 1994–1997, the Minister of Agriculture and Rural Development issued “Temporary Regulations on Safe Vegetables Production” in 1998. The Regulations set quality requirements both on internal criteria and external criteria.

Integrated pest management (IPM) has been adopted in Viet Nam since the 1960s in the North and since 1977 in the South, firstly on rice crops then on other crops such as cotton, tea and soybean. An IPM programme on vegetables has been implemented from 1996 in Viet Nam with FAO assistance. IPM knowledge was embedded in safe vegetable production alongside with technical procedures for specific products. As a result, pilot production sites were established at provincial level. Some have become the first points supplying safe vegetables for the local market. The safe vegetable production movement has spread since 1999–2000.

Certification and inspection

Safe vegetables certification and inspection are executed by the Plant Protection Department. The certification process may vary by provinces. It has to abide by the regulations on water, soil and fertilizer application method. The renewal of certification may be based on the actual production results (95 percent of vegetables sampled below maximum residue levels (MRLs) and 95 percent of farmers taking training on safe vegetable production) as in Ho Chi Minh City (HCMC) or based on a satisfactory laboratory analysis of vegetable samples, as in Dalat City. The analysis is implemented by accredited institutes. The cost of testing is met by the producer applicants.

Safe vegetable inspection is carried out periodically with samples taken from markets, supermarkets, other vegetable outlets, and certified or to-be certified production areas. The certification, certification renewal and inspections depend much on pesticide residue analysis. There are several weaknesses in these procedures: the number of samples is small and the method of quick testing applied in inspection can detect only a few types of pesticide (i.e. organic phosphor and carbamat). Thus, a negative test result may not assure safe vegetables. Furthermore the sampling for certification renewal is often subjective.

Food safety and consumer preferences and behaviour

Vegetables represent the second most consumed foodstuff (6 million tons per year) after rice in Viet Nam (13 million tonnes per year). Per capita consumption of vegetables, particularly leafy vegetables, increased from 48.4 kg per year in 1987 to 71.2 kg in 2000. Fruit per capita consumption increased from 44.6 kg per year in 1987 to 46.3 kg per year in 2000. Despite the important role of fruits and vegetables in consumption, there have been only few studies on consumption patterns, mainly focusing on the North.

North Viet Nam

A survey on perception of food-related risks by consumers that was carried out in Hanoi and Ha Tay province in 2002 revealed that vegetables were considered as the most unsafe food product, followed by meat, fruit and aquatic products. People fear agrochemicals used in fruits and vegetables, particularly pesticide residues in

vegetables and preservative substances used for fruits (Figuié, 2004). Vegetable species considered as most dangerous were water spinach (*Ipomea aquatica*); followed by “rau cai”, a group belonging to the genera *Brassica*, *Raphanis* and *Nasturtium*, then yard-long bean (*Vigna sesquipedallis*) and cucumbers (Figuié and Bricas, 2003).

Safe vegetables (limited use of agrochemicals) and organic vegetables (no use of agrochemical) were sold in Hanoi at a price higher than regular produce. As a result, only well-off consumers could afford these vegetables. Another major deterrent was the location of supermarkets usually not in the proximity of consumer households.

The quality signs used for vegetables were found to be confusing. The origin of the products was indicated only in certain cases. The quality signs are not carried by the products but by the points of sale. In addition, these signs are not governed by a consolidated certification process. There are no precise, standardized specifications concerning authorized and prohibited pesticides, maximum tolerated quantities or the time which must lapse between treatment and harvesting (Moustier *et al.*, 2005). Some consumers mistook the term “safe vegetables” for “organic vegetables”.

Lack of transparency of the safe vegetable supply chains resulted in generalized mistrust of the real safety of these so-called safe vegetables. In fact, the “safe vegetable” labels in supermarket aisles poses a problem insofar as not all the vegetables sold at these points of sale are produced according to the “safe vegetables” procedure. Indeed, during the rainy season, these stores may purchase their supplies from Dalat or China with unspecified farm origin (Moustier *et al.*, 2005).

In order to avoid health risks due to vegetable consumption, Northern people seemed to use two strategies: trust relationships with traders and preventive measures. When buying vegetables in wet markets, Northern consumers who looked for quality guarantees relied on trusted retailers whom they had known for a long time. The majority believed that they could protect themselves from risks by washing and soaking produce in salty water. Another measure was to look at vegetables of poor appearances (insecticide bites, small size...) in the belief that they had been grown without pesticides. Consequently, consumers still decided to buy vegetables and maintain their belief that eating more vegetables brings better health (Figuié, 2004).

South Viet Nam

A small study in HCMC revealed a clear consumer preference for convenience of retail outlet over price of vegetables, food safety and even freshness of the produce. Results from the survey of vegetable buyers leaving a particular outlet showed that these customers went to a particular outlet because it was close to their home (51 percent). Freshness of vegetables only came second (41 percent), food safety issues third along with cheap price. However, customers in modern distribution outlets were more focused on vegetable food safety issues than customers of traditional retailers. Ninety percent of supermarket customers believed that vegetables sold in supermarkets were safe to eat (Cadilhon and Tam, 2004).

In a recent survey, about 97 percent of people interviewed frequently consumed vegetables both in urban and rural areas. However, urban consumers used vegetables more frequently than rural ones (90 percent and 61 percent urban and rural consumers

respectively eating vegetables daily). Almost all consumers interviewed ate fruit. However, people tended to eat fruit less frequently than vegetables. Rural people tended to eat fruit more frequently than urban dwellers. This may be explained by the cheaper prices and greater availability of fruits in rural areas. Another observable reason was that some people in remote rural areas usually substituted vegetables with fruit when fruit was in season.

Consumers were well aware of food hazards. Eighty-six percent of urban consumers and 93 percent of rural consumers were informed about food poisoning, mainly by television and radio. Rural consumers also received information from neighbours, local officers and local radio broadcasts while 37 percent of urban consumers received information through newspapers.

There was perception of high health risks due to vegetables. More than 90 percent of respondents believed that vegetables could poison consumers. Most consumers believed that some vegetables were more risky than other vegetables. The vegetables perceived as more risky were cai (a group of leafy vegetables belong to the genera *Brassica*, *Raphanis* and *Nasturtium*), green long-bean, water spinach, bitter gourd, cabbage and cucumber, because they were very susceptible to pest or diseases.

Most consumers without access to safe vegetable outlets had to rely on their own judgment of safety, mainly based on the appearance. More rural consumers (60 percent) than urban consumer (48 percent) claimed that they could distinguish unsafe vegetables by looking at the appearance (greener, shinier, no worm or insect bites). More than 90 percent of consumers said that they washed produce carefully and soaked it in salty water if eating raw vegetables, or cooked them well.

Consumers' perception of health risks due to fruit was less common than with vegetables. The following factors were supposed to cause fruit poisoning: using too much pesticides and growth stimulants; spraying before harvest; direct spraying on fruit; using preservative chemicals by traders. Some fruits with thin skin were perceived by consumers as more risky than others (e.g. apple, grape, plum). Other fruits were also considered as risky as a result of consumers' experiences (watermelon, longan, litchi). Some believed that fruits imported from China were dangerous.

Limited market opportunities for safe vegetables

Despite great demand for safe vegetables, the supply of vegetables labeled as safe or organic is still limited. It represents less than 5 percent of total consumption, with few suppliers (mostly five cooperatives), and few outlets (22 shops and stalls, 13 supermarkets) in Hanoi (Moustier *et al.* 2005). In HCMC, safe vegetables are sold at 17 supermarkets, two Metro Cash-and-Carry outlets and 23 shops and stalls. These stores have shelves, cool storage and signs that are rarely seen at traditional vegetable stalls. However, the volume sold remains small, about 50–100 kg per day per store. Therefore, some farmers producing safe vegetables had to supply part of their production to traditional outlets including food stores and local retailers (Tuan, 2004). As a result, trading safe vegetables is considered unprofitable by traders. Supermarkets that have made efforts to promote safe vegetables admitted that this section of their stores was retained to attract consumers by making the supermarket a “one-stop shopping place”.

Most safe vegetable producers after delivering a small portion of their products to contract companies and supermarkets had to sell the remainder to traders in traditional chains at the same price as regular vegetables. A study on one safe vegetable area in HCMC – Hoc Mon District – found that 70 percent of the produce was sold to wet markets while only 30 percent was sold at higher prices through contract arrangements (Oanh, 2004). In Binh Chanh district, among 145 ha that were certified for safe production, there were only 6.35 ha that supplied a daily amount of 700–800 kg to a state company through contracts or only 150 kg per household (Anh, 2004). The safe vegetables farmers' association in HCMC – Tan Phu Trung – has 60 ha with production of 30 tonnes per day but sells to supermarkets an amount of 700 kg per day. The contracted amount could be increased if farmers could provide more diversity of vegetables and consistent quality. According to farmers, supermarkets have ordered a larger volume but with the condition that products must be safe and of the same size. This is convenient for packing, but difficult for farmers to provide.

In HCMC, where the outlets of safe vegetables are relatively common, a survey of 288 consumers by the Economics Faculty, Nong Lam University, found that many consumers who were well informed of these outlets did not buy such produce. The reasons not to buy safe vegetables were inconvenience of the outlet location (56 percent); no belief in the quality of safe vegetables (28 percent) and high price (16 percent). In the Mekong River Delta, in a survey of 30 consumers at the market where there were safe food stores, the reasons quoted for not buying at the stores were: few varieties for choice (33 percent); belief that careful washing vegetables can remove all toxins (31 percent); higher price (12 percent); not convenient (8 percent) and other reason (16 percent) (Tuan, 2004). In a survey of 150 vegetable consumers in the Mekong River Delta, most respondents suggested that there should be a wider market outlet network, the outlets should be located at the most convenient places (i.e. at least one stall at each existing market); more varieties of safe vegetable should be offered with some kind of certification of the products (i.e. stores with government certification, labels, certified quality signs). In the same survey, 30 percent of respondents expressed insufficient trust in safe production practices.

Cabbage produced in Lam Dong province

Farmers producing cabbage in Dalat City use excessive fertilizer and pesticide. Fertilizer should be applied three times after planting and application should be finished 20 to 25 days before harvesting. Most farmers applied mineral fertilizers at doses three times higher than recommended and combined this with liquid micro-fertilizer (applied on leaves). Others followed no strict application scheme; more fertilizers were applied if the crop growth seemed to be slow. The last application was usually only 10 to 15 days before harvest.

Pesticide application may range from 13 to 15 times in the wet season or even almost every two days if pests were severe. A few farmers used banned pesticides. They did not know about the banned list. In addition, growth stimulants were generally applied three to four times a season to enhance appearance. The last application was usually 10 to 15 days before harvest.

Water used in agriculture is pumped from lakes and streams to which farmers still enjoy open-access. As such there is no control on water use and water quality. Most farmers realized the potential damage that came from the water source but they had no alternative supply. Soil is also a source of contamination to crops. In this area, organic fertilizers were generally applied (about 1 000 kg/1 000 m² for cabbage production). Organic fertilizers include various types that came from different origins with limited government quality control: animal manures and residues of fish fermentation for fish sauce production from Ninh Thuan province; bio-chemical fertilizers and micro-organism fertilizers from HCMC. Composting was not familiar to Ninh Thuan farmers yet most manure was sold directly from the animal house when it was still wet. Compacted soil has been a problem due to the application of salty residues from fish fermentation.

In brief, contaminated soil and water has made crop diseases permanent. Facing disease problems, farmers used more and more pesticides. The excessive use of pesticides over a long time has increased pest tolerance of plants and resulted in increasing costs. Recently, the disease of swollen roots (*Plasmodiophora brassicae* Woronin) has spread, causing lower yield, higher pesticide costs and an estimated loss of 40 percent total production.

Dalat is one area where local government has paid great attention to IPM training for farmers. However, this survey identified that only 58 percent of farmers were attending training. The reasons quoted most often for not attending training were: not being invited (43 percent), no time to attend (25 percent), no need (19 percent), having to go far (6 percent) and the training not useful (6 percent).

In addition, trained farmers reported to apply about 30 to 50 percent of what they had learned from training as the instructions were found not to be effective. As a result, farmers had to do more experiments themselves after training and would only share their successful lessons with a few people. The interviews showed that almost every farmer has his or her own application methods even if they were all in the same safe vegetable cooperative.

Training did cause differences in farming practices between trained and non-trained producers. Trained farmers were more likely to implement good practices such as spraying according to labels, and appropriate disposal of pesticide containers. However, a high portion of farmers still threw plant residues into water as a waste disposal method, regardless of training. This malpractice has contaminated the water source and, in turn, water became a means to spread out diseases all over the area.

Some new supply chains that aim to supply safe produce to a niche market have been developed in Dalat. Some private companies have provided technical assistance and inputs to contracted farmers and buy back farmers' produce including cabbage for the export to strict standard countries such as Japan and Singapore. However, the amount sold in these contracts was still very small compared with the production.

While most cabbage was sold within country or exported to Cambodia or Laos through traditional markets, the wholesale traders in HCMC have perceived no demand for safe vegetables at all. Good-looking produce has been always sold more easily and at a higher premium compared with poor-looking vegetables. Cabbage is

graded based upon the firmness, weight and appearance (no disease, damage or insect bites). Safety is not included in grading. Although aware of farmers' high-dose spraying, most traders argued that safety of cabbage is secured as most outer leaves were removed when selling, particularly to supermarkets, for which eight to twelve leaves per cabbage are removed, representing about 20–30 percent of the weight at harvest.

The most common procurement method is buying produce on the whole lot about seven to fifteen days, or even 30 days (about one third of the production span) before harvest. Payment is made immediately to farmers when farmers and traders come to a verbal agreement. Whether the payment is in total or only a portion is dependent on the scarcity. In the wet season when supply is inadequate all farmers get total payment in advance whereas in the dry season only 74 percent of farmers receive all payment at once. Hence, produce is still standing in the field but the ownership of these vegetables has transferred from farmers to traders who will decide when to harvest. From this time to harvest, farmers are still responsible of looking after products standing on field but they have to follow the instruction of traders, if required; about how to care for the cabbage.

This implies that traceability and quality control could be implemented to a large extent by collectors and assemblers. Some wholesalers in HCMC said they have been instructed to record from whom their produce was obtained so that if there is a problem, the producer could be contacted immediately to identify types of chemicals applied on vegetables.

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Annex 11 – Fieldnotes on visit to Talaad Thai Market

Siobhan Casey¹

As part of the “FAO/AFMA Workshop on Quality and Safety in the Traditional Marketing Chains of Asia” the market was visited on Wednesday 9th November 2005.

General Information on Talaad Thai

Talaad Thai is the largest agricultural wholesale market in Thailand and it is open 24 hours a day. It has the aim of being a centre of trade for quality food and agricultural products; providing an essential link between production and consumption. The founder’s intention was also to minimize the intermediaries between the farmer and consumer, particularly for farmers in the surrounding province.

It was established in 1995, and has approximately twenty different market halls or areas selling a wide range of agricultural products. It is extremely accessible, located very close to Bangkok and only 15 km from Don Muang airport.

Talaad Thai objectives

- To be a central market for agricultural products;
- To establish fair market price;
- To improve product quality by sorting, grading and packing in well-designed packages;
- To improve efficiency for distribution, import and export of products;
- To improve farmers’ income and capabilities.

Talaad Thai is privately owned by the Thai Agro Exchange Co., Ltd. It is situated on 80 ha of land and has 200 employees. Registered capital is 2 000 million baht with transactions from B400 to 600 million per day.

Layout

The market has well laid out road infrastructure, with a vehicle flow of 30 000 a day, 24-hour security, a waste water system, three food centres, stores, parking and many automatic teller machines – as all the transactions are in cash.

Markets

There are approximately twenty market areas. These are: the citrus market – where about 70 percent of citrus fruits consumed in Thailand are traded, the mixed-fruit

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market, seasonal fruits market (in November, primarily pomelo and pineapple), coconut, water melon, rice, and farm crops markets, fresh water fish market (night and day), pets, flowers and ornamentals, a retail grocery market, and a one-stop export service centre for perishables.

The market also has a special distribution centre for Q products (“Q” is the Government quality certification scheme). It is envisaged in the future that there will be no special zone, as all products will be Q certified.

Perishable one-stop service export centre

The Perishable One Stop Service Export Centre (POSSEC) was newly opened in 2004, as a cooperation between Talaad Thai and the Government sector. POSSEC has laboratory facilities to ensure phytosanitary quality (minimum residue level testing), but this is only for exporter use at present. Origin of Product certificates are issued here and there are also Cold Storage facilities. Future plans involve organic product testing facilities.

Government cooperation with Talaad Thai

The setting up of Talaad Thai involved cooperation with the government, as no corporation tax was paid for the first eight years.

The business plan involves three phases:

Phase 1 is completed, focused on developing a central wholesale market for agricultural produce, with the establishment of various produce markets. This phase also included a pilot “Auction centre” project.

Phase 2 involved the establishment of the POSSEC (with government collaboration) in 2004, the establishment of a quality vegetables zone and retail market for quality products and cold storage facilities.

Phase 3, which they are now entering, consists of the development of agro businesses, an auction centre and a packing house.

Government policy

The market cooperates with the wide range of government policies and schemes, including the “Kitchen of the world”; “clean food good taste”; “Healthy market”, good agricultural practices, good manufacturing practices, hazard analysis critical control point, and various other schemes.

Talaad Thai Market provides training courses and information to both farmers and traders, and promotes the establishment of quality farmer groups.

Fees

Entrance fee charges vary according to market and vehicle size. Basis entrance fee for the vegetable yard is B100 for a 4-wheel vehicle; B150 for a 6-wheel vehicle and B200 for a truck. These rates are charged for 24 hours; with an additional B100 fee, if this time is extended. Fruit yard fees start at B200, rising to B400 for a truck.

Permanent traders with a fixed, rented space in a building must register once a year and sign a contract. Traders pay B35 a day for a space of four square meters. In some cases permanent traders spill over into open areas. These have to pay for umbrella rental.

Transactions between traders and farmers are negotiated on a one-to-one individual basis. It was mentioned that a pilot auction project had not been overly successful a few years ago, as farmers preferred individual business transactions. As there are a large number of buyers and sellers, the price remains relatively stable for both parties.

Imported and exported produce

Information was not readily available on the amount of produce that was imported or exported, as Talaad Thai Market does not register this information. In the mixed fruit market, produce is both imported and exported, with an estimated 30 percent of the fruit sold being imported (mostly apples and pears from China).

Traceability

Questions were raised on traceability of produce sold at the market. This is difficult as the market only registers traders. Most of the product sold at the market comes from collectors.

Farmers do not have to register and are free to sell produce at the market, on payment of the entrance fee. When the farmers come to market; they have a number of options. They can:

- sell produce themselves to the retailers or, occasionally, consumers, for which they pay only the daily entrance fee;
- sell to the permanent traders, for which they must negotiate a price on a one-to-one basis.

Although the market was seen as a way of enabling farmers to sell directly without dealing with itinerant traders in their villages, it advises that only about ten percent of produce sold in the market is supplied directly by farmers. The percentage varies by crop and appears highest for highly perishable leafy vegetables and herbs and seasonal fruits such as pomelo. These crops are primarily supplied by farmers living relatively close to the market.

Price information within the market

Talaad Thai Market has a research group to collect prices which are displayed on the Talaad Thai Market internet site (www.talaadthai.com). Quantities supplied are also indicated. These are estimated based on metric volume of each vehicle.

Quality

Talaad Thai Market is only a service provider, it has not introduced minimum standards and cannot impose penalties for poor quality produce. The quality of produce affects the final market price, but the market has no authority when a quality

dispute arises. Prices are negotiated on a one-to-one basis and this is the method the farmers prefer. Talaad Thai Market plays an advisory role in relation to quality, as it informs the buyer of the importance of inspection before purchase.

While Talaad Thai Market officials stated that responsibility for quality lies with the government sector, they do have a team that visits farmers' groups annually, giving advice on quality, packaging and other issues. It was observed that they have noticed a change in presentation over the last 10 years, e.g. tangerines that were delivered in baskets are now packaged.

Observations from the market

There was much activity on the day of the visit, with trucks being loaded up with produce bought from permanent traders in the market, where minimum bulk for sale was ten kilograms. In the open yards, leafy vegetable and herbs bought from the farmers were being prepared and packaged in smaller, individual bags by retailers and secondary wholesalers for sale in Bangkok.

It was observed that the farmers sell their own produce during the day, but if it is not sold by the end of the day, they would then sell to the permanent traders for a lower price. The ripening agent, Calcium Carbide, was sitting in open bags, at individual stalls, with no protection taken when using it. This was common practice.

On discussions with one pineapple farmer, selling her pineapples in the seasonal fruit market, the price she was asking was B7 per kilogram, with a minimum purchase volume of ten kilograms (i.e. B70). If it was taken into account that the entrance fee to the fruit yard was B200; approximately 30 kg of pineapples must be sold before the breakeven point is reached, not counting the cost of B20 a day to hire an umbrella in the outside yard.

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