A Chain of Quality: Linking Quality Aspects in the Chain to Meet Consumer Demand

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INTRODUCTION
This paper examines the impact of changes in life styles in a developing Asian country such as Thailand on the supply of fresh fruit and vegetables to urban domestic populations as well as to export markets. As a consequence of improving education standards and public communications systems people in Thailand are becoming just as aware of issues such as food safety, value for money, reliability of supply and variety of choice as in more highly developed countries. Successive Governments have also encouraged export development to earn foreign exchange. A large number of Thai people have received advanced education in foreign countries and many of them are challenging traditional ways, which they perceive to be unhealthy, unsustainable or damaging to the environment. The growing public awareness of these issues is evident when one sees on company signs, e.g. catering companies, advertising that they are certified according to ISO 9000. These changes in Thailand are evidence of globalisation of markets at work. Governments throughout South East Asia are grappling with these pressures for change. Regional Trade Groups are being formed and more countries are joining the World Trade Organisation (WTO). Membership of WTO requires the gradual removal of trade barriers and import duties but recognises that countries have a right to implement quarantine measures to prevent the entry of unwanted pests and diseases. These economic pressures require new ways of growing, handling and distributing fresh produce if the Nation's farmers and population as a whole are to benefit from the move towards free trade. The freeing of trade allows imported products to enter the domestic market. Some of these may be aimed at the luxury end of the market but others may actually force some local products off the local market. Ideally these new ways of doing business should accommodate traditional social customs.

The domestic trade in fresh fruits and vegetables in the larger cities such as Bangkok is shifting from traditional wet markets to supermarkets as people have more disposable income and an increasing desire for convenience and safe quality fresh produce. A high proportion of the supermarkets are being formed and more countries are joining the World Trade Organisation (WTO). Membership of WTO requires the gradual removal of trade barriers and import duties but recognises that countries have a right to implement quarantine measures to prevent the entry of unwanted pests and diseases. These economic pressures require new ways of growing, handling and distributing fresh produce if the Nation's farmers and population as a whole are to benefit from the move towards free trade. The freeing of trade allows imported products to enter the domestic market. Some of these may be aimed at the luxury end of the market but others may actually force some local products off the local market. Ideally these new ways of doing business should accommodate traditional social customs.

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perception of quality changes as the product moves along the distribution chain. Factors such as size, freedom from obvious defects and percent packout are important to the grower. To the wholesaler (middleman) the durability or how long the product will maintain its fresh appearance (keeping quality) are more important but the retailer may have additional requirements such as a minimum re-trimming, freedom from obvious decay and a guarantee that no residues of unapproved pesticides or excess levels of approved pesticides are present, particular product sizes and specific packaging. Ultimately, the retailers have to make the correct judgements if they are to maximise turnover and minimise losses. The consumers usually can only make their decisions on appearance, judgment of value for money, faith that the products are safe to eat and historical experience that the product they purchase will have acceptable eating quality. It is this latter issue that is the most vexatious for everyone. The leading retailers in Thailand all have documented HACCP based QA standards but as in other countries they have to rely on destructive sampling and feedback from consumers about internal quality. In a country such as Thailand where there are no food shortages consumers have much choice. Consumers will stop buying products that have internal defects or poor eating quality. These issues pose a major challenge for all those people who service the supply chain. The underlying key discipline is postharvest technology that recognises that we are dealing with highly perishable living products continuously losing quality. The application of the first principles of temperature management is especially important in Thailand's tropical climate where the products range from traditional cool season or temperate vegetables to sub tropical and tropical fruit and vegetables.

Consumers' perception of expected quality before a purchase is often different from that after consumption. Shewfelt (2000) cited that in mango for example, most important purchase quality characteristics were found to include colour, size, firmness and aroma while for consumption quality characteristics, flavour, mouthfeel, juiciness, flesh colour and fibrousness. Models and concepts were formulated to correlate product characteristics with consumers’ quality expectations, such as the Total Food Quality Model (Grunert et al., 1996), the Quality Function Deployment Model (Hauser and Clausing, 1988), Quality Guidance concept (Steenkemp and van Trijp, 1996), the Assigned Quality concept (Sloof et al. 1997) and Quality Formation concept (Poulsen et al., 1996). Ideally, the product should possess both high quality at the time of purchase and at the time of consumption to ensure high marketability. There could be strong relationships between expected quality and experienced quality, but in some cases expectations may not be fully predictive of the quality upon consumption. Hence, mutually beneficial tradeoffs are necessary. However, the situation becomes more complicated when the overall acceptability of the product is taken into account because product quality is only one of the determining factors (Tijskens, 2000).

QUALITY MANAGEMENT IN SUPPLY CHAINS

The application of HACCP based QA systems to fresh produce in Thailand is still in its infancy with the exception of some firms who export to Europe, Japan, Australia etc. The terms Good Manufacturing Practices (GMP), ISO 9000, Total Quality Management (TQM), Hazard Analysis and Critical Control Points (HACCP) and Safe Quality Food 1000 or 2000 (SQF 1000 or 2000) are well known. Many of these systems e.g. ISO 9000 were developed for the manufacturing industries and are not well adapted to perishable living products. HACCP by itself deals with food safety issues. ISO 9000 has been combined with HACCP for fresh food but more recently the SQF series were developed in Australia to support food systems in both manufacturing and handling of fresh products. All of these systems require the employment of certified-trained practitioners and independent third party auditors to verify compliance. A good system is considered to be one in which the added value of implementation is more than offset by improvements in efficiency. Maintenance of accurate records is a key component that enables full trace-back in the event that problems occur further along the chain. Quality management systems are still evolving. Euro-Retailers Produce Working Group (EUREP)
Good Agricultural Practices (GAP) or EUREPGAP is one of the latest schemes to enter the market place (Bennett, 2003). GAP stands for Good Agricultural Practices. EUREGAP has a Protocol that is a list of farm practices that leading European retailers and their suppliers consider being best practice. It is a prescriptive system. It lists the actual practices that it requires growers to achieve, unlike SQF and HACCP where the growers are required to do their own risk assessment and be analytical in their business. This system is expected to have a major impact on all who wish to trade fresh produce to Europe. Hopefully the not-for-profit company Food Plus set up to run EUREPGAP will be truly independent and accountable and will not impose unreasonable hurdles to trade.

**QUALITY MANAGEMENT MODELS IN THAILAND**

**Model 1: Traditional**

The Grower is financed by or committed to a middleman (merchant). The middleman receives the crop and sells it in a wholesale market to street vendors (wet market) and to supermarkets. This is a low technology system usually with no temperature control that is reliant on selling the produce within one day after harvest. Losses of produce may be very high particularly when weather conditions are adverse. As the export trade developed some produce was bought from the middlemen, packed and shipped by air. This practice has mostly stopped because of the lack of documentation of pesticide use (trace back records), lack of sanitation practices, lack of temperature control and high losses.

**Model 2: Private company**

A private Thailand export company has established the capital infrastructure for preparing produce for export for the high quality end of the domestic market. Under this model a network of growers are contracted to grow the required produce under the guidance of the company. The company also maintains its own production farms. Before planting, the physical characteristics of the land and the previous uses of land are documented. The contract farmers’ family backgrounds are also checked to ensure that the family is a responsible member of the community and has no vices, particularly gambling and drunkenness. The farmers will then undergo intensive training in production technologies of the crops and production planning in relation to market demand. Crops covered are baby corn and asparagus for export to Europe and Japan and other Asian vegetables, banana leaves and lemon grass for the domestic market. Prior to planting the crops, the company relays to the farmers a guaranteed price higher than the ordinary domestic market price. The company maintains its own farms parallel to the contract farms. The company employs professional workers (foremen) to assist growers in the selection of varieties, pest and disease management and harvest practices and to check the farmer operations following the principles of GAP. All operations after harvest are undertaken by trained personnel of the company. The harvested produce are packed in collection containers and transported in non-refrigerated trucks within two hours to the company’s packinghouse where cleaning, grading using the Thai FDA quality standards, packing, pre-cooling and cold storage are undertaken. During distribution and transport to destination markets, a cold chain system is employed. For baby corn and asparagus, the produce from the cold room is loaded into refrigerated trucks for transport to the airport and upon arrival, the packages of produce are loaded into refrigerated containers destined to export markets. For the vegetables for domestic markets, also refrigerated trucks are used to transport the produce to supermarkets where they are displayed on refrigerated shelves. For the various operations in the packinghouse up to market destination, the HACCP principles are followed. This model is shown in Figure 1.

**Model 3: Corporation**

A food corporation supplies fruits and vegetables to its chain of supermarkets in Thailand. Farmers are contracted to grow the crops following recommended production
practices established by research institutions. Pricing of farmers’ produce depends on prevailing market price. Depending on the crop, the harvested produce are sorted and packed on farm and brought to the company’s headquarters for subsequent distribution. Other crops are brought to the company’s packinghouse for further cleaning, grading using company quality standards, packing and holding/storage. The packinghouse is located near the company’s headquarters and distribution centre. If distribution cannot be done on the same day of arrival, the produce is stored in the company’s central cold room. The produce is distributed to the supermarket outlets in refrigerated trucks and displayed on refrigerated shelves. This model is illustrated in Figure 2.

**Model 4: Direct supply**

This model is a variation of Model 3. In this model alliances are formed between individual growers or groups of growers and retail chains to supply particular lines of produce. Multi-national retail chains use this model for some imported lines but implementation for domestic growers has been limited. The barriers include establishing the price, unreliability of supply and a lack of infrastructure to enable implementation of a HACCP based QA system. There are many examples of successful direct supply arrangements in other countries including in Australia but they mostly involve large family companies or marketing groups that draw from a range of production areas to ensure continuity of supply.

**IMPLICATIONS FOR RESEARCH, EXTENSION AND EDUCATION**

The increasing sophistication of the production and distribution system will in time increase the demand for qualified people to work at all levels along the distribution chain. King Mongkut’s University of Technology Thonburi (KMUTT) has begun to address this challenge. It has established modern postharvest teaching and research laboratories at Bangkhunthien in Bangkok. In addition to offering postgraduate training at the Masters and PhD level, it also provides short courses on postharvest technology for industry. KMUTT is also examining new ways of delivering training programs using computer-assisted programs to be delivered at distance. KMUTT has developed links with other countries in Southeast Asia via APEC and other leading universities in postharvest technology. KMUTT recognises that modern HACCP based QA systems will be rapidly adopted by exporters as these standards will be part of the terms of trade. Schemes that are compatible with traditional customs will be preferred but the ultimate buyer will be the chief arbiter. EUREPGAP is an example of a prescriptive system designed to suit buyers in Europe rather than growers in Thailand and in other Asian countries. However, since quality management systems are still evolving there will be scope to develop standards and procedures suited to climatic factors and the unique food crops grown in the region. We will most probably have two systems operating in parallel. One system will meet the specific requirements of importing countries and perhaps the supermarkets run by multi-national companies, the other will be adapted to domestic requirements. Although supermarkets are expanding rapidly in Bangkok and other large centres of population the traditional trade will continue. There is no need for costly infrastructure if you can harvest your crop, sell it and have it consumed on the same day.

**Literature Cited**


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Fig. 1. Private company-led supply chain of fresh vegetables in Thailand.

Fig. 2. Private corporation-led supply chain of fruits and vegetables in Thailand.