

## **MARKET ANALYSES**



## **Alternative supply chain management practices and the performance of marketing channels in fresh fruit and vegetable marketing in Sri Lanka**

T. Abeysekera  
World Bank Colombo Office  
SRI LANKA  
E-mail: tabeysekera@worldbank.org

S. Abeysekera  
University of Manitoba  
CANADA  
Email: sarath\_abeysekera@Umanitoba.ca

### **Abstract**

*The purpose of this study is to investigate how alternative supply chain management practices adopted by leading supermarkets engaged in fresh fruit and vegetable marketing in Sri Lanka impact on the performance of the supply chain. We investigate on-going changes in the supply chain using information from leading supermarkets and related players. The information sheds light on how the new supply chain management policies and procedures have affected the cost structures, long-term profitability and organizational viability of the system. The emergence of supermarkets over the last decade or so has profoundly influenced Sri Lanka's fresh fruit and vegetable marketing system, and the trend is expected to continue into the foreseeable future. The efforts of profit-motivated supermarket giants to sustain a very competitive market have altered traditional production and marketing channels. Evidence suggests that the supermarkets are competing to adopt a range of management strategies to offer quality products, a wider choice, reduced wastage, greater value for money and shorter, but more effective supply chains. The impact of supermarkets on global and local supply chains, and its implications for actors in the supply chains has received much attention in recent years. This research study will utilize standard performance measures to compare performance of competing supply chains including: (i) satisfaction of stakeholders (supermarkets); (ii) price performance (profitability); (iii) labour employment; and, (iv) efficiency (price stability, timely delivery of orders, quality management). Information will be collected through a series of interviews with the appropriate personnel in the supermarkets concerned and their supply chain partners.*

### **Introduction**

Emergence of supermarkets and their explosive growth over the last 10–15 years has profoundly influenced Sri Lanka's fruit and vegetable marketing system, and the trend is expected to continue into the foreseeable future. Efforts made by supermarkets to thrive in a competitive market have altered traditional agricultural production and marketing channels. The supermarkets are competing to adopt a range of management strategies to offer superior quality products, a wider choice, reduced wastage, greater value for money and shorter and more effective supply chains.

The primary aim of this study is to investigate how the alternative supply chain management practices adopted by leading supermarkets for marketing fresh fruit and vegetables in Sri Lanka has impacted on the performance of the existing supply chain. The study was focused on information obtained from leading supermarket chains and other key players in the marketing system with a view to exploring how the emerging supply chain management policies have affected the operations and organizational viability of the marketing system. The paper focuses on changes in the supply side, mainly on the coordination and functioning of supply chain partners and how they have contributed to the effectiveness of the overall system. In more specific terms, the study seeks to:

- i. identify major changes emerging in Sri Lanka's fresh fruit and vegetable supply chain system with respect to its organizational and functional aspects;
- ii. establish to what extent the coordination of supply chains and its key partners have contributed to the transformations in the marketing system and their implications on the operational effectiveness;
- iii. identify key policy issues that require the attention of public policy makers for further improving the fresh fruit and vegetable marketing system.

The study is based on data gathered from key supply chain partners in the fresh fruit and vegetable marketing system. Data from supermarkets, mostly involving primary data gathered through interviews and case studies, and data from the traditional supply chains, mostly in the form of secondary data, is used. The dual approach allows researchers to gain a better understanding of the processes involved in the marketing system by combining information within the given context. The study seeks to establish the performance of emerging supply chains and their impact on price levels, cost compositions and functional efficiency.

The paper is organized as follows. The next section provides a brief background of the literature followed by an overview of fresh fruit and vegetable production and consumption patterns in Sri Lanka. Section Three focuses on an overview of the management practices adopted by the supply chain partners and their impact on the performance efficiency of the supply chain. Section Four provides a discussion on the relevant issues, and Section Five concludes the paper.

## **Background**

The impact of supermarkets on global and local supply chains and its implications for all actors in the supply chains has received much attention in recent years; e.g. Ghezan *et al.* (2006), Cadilhon *et al.* (2006), Neven and Reardon (2004). Cadilhon *et al.* (2006) use parallel performance measures that are evaluated using data collected through interviews and case studies. Chen *et al.* (2005) investigate the issue of modern agrifood systems organization and its effects on fresh fruit and vegetable farmers and traditional marketing systems in Asia. They observe that individual small farmers are unable to compete with larger counterparts. If they are to supply the supermarkets, they will have to work in groups. The paper suggests ways for small farmers to adapt to the situation, and for government to respond with changes in their policies. Shepherd (2006) also agrees with the need for government to recognize these trends, to identify ways to

support farmers, and to assist existing marketing systems to compete with the supermarket sector.

In Sri Lanka, fresh fruit and vegetable supply chains and their management is an area that has not been studied in detail. The information available is limited to more general market- and price-related details on a few specific fruit crops (HARTI, 2003). Other currently available sources of information on this subject are mostly based on secondary data sources (De Silva, 2006; Perera *et al.*, 2006). A study undertaken by Sinhapura (2004) using primary data from a smaller set of supermarkets in Colombo provides more detailed insights but is devoid of field level information.

### **Fruit and vegetable production and marketing system in Sri Lanka: an overview**

Sri Lanka has a total population of about 20 million, of whom nearly 70 percent live and work in rural areas. In 2005, agriculture contributed 17 percent of the GDP, down from 35 percent in 2000 (World Bank, 2006). Agriculture accounts for about a third of the country's labour force. Despite a relatively high per capita income of around US\$1 100, Sri Lanka shows a significant income disparity at the regional level highlighting marked rural and urban differences. The sector problems are compounded by the sluggish growth trend in agriculture over the last two decades – around 1.7 percent per annum – while the overall economy has been growing around 5 percent. In the last two decades, the population has shown a major rural-to-urban migration, notably to Colombo and its adjacent suburbs.

In terms of supply, the bulk of the fresh fruit and vegetables produced in the country are grown in the drier parts of Sri Lanka, which accounts for two-thirds of the country's physical land area. This area typically produces “lowland”, hot climate fruits and vegetables. Because of its seasonal rainfall, fresh fruit and vegetable production in the dry zone is highly seasonal. On the other hand, in the wet zone, due to a more reliable rainfall intensity and distribution, a wider range of fruit and vegetables are cultivated on a year round basis. The central hills of the country, with their milder climatic conditions, produce temperate vegetables, typically known as “upland” vegetables, throughout the year.

### **Key features in conventional fresh fruit and vegetable supply chains**

Wide seasonal fluctuations in production with a peak in January to March and a trough in May to June is a predominant feature of the supply chain for fresh fruit and vegetables in Sri Lanka. Inadequate storage facilities lead to surpluses during the harvest period and extreme shortages during the off-season. The system therefore exhibits wide seasonal price variation. This situation is more evident in the case of fruits. During the peak supply season, the fresh fruit and vegetable supply system typically records wastage of around 30 to 40 percent (HARTI, 2005).

Prior to the introduction of economic liberalization policies in 1980s, the fresh fruit and vegetable marketing system in Sri Lanka was dominated by state sector interventions including the operation of commodity marketing boards, purchasing mechanisms and other interventions. This period was typically characterized by: (i) high levels of

production and price risks faced by producers, (ii) the presence of multi-layered and long marketing chains, (iii) poor product quality at the retail end with little or no choice, and (iv) high price uncertainty for the consumer.

### **New partners in the emerging fresh fruit and vegetable supply chains**

With the adoption of economic liberalization policies in the 1980s, there have been significant changes in the fresh fruit and vegetable marketing system. Policy changes enabled private sector entrepreneurs and institutions to play an increasingly dominant role in improving supply chain management and the structure and performance of the fresh fruit and vegetable production and marketing system. The change was further supported by a number of factors including increasing per capita incomes, expanding urbanization, shifting food preferences and consumption patterns, and improved communication facilities. New supply chain partners have emerged including outgrowers, private sector extension workers, transport operators with refrigerated trucks and modern packaging systems, warehouse operators and integrators at the intermediary level, supermarkets, retail shops and exporters.

### **Outgrowers and village level assemblers**

The establishment of a formal outgrower system and collecting centres at the village level by supermarkets is a new phenomenon in Sri Lanka's agricultural marketing system. The system reflects a well-coordinated effort by private entrepreneurs to improve their supply chains and to ensure quality product and continuity of supply. Outgrowers are organized at the village level as informal producer associations. Evidence indicates that most of these groups are strong and cohesive with a high degree of accountability. Some of these associations have developed close linkages with the village level microfinance institutions (e.g. SANASA Bank network) to use short-term production credit facilities. Generally, a collector agent or facilitator is stationed in the village to coordinate supply, thereby providing the supermarkets with a cost-effective and financially sustainable strategy that enables the retailer to adopt a demand-responsive extension system. The system is effectively used to disseminate extension-related information between the supermarket and the producer to ensure product quality and to manage and plan supply levels.

### **Transporters with refrigerated trucks and non-conventional packaging**

Poor transportation and packaging is a major cause for the high wastage reported in Sri Lanka's fresh fruit and vegetable marketing system. As a consequence, most supermarkets have developed an alternative practice of using refrigerated trucks and plastic crates for packing. The new system has reduced wastage to around five percent. Under the conventional system, fruit and vegetables were packed in gunny bags and transported in ordinary lorries. The charge levied for the lorry was determined by the number of gunny bags transported and hence, the system automatically encouraged carriers to pack the maximum amount in a gunny bag and to accommodate the maximum number of gunny bags per lorry.

The improved transport system adopted by the supermarkets is estimated to be more than 50 percent more expensive than the conventional system, but the cost disadvantage is more than compensated by the improved product quality and higher overall prices. In

order to improve the situation further, some of the leading supermarkets are currently working closely with local plastic manufacturers to develop low-cost, more durable plastic crates.

### **Warehouse operators**

The operation of warehouses for fresh fruit and vegetables is a new activity emerging from the establishment of supermarkets. Most major supermarkets operate large warehouses, usually more than 2 000 square feet, in or around metropolitan city centres. Warehouse management plays a key role in the procurement process, mainly for sorting, grading, weighing and packing the product before the product is dispatched to the individual supermarkets. The warehouse provides a major source of employment for the unskilled workers.

### **Larger scale retail centres specializing in fresh fruit and vegetables**

The establishment of retail stores specializing in fresh fruit and vegetables only is another new feature in the fresh produce marketing system in Sri Lanka. These retail outlets generally handle larger volumes than the ordinary retail shops, but seldom handle more than 500 kg per day. They are usually managed by a single entrepreneur as small stalls, averaging about 500 square feet and employing about five to ten employees per stall. A larger chain of this type of retail shop currently employs a total of about 400 full-time employees.

### **Supermarkets**

The emergence of supermarkets as a partner in the supply chain is a recent phenomenon in the Sri Lankan economy. These supermarkets differ from other fruit and vegetable outlets in being large, self-service units with at least 1 000 square feet of floor space. They deal with a wide range of food and non-food items and offer greater choice to customers.

The wave of “supermarketization” in fresh produce marketing in Sri Lanka began in 1983. In subsequent years, the network of supermarkets increased progressively, triggering a major shift in the production and marketing system. Currently, there are about 170 supermarkets in a number of major cities in the country. Competition among them is intense.

### **Integrators**

These are corporate entities that are dedicated to providing a wide range of agriculture products and production-related inputs and services to fresh fruit and vegetable growers as a one-stop-shop. As a part of the range of services provided, the integrators are involved in production and retail marketing, particularly for processed and semi-processed forms. Among the other services provided by the integrators are local production of paddy, vegetable seeds and planting materials; the sale of agrochemicals and fertilizers; soil, plant and water analytical services; tissue culture and plant nurseries.

### **Exporters**

Fresh fruit and vegetable exports from Sri Lanka have been increasing over the years. In 2005, more than 14 million kg of vegetables and 7 million kg of fresh and dried fruits,

with a value of Rs1 115 million and Rs609 million respectively, were exported from Sri Lanka (Source: Export Development Board, Ministry of Trade, Colombo).

### **Supply chain management practices for fresh fruit and vegetables**

The evolution of supply chains associated with the marketing of fresh fruit and vegetables is a function of the changing demand and supply conditions in the market, along with many advances in transportation, storage and information technology. The many changes that have occurred over time can be generally attributed to the financial and operating efficiencies gained by the partners in these supply chains.

#### **Gains from the outgrower model**

The outgrower model of production provides a number of advantages for the grower including: (i) promise of a better price; (ii) ensuring a guaranteed market for the produce in advance; (iii) access to better technical know-how; (iv) adjustment of the cropping calendar to avoid oversupply; (v) access to financial assistance; and (vi) absence of trading intermediaries. In most instances, the contract growers enter into formal forward-sales contracts with the buyer at predetermined prices.

#### **Cost savings from shortened and more secure marketing chains**

Intervention by supermarkets has helped to reduce the length of the supply chain. The appointment of a field level representative to purchase vegetables from the grower at the collection points is the major strategy underlying the change. The vegetables collected at the village level collection centre are packed in reusable plastic crates and transported directly to the supermarket warehouse in Colombo by a transport operator using refrigerated vehicles. For cost efficiency, the supermarket outsources the transport. The process, although more expensive than the conventional system, reduces wastage, maintains quality and provides growers with a higher net farm gate price (Table 1).

**Table 1: Comparison of the distribution costs of vegetables as a percentage of the selling price in supermarkets and conventional retail shops**

	Percentage distribution of costs	
	Supermarket chain	Conventional marketing chain
	-----	-----
Farmgate price	42	27
Handling/transport/packing	29	15
Commission agents	-	15
Wastage	6	16
Retailers margin	23	27
	-----	----
Selling Price	100	100

An investigation into the marketing costs for fresh vegetables in one of the leading supermarkets indicated that, for reasons of cost control, their warehouse operations are considered as a separate cost-centre in their management system. This constitutes a new approach under which the warehouse operates as a non-profit, no loss basis. The



procurement process is handled by the warehouse operators. The produce brought to the warehouse is graded and packed and sent to the supermarket for sale. The supermarket typically retains a sales margin of around 20–25 percent. The elimination of several intermediate layers in the traditional supply chain has enabled the supermarket to substantially reduce costs, the benefits of which are, in part, passed onto the producer.

### **Reduction of post-harvest losses**

Reducing post-harvest losses is a critical factor in marketing fresh fruit and vegetables. In general, fruit shows higher level of post-harvest losses, mainly due to poor harvesting and post-harvest handling practices, while vegetables as a whole, show lower wastage. Most supermarkets have taken several steps to ensure quality and to improve the shelf life of fruit and vegetables. Some leading supermarkets have established teams of officers to provide advice to farmers on how to minimize post-harvest losses and to improve quality. Some of the major supermarkets have substantially reduced their losses by engaging in processing and value addition.

### **Offering cheaper prices to the consumer and higher prices to the producer**

An analysis of the prices of vegetables sold in the supermarkets indicates that the retail prices are typically 10 to 15 percent lower than the retail prices in the conventional marketing chain. The lower price offered in the supermarkets can be attributed to the “high volume–low mark-up” strategy adopted by most supermarket chains. In the conventional marketing system, the retailers usually transact on the basis of “low volume–high mark-up”. The analysis also showed that retail prices among five supermarkets in the city of Colombo did not show a high degree of correlation (0.68) indicating independent pricing mechanisms. The correlation between the retail prices in the supermarkets and the retail prices in the conventional retail shops were even lower (0.56). Evidence also suggested that the contract growers supplying vegetables to the supermarkets consistently received prices that were 15–25 percent higher compared to the conventional marketing system.

### **Efficiency gains from establishing village-level, private-sector agricultural extension workers**

Establishment of a new, private-sector driven extension system initiated by the supermarkets has streamlined many important segments of the supply chain. Typically, the persons operating the purchasing centres at the village level provide advice to their growers on how to produce higher quality fruit and vegetables and provide guidance on various ways of selecting, growing, harvesting and transporting to minimize losses and maintain quality.

### **Benefits from countering seasonality**

The leading supermarket chains in Sri Lanka operate their outgrower systems in both the wet zone and dry zone geographic areas. This arrangement allows the supermarkets successfully to counter the seasonal availability of most fruit and vegetables.

Some supermarkets have even taken a step further and have supervisors and field officers who provide technical advice to the farmers about agronomic practices such as rescheduling of planting dates to overcome oversupply situations. The field-based officers also provide advice on accessibility to credit, fertilizers, and improved seeds and planting materials.

## Discussion

Supply chain management practices in the fresh fruit and vegetable sector in Sri Lanka have irreversibly impacted on the performance of marketing channels in a variety of ways. Our analysis shows that the new development has had a significant “pull” effect on fresh fruit and vegetable production at the national level. The change has facilitated the emergence of a more dynamic marketing system that is more responsive to the consumer needs. It has also enabled the introduction of contract farming and forward–purchase mechanisms at the producer level.

The change has led to a substantial increase in consumer satisfaction by providing them with more competitive prices, a wider choice of varieties, and improved product quality and presentation. The consumer-friendly nature of the supermarkets has led to a major increase in the number of consumers patronizing the modern outlets. This has led to the creation of new job opportunities in the form of processing and value-added activities. The six major supermarket chains currently employ about 4 700 people.

A negative effect of the process, however, is an undermining of the role of small vendors and hawkers. Even although it is argued that the two players, supermarkets and small vendors, serve two very different markets, it is likely that there will be a negative overall impact on the welfare of the small-scale traders.

For efficiency reasons, the outgrower system of purchasing fruit and vegetables appears to favour a smaller number of larger producers at the village level who are capable of supplying the necessary quantities and quality. This excludes many small-scale farmers in the village from participating in the supermarket supply chain, depriving them of a livelihood.

A fair and equitable distribution of benefits from the transformed supply channels to all potential participants calls for a better understanding of the economic and social dynamics of the changing supply chains. Managers and policy makers are expected to develop strategies that could ensure economic growth in the sector while the social benefits are maintained at the highest possible level. Some of the key areas for the policy makers to consider are:

- i. provide infrastructure facilities or public utilities to enhance efficiency;
- ii. improve access to financial facilities at the village level to encourage greater participation in production;
- iii. improve extension services to provide information to growers so that they are fully aware of the opportunities as well as the most efficient techniques of production, crop establishment and management, transportation and storage;
- iv. provide an enabling environment for small farmers to group together so that they can avail some of the economies of scale that larger farmers have when dealing with agents of the supermarkets.

Efficient supply chains in the fresh fruit and vegetable sector have strong implications for the economic and social welfare of the consumers who patronize supermarkets in

urban areas, the primary producers in the villages, and others who form the chain. Recognizing the fact that the private sector is a powerful force in the market, policy makers have the supreme responsibility of balancing the roles of the public and private sector.

### **Summary and conclusion**

This study focuses on alternative supply chain coordination practices adopted by leading supermarkets in the fresh produce industry in Sri Lanka, and how these practices impact on the performance of the supply channel. The paper places special emphasis on innovative practices adopted by different participants and determines how these practices impact on the performance of market channels, particularly in terms of economic and operating efficiencies.

The explosive growth of supermarkets in Sri Lanka has profoundly influenced the fresh fruit and vegetable marketing system, and the trend is expected to continue into the future. Continuing efforts by the supermarket chains to maintain their position in a very competitive market has altered the traditional production and marketing channels in Sri Lanka. The study indicates that the influence of the supermarkets has brought about major improvements in the quality of fruit and vegetables. The study suggests that the supermarkets are adopting a range of management strategies such as the establishment of outgrowers, reduction in waste, and improved transportation and storage, to offer superior quality produce to consumers, to give them a wider choice, uninterrupted supply and greater value for money. Efficient management of supply chains and closer coordination from the farmgate to the consumer will have a strong influence on the future welfare of the consumer and everyone else involved in the fresh produce industry in Sri Lanka.

### **References**

**Cadilhon, J.-J., Moustier, P., Poole, N.D., Giac Tam, P.T. & Fearne, A.P.** 2006. Traditional vs. modern food systems? Insights from vegetable supply chains to Ho Chi Minh City (Vietnam). *Development Policy Review*, 24(1): 31-49.

**Chen, K., Shepherd, A.W. & da Silva, C.A.** 2005. Changes in food retailing in Asia: implications of supermarket procurement practices for farmers and traditional marketing systems, AGSF Occasional Paper no. 8. FAO, Rome.

**De Silva, G.A.C.** 2006. Crop diversification and marketing. A paper presented at the Council for Agriculture Research Policy (CARP), 15 November 2006, Colombo.

**Ghezan, G., Mateos, M. & Viteri, L.** 2002. Impact of supermarkets and fast-food chains on horticultural supply chains in Argentina. *Development Policy Review*, 20(4): 389-408.

**Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI).** 2005. A study on marketing on selected fruits in Sri Lanka. HARTI, Colombo.

**Neven, D. & Reardon, T.** 2004. The rise of Kenyan supermarkets and the evolution of their horticulture product procurement systems. *Development Policy Review*, 22(6): 669-699.

**Perera, M., Kodithuwakku, S. & Weerahewa, J.** 2006. Vegetable supply chains of supermarkets in Sri Lanka. A paper presented at the Council for Agriculture Research Policy (CARP), 15 November 2006, Colombo.

**Shepherd, A.W.** 2006. Quality and safety in the traditional horticultural marketing chains of Asia. AGSF Occasional Paper no. 11. FAO, Rome.

**Sinhapura, D.** 2004. Emergence of supermarkets and their implications on domestic food production and distribution system. Unpublished paper, University of Ruhuna, Matara, Sri Lanka.

**World Bank.** 2003. Sri Lanka: promoting agricultural and rural non-farm sector growth. World Bank, Colombo.

## **Key strategies for horticultural industries to remain internationally competitive**

A.P. George, R.H. Broadley and R.J. Nissen  
Queensland Department of Primary Industries and Fisheries  
Maroochy Research Station  
AUSTRALIA  
Email: Alan.George@dpi.qld.gov.au

### **Abstract**

*With the exception of some tropical fruits, the world production of fruit and vegetables is slowing. Exports from developed and even some developing countries are also being threatened by increasing competition from low labour-cost countries. The consumer demand for more processed products also favours imports from lower-cost producers such as the People's Republic of China, thus increasing their international competitiveness. Processed and semi-processed products are less affected by quarantine barriers in importing countries. As the world trade in fresh produce comes under the increasing control of the major supermarket chains and global distribution companies, a strategic analysis of a nation's competitive advantages will become an essential precursor to implementing and maintaining globally competitive supply chains. One of the most important sources of competitive advantage is the ability to supply the chains all year round with safe, high-quality product lines. For seasonal fruit, this has meant a shift to producing and supplying product from both the northern and southern hemispheres. To remain commercially viable, farmers in the developed and developing countries will be required to implement new supply chain management strategies. These may include: increasing productivity and the economies of scale; moving to more collaborative packing and marketing systems; forming northern and southern hemisphere alliances; and controlling Plant Breeder's Rights (PBR) and associated Intellectual Property (IP). Governments can assist farmers to remain competitive by increasing research and development spending; creating seamless logistics or transport systems; improving export capability by setting up physical and virtual export hubs; and by providing tax incentives for exports and promotion. Farmers also play a key role in this process by working collaboratively, not only regionally, but also throughout the whole global supply chain. This process will be driven and facilitated by E-commerce systems.*

### **Global fresh fruit and vegetable consumption**

With the exception of some tropical fruits, the production and consumption of fruit and vegetables in developed countries is leveling off (George *et al.*, 2006), despite significant promotional programmes within country and despite improvements in product quality. This trend is due to a number of factors including: overconsumption of food in general, competition from other snack foods, and substitution of fruit and vegetables with vitamins, pharmaceuticals and other nutraceuticals. Australian Bureau of Statistics, USDA and FAOSTAT figures show that consumption of fresh fruit and vegetables is steady or increasing very slowly. In addition, fruit quality and price are

often poorly related due to many factors (Owen *et al.*, 2000; George *et al.*, 2005), so farmers may not be rewarded for their efforts.

A major cause for the lack of increased consumption of fruit and vegetables is the overwhelming variety of food products available to the consumer: in the 1960s there were about 600 food lines on retail shelves, today there are more than 12 000 (Stanton, pers. comm. 2002). In addition, the promotional dollars spent on advertising fruit and vegetables is too small to be effective, with less than 2 percent of the total advertising dollars spent on food lines (Cohen, 2002; Stanton, pers. comm. 2002). Increasing global obesity levels have occurred in spite of significant investment by health agencies and governments to promote the health benefits of fruit and vegetables through “5-a-day” campaigns. This is important because most industries prioritize domestic market promotion as their first strategy to increase consumption and subsequently stimulate production and prices. We suggest that promoting individual lines displaces other competing lines or substitutes for a short period, but has no long-lasting effects. Fruit also fits into a mundane, non-sexy product category, which is of variable quality and for which consumers lack confidence (Owen *et al.*, 2000). This makes fresh produce more difficult to promote compared with other “snack foods”. In 2004, there were about 30 fresh fruit snack lines compared with 1 700 processed snack foods in the average supermarket (Stanton, pers. comm. 2002). Farmers also believe that new varieties will increase their profits. However, the introduction of new varieties into the market has only a short-term benefit (George *et al.*, 2004), because the price–volume relationships for horticultural products are highly inelastic, and prices drop very quickly as increasing volumes are placed onto the market (George *et al.*, 2005).

### **World horticultural trade**

Exports from developed and even some developing countries are being threatened by increasing competition from low labour-cost countries (George *et al.*, 2004; 2005; 2006). Within the developed countries, there has been a shift towards the consumption of more processed food products (Robbins, 2005). Because processed and semi-processed products are less affected by quarantine barriers in importing countries, this shift favours imports from lower-cost producers such as the People’s Republic of China, thus increasing their international competitiveness.

The world trade in horticultural products is coming under increasing control by the major supermarket chains and global distribution companies who are demanding an assured all-year-round supply of good-quality, safe product (George *et al.*, 2004; 2005; 2006). Oversupply has also led to a shift in power in the supply chain moving it from a “push” to a “pull” process, where the supermarket chain and the consumer have increasing discretionary choice in terms of suppliers.

### **The importance of strategic analysis**

Strategies to maintain and enhance competitive advantage by industries have been well defined by Porter (1980; 1990; 2001). Porter (1980) suggests that there are three winning competitive positioning strategies, which are cost leadership, differentiation and focus, and that nations possess factor endowments which give them a comparative

advantage. Whilst most horticultural farmers are trying to implement Porter's winning strategies, horticultural supply chains have specific characteristics that are notoriously difficult for horticultural farmers to control or influence. These factors include: 1) poor relative power of many, small horticultural farmers within supply chains dominated by the large multinational supermarket chains; 2) reluctance of farmers to change varieties that are better accepted by consumers; 3) poor information transfer and awareness about competitors; 4) high perishability of fruit and vegetables often makes farmers price-takers rather than price-setters; 5) oversupply and market saturation and associated low farmgate price.

More recently, due to the greater dominance of supermarkets in global supply chains, one of the most important sources of competitive advantage that has emerged has been the ability to supply the chains all-year-round with safe, high-quality product lines (Cook, 2005). For seasonal fruit, this has meant a shift to producing and supplying product from both northern and southern hemisphere alliances.

In conclusion, farmers will need to use all of the above competitive strategies as defined by Porter (1980; 1990; 2001) and this strategic analysis, to identify competitive advantage, will be an essential precursor to implementing and maintaining globally competitive horticultural supply chains.

George *et al.* (2004; 2005; 2006) have described in some detail the key elements of the strategic analysis process for horticultural industries.

### **Research and development priorities**

Research and development (R&D) priorities must be based on strategic analyses which critically evaluate global competitiveness and supply chain performance. Hofman and Ledger (2006) suggest that R&D be linked to removing the most limiting factors in the supply chain. For example, in countries where domestic consumption has plateaued and export is difficult, farmers must reduce costs and increase productivity. Consequently, research should be directed towards improving these aspects. Alternatively, where significant export market windows exist, then R&D efforts should be directed towards selecting varieties suitable for the export market, improving transit and storage life and implementing efficient logistics systems. A list of possible production and marketing scenarios and R&D solutions is presented in Table 1.

**Table 1: Production, consumption and marketing scenarios for horticultural products and their potential impact on R&D and marketing priorities**

Status of domestic fruit consumption	Availability of export markets	Import risk	Research, development and extension priorities	Marketing priority
Static consumption, domestic market saturated	Difficult due to competition	Low	Increase farm productivity, reduce farm costs, consolidate farms to achieve economies of scale	Increase domestic market consumption through generic health promotion and education
Static consumption, domestic market saturated	Difficult due to competition	High. No sanitary and phyto-sanitary reasons for exclusion	Diversify production, select crops with competitive advantage, identify PBR varieties with superior quality to imported varieties	Promote own country product Market PBR varieties to obtain premium price
Static consumption, domestic market saturated	Good prospects, little competition e.g. counter-seasonal or exclusive PBR of varieties	Low	Select varieties for export markets, develop virtual and real export hubs and systems, develop low-cost seafreight systems and disinfection protocols	Identify and market to fill consumer needs in export country Promote product in export country
Good prospects to increase domestic consumption	Good prospects, little competition, e.g. counter-seasonal	Low	Prioritize above strategies to achieve maximum short and long-term profits	Prioritize above strategies to achieve maximum short and long-term profits, monitor potential competition

### Key strategies to increase global competitiveness

Some key strategies are presented below that may ensure a sustainable future for horticultural industries in both developed and developing countries. We have selected these strategies based on analyses of interviews, presentations and reports by leading horticultural producers and exporters from countries such as New Zealand (e.g. Zespri) and Chile (e.g. Chilean Exporters Association) (Brown, 2005; Martin and Luxton, 2005). We have verified our findings through an analysis of statistical data on fruit and vegetable production, consumption and exports for different countries (FAOSTAT, Australian Bureau of Statistics and USDA databases) and through an examination of audited company financial reports. We also elaborate on many of the strategies previously described by George *et al.* (2004; 2005; 2006).

The context in which these strategies can be used either at the national, industry or farmer levels is presented in parenthesis after each strategy. We suggest that all strategies, whether they are focused at the national, industry or farm levels are inevitably interconnected and that the objective is to increase awareness of their importance at all levels.

#### **Strategy 1: Strategic analyses** (national, industry and farm levels)

We suggest that for small farmers to remain viable in an increasingly competitive global market, it will be necessary for them to undertake stringent strategic analyses before even contemplating entering a new supply chain and that, for existing supply chains, structural changes may be needed to maintain profit share (George *et al.*, 2006). We



suggest that the strategic analysis process fits above the current “within house” supply chain planning processes. In the future, working “on the supply chain” will become equally, if not more important, than working “in the supply chain”. We also suggest that the strategic analysis process is too complex to be undertaken by individual farmers and that it should be conducted in collaboration with professional strategic analysts and marketers. George *et al.* (2006) have previously presented some of the key steps involved in the strategic analysis process. These analyses should be based on real time market intelligence due to the rapidity at which changes are occurring in global markets.

**Strategy 2: Increased R&D funding** (national and industry levels)

To maintain the competitive edge, it will be essential to stimulate both government and business investment in R&D in horticulture. In 2002, the percentage R&D per GDP varied from 0.3 percent for sub-Saharan states to 4.9 percent for Israel (UNESCO, 2005). For the United States of America, only 1.6 percent of the R&D budget was spent on agriculture. In recent years, there has been a significant increase in expenditure on research in the People’s Republic of China and other Asian countries, but a declining level of expenditure in many western countries. The government contribution to R&D has been decreasing steadily in many developed countries. Science is becoming increasingly dependent on international collaboration and off-shoring and outsourcing of R&D will become more common.

**Strategy 3: Collective promotion and education** (national and industry levels)

To increase significantly fruit consumption in the developed countries, where levels of consumption are currently amongst the highest in the world, we suggest that all fruit and vegetable industries will need to pool their promotional dollars. These programmes should be aimed at young children, teenagers and “baby boomers”. However, despite significant television advertising, through “5-a-day” campaigns there is little evidence to show that these campaigns are working. More recently, there has been a shift to implementing educational programmes in schools to alter eating behaviours of young children (Buzby *et al.*, 2004). These programmes appear to be having greater success. In Europe, a whole supply chain approach is being used to increase fruit consumption (Timmermans, 2006). If domestic market consumption cannot be increased in developed countries, an alternative strategy for continued growth is through expanding exports.

**Strategy 4: Export** (national, industry and farm levels)

Many countries have an excellent opportunity to capture counter-seasonal export markets. According to the Chinese Academy of Social Sciences (China View, 2004), the People’s Republic of China now has over 200 million middle-class people, with this number expected to double in the next ten years. This group will have sufficient income (US\$10 000 per year) to purchase high quality fruit and vegetable imports (George, unpublished data). Timing and product selection must be optimized.

Substrategies are to:

- re-engineer the whole export supply chain;
- set up real time market intelligence systems;
- set up seamless logistics or transport systems;

- set up physical and virtual export hubs;
- facilitate activities by E-commerce systems;
- move to low-cost seafreight systems;
- increase storage life and fruit quality.

**Strategy 5: Selecting export market “winners”** (national, industry and farm levels)

Only selected fruit and vegetable industries will remain viable and competitive in an open global market. Particularly threatened will be commodities that can be processed, produced or stored all year round such as bananas, apple and pineapple, and vegetables such as potatoes, carrots and garlic. Successful fruit and vegetable industries will need to market products matching the most important competitive advantages such as:

- having a global niche, off-season or counter-seasonality to lower-price competitors;
- significantly differentiating one’s product from competitors – ideally production and marketing can be controlled;
- having a short (less than three months), but sufficient storage life to ensure that the commodity can be seafreighted while remaining counter-seasonal;
- having a product that suits consumers’ palate in the target countries;
- requiring a higher level of technology or grower skill to produce.

**Strategy 6: Setting up global- and regional-based marketing companies** (national and industry levels)

To achieve economies of scale in marketing, farmers must market their produce together (horizontal integration) so as to control supply and to develop an internationally recognized brand name (Verheijen and Heijbroek, 1994). In addition, farmers will need to form strategic alliances with processors and retailers and focus their activities to supply safe, quality-assured, high-quality product. This process will be driven and facilitated by E-commerce systems.

Based on current production levels, Australia can only sustain three globally competitive, regional marketing companies. These export companies need to be of similar capacity to Capespan International in South Africa, Carmel in Israel, Dole, Del Monte and Chiquita in Chile. Each of these companies is exporting and distributing worldwide over 100 million tray equivalents per annum. In Australia, we currently have over 180 companies or farmers exporting fruit, with most exporting less than 20 000 trays. This is far too many actors to be successful.

Ideally, these global marketing companies should be farmer-owned and employ their own professional marketers (vertical integration). This eliminates the problem of unprofessional merchants or agents and sourcing of poor-quality fruit from the market floor for export, which severely damages Australia’s export reputation. Ideally, these global companies need to market through a single desk with a single brand. Characteristics of such a company would be:

- employing professional marketers;
- enforcing quality standards;

- employing on-farm best practice consultants;
- achieving economies of scale.

Many horticultural farmers have been reluctant to market cooperatively for many reasons including:

- lack of trust and transparency between farmers and regions;
- factional infighting within many existing farmer commodity associations;
- the tyranny of distance between regions;
- lack of familiarity with single desk marketing;
- lack of effective industry leadership;
- lack of entrepreneurial ability;
- lack of education;
- aging farmer population and lack of willingness to change.

These social issues need to be addressed if horticultural industries in developed countries are to remain viable. Similarly, horticultural farmers in developing countries have also been reluctant to market cooperatively. They have based their success on low costs of production, but increasing production and competition is starting to erode this advantage.

Farmers must also play a key role in this process by working collaboratively, not only regionally, but also throughout the global supply chain. This process will be driven and facilitated by E-commerce systems. An example of a successful global company is Zespri Ltd which markets close to AU\$1 billion of kiwifruit globally. It licences growers in both the northern and southern hemisphere to grow and market its selected varieties through a single desk system. It retains marketing rights for its varieties.

**Strategy 7: Setting up global closed loop marketing systems** (national and industry levels)

To obtain a durable, competitive advantage, new varieties and unique germplasms need to be grown and marketed globally under licence. Farmer-owned marketing companies should aim to form northern and southern hemisphere alliances to manage production and marketing all year round.

Sub-strategies include:

- moving to more collaborative packing and marketing systems;
- forming northern and southern hemisphere alliances;
- controlling germplasms through Plant Breeders' Rights (PBR) and associated Intellectual Property (IP);
- licensing not only the germplasm, but also the global marketing rights.

**Strategy 8: Disintermediation or shortening the supply chain** (industry and farm levels)

Under a single desk system, farmer-owned companies can employ their own professional marketer(s) who could be paid a base salary plus bonuses based on the

number of trays exported, and not on a commission basis as is customary with farmers selling their produce via merchants or agents. These global companies could also deal directly with the supermarket chains, thus eliminating commissions paid to market intermediaries and, at the same time, reducing transactional costs. We estimate that about 15 to 20 percent of the costs in the supply chain could be eliminated by this strategy. Disintermediation will be driven and facilitated by E-commerce systems.

**Strategy 9: Government incentives** (national level)

There are many areas where governments can assist farmers to establish viable supply chains without resorting to direct farm subsidies. Some of these are listed below:

- provide real time market intelligence e.g. USDA FAS service;
- fund export promotion;
- fund the establish of export hubs;
- reduce freight or logistic costs;
- facilitate freight coordination;
- provide tax incentives for exporters;
- facilitate clustering, amalgamations and alliances;
- provide low interest rate loans to establish or subsidize the amalgamation of regional packing houses;
- organize grower delegations to other countries to view systems;
- facilitate the use of single brands;
- facilitate market access;
- provide product insurance.

A summary of the key strategies and the role of farmers, marketers and government facilitating their implementation are presented in Table 2.

**Table 2: Relative importance of the role of farmer, marketing and government sectors in implementing key strategies**

Strategy	Sector			Key points
	Farmer	Marketing	Government	
Strategic analyses	***	***	***	This process needs to be conducted by all members of the supply chain but particularly by marketing and holistic system specialists
Increase R&D	***	***	***	Need for greater funding from the private sector to fund R&D. Significant R&D needed to maintain competitive advantage
Collective promotion and education	*	*	***	Educate children on health benefits of fruit and vegetables. Government intervention is needed to reduce obesity
Export	***	***	***	Setting up logistics and virtual and export hubs; this process needs to be conducted by all members of the supply chain
Selecting export market winners	***	***	***	Need for excellent strategic analyses and real time market intelligence. Difficult for the farmer to achieve this alone
Setting up global- and regional-based marketing companies	***	***	*	Must be driven by industry leaders and champions. Move to single desk marketing requires trust and transparency
Setting up global closed loop marketing systems	***	***	*	Requires significant organization and coordination. Licensing of varieties and marketing essential
Disintermediation or shortening the supply chain	*	***	*	Requires significant organization and coordination and real time E-commerce and communication systems
Government incentives			***	Many strategies that governments can use to assist farmers maintain competitive advantage

\* low involvement, \*\* moderate involvement, \*\*\* high level involvement

## References

**Brown, R.** 2005. The Chilean fresh fruit industry and the role of the Chilean Exporters' Association. A paper presented by the Chairman Chilean Exporters Association to *DPI&F*, Queensland Government, May 2005.

**Buzby, J., Guthrie, J. & Kantor, L.** 2004. Evaluation of the USDA fruit and vegetable pilot program. Report to Congress. Washington, D.C. (also available online at <http://www.fns.usda.gov/cnd/Research/FV030063.pdf>.)

**China View.** 2004. China's middle-income class in the making. June 23. (available at [www.chinaview.cn](http://www.chinaview.cn))

**Cohen, E.** 2002. Why aren't you eating your fruits and vegetables.

**Cook, R.** 2005. The changing marketplace for California crops: focus on fruits and vegetables. A paper presented at the *California Agricultural Symposium*. Sacramento, 23 March 2005.

**FAOSTAT.** 2004. *FAO agricultural statistics*. Available at <http://faostat.fao.org>.

**George, A., Broadley, R.H. & Nissen, R.J.** 2004. The future of Australian horticulture - can it meet the global challenge? *In Proceedings of the Second Australian New Crops Conference*, pp. 52-61. Gatton, Australia.

**George, A.P., Broadley R.H., & Nissen, R.J.** 2005. Can Australian horticulture survive and meet the global challenge? *Acta Horticulturae*, 694: 289-294.

**George, A.P., Nissen, R.J. & Broadley, R.H.** 2006. Strategic analyses: a key factor in developing horticultural supply chains in transitional Asian economies. *Acta Horticulturae*, 699: 205-211.

**Hofman, P.J. & Ledger, S.N.** 2006. Using a supply chain approach to guide R&D. *Acta Horticulturae*, 699: 219-226.

**Martin, R.A. and Luxton, P.** 2005. The successful commercialisation of ZESPRI Gold kiwifruit. *Acta Horticulturae*, 694: 35-40.

**Owen, K., Wright, V. & Griffith, G.** 2000. Quality, uncertainty and consumer valuation of fruits and vegetables. *Australian Agribusiness Review*. Paper 4.

**Porter, M.E.** 1980. *Competitive strategy: techniques for analysing industries and competitors*. New York, The Free Press.

**Porter, M.E.** 1990. *The competitive advantage of nations*. London, Macmillan.

**Porter, M.E.** 2001. Strategy and the internet. *Harvard Business Review*, 2001(March): 63-78.

**Robbins, L.** 2005. Canadian food trends to 2020: long range consumer outlook. A paper presented at *The Economics of Food and Health Conference, Agriculture and Agrifood*. Banff, Canada.

**UNESCO.** 2005. *UNESCO Science Report*. (available at [www.unesco.org/publishing](http://www.unesco.org/publishing))

**Verheijen, J.A.G. & Heijbroek, A.M.A.** 1994. Cooperatives in changing market conditions. In *Proceedings of the First International Conference on Chain management in agribusiness and food industry*, pp. 168-174. Wageningen, Wageningen University.

## **Auctions: a proposed framework for research**

A. Brown  
Pennsylvania State University  
UNITED STATES OF AMERICA  
Email: cardoon1313@yahoo.com

M. Montesano  
National University of Singapore  
SINGAPORE

### **Abstract**

*In much of the agricultural marketing world, the wholesale auction, in particular the low-volume fresh produce auction, has been supplanted by selling mechanisms deemed more efficient. However, in contexts such as Pennsylvania, in the United States of America, low-volume wholesale auctions for fresh produce have persisted. Like farmer-to-consumer farmers' markets, once thought to be "old-fashioned", these auctions are proving their continued usefulness in the modern marketing system for fresh produce. Other contexts have likewise witnessed the introduction of low-volume wholesale auctions as a means of marketing and of price determination, among them the rubber sector of southern Thailand, historically dominated by a small number of large corporate concerns and affiliate marketing networks. Rubber auctions in the south of Thailand appear to have challenged these networks and thus brought benefit to smallholders and to the region's rubber sector. The putative success of auctions as a sales mechanism in Pennsylvania and Thailand raises important questions relating to the efficiency of low-volume wholesale agricultural auctions and to the possibility of promoting such auctions for the benefit of small-scale producers elsewhere. This research note presents a preliminary report on work in progress comparing Pennsylvanian low-volume vegetable auctions and Thai low-volume rubber auctions. We outline a few of the many research questions that have emerged during the investigation of these case studies. Findings to date suggest that the subject is more complex than initial observations suggest and that the initial objectives of the research were too narrowly focused. In order to explain the usefulness of auctions in the modern agriculture marketing system and their benefits to small-scale farmers, the small-volume auctions we are examining will probably need first to be placed within the larger context of value networks and marketing channels. Second, the importance of low-volume auctions will change, we suspect, as the products being considered, undergo commoditization. Third, location effects might prove to be critical in the success of auctions. Nonetheless, we believe that the benefits to farmers commonly ascribed to small-volume auctions are likely to be confirmed, although not necessarily for the reasons that are currently presented in anecdotal reports.*

### **What is an auction?**

An auction is a way of selling goods and services characterized by a time-limited bidding system. The item is sold at the highest amount offered by buyers in a competitive bid, rather than at a price set by the seller in advance. The largest and



perhaps best known auctions today are conducted on the Internet by intermediaries such as eBay. However, the auction as an institution had its beginning far back in history. There are a number of different ways to structure an auction, each of which is said to offer advantages.

Auctions are the preferred sales mechanism to use when an item is rare in the market or when the true commercial value of an item is not known, such as in the case of rare books, original paintings or radio frequencies. Auctions are thought to offer the best opportunity for maximizing returns to buyer and seller because, as the theory suggests, the industry as a whole knows more about the value of an item than does any individual buyer or seller. Auctions are considered to be the fastest way to sell multiple batches of non-uniform items and items with variable price and variable quality characteristics, when the items are perishable, and when the buyers are influenced by idiosyncratic perceptions of value.

Auctions are thought to offer several other efficiencies, among them diverse kinds of information exchange. At an auction many buyers and sellers come together at the same place rather than meeting one-on-one. The auction process sharpens competition (in the absence of collusion among buyers or sellers). Widening circles of acquaintance among buyers and sellers can lead to other kinds of business interactions. Side-by-side quality comparisons in an auction may help reduce price and quality uncertainties. Auction gatherings also lend themselves to the sharing of technological and demand information.

The growth of on-line auctions and the spectacularly successful auctions of government bandwidth assets in the recent past suggest that auctions offer benefits to sellers and buyers that are not found with other sales mechanisms (McMillan, 2002). Some of the research on modern auctions focuses on the sources of these benefits.

### **Research on auctions**

Auctions are studied academically primarily as subdisciplines of game theory and information management science. Imaginary auctions are used extensively as a research tool in advertising science.

Game theory involves the mathematical analysis of the way competitors interact. Information management research studies the way behaviour changes when the amount of information available to each participant is different, or when the item offered holds different subjective or practical value for one participant than for another. Advertising research uses imaginary auctions with sample consumers to estimate the relative value of one product characteristic over another, asking, for example: "How much more is a car with leather seats worth than one without?"

The formal study of game theory began in the early 20th century but did not come into its own till post-World War Two when it was used to formulate Cold War strategies. John Nash's 1994 Nobel Prize for Economics<sup>2</sup> was for his work on the mathematics of

---

<sup>2</sup> The Bank of Sweden Prize in Economic Sciences.

game theory. The 1996 award went to William Vickrey for his mathematical analysis directly on auctions mechanisms, one of which is now called a Vickrey auction. Vickrey and others have done considerable work on bid maximization under various auction structures. Some of the best recent theoretical work on auctions has been done by Milgrom (1999; 1989; with Weber 1982), McAfee (with McMillan, 1996; 1993), Weber (with Milgrom, 1982), and McMillan (2002). Comprehensive, non-mathematical descriptions of auctions can be found in the writings of Klemperer (2004).

Unfortunately, it appears that almost no recent scholarly work has addressed agricultural auctions and the role they might play in increasing profits for certain groups of farmers. The recent mergers of auction houses in the Netherlands and the expansion of auctions from Pennsylvania to other locations in the USA has generated some descriptive work but seemingly no work on the mathematical or theoretical approaches.

No matter how quickly auctions have proliferated in the modern world, agricultural auctions remain rather out of fashion. It is generally felt, based, it seems, on very weak evidence, that auctions are less efficient sales mechanisms for agricultural products than other mechanisms, in particular contract sales. Some forecasters even suggest that the Dutch flower auctions, which today move many millions of tonnes of flowers and nursery crops per year, will soon be supplanted by increasingly more effective web-based marketing systems that allow virtually instantaneous trade across international borders.

Two examples of agricultural auctions today seem to be exceptions to the above generalization. These are the small-volume fresh produce markets in the United States of America (Pennsylvania in particular) and local, small-volume rubber auctions in Thailand. The reported usefulness of auctions in obtaining good prices to farmers in these two contexts forms the basis for our research.

### **Pennsylvania produce auctions**

Small-volume produce and livestock auctions were common in Europe and North America until shortly after World War Two when an improvement in transportation and communication transformed wholesale marketing systems for fresh produce. As local food systems came increasingly to rely on supplies shipped from distant production sites, the need for localized production and sales decreased. Regional auctions in horticultural production areas initially grew as products became commoditized<sup>3</sup> but auctions were later phased out as farm consolidation led to markedly increased production capacity and contract production became more popular. Reliable historical information on the location and characteristics of auctions in North America and elsewhere has not been collected (Tourte and Gaskell, 2004; Brown, 2001) but, by the end of the twentieth century, only a handful of small volume auctions remained active in the United States of America, several of them in Pennsylvania. Today, there are about 11 fresh produce auctions active in Pennsylvania, clustered in the southeast and south central regions. There is, to our knowledge, no current count of the small-volume

---

<sup>3</sup> “Commoditization” refers to the process by which a product evolves from one that is somehow special in the market place into one which is little different from similar offerings and is sold on the basis of price alone.

auctions operating today in the United States of America or elsewhere, nor are there empirical studies of their economic benefits. It is known, however, that new auctions of this type have recently sprung up, generally initiated by groups of farmers supported by local agricultural extension officers acting on reports about successful auctions in other communities. Financing for these ventures may be offered by local government.

The persistence of small volume produce auctions in the United States of America is commonly attributed to the coherence of their membership base, a topic to which we will return later in this paper. The auctions are generally reported to be organized for the benefit of growers, not buyers<sup>4</sup>, while aiming toward fair prices for all. Although there is no formal literature on the subject, conventional wisdom among auction organizers is that the farmers who benefit from these auctions, in those locations where they are available, are likely to be:

1. farmers who cannot participate in the wholesale marketing system for technical reasons such as small volume of production, lack of a ready market for the niche products the farmer prefers to grow, or a poor farm location relative to market collection points;
2. farmers who choose not to participate in the wholesale marketing system;
3. farmers who spread risk by using numerous market channels;
4. farmers who produce too much to sell by direct market methods;
5. farmers who do not enjoy direct marketing;
6. farmers with a temporary glut and convenient access to an auction.

We believe that it is important to note that the Pennsylvania auctions exist in relatively densely populated regions with a wide range of marketing channels which farmers might also use.

### **Thai rubber auctions**

Since its integration into the commodity trade centred on the North Atlantic in the mid-nineteenth century, Thailand has had a classic market-led economy. The rapid emergence of Thailand as a major exporter, most famously of rice, but also of rubber, teak and tin, came on the basis of the integration of national trading networks into a liberal international economic order. The almost exclusive role of smallholders in Thailand's rice and rubber economies and the comprehensiveness of Thai integration into the worldwide market systems highlight the way that prices determined on world markets shape the evolution of local agriculture. That is, world market signals are as important in Thai national markets as they are in the country's international trade. These prices serve as the primary determinant of the allocation of scarce factors of production, in particular rural labour, among alternatives.

---

<sup>4</sup> While it is understood that buyers and sellers must both benefit from any transaction, market places can be characterized by whether their structures favour one over the other. Auctions, because they are thought to maximize the price received for an item are generally said to benefit sellers. In the sociopolitical context of small-volume produce auctions in the eastern United States of America, the auction's benefits to supposedly disadvantaged smallholder farmers are often stressed in public reports.

Thai smallholder rubber is linked to international markets through a highly developed, efficient system of international price determination and purchasing, centred historically on Singapore and dominated by members of the Hokkien Chinese speech-group.

Historically, auctions did indeed lie at the core of the Hokkien rubber marketing system. In London, New York, and above all at dock-side in Singapore, auctions for Southeast Asian smallholder rubber determined prices across Singapore's transnational rubber-producing hinterland, including southern Thailand. Before the establishment of branches of Singaporean and Malayan firms in the early post-1945 period, local smokehouse operators and exporters monitored radio broadcasts of rubber prices. Local managers of these firms and the lower-order buyers that connected them with rural producers were well-informed of price fluctuations on the international, and thus the local rubber market. In abstract terms, all participants in the Thai rubber economy were price takers based on benchmark prices determined elsewhere.

Thus, the sort of price uncertainty that typically explains recourse to auctions did not appear. In addition, it is an open question whether the volume of rubber traded in Thailand as a proportion of the total international trade would have given the local market enough power to influence price determination outside the international benchmarks.

These realities understood, how then do we account for the recent initiation of auctions for smallholder rubber in Thailand? Quantitative data on the Thai rubber sector is notoriously difficult to obtain. As yet, we have been unable to gain much headway in our investigation of the reasons why small-volume auctions are so highly considered. In particular, the analysis of price trends across market locations is incomplete.

### **Research questions**

Our research begins with the observation that small volume auctions of rubber in Thailand and of fresh produce in the USA are increasing in number and are praised for their ability to get high prices for farmers. Our hypothesis is that in some circumstances, auctions represent a more advantageous sales mechanism for small- and medium-scale farmers than other options to which they have access. This hypothesis leads to a number of research questions beginning with the fundamental question of whether the observations and case studies that are presented in the (mostly) popular press are really true or if auction observers are misinterpreting what they see. What evidence of higher returns from auction sales exist? Are there real time savings in auction selling? If not, how did the idea that they are better for farmers arise?

If auctions can be shown to offer benefits for some farmers and that these benefits are superior to other available options, then we must ask what theoretical and practical advantages are demonstrated by these auctions? Do American and Thai auctions use the same mechanisms? What benefits do these growers get from auctions that they do not get from other market mechanisms? What are the factors that determine success in the auction setting? Is the primary benefit economic (higher returns on investment) or social (better business connections, market information, and the like)? To what extent is farm location a factor in the success of auctions?

What lessons can be learned from auctions in Thailand and America? Can auctions be promoted as development tools to improve profitability for farmers in a wide range of situations in developed and less-developing economies? If so, when and how do you introduce small-volume commodity auctions for commodities and niche products in contexts where there is not much local experience with auctions? What institutional structures are required for auctions to succeed?

### **Progress to date**

Our research is only in the very early stages, but we can offer some findings, unfortunately based mostly on anecdotal evidence.

Our initial scrutiny of the two scenarios identifies several similarities and differences between the case studies that complicate the research methodology. The most obvious difference is that fresh produce is perishable while rubber is not. Thus the speed of auctions offers advantages for vegetable growers that perhaps are not as important for rubber growers.

Another difference, which was mentioned earlier in this paper, is that rubber is commoditized. Horticultural products of the kind that flow through the Pennsylvania auctions are not. This, in turn, leads to what may prove to be the most difficult issue to incorporate into the analysis; the fact that buyers of fresh produce in Pennsylvania auctions represent a different class of buyer than Thai rubber buyers.

A third issue which must be explored is the notion commonly put forward in the United States of America, that auctions are successful because the organizing committee is socially cohesive. While good management is certainly important in any business, is an unusually strong bond between auction organizers actually important to the successful realization of profits? This, on the face of it, seems unlikely. There are also nuances in the auction setting that are linked to farm size and auction volumes which may prove to be important in the final analysis.

### **Findings**

Based on the information gathered to date, we believe that the market mechanisms of auctions in the two scenarios will be different, perhaps so different as to derail the research project altogether. Our reasoning is as follows:

Thai rubber auctions are clearly traditional agricultural wholesale markets that function to consolidate supplies in rural areas where other marketing options are unavailable or are too time-consuming to access. Buyers, sellers and institutions represented at these auctions are not segmented. Quality criteria are standardized and adherence to this standard largely determines a price consistent with fluctuations in the world market. The Thai auctions most likely offer a time saving mechanism to buyers and sellers, which, although important to profitability, is not the same as a higher net price.

Pennsylvanian horticultural auctions are very different. The most obvious difference is that Pennsylvanian auctions are characterized by a greater diversity of buyers, sellers and institutions. Buyers at Pennsylvanian small-volume produce auctions can generally

be characterized as businesses that deal directly with the final consumer. These buyers hold subjective political or aesthetic motives for attending the auction rather than buying from the national wholesale system. Within this general description of buyers, we find a great range of subjective criteria.

Who are these buyers? They may be restaurateurs who want best quality, perfectly ripe produce, non-standard varieties, produced using alternative production methods such as organic. These buyers are also likely to buy some proportion of damaged goods (for sauces and other uses where beauty is not a factor) so long as the product meets other aesthetic criteria. Other buyers might be farmers who operate road-side stands or farm markets who are supplementing their own production. These buyers want ready-to-eat, good quality products with high retail sales appeal. These buyers may also want to be able to advertise “locally grown” products. Depending on location, buyers might include a sprinkling of small institutional buyers such as managers of nursing homes, food kitchens, privately-owned schools, or church groups. These buyers want good quality products that are suitable for industrial food preparation. The transactions at these auctions, although they are wholesale business-to-business sales, exhibit social characteristics more similar to farmer-to-consumer direct marketing.

It is clear, based on the characteristics of the buyers at these auctions, that unlike the Thai auctions, there is little or no consolidation going on. Although we ourselves are not inclined to develop mathematical models in the course of our research, the task of modelling a market where price, quality and volume are nearly independent seems almost impossible.

### **Conclusion**

We can offer a few definitive answers about auctions at this stage. Much of the data we want is not available and some sources of information are averse to sharing what they know. The research protocols are proving difficult to conceptualize.

One of the most pressing issues is the need to quantify how much of the benefit attributed to Thai rubber auctions comes from improved profitability resulting from the auction mechanism, how much from time saving, and how much from the value of information exchanged during face-to-face competitive bidding. That is, are the better prices reported a result of the auction itself or of the gradually increasing quality of the rubber on offer?

We are convinced that if we are to continue to investigate the modern auction as a sales mechanism for agricultural products, and especially if we want to promote auctions as a tool to help small-scale farmers, we must broaden the range of descriptors and of products being considered so as to include high volume auctions and auctions of non-perishable commodities such as tea and tobacco in the comparison. We will also have to figure out how to collect quantitative information on the auctions of greatest interest. Eventually we believe it will be necessary to develop a multi-dimensional characterization that discusses how auction mechanisms work along a continuum of farm size, product commoditization, availability of other sales mechanisms, and cultural familiarity with auctions.

This original rather simple research activity has thus become a rather daunting task with wide international implications. We hope that by publishing interim reports such as this, we may spark greater debate among researchers in several disciplines and that this debate will lead to a greater understanding of the role auctions can play in modern agricultural marketing.

### References

- Brown, A.** 2001. Counting farmers markets. *Geographical Review*, 91(2): 655-674.
- Klemperer, P.** 2004. *Auctions: theory and practice*. Princeton, New Jersey, Princeton University Press.
- McAfee, R.P. & McMillan, J.** 1996. Analyzing the airwaves auctions. *Journal of Economics Perspectives*, 10: 159-175.
- McAfee, R.P.** 1993. Mechanism design by competing sellers. *Econometrica*, 61(6): 1281-1312.
- McMillan, J.** 2002. *Reinventing the bazaar: a natural history of markets*. New York, Norton.
- Milgrom, P.** 1997. Putting auction theory to work: the simultaneous ascending auction. Technical Report, Stanford University, Department of Economics. Revised 4/21/1999 and later published in many forms.
- Milgrom, P.** 1989. Auctions and bidding: a primer. *The Journal of Economic Perspectives*, 3(3): 3-22.
- Milgrom, P. & Weber, R.** 1982. A theory of auctions and competitive bidding. *Econometrica*, 50(5): 1089-1122.
- Tourte, L. & Gaskell, M.** 2004. Horticulture auction markets: linking small farms with consumer demand. *Renewable Agriculture and Food Systems*, 19(3): 120-134.

## **The European tropical fruit market: constraints and opportunities<sup>5</sup>**

D. Loeillet  
CIRAD  
FRANCE  
Email: denis.loeillet@cirad.fr

### **Abstract**

*The international fresh fruit and vegetable market represents approximately 100 million tonnes. It is one of the agricultural sector's most internationalized products: more than one fruit in every ten has been the subject of an international exchange. However, the majority of trade occurs around just three fruit: citrus, apples and banana. Nonetheless, there is a significant and growing trade in tropical fruit. Growth rates in this category are significant and include pineapple, mango, avocado, litchi and papaya. It is all the more impressive to note that this development is occurring in the more developed markets where fresh fruit consumption is stagnating and even falling. The principal constraints which impact on the fresh fruit sector include: (1) the need to modify the modes of consumption – the increasing importance of consumption away from home and the increasing competition from processed products containing fruit; (2) the increasing power of the multiple retailers – concentration of distribution and price competition; (3) globalization – the increase in suppliers and erosion of price premiums; and (4) the reduction in margins at the production level. Conversely, many opportunities are available to be seized. The health benefits of consuming fresh fruit and vegetables are significant. Tropical fruit offers pleasure and innovation. But such opportunities can only be captured if the public sector works in conjunction with the private sector to demand standardized products, to regulate plant health and to ensure product traceability. In part, this has resulted in the emergence of GLOBALGAP. Taking pineapple as an example, the specificities an importer faces in consigning tropical fruit to Europe will be explored: innovation, competition, logistics, marketing policy, plant health regulation, certification, consumption patterns, prices and margins. As market research cannot be undertaken without data, a short presentation of the principal sources of information will be provided.*

### **Introduction**

My presentation this morning will be limited to the European fresh tropical fruit market. In a few minutes I will give you an overview of the European market, its opportunities and its constraints. I will give you a description of the tropical fruit market in Europe and a case study on the fresh pineapple market. This case study will illustrate all the constraints and opportunities identified.

---

<sup>5</sup> The following paper is an edited transcript of a presentation delivered to the International Symposium on Fresh Produce Supply Chain Management



## **The European fruit market**

In 2005, total fruit imports were approximately 11 million tonnes. Of this quantity, 1.5 million tonnes was tropical fruit, not including bananas. More interesting, however, is the dynamics of the market. If we study European tropical fruit imports over the period from 1988 to 2005, we notice that imports have increased three fold. On the other hand, the average unit value, while increasing significantly over the period, suddenly dropped at the beginning of 2000 to lose, in a few years, €200 per tonne, a fall of 7 percent.

The principal fresh fruits imported in the European Union are pineapple (43 percent), tropical nuts (14 percent), mango, mangosteen and guava (13 percent) and avocado (12 percent). Other tropical fruit represent 18 percent of imports or about 250 000 tonnes in 2005. It should be noted that European customs rarely distinguish between tropical fruits except for papaya, dates and cooking banana or plantain.

Since 1988, all tropical fruits, without exception, have posted impressive growth rates. However, the performance of pineapple is exceptional. The volumes have doubled over the last decade. Mango also shows very interesting dynamics in terms of volume, but there has been a consistent decline in its unit value, by about 40 percent. Approximately 100 countries supply the European market. Mango is available throughout the year. Brazil is the leader in this market with more than 40 percent of market share. Central and South America hold the majority of the market and only Israel, West Africa and South Africa that try to compete.

The market for papaya has accelerated from less than 20 000 tonnes at the beginning of 2000 over 40 000 tonnes in 2005. This is primarily due to the development of sea freight from Brazil and the recent interest from German discounters like Aldi. Import prices are clearly retreating; papaya has lost a quarter of its value in five years.

Litchi is a very, very particular market with very strong seasonality. Supply extends from the end of November with fruit coming from Mauritius and Reunion Islands. Supply develops quickly with the arrival of fruit in the second half of December from Madagascar and South Africa by sea containers or reefers until March. From April to May, a small quantity comes by air from Asia. With the arrival of the fruit shipped by sea from Madagascar, the import price drops. The demand seems unlikely to exceed 30 000 tonnes per year which remains concentrated over one rather short period of the year and within limited European countries.

The market for passionfruit is very narrow, with supplies arriving from Kenya, Colombia, Zimbabwe and South Africa. For pittaya, fruit is sourced from Colombia, Malaysia, Viet Nam and Israel. For much of this fruit, the customs' codes do not enable us to capture the diversity of the offer; the range of fruit available is much larger than the list of codes. Trade may take place for just a few tonnes or a few hundred tonnes, perhaps even a few thousands of tonnes.

### **Characteristics of the tropical fruit market**

For tropical fruit there are many unique features: the limited life span; the use of innovative post-harvest techniques; the temperature of transport adapted for each product; and the use of the cold chain or the warm chain throughout the distribution. From a commercial point of view, the European market is characterized by very strong competition. Except for fruits like the litchi, supply is now available all year round due to the capacity to source the fruit worldwide.

Mango is available all year round; the countries of origin follow one another. We see a similar situation for avocado. The calendars between green varieties and Hass varieties are common and for each month, fruit is available from at least three major countries.

Individual countries can seek to extend their presence in the market through developing new varieties. Take Spain for example: Spain has extended its presence in the citrus market through introducing new varieties, which extend the season of supply.

Competitiveness does not however depend on the product itself but, rather, there is a raft of factors which must work together to make an offer which is competitive. This will include the effectiveness of the production and commercial organization, presence in the market, a logistical organization that runs well, additional services like promotions and communication, and working with a mid- to long-term view, not thinking only in the short-term.

As the European consumer becomes more and more selective, the market becomes more and more competitive. Producers have to share the consumer's stomach with numerous other products. Producers must also deal with a demography which is not favourable: the population is aging and thus there is very little real growth. Competition will also come from other food products; dairy products, for example, and substitute products; fruit juices are very serious competitors for fresh fruits.

Another fundamental of the European market is the very inequitable sharing of the added value. If we look at the distribution of the value added for dessert banana between the producer and the consumer, the gross margin is concentrated towards the downstream sectors. Particularly for tropical fruit, we must always consider the various costs associated with the logistics utilized or made possible by the application of post-harvest technologies. For example, whether litchi is transported by sea or by air will have a very significant impact on the final cost. This may range from as much as €2–8 per kilogram.

Another characteristic of the European market is its very strong concentration in terms of distribution; in particular, the dominance of the multiples in northern Europe, the United Kingdom, Germany and France. The hypermarkets, supermarkets and hard discounters realize between 68 and 83 percent of the sales for fresh fruit.

For new and exotic fruit, the retail price is often significantly higher. Tropical fruits, like all other products, adhere to the product life cycle. They pass through an introductory phase, a development phase, become mature and the finally decline. Each

fruit has its own life cycle. Indeed, pineapple is the perfect example which shows how the life cycle can be reactivated thanks to a technical innovation, in this case a new variety of pineapple. The case of papaya is also interesting. It shows how a change in logistics made it possible for the fruit to move from introduction to development.

The demand for tropical fruit in the European market is very seasonal. Tropical fruits are consumed for the festive periods at the end of the year, Chinese New Year, Ramadan and Easter. Differentiation also occurs in the market on the basis of the mode of production, organic, fair-trading, by varieties, and occasionally on brands.

Public authorities are involved in setting up regulations like the minimal conditions for accessing the European market, phytosanitary regulations, and so on. However, private institutions are also involved in managing the quality of fruit imports through their own quality assurance schemes. Two such standards seem to be crucial at the moment: the maximum level of residues from the public health point of view and the GLOBALGAP certification from the private point of view.

### **A case study – pineapples**

The outstanding performance of pineapple in the international food sector makes it a star. The fresh world pineapple market is about 1 700 000 tonnes and it is difficult not to be enthusiastic about the international fresh pineapple market. Fresh pineapple imports have doubled since 1999 into both Europe and the United States of America. This exemplary performance has arisen, in part, from the emergence of sweet pineapple. In the mid-1990s, the European market lost its dependence on just one variety, Smooth Cayenne, from one origin: the Ivory Coast. The new variety, extra sweet MV2 was developed and Costa Rica emerged as a new origin and a new market leader. While Costa Rica developed very rapidly, it would be wrong to surmise that this success was the result of a simple combination of origin and variety. It is true that variety has proved its worth both in the field and on the supermarket shelves. However, nothing would have happened without the involvement of a transnational corporation, Del Monte, which provided both a logistical and commercial strategy. Costa Rica emerged as the result of rationalization of production, reliable and rapid logistics, efficient organization of sales and a powerful marketing plan.

As a result the MV2 entered the high-quality segment and gradually gained a superior market position. The Ivory Coast was elbowed out of its own market in Europe in only a few years by Costa Rica matching its success. However, the Del Monte honeymoon is coming to an end. In a market where one is so successful, it's not difficult to attract a competitor: Dole, Chiquita, Fyffes and Noboa have each developed their own supply chains, first in Costa Rica, but then extending to Latin America and Africa. Sweet pineapple has dominated the market, taking the top spot from Smooth Cayenne.

Although the battle has already been lost to some extent, Del Monte has announced that it possesses a new variety, Honey Gold, but in the current more competitive market it will be difficult to replicate such a success.

DELEGATE: On the way to this symposium I was reading an article in an English newspaper about Prince Charles, who has a brand of products which he markets. On this brand of products he now indicates the contribution each product makes to global warming. At the same time, the article noted that several restaurants in London and other parts of the world are beginning to talk about the number of air miles that were involved in getting produce onto the table. At a time when the effect of air transport on global warming is beginning to get increasing attention, what implication could this have for the European market for airfreighted fruit and vegetables?

MR LOEILLET: While the market is not yet considering this, work is ongoing to identify more cost-effective ways to reduce the cost of shipping through the development of appropriate post-harvest technologies like sulphur for litchis, or biologically active films for mangoes.

DELEGATE: I found the presentation very interesting, but you conclude by saying that it will be impossible to duplicate this type of success as far as pineapples are concerned. Can this type of success be observed for crops such as banana? You mentioned small banana, or mango; probably a new variety, because the mango has a lot of constraints as a product itself.

MR LOEILLET: If you want to match this kind of success, you have to meet all of the market requirements: a good product, an innovative product and have a very good marketing organization in Europe. For example, Del Monte has segmented the market in Europe into two parts: one part in the north, the other is in the south, so that one product does not compete with the other. You have to protect your innovation and that is the reason why Del Monte has now protected this new variety. To meet all of these things, it is very difficult for a small producer.

## **Economic analysis of value addition along the supply chain of fresh and semi-processed products – the case of *totapuri* mango in South India**

M. Sudha  
Indian Institute of Horticultural Research  
Bangalore  
INDIA  
Email: sudhamys@yahoo.com

F. Kruijssen  
Bioversity International  
Serdang  
MALAYSIA

### **Abstract**

*India is home for over 1 000 varieties of mango and accounts for over 38 percent of the world's mango production. Although exports represent barely one percent of total production, India is still the second largest exporter of mango. Because exports generate higher returns, efforts have been undertaken by government and non-government agencies to expand the varietal base and to comply with international production and packaging standards for fresh, semi-processed and processed fruit products. One of the major varieties used for mango pulp is totapuri. This variety is mainly grown for processing purposes, especially for export. In south India, the main source for totapuri pulp is Chittoor district in Andhra Pradesh, a major market hub for fresh mangoes and home to over 50 semi-processing units that cater to the pulp requirements of domestic and export markets. Most of the units are small scale and require limited investments. Nevertheless, there are a few large scale processors with state-of-the art technology that is required to meet the quality standards of importing countries. The mango supply chain is typically characterized by a large number of actors and outlets, including wholesalers, market agents, retailers, processors and exporters, and a number of other smaller actors, each contributing to a specific stage in the market chain. An economic analysis of the value addition made at the various stages along the market chain is of interest to understand the role of each of the market intermediaries, the risks associated at each level and the distribution of margins among the actors in the chain. This study, based on a sample of 47 growers and 15 other market chain actors, analyses the marketing practices, costs, returns and value added across the supply chain for totapuri mango. The study highlights the constraints in the market chain such as the lack of market information and appropriate technology and limited access to working capital for small-scale processors. Large-scale units need to ensure sufficient supply to operate their factories at full capacity in order to break even. The mango supply chain is not yet integrated and a stable supply of raw material is therefore not guaranteed. This paper attempts to provide alternate strategies for market integration for export oriented production of semi-processed mango.*

## Introduction

Value addition in a production process is only effective if the final consumer is willing to pay for it and the value addition is distributed to all actors along the supply chain. How efficient and equitable this distribution is depends on the movement of three associated but distinct flows along the chain: the physical, monetary and information flows (Crawford, 1997). The smooth functioning of the first is mainly dependent on access to the third, which in turn depends on a number of factors such as technology, infrastructure, policy and financial resources, which are governed by the market forces. This is especially a challenge in the supply chains of highly perishable commodities like horticultural products.

Cross-border supply chains involving horticultural produce have proven to be an instrument that stimulates development of local agro-industry, generating employment and improving access to technology, if the connection between the producers and the different actors within the chain are well managed (van Roekel *et al.*, 2002; Diop and Jaffee, 2005). Although cross-border supply chains for mango pulp have been in operation for some time in India, they are characterized by the absence of coordination or “risk sharing among the participants across the chain” (Preckel *et al.*, 2004).

The Indian agricultural export basket, which comprises both fresh and processed products, is traditionally dominated by mango, although efforts aiming at diversification to other products are clearly visible. Semi-processed mango in the form of mango pulp is especially important, comprising over 25 percent of the export of processed fruit and vegetables and over 80 percent of all mango products (Sudha, 2003).

As the world’s largest mango producer, India accounts for approximately 38 percent of the world mango (*Mangifera indica*) production and is home for over 1 000 varieties. Among the 20 commercially cultivated varieties, *alphanso* (from the western part of India) and *totapuri* (from the south), are the two varieties which cater to the domestic and export demand for both fresh and processed fruit. According to traders in Chittoor, over 80 percent of the *totapuri* produced is processed into mango pulp, of which about half is exported, while the rest is used domestically for manufacturing into juices, jams and other mango products.

Although India has been exporting mango pulp for over three decades, the existing supply chains are not benefiting the actors along the chain equally. In this paper, an attempt has been made to examine the status and function of the supply chain for the variety *totapuri* in Chittoor district in South India.

## Materials and Methods

Data for this paper was collected in the context of a project on the conservation and use of tropical fruit diversity funded by UNEP/GEF. A survey was conducted during the harvest season in June 2006, involving 47 commercial mango growers from the Chittoor district of Andhra Pradesh. Key stakeholders, including five preharvest contractors, three semi-processors and five retailers were also interviewed. Questionnaires were designed to collect information on a range of themes including general household

information; the costs, returns and profit from mango production; the marketing strategies used; and access to credit, insurance, information and networks. The data was analysed using simple descriptive tables to highlight the constraints and prospects of maintaining the supply chain.

## Results

### Mango in Chittoor district

The south Indian state of Andhra Pradesh accounts for 21 percent of the country's mango area and 25 percent of production. Productivity averages 8 tonnes per hectare. Chittoor district, which comprises an area of over 52 000 ha, is the main mango belt. It contributes about 15 percent of the region's mango production (Government of Andhra Pradesh, 2005).

In the farmer's fields up to ten commercial varieties are commonly found with, on average, about four varieties per farmer in our sample and with *totapuri*, *neelam*, *banganpalli* and *alphanso* (locally known as *badami*), being the most extensively planted. Estimates indicate that from the total annual production of 427 000 tonnes, *totapuri* contributes 70 percent (Ministry of Agriculture, 2005). In our sample 93 percent of farmers had some *totapuri* trees making up 60 percent of the total number of trees.

Chittoor is home to over 50 small- to medium-scale semi-processing mango units, located within a radius of 50 km from the mango orchards. These units operate during three months in the year, converting fresh mango (mostly *totapuri* and to a lesser extent *alphanso*) into pulp. In 2003, they collectively processed pulp to the value of US\$26.5 million (Mahendradev and Rao, 2004). Chittoor also has a large wholesale market where the commercial varieties are traded both for fresh and processed consumption, although mango for processing purposes is also supplied directly to processors as they are located near the production centres.

Mangoes in Chittoor are usually produced in a mixed commercial orchard which maintains a number of varieties and trees of different ages. The orchards in this region are mainly large farms of over ten hectares each, although farm size varies from less than one to over twenty hectares. About 50 to 80 trees are cultivated per hectare, which necessitates an initial set up cost of US\$114 per hectare. Because they constitute an important source of farm income, mango orchards in the region are usually well maintained. An annual application of farmyard manure and the occasional application of fertilizers and irrigation are undertaken as part of regular orchard maintenance. The annual maintenance costs vary with the bearing age of the trees in an orchard and range on average from US\$114 to 777 with the largest quantity of fertilizers, manure and pesticides applied during the peak production years of the tree (up to about 40 years).

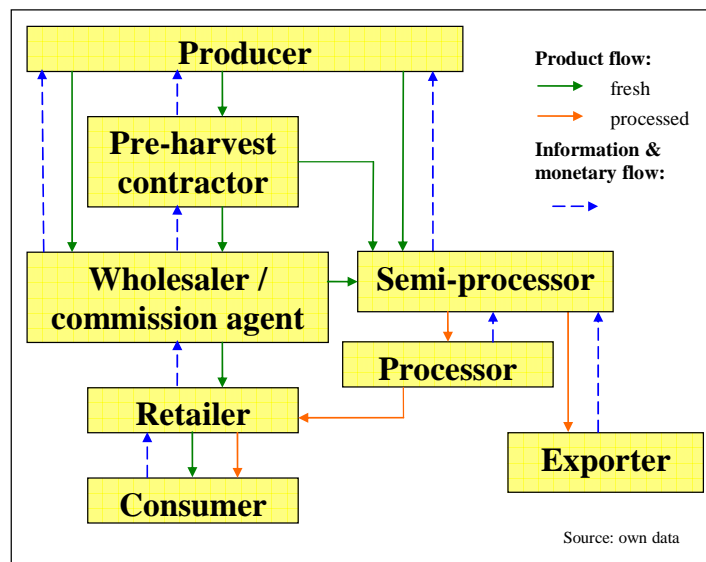
Mango trees come into bearing from the fourth year after planting and continue to yield for up to 60 years. However, the economic benefits are highest 8 to 40 years after planting. A full-bearing, fully grown mango tree can yield up to 60 kg, although mango cultivation is constrained by biennial bearing. This specific characteristic of mango trees

requires appropriate strategies to deal with the instability in production, such as diversification in age and varieties.

### The mango market chain

Figure 1 presents a simplified diagram of the market chain and shows the product flow and the information and monetary flows, which flow in the opposite direction.

**Figure 1: Simplified diagram of the fresh and processed mango market chain**



The market chain of fresh and processed mango is characterized by a large number of actors and a number of alternative marketing channels.

Irrespective of the variety or orchard type, mango is mainly sold through preharvest contractors (PHCs), although farmers also market the product themselves. The PHC enter into a contract with the farmer three to four months prior to the harvest season, based on the flowering of the orchard. The PHC will also undertake some of the maintenance of the orchard. The PHC enters into contracts with several farmers and is therefore able to achieve economies of scale by amassing the produce. By entering into a contract with the PHCs, farmers transfer their production and marketing risks down the market chain. The specific characteristics of mango production and sale – such as the biennial bearing of mango trees, high transaction costs and the lack of access to credit – encourage producers to enter into an agreement to sell to the PHC.

Although much has been accomplished to enhance the marketing infrastructure, such as establishing markets nearer to production centres, the dominance of the PHCs still persists due to the characteristics of mango production and marketing already described and the need of growers to mitigate their risks. The farmer or the PHC transports the harvested mango to the wholesale market, where it is auctioned by a wholesale or commission agent. The commission agent owns or rents an auction lot during the mango season and auctions the fruit to processors, retailers and petty vendors. To facilitate these transactions, the commission charges a fee to both the seller and the buyer. A few large-scale farmers also sell directly to processing units.



Given that the processing units are located close to the production centre, the farmer has the option of supplying directly to the processor. Most of the processors are small-scale canning units with investments up to US\$50 000 (with a capacity of 10 tonnes per hour) (Ministry of Agriculture, 2005). There are only a few units with state-of-the-art technology for undertaking aseptic packaging, which necessitates an investment in excess of US\$125 000 (5 tonnes per hour capacity). The process for aseptic packaging, which produces a higher quality product with a higher market value, is more rigorous and time consuming than that of the canning process and requires much more costly processing equipment.

The processing units undertake customized processing based on orders from exporters. The raw material and the packing material (tin cans) are supplied by the exporter, while the semi-processing units simply convert the fruit into pulp using the available infrastructure and labour. The amount paid to the processor to conduct this activity is US\$50 per tonne of pulp. Processing units also undertake their own processing, procuring the raw fruit from the market. Working capital of over US\$50 000 per export container (6 000 cans or 18.6 tonnes of pulp) is required. The final product of this processing stage is a semi-processed product, mango pulp, which is usually canned or in some cases packed in aseptic packaging. The exporter bears the costs of transporting the pulp to the port and exports to different destinations by sea.

### **Value addition and margins in the chain**

In the marketing chain, each market intermediary performs a specific function or value-adding activity, in anticipation of remuneration that is directly proportional to the quality of the service rendered. However, when power in the chain is not equally distributed among the chain actors, there will be no equitable division of value added in the chain. This concentration of power with a specific market intermediary stems from their access to market information and their ability and capacity to take higher risks, thereby leading to differences in margins among the supply chain actors (Preckel *et al.*, 2004). Although bearing of higher risk should be rewarded, a lack of transparency in the chain causes disproportionate differences in the margins at different levels in the chain. In this paper, an attempt has been made to analyse the production and marketing costs and margins along the market chain for both fresh and processed mango. The market chain of processed *totapuri* is analysed up to the level of export, therefore the semi-processor's sale and margins are also calculated as a share of the export price.

Table 1 presents the costs and margins for fresh and semi-processed *totapuri*. These figures are based on averages of the sample and comprise all costs incurred in the chain. The highest margin in the fresh *totapuri* chain is earned by the retailer (28 percent), followed by the wholesaler (16 percent), farmer (10 percent) and lastly the PHC (9 percent), whereas in the processed chain, the exporter receives the highest share (17 percent). The PHC in this chain is better off than in the fresh chain (11 percent) and is only then followed by the processor (7 percent) and finally the farmer (6 percent).

In real terms there is no price difference for the farmer. However, as indicated above, their relative margin is lower in the processed chain. The PHC however is able to increase the margin in real terms due to the elimination of the commission agent (and thus paying commission) from the chain. Transport and handling costs are also reduced

due to direct delivery to the processing units that are located nearer to the farmer fields and the fact that less sorting and handling is involved than in the wholesale market.

**Table 1: Marketing margins and price spread**

Fresh			Processed		
	Value (Rs/kg)	Percent of total		Value (Rs/kg)	Percent of total
<b>Farmer</b>			<b>Farmer</b>		
Net price	1.63	10.19	Net price	1.63	6.14
<b>PHC</b>			<b>PHC</b>		
Buying price	3.00	18.75	Buying price	3.00	11.30
Costs			Costs		
<i>Transport</i>	0.12	0.75	<i>Transport</i>	0.01	0.04
<i>Handling</i>	0.30	1.88	<i>Handling</i>	0.01	0.04
<i>Commission</i>	0.42	2.63	<i>Commission</i>	0.01	0.04
Margin	1.41	8.81	Margin	2.97	11.19
<b>Wholesaler</b>			<b>Processor</b>		
Buying price	5.25	32.81	Buying price	6.00	22.61
Costs	0.65	4.06	Costs	0.06	0.23
Margin	2.60	16.25	Margin	1.91	7.20
<b>Retailer</b>			<b>Exporter</b>		
Buying price	8.50	53.13	Buying price	7.97	30.03
Costs			Costs		
<i>Transport</i>	2.50	15.63	<i>Cans</i>	3.33	12.56
<i>Handling</i>	0.50	3.13	<i>Reforming &amp; filling</i>	1.67	6.29
Margin	4.50	28.13	<i>Packing</i>	0.02	0.09
			<i>Transport to port</i>	0.25	0.94
			<i>Sea freight</i>	2.53	9.52
			<i>Commission</i>	0.64	2.41
			<i>License</i>	5.56	20.95
			Margin	4.57	17.22
<b>Consumer price</b>	16.00	100.00	<b>Export price</b>	26.54	100.00
Price spread	14.37		Price spread	24.91	

Some large-scale producers who are located in the vicinity of the processing units are able to make direct deliveries to the processing units, thereby substantially increasing the margin they receive. The processor's margin reflects the level of risk undertaken by this chain actor, for the work is contracted and own-investment is thus limited. This results in a relatively low level of risk and low costs. Along the market chain of processed mango, the fruit is increasingly bulked due to a concentration of the produce with a reducing number of players at each stage in the chain. This implies that income, in real terms, will increase along the chain.

The difference between the price paid by the ultimate consumer and the price realized by the producer is the price spread. In the case of fresh and processed *totapuri*, this is Rs14.37 and Rs24.91 per kg respectively. Although the price spread is significantly different in the two chains, because the costs involved in processing are much higher,

this is not reflected in the margins earned in real terms. Processing costs are divided among two chain actors, the processor who only incurs the labour costs and the exporter who bears all other expenses and more risk. Consumer prices for fresh product are based on the average in the sample and thus reflect differences in quality. Processor prices are predetermined by buyers before the start of the harvesting season.

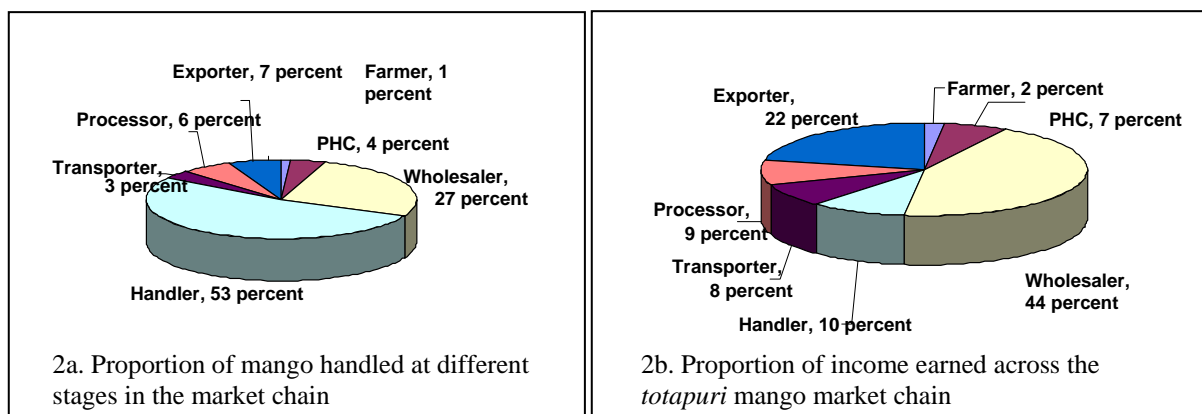
**Employment creation**

Besides the prominent actors in the chain such as the PHC, wholesaler or commission agent, retailer, processor and exporter, others can also earn an important part of their livelihoods by participating in the mango trade. Employment is provided to a large number of people who are involved in odd jobs such as loading and unloading, sorting and grading at the market yard and sorting, cleaning, cutting and packing at the processing unit. Also transport at all stages in the chain provides employment for many.

During the mango season, families temporarily migrate to the market in the urban area or the processing units from as far as 200 km away to earn a living. During those years when the quantity is high, it is not uncommon that some of them also act as small (on the spot) retailers.

Jobs performed at the processing level are under threat by the increased use of automated machinery that is required for the aseptic packing. Figure 2a shows the share of mango handled by different actors involved in the mango chain at all stages. The “handler”, who can be a loader or sorter at the wholesale market or processing unit, seems to handle a disproportionately large share of mango. This is due to the fact that these actors handle the mango at several stages in the chain. These costs were shown in the table as handling costs. Comparing this share to the proportion of income as depicted in Figure 2b, it becomes clear that the income they earn for undertaking this job is low.

**Figures 2a and 2b: Proportion of quantity handled and distribution of margins at different stages in the mango market chain**



As can be seen from Figure 2b, the wholesaler and exporter earn the highest margin in the totapuri trade.

**A model for integrating production and processing through marketing for quality and sustainable production**

With the increased attention on food safety standards, the demand for aseptic packaging of pulp for the export markets is increasing. This type of process requires substantial investments in sterile processing and packing technology and material and laboratory testing facilities. In south India, there are only two such units: one in Chittoor and one in Bangalore. Because the daily requirement of raw material for these units is around 160 tonnes of fresh mango (24 hours after which the process is interrupted by a sterilization process required for production according to Hazard Analysis Critical Control Point standard), sourcing of raw material in the appropriate quantity, with the required maturity, for the requisite price, is a crucial constraint in the process. With the high level of fixed investment involved, it is essential for processors to utilize the unit at full capacity at all times during the mango season. The international buyers fix the price of mango pulp before the start of the harvesting season and processors therefore face a large profit reduction when the price for raw material rises.

In view of the vast investments involved in the advanced (aseptic packing) processing units and their raw material requirements, efforts have been made to develop a cost-effective yet sustainable model to integrate production and processing with the required quality for the export market. The “Horticultural Mission” of the Indian Government (an initiative launched in 2003 that aims to reform the horticultural sector), research organizations and private entrepreneurs are aiming to establish technology parks in the mango producing areas that have the potential for processing and export-oriented production. As a first step in this direction, the Government has identified areas that have a large area under mango as “Agro Export Zones” (AEZs), where several incentives are provided to producers and processors to improve their production.

Two models have been introduced to attain vertical integration across the chain. The first aims to create infrastructure, i.e. setting up state-of-the-art processing technologies on a large scale, close to the production centres. As a result, the link between farmers and processors is strengthened. Although this model, introduced in the mid 1990s by the Indian Tobacco Company (ITC), is successful to a limited extent, the benefits of market information have not trickled down to the farmer. With the number of semi-processing units in the area increasing over the years, farmers, PHCs and commission agents alike allege that processors are controlling the market price by forming cartels, resulting in a major reduction in the specific advantage of this infrastructure.

Secondly, the government has made efforts to promote the establishment of so-called “Technology Infrastructure Parks” (TIPs), which provide centralized facilities for processing and packing to producers or semi-processors who wish to set up a processing centre at reduced rates, thereby allowing them to utilize the resources and reduce their fixed investment costs and overheads, resulting in higher profits. In addition, the central unit also offers market information on quality parameters, standards, arrivals and prices in different export destinations, in order to assist entrepreneurs to benefit from trade. It is important to ensure that the price benefit realized by an effective market information system is distributed along the market chain. This second effort however has also failed to achieve the vertical integration intended. A few large processors dominate by

acquiring the produce of small-scale players operating on job work or customized processing, thereby still benefiting from economies of scale.

Apart from the interventions at the processing level, efforts are also required to minimize or eliminate the apparent oligopoly at the wholesale level, which has been indicated by many as a major barrier for a more equitable distribution of margins along the chain (Deodhar and Pandit, 2002; Gadre *et al.*, 2002). Otherwise, wholesalers may acquire a major share of the margin, disproportional to the role played and the risk taken. This will require collective action in a three-tier structure, grouping farmers at community level into self-help groups, identifying processors at the district level who procure fresh material directly from these groups and who, in turn, are integrated with exporters to export the semi-processed pulp under one brand name. Obstacles that have to be overcome for such an intervention to become successful are manifold and include export demand inconsistencies; lack of transparency and information sharing in the market in terms of price, quantity and quality; a lack of trust among the chain actors; difficult and cumbersome taxation policies; and the absence of initiatives to build brand names.

### Conclusions

Comparison of the market chains of fresh and processed *totapuri* mango has highlighted the constraints in the mango market chain. First of all, producers lack information about the differentiation in the chain and therefore are not rewarded in terms of price. The PHC bears a high level of risk, because it is transferred by the farmer through the closure of a contract during the flowering season, when the actual harvest can still be affected by many variables (such as weather and natural hazards). The margin earned by the PHC reflects this risk. On the other hand, the risk borne by the commission agent is very limited, while the margin at this level is very high. Dealing with the power of this intermediary would be an important step towards the more equitable distribution of marketing margins in the chain. At the processor level, there is a problem with regard to the lack of appropriate technology and limited access to working capital for small-scale processors. Advanced large-scale units, which have made substantial investments to acquire the appropriate equipment, on the other hand, have the problem of a constant raw material supply to operate their factories at full capacity in order to break even.

A solution to these processing problems may be offered by integrating the mango chain and the establishment of technology parks. It is also important to keep in mind the employment opportunities and the livelihood support the existing chain offers, and to make necessary arrangements to safeguard the income sources of all those involved.

Finally, it is important to note that the income of most of the chain actors largely depends on the mixture of varieties maintained in order to spread risk, prolong the mango season and benefit from varietal price fluctuations. Besides regoverning the mango chain, it is important to promote the maintenance of on-farm diversity.

### Acknowledgements

The authors are deeply grateful for the assistance of all growers, traders and processors of mango who were willing to share their valuable time and information for the compilation of this study. The authors gratefully acknowledge the funding from UNEP/GEF that has made the undertaking of this study possible, in the context of a project entitled “Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Diversity: Promoting Sustainable Livelihoods, Food Security and Ecosystem Services”. The support of the Indian Council for Agricultural Research (ICAR) is also highly appreciated, especially that of the Director of the Indian Institute of Horticultural Research (IIHR), Dr. S.D. Shikamany. To conduct the fieldwork, the researchers received much assistance from Mr. V. Dakshina Moorthy, also from IIHR.

### References

- Crawford, I.M.** 1997. Agricultural and food marketing management, FAO, Rome. (also available at [www.fao.org/docrep/004/W3240E/W3240E00.HTM](http://www.fao.org/docrep/004/W3240E/W3240E00.HTM))
- Deodhar, S. Y. & Pandit P.S.** 2002. Quality issues in supply chain: a case of Kesar Mango at Saurashtra Region. *Indian Journal of Agricultural Marketing*, 45( 3): 27-34.
- Diop, N. & Jaffee, S.M.** 2005. Fruits and vegetables: global trade and competition in fresh and processed product markets. In: Aksoy, M.A. & Beghin, J.C. (eds). *Global Agricultural Trade and Developing Countries*, pp. 237-257, Washington, D.C., World Bank.
- Gadre, A.V., Talathi, J.M. & Wadkar, S.S.** 2002. Price spread in marketing of white onion in Raigad District of Maharashtra State. *Indian Journal of Agricultural Marketing*, 45(3): 22-26.
- Government of Andhra Pradesh.** 2005. Area, production and productivity of horticultural crops in Andhra Pradesh, season and crop report. Government of Andhra Pradesh.
- Mahendra Dev, S. & Rao, N.C.** 2004. Food processing in Andhra Pradesh, Opportunities and challenges, Working Paper no. 57. Centre for Economic and Social Studies (CESS), Hyderabad, AP, India.
- Ministry of Agriculture.** 2005. Action Plan Andhra Pradesh, National Horticulture Mission. Ministry of Agriculture and Cooperation, Government of India.
- Preckel, P.V., Grey, A., Boehlje, M. & Kim, S.** 2004. Risk and value chains: participants sharing risks and rewards. *Journal on Chains and Network Science*, 4(1): 25-32.
- Sudha, M.** 2003. Export prospects of Indian horticulture products in the post-WTO regime. *Indian Journal of Agricultural Marketing*, 17(2): 84-96.

**van Roekel, J., Willems, S. & Boselie, D.M.** 2002. Agri supply chain management – to stimulate cross-border trade in developing countries and emerging economies. World Bank Paper. Washington, D.C., World Bank. (also available at [www.ifama.org/chainletter/letters/v2i2.pdf](http://www.ifama.org/chainletter/letters/v2i2.pdf))

## How supply chain management gives benefits to banana growers

S. Kuntarsih, T. Kustiati, D. Iswari and A. Dimiyati  
Ministry of Agriculture  
INDONESIA  
Email: srikuntarsih@yahoo.com

### Abstract

*Banana is one of the main horticultural commodities in Indonesia and it is one of the most important export commodities. In Indonesia, banana is mostly cultivated and distributed to consumers through a long and complex supply chain. This both limits the amount of good quality product that is available to consumers and the revenue that is available to growers. A study of the banana supply chain from Lampung district to the Cengkareng wholesale market in Jakarta indicated that 5–6 levels are usually involved in traditional supply chains. On the other hand, in Lumajang district, only three levels were employed. In traditional banana supply chains, most of the activities are performed by traders in the Cengkareng wholesale market, where the fruit is stored, ripened and offered to retail buyers. Product losses are high. In the improved banana supply chain, many of the value-adding activities are performed by farmer cooperatives. The improved banana supply chain has a better payment system where the cooperative buys the fruit from the growers in cash. However, in traditional banana supply chains, collector agents buy the fruit using three payment systems: advance payment, advance loan and credit terms. This results in the grower having a weak bargaining position. As the long chain distorts information on price and fruit quality, growers are often unaware of quality problems. As a result, they do not get a good price. In the improved supply chain, the cooperative provides guidance and advice to the growers about the quality that is required by consumers, resulting in a better price. By implementing improved supply chain management, it is possible to shorten the chain and increase the market value. Besides, modern retail markets require better quality fruit than the traditional banana supply chain.*

### Introduction

Banana is one of the main horticultural commodities in Indonesia. It is the major fruit produced (40–45 percent) and it is the major fruit exported. Banana is widely grown in Indonesia with production centres located in 14 provinces. The biggest banana production centres are in West Java, Central Java, East Java, South Sumatra, Lampung and North Sumatra.

The major banana varieties cultivated are Ambon, Kepok, Nangka, Tanduk, Lampung, Raja and Mas. These are consumed as fresh or processed banana. Generally, bananas are traded in bunches so that they are easier to handle and will have a longer life. However, for specific markets such as supermarkets, hypermarkets and fruit stalls, bananas are traded as hands. Mas Kirana is one species of the Mas banana variety. This banana is very suitable for fresh consumption because of its small size (length: 70–100 mm, diameter: 24–32 mm), bright yellow flesh colour and sweet taste. Mas Kirana is mainly grown in Lumajang District in East Java.



In general, growers cultivate banana using traditional methods. Most have access to only limited technology, so that fruit produced is often of low quality. Moreover, there is no post-harvest handling and no cooling system available to improve quality.

The traditional supply chain for bananas is generally long and complex. Fruit often has to travel very long distances from the production centres to the wholesale market. Invariably, poor handling results in significant product losses. Before the fruit reaches the wholesale market, fruit is traded by collector agents at the village level, subdistrict level and district level. Traders in the province then sell the fruit to interisland traders who consign the fruit to wholesale markets in Jakarta such as Cengkareng.

Lumajang district, East Java, is the production centre of Mas Kirana. In this area, Mas Kirana is cultivated using more advanced techniques, so the fruit is generally of better quality. Rather than sell banana individually, growers in Lumajang district sell their fruit through a cooperative. Moreover, the cooperative has a good relationship with a trader who supplies banana to modern markets such as supermarkets and hypermarkets.

A previous study evaluated the banana supply chain in Cikalong, West Java, Indonesia (Setyajit *et al.*, 2003) and from Lampung Province to the Cengkareng wholesale market (Kuntarsih *et al.*, 2005). In this study, we compare the complexity of the traditional banana supply chain with the improved banana supply chain in Lumajang, East Java.

### **Method**

Research was conducted in 2004 and 2005 through a case study. The object of this research was the supply chain for banana from Lampung province to the Cengkareng wholesale market which is located in the city of Tangerang. This is compared to a much shorter supply chain for fruit from Lumajang District in East Java. Data was collected by personal interview, observation and the distribution of questionnaires.

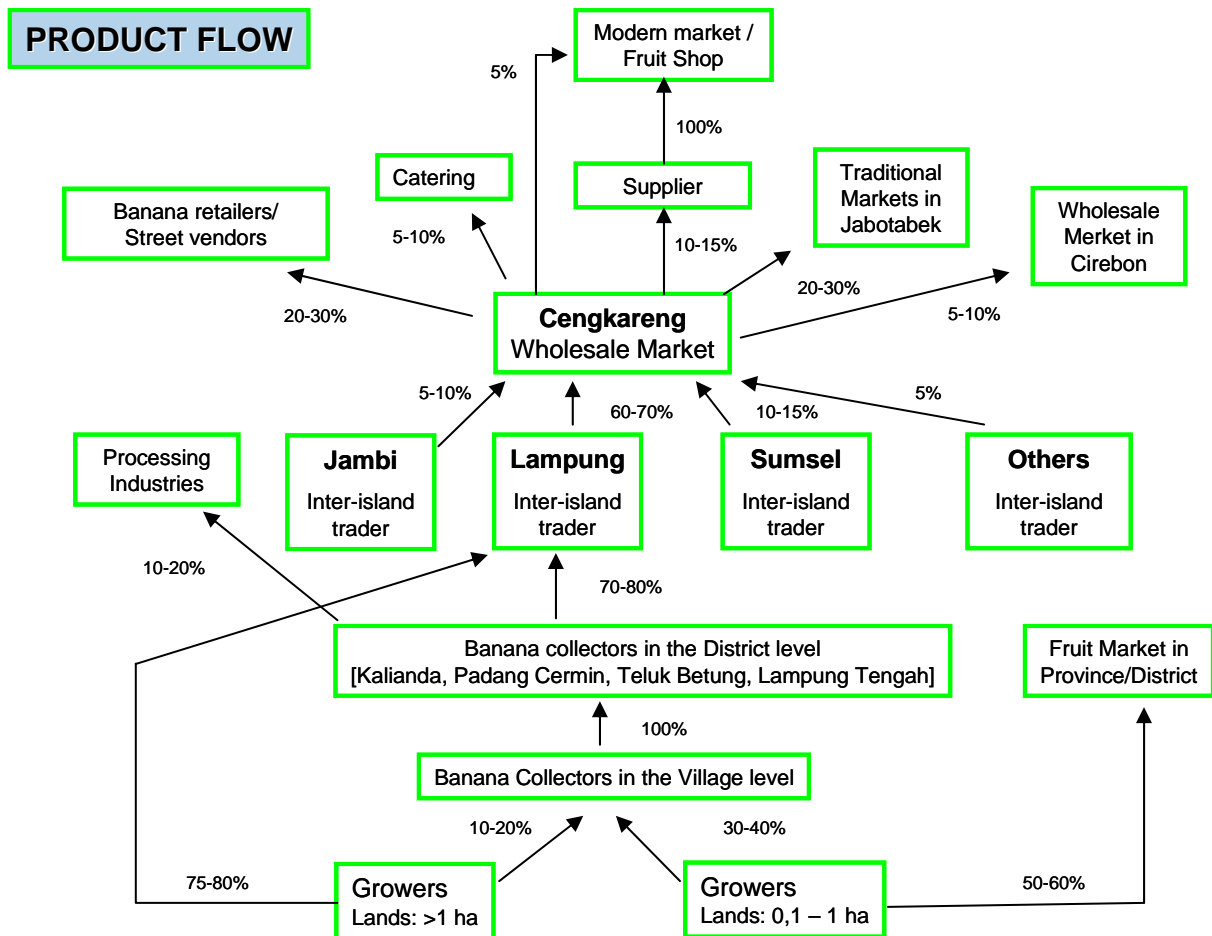
### **Results and discussion**

Generally, banana trading in Indonesia has been done for years through a trust system between growers, collector agents at the village, district and provincial level, interisland traders and the wholesale market. This traditional supply chain is long and complicated involving many stakeholders, from the growers to the traders (Figure 1).

However, it is possible to shorten the supply chain from growers to consumers. Figure 2 shows the improved supply chain operating in Lumajang district, East Java. In Lumajang, growers sell their fruit to a cooperative where it is mainly distributed to traders (70–75 percent), with 10–25 percent sold to traditional markets, and 5 percent direct to retailers and street vendors. Traders sell the bananas to modern retail markets including supermarkets, hypermarkets and fruit stalls.

On the other hand, in the traditional supply chain, only 10–15 percent of the fruit goes to traders. Therefore, modern markets only receive a limited quantity of good quality fruit. The other 85–90 percent of fruit is distributed to consumers through banana retailers, street vendors and traditional markets, where the fruit quality is low.

**Figure 1: Product flow of the traditional banana supply chain in the Cengkareng wholesale market from growers to retailers**

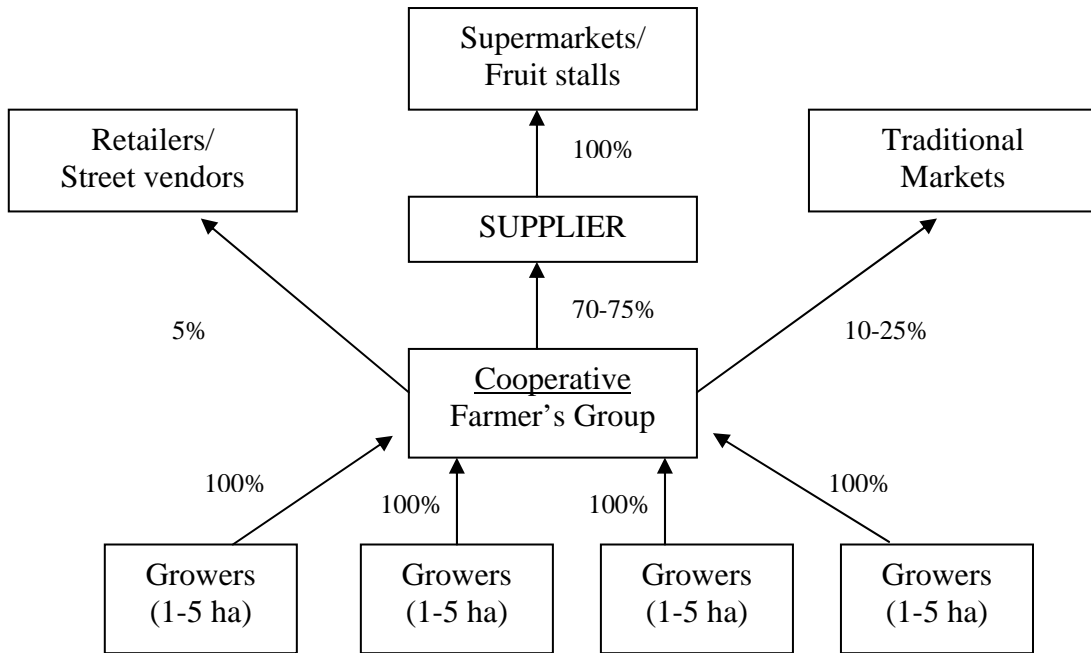


Source: Kuntarsih *et al.* (2005)

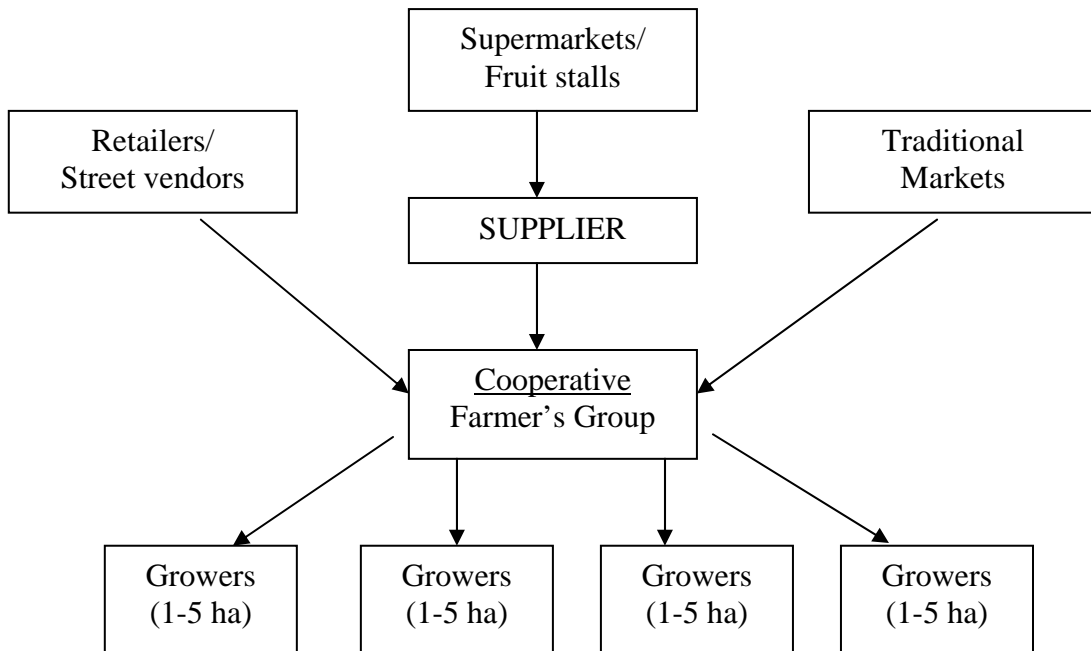
For growers and fruit traders, information is important to maintain the supply. This includes information from the fruit collectors at the district and village level, information about consumer demand and behaviour, product losses and other problems in the wholesale trade. Information from the collector agents includes the selling price, fruit quality and delivery. Information about consumers is also important, especially from the fruit vendors, institutions, fruit shops, supermarkets and individual consumers.

In the traditional supply chain, this information seldom reaches the growers clearly. Information on quality requirements and price are determined by the fruit trader in the Cengkareng wholesale market. Then, this information is distributed to the interisland traders and collector agents at the district and village level. Finally, it reaches the growers. Not unexpectedly, this can bias the information received by growers. Besides, collector agents buy all the fruit irrespective of quality. Therefore, growers do not know what the exact quality requirements are, so they cannot differentiate between good and poor quality fruit. As a result, their fruit attracts a low price. In the improved banana supply chain, growers receive information about quality requirements and price more quickly and the information is more accurate (Figure 3).

**Figure 2: Product flow of the improved banana supply chain in Lumajang District East Java**



**Figure 3: Information flow of the improved banana supply chain in Lumajang District, East Java**



In this case, the trader provides information to the growers through the cooperative and growers provide fruit that matches the quality standards required by the customer. As a result, growers are more aware of the fruit quality requirements and they cultivate banana more intensively by implementing more advanced technology.

Generally, growers cultivate bananas with limited technology. They provide plant material which is usually derived from their own seedlings and suckers. Growers apply a minimum of manure, fertilizer and pesticides for their crops. As a result, growers may be unable to harvest as a result of pest and disease infection, nutrient deficiencies and natural disasters.

Post-harvest activities in the traditional supply chain are mostly performed by traders in the Cengkareng wholesale market. Traders pay for the cost of ripening, transportation, the rental fee and product losses. Collector agents purchase banana from growers and are responsible for harvesting and transportation from the field to the collection place. Collectors at the district level are responsible for transporting bananas from the village to the district, from the district to Lampung, and thence to the processing industry. In Lampung, interisland traders dispatch bananas to the Cengkareng wholesale market. All three types of collector agents risk fruit damage during transportation.

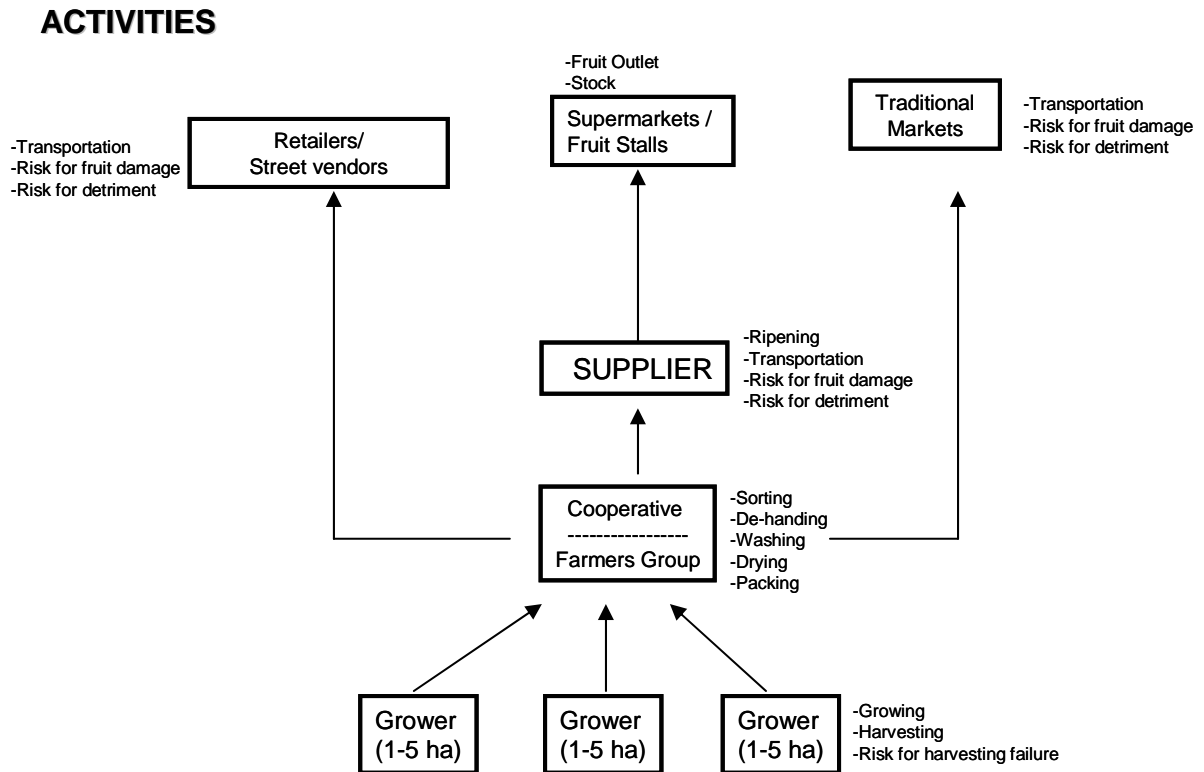
In the Cengkareng wholesale market, the bananas are unloaded from trucks and ripened. During these processes, the fruit is often damaged, a risk that the traders must cover. The banana ripening rooms are simple (an air conditioner), and traders use carbide to ripen the bananas. From the wholesale market, bananas are then dispatched to the street vendors, caterers, supermarkets and fruit shops and traditional markets around Jakarta, Tangerang, Bogor and Bekasi, and the wholesale market in Cirebon. As the fruit moves between market intermediaries, further damage is often inflicted.

In the improved banana supply chain, post-harvest handling is done by the cooperative, which includes sorting, de-handing, washing, drying and packaging. In the cooperative, fruit is treated carefully to meet the requirements of the customer. Growers have started to implement Good Agricultural Practices (GAP) to produce safe, good-quality fruit. They have also implemented Standard Operational Procedures (SOP) for the Mas Kirana. The trader buys bananas which meet prespecified quality criteria and it provides packaging to the cooperative. In this case, the trader and his or her downstream customers experience less fruit damage and deterioration (Figure 4).

In the Cengkareng wholesale market and other fruit trading levels, banana trading is done using three payment systems: cash; one or four weeks credit terms; and consignment, whereas, at the grower level, the transaction is done by various ways such as advanced payment, advanced loan before harvest and credit terms (Figure 5).

In the traditional banana supply chain, collector agents usually buy the fruit in advance from the growers, an advanced loan before harvest, and credit terms. In this case, collector agents control the price, so growers have a weak bargaining position.

**Figure 4: Activities in each channel of the improved banana supply chain in the Lumajang District, East Java**

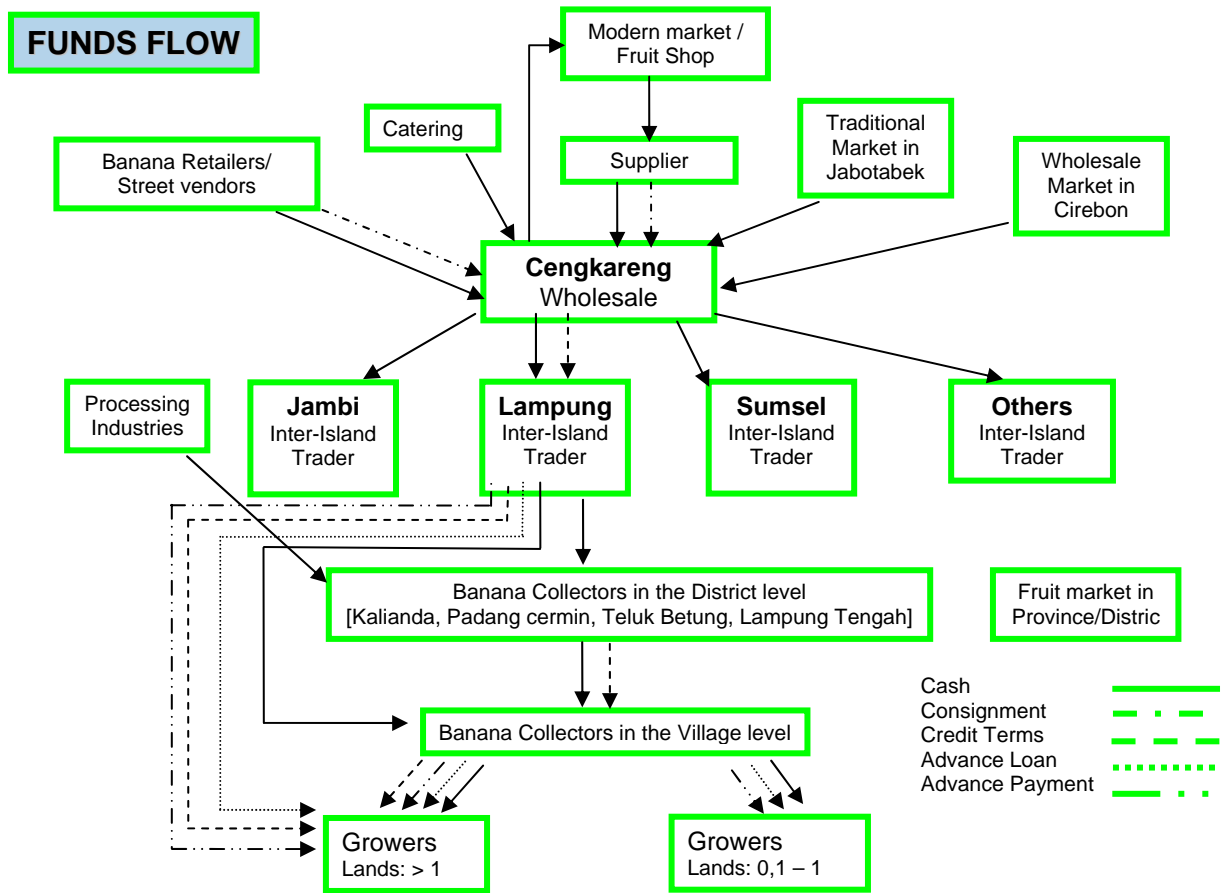


In the improved banana supply chain, the cooperative acts as a negotiator. It provides good-quality fruit to the trader and offers a good price to both the buyer and the growers. Traders buy bananas from the cooperative on two weeks' credit, while the cooperative pays the growers with cash on delivery (Figure 6).

With regard to market information, growers are always in the weakest position. There are no price guarantees for banana, for the price depends on the dynamics of the market. Therefore, the bargaining position of the growers is very weak.

In the improved banana supply chain, the cooperative provides advice on orchard management and marketing. It also acts as the marketing agent and plays a key role as a negotiator. As an advisor, there is a champion who gives guidance to the growers. This champion is chosen from the more advanced growers or from the government service. Besides acting as the marketer, the trader provides information on the price and quality to the cooperative and it also provides the packaging. In this case, the trader acts as a bridge between the fruit buyers such as modern markets and the fruit growers.

**Figure 5: Funds flow of the traditional banana supply chain from the growers to retailers**



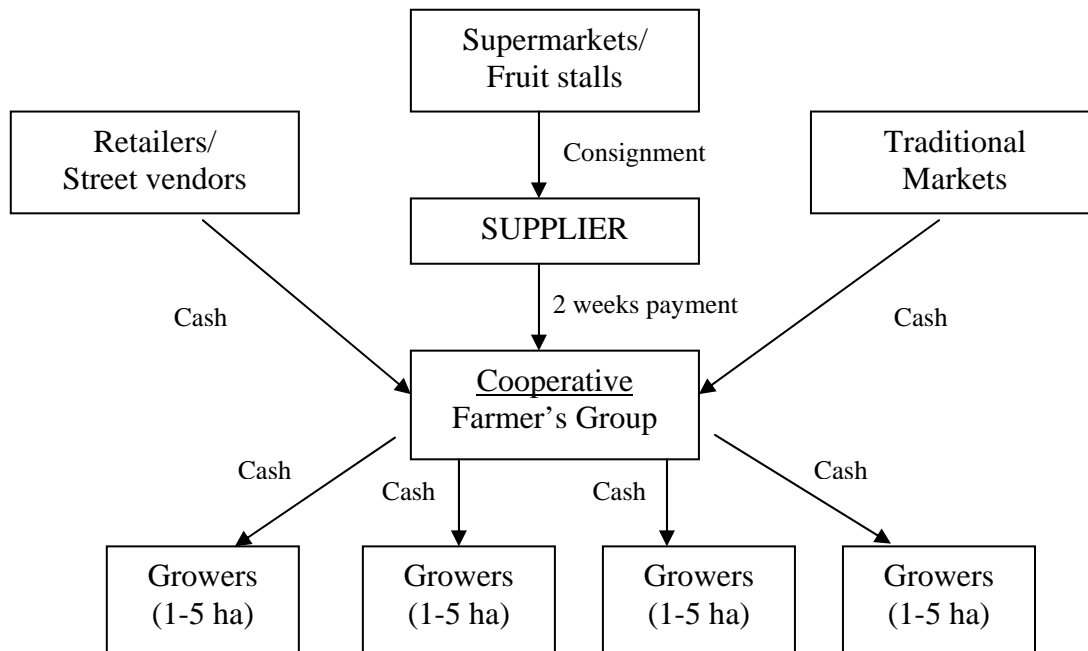
Source: Kuntarsih *et al.* (2005)

An evaluation of the price margin along the traditional banana supply chain indicates that the benefit at the grower level is low and that the retail margin increases as the fruit moves closer to the consumer. Table 1 shows that growers extract a retail price margin of just 20 percent and the price is low (Rp600 per kg). On the other hand, the price at the retail level is high (Rp3 000 per kg), and the price margin is high (30 percent).

**Table 1: Price margin allocation of each member in the banana supply chain**

Traditional banana supply chain			Improved banana supply chain		
Chain member	Price (Rp)	Margin (percent)	Chain member	Price (Rp)	Margin (percent)
Retailers	3 000	30	Retailers	4 700	32
Cengkareng wholesale market	2 000	20	Supplier	3 200	43
Inter Island Trader	1 700	15	Cooperative	1 800	5
Collectors (District)	1 100	10	Growers	1 000	20
Collectors (Village)	900	5			
Growers	600	20			

**Figure 6: Funds in each channel of the improved banana supply chain in the Lumajang District, East Java**



On the other hand, in the improved banana supply chain, growers achieve a much better price of Rp1 000 per kg, although the retail price margin is similar to the growers in the traditional supply chain. Although growers receive only 20 percent of the retail price margin, they have a market guarantee and a defined demand with the promising price. The trader must maintain fruit quality and provide good quality products for the modern markets. Therefore, they have the highest price margin (43 percent).

Figure 7 illustrates the comparison of the traditional supply chain and the improved supply chain. In the traditional supply chain, growers usually sell their product in bulk without any post-harvest treatment. The fruit is packed into simple containers and furthermore, the fruit is seldom graded. The supply chain through which this fruit passes is long and complex and as a result product losses are high. Only 55–60 percent of good quality fruit ultimately reaches the market.

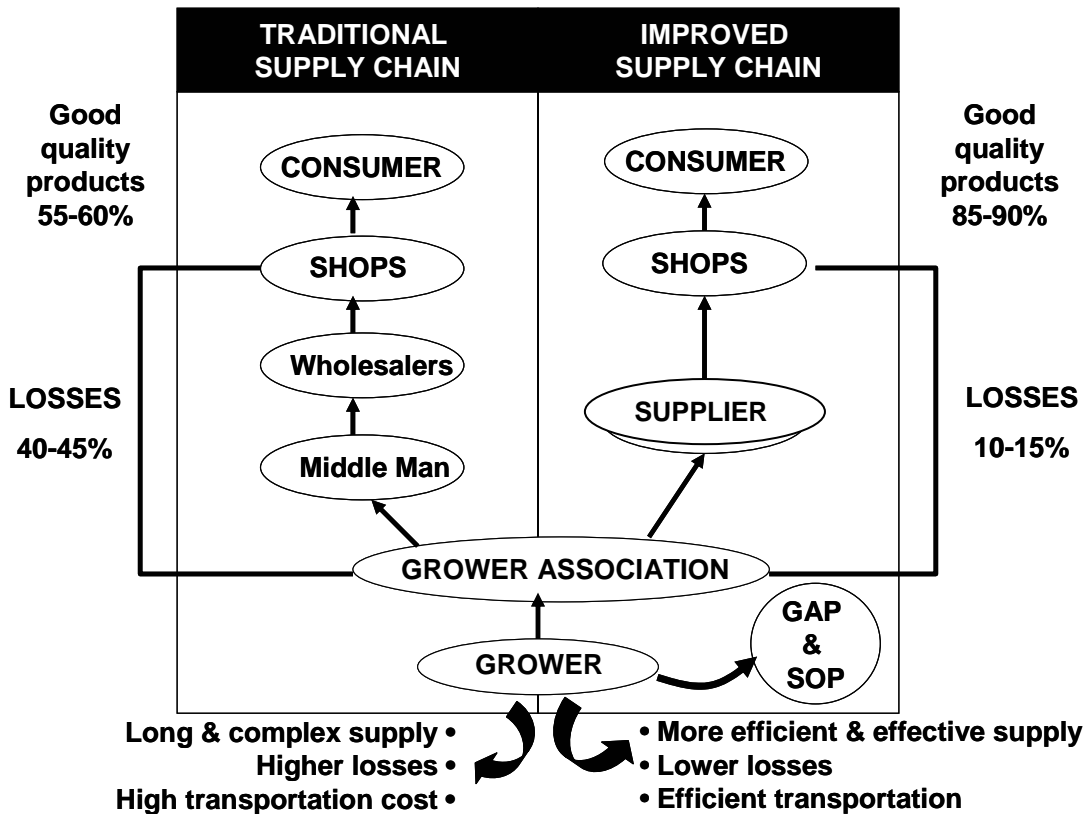
In the improved supply chain, growers sell their fruit to the grower cooperative which has a long-term relationship with the trader who will sell the fruit to the modern retail market. The benefits of this improved supply chain are that growers are encouraged to supply good-quality products and to implement GAP and SOP. The shorter supply chain reduces losses by 30 percent. As a result, more good-quality fruit can be supplied to consumers in both the domestic and export markets.

### Conclusion

The majority of banana growers in Indonesia are small-scale businesses and they are scattered in villages. Growers usually manage their businesses individually so that their

bargaining position is weak and they are highly dependent on collector agents in the village. Generally, the quality of the banana offered for sale is low, due to the limited implementation of pre- and post-harvest technologies and inappropriate infrastructure. At the grower level, the resultant price is low. The supply chain from the growers (in Lampung) to the Cengkareng wholesale market is long and complicated. Many stakeholders are involved and their relationships are strong.

**Figure 7: Comparison of the traditional supply chain and the improved supply chain from grower to consumer**



There are efforts to improve the performance of the supply chain through the application of pre- and post-harvest technology. The encouragement of mutually beneficial relationships between growers and traders (wholesale market, fruit traders and modern market) can provide greater profits for the growers. However, these need support from private and government institutions.

By implementing an improved supply chain, it is possible to shorten the chain and increase the market value. Growers become more aware of the fruit quality that is desired by downstream customers and they achieve higher prices. Besides, the modern retail market requires better-quality fruit compared to the traditional market.

### Acknowledgements

We would like to thank to Indra Husni for providing information.



### References

**Kuntarsih, S., Indra H. & Sulihanti.** 2005. Assessment of banana supply to Cengkareng Wholesale Market, Banten, Indonesia. *Acta Horticulturae*, 699: 253-262.

**Setyajit, Dimyati, A., Lokollo, E.M., Kuntarsih, A., Basuki, R.S., Hidayat, A., Hofman, P.J., Ledger, S.N., Woods, E.J.** 2003. Analysis of the constraints to banana industry development in Indonesia using the supply chain concept. *ACIAR Proceedings*, 119: 59-68.

## **Current status and future prospects of litchi exports from India**

N.C. Nainwal  
Agri Export Development Unit  
Government of Uttaranchal, Dehradun  
INDIA  
Email: ncnainwal1969@rediffmail.com

S.S. Singh  
GBPUAT  
Krishi Vigyan Kendra, Dehradun  
INDIA

### **Abstract**

*India is the second largest producer of litchi in the world after China. However, with an average productivity level of just 7.6 tonnes per hectare, India lags behind many other exporting nations. Litchi has very specific climatic and soil requirements, restricting litchi cultivation to only a few countries, yet Indian exports of fresh fruit and processed litchi products are low. Nevertheless, India has tremendous potential to export litchi because of the existence of a window of opportunity in the European market and the presence of a wide range of litchi germplasm. However, the lack of infrastructure and the non-availability of export quality fruit, due to improper preharvest practices, coupled with low productivity and high prices, make Indian exports non-competitive in the world market. In view of the rising need to export chemical-free fruit, litchi will benefit from integrated pest management. IPM strategies and their proper implementation in orchards to promote sustainability and to reduce the application of hazardous chemicals are important. To promote litchi cultivation and export, the Government of India has developed three commercially important litchi growing zones in the country, namely Uttaranchal, Bihar and West Bengal. With favourable agroclimatic conditions and free marketing opportunities, there is a bright prospect for high-quality litchi production and export from these litchi export zones in India.*

### **Introduction**

Litchi (*Litchi chinensis* Sonn.) is the most delicious and nutritious summer fruit in India. It is commercially grown in Bihar, Uttaranchal, West Bengal and Uttar Pradesh. Due to its high economic returns and good export potential, the crop is also gaining momentum in Punjab, Himachal Pradesh, Arunachal Pradesh, Jammu and Kashmir, Tripura, Karnataka and Tamil Nadu (Pandey and Sharma, 1999; Cebeco, 2001).

India is the second largest producer of litchi in the world after China. Presently, litchi is cultivated on over 56 200 ha with total production exceeding 428 000 tonnes (NHB, 2006). However, the national average productivity of litchi is just 7.6 tonnes per hectare, which is much lower than the potential yield under managed conditions.

The short span of fruit availability, coupled with poor shelf life, limits the availability of litchi on the domestic as well as the international market. The fruit is available from 15

May to 15 July and the shelf life varies from three to five days. With the proper post-harvest treatment (sulphuring), the shelf life can be extended to up to three weeks.

At present, about 37 000 tonnes of litchi are exported from India to the Middle East, Europe, Russia and Canada. APEDA and NAFED are the major export promoters of Indian litchi. In the international market, litchis are available from November to March from countries like Australia, Mauritius, South Africa and Madagascar. Conversely, the availability of fruit from India coincides with the period of least production in May to July.

### **Export-oriented varieties of litchi in India**

In India, about 50 cultivars of litchi are cultivated. However, Shahi, China and Purbi are the leading commercial varieties for North Bihar and eastern Uttar Pradesh; Purbi, China and Deshi for North eastern Bihar; Rose Scented for Uttaranchal and adjoining areas; Shahi, Ajhuli, Chaina, Swarna Roopa and Purbi for Jharkhand; and Bombai, Bedana and Rose Scented for the eastern parts of West Bengal.

Shahi is the most popular cultivar in North Bihar and Jharkhand, Uttaranchal and Uttar Pradesh. The fruit has a distinctive aroma and is often called Rose Scented. It is known as Shahi in Bihar, Rose Scented in Uttaranchal and Muzaffarpur in Western Uttar Pradesh. This is an early season maturing cultivar which ripens in the last week of May to the first week of June. Trees are very vigorous (7.6 m in height and 8.2 m in canopy width) and very productive (90–100 kg/tree), but mature fruits are prone to cracking. Fruits are medium to large in size (3.2 cm length and 3.1 cm diameter) and have a fuchsia purple background with red tubercles at ripening. The pulp is greyish–white, soft and moderately juicy.

Early Bedana is also known as Early Seedless because of its early ripening and small seeds. The cultivar is very popular in Uttar Pradesh and Punjab. Trees attain an average height of 5 m and canopy spread of 6.2 m. It is a medium yielding cultivar (50–60 kg/tree), which bears fruits regularly. Fruits are medium in size (3.2 × 3.0 cm) with a rough surface and uranium green skin, covered with carmine red tubercles at maturity. The pulp is creamy white, soft and juicy. The seed is very small and the overall fruit quality is good.

Late Bedana is also known as Late Seedless. This is a late maturing cultivar which usually ripens in the third week of June in Uttaranchal and the end of May in Jharkhand. The trees are vigorous with an average height of 5.5 m and spread of 7.5 m. It is a high yielding cultivar, giving an annual yield of 80–100 kg/tree. The fruit size is of medium size and the pulp creamy white, soft and juicy. The quality of the fruit is very good.

Swarna Roopa is a medium-late maturing, crack resistant cultivar selected at CHES, Ranchi. The fruit are attractive red in colour with a small seed and high pulp percent.

CHES-2 is a late maturing genotype. The tree is medium to vigorous in growth. This variety bears fruits in the outer canopy as well as in the inner canopy, thus reducing the

incidence of sunburn as well as fruit cracking. The fruits are deep red, conical in shape and appear in a cluster of about 15 to 20.

Ajhauli is another early maturing variety that is ready for harvest mid-May. Yields average 70–95 kg per tree. The tree is vigorous in growth, bearing red fruit.

China is one of the best cultivars for North India. It is tolerant to high temperatures and fluctuations in soil moisture, making the fruit less susceptible to cracking. This is a medium-to-late season cultivar with the fruit ripening at the end of May in West Bengal, in the first week of June in Jharkhand and in the third week of June in North Bihar. Trees are only 4 m high, but with 6 m spread. Although it is a high-yielding cultivar (80–100 kg/tree), it is prone to alternate bearing. Fruits are large in size (3.86 cm length and 3.26 cm diameter), of medium weight (22 g/fruit), oblong in shape and tyrant rose in colour with dark tubercles at maturity. The flesh is cream–white, soft and juicy and sweet.

Bombaiya is a vigorous cultivar attaining a height of 6–7 m and a spread of 7–8 m. The cultivar matures in the first to second week of May and produces 80–90 kg per tree. The fruit are large, with an attractive carmine red and uranium green skin background at maturity.

Based on field performance and observations, it has been noted that the water content of China is higher than Shahi. This is because the harvesting of China coincides with the rainy season. A high water content can lead to shrinking of the fruit after the application of sulphur and in some instances, the formation of sulphuric acid which spoils the fruit completely. Shahi, Rose Scented and Ajhauili are very thin skin varieties which make them more susceptible to splitting and sunburn, particularly when high temperatures and dry winds persist for some days. The thick skinned varieties like Early Bedana and China are comparatively free from this problem. Shahi and Rose Scented are very delicate and perishable, but are also the most popular cultivars in the international market (Europe and Middle East).

### **Strengths of Indian litchi exports**

India is second largest producer of litchi in the world. Although the productivity per tree is low, it can be improved by adopting better agricultural practices in the orchards. Litchi has been grown in India since the 18<sup>th</sup> century, hence farmers are very familiar with the crop.

India is accepted worldwide as a source for good-quality litchi. Shahi and Rose Scented are considered among the best varieties in the world, in terms of their taste and flavour. Favourable soil and climatic conditions exist in most parts of the country for commercial litchi cultivation. The harvesting season in India starts earlier than in the People's Republic of China and Taiwan Province, the other main areas of litchi production. This provides India with a significant marketing advantage, especially in Europe. Even with respect to competition from Thailand, which produces fruit at a similar time as India, India is geographically closer to the market.

India has a well-established food processing industry. Entrepreneurs are familiar with the technology and both equipment and trained manpower is readily available.

### **Weaknesses in Indian litchi exports**

Most litchi growers in Uttaranchal are not landowners and operate mostly on yearly contracts. Hence, greater emphasis is placed on maximizing the output in a particular year, rather than the long-term perspective.

The Rose Scented cultivar is highly perishable, due to fruit splitting and skin burning. Despite the large amount of germplasm available, little significant research and development work has been conducted to improve varieties and planting materials.

Planting material is obtained from unproductive and low yielding trees. Farmers are not willing to sacrifice productivity in the short term in order to replace or to rework trees with superior planting material. Over the years, the size of the seed has generally increased, which reduces the amount of pulp and thus fruit quality has deteriorated.

In India, the litchi harvest season is very short, lasting for only about three weeks in a year. Conversely, in Taiwan Province of China and Madagascar, for example, the harvesting season extends for two to three months.

In general, the desired post-harvest infrastructure and transportation is not available to move the fruit from Bihar, the main producing area, to the international airport. The majority of exports from India are conducted by very small exporters, who have limited resources and market reach.

Although India has a well established food processing industry, it generally serves the domestic market. There are no world class food processing facilities available to process litchi. Canned whole litchi is the most popular processed form. In some states, due to manual peeling and destoning, a large percentage of the fruit is broken and is discoloured.

### **Opportunities for Indian litchi exports**

There is tremendous scope for the export of both fresh and processed litchi from India. The quality of the fruit available readily meets the needs of international customers.

Since suitable agro-ecological conditions are available in Uttaranchal, the planting of successful varieties from other countries may provide an opportunity to extend the seasonality of supply and to improve fruit quality.

The commercial viability of litchi processing in India can be enhanced by using it for processing other complementary fruit and vegetables, which have good export potential and for which the harvesting season does not clash with that of other countries, e.g. baby corn, gherkins, snow peas, runner beans, guava, plum, pear and apricot.

The international prices for fresh and processed litchi are quite attractive. Competition is limited, as only a few countries produce litchi and the European market is undersupplied during May to July.

### Threats for Indian litchi exports

The established exporting countries (Taiwan Province of China, Madagascar, South Africa and Thailand) already have well-established export marketing networks. The People’s Republic of China, the world’s largest producer of litchi, is presently not very active in world trade. However, when China decides to aggressively promote litchi exports, it will present a major threat to India. Furthermore, several countries have significantly expanded the area of litchi cultivated. Many of these orchards will mature in the next two to three years, substantially increasing the quantity of fruit available.

Many countries have developed technology for extending the litchi harvesting season to about two to three months, through delayed ripening of the fruit. In India, a stand-alone litchi processing unit, based on modern technology, is unlikely to be viable due to the limited availability of the fruit.

### Seasonality of litchi in the world

Litchi is available throughout the year in some parts of the world, even although the harvesting period for litchi in any one particular region may be very short, i.e. not more than two to three months in a year (Figure 1).

**Figure 1: Harvesting season of litchi in major litchi-growing countries**

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
PR China					■	■	■					
India					■	■	■					
Taiwan Province					■	■	■					
Thailand			■	■	■	■	■					
Viet Nam					■	■	■					
Nepal					■	■	■					
Bangladesh					■	■	■					
Reunion Island	■										■	■
Mauritius											■	■
Madagascar	■										■	■
South Africa	■	■	■	■							■	■
Australia	■	■	■	■							■	■
USA					■	■	■					
Mexico					■	■	■	■	■			
Israel					■	■	■	■	■			
Spain								■	■	■		

Source: Gerbaud (2007)

### Post-harvest practices and infrastructure

Litchi fruit is highly perishable, thus rapid distribution and marketing is paramount. Freshly picked litchi will maintain their colour and quality for only two to five days at room temperature. Except for fruit that is destined for the local market, litchi requires

proper post-harvest treatment, packaging and appropriate storage conditions to retain its quality for longer periods. The most important post-harvest need of litchi is the retention of fruit colour and quality so that the marketing can be extended to avoid a glut. In India, fruit for the domestic market is normally packed into baskets or crates lined with other cushioning material. However, for export, fruit needs to be packed individually in shallow, ventilated cartons with shredded-paper cushioning.

Post-harvest sulphur fumigation, acid treatment, pre-cooling and cold storage facilities (cold chain technology) are considered to be the most effective way of preserving the quality of fresh litchi fruit. Unfortunately, this technology is available with only one exporter in Bihar and only one grower in Uttaranchal has the capacity to treat the fruit with sulphur, and then in quantities less than one tonne. If proper post-harvest holding facilities were available, litchi growers would be in a position to secure a better price by marketing their produce in more distant markets over an extended period of time.

### **World trade**

The demand for fresh litchi in the world market has steadily increased during the last decade. The European Union is the largest importer of fresh litchi, followed by Hong Kong, Singapore, Canada and Japan. Although India and the People's Republic of China are the leading producers of litchi, smaller producers like Madagascar, Taiwan Province of China and South Africa dominate the world trade.

#### **The European Union market**

Litchi is the most popular imported Asian fruit. Although the majority of the demand emanates from the Asian communities in Europe, litchi has successfully entered the mainstream markets as well. In the early 1990s, the United Kingdom, the Netherlands and Germany had an almost equal share, which collectively comprised 75 percent of all European Union imports. However, more recently, France has emerged as the single most important market for litchi imports into the European Union, consuming over 75 percent of imports, while the United Kingdom, Germany and the Netherlands make up the balance.

Although Europe receives fruit all year round, the main season is between December and February, with about 90 percent of imports occurring during these months. Even within this period, nearly 50 percent of all litchi imports arrive in the month of December, with the peak demand occurring during Christmas. Madagascar and South Africa are the major suppliers of litchi to Europe between December and February.

#### **India's share of the world litchi trade**

In spite of being the world's second largest producer of litchi, India has a negligible share of the world market. In 2003–2004, India exported only 155 tonnes of fresh litchi valued at Rs15 million (APEDA, 2005). Although world trade statistics for the corresponding year are not available, India's share of the world market amounts to less than 1 percent. The export of processed litchi is not reported separately in official statistics, but it would be reasonable to conclude that this is also negligible. Nevertheless, exports have been increasing steadily.

Into Europe, India is at a disadvantage vis-à-vis Madagascar, due to the mismatch in the seasonal demand as well as the freight cost. On the other hand, the Asian markets in Singapore, Hong Kong and Japan should be the target markets. However, Indian exporters are unable to compete with Taiwan Province of China in these markets. Furthermore, India's fresh litchi exports are not made consistently to any particular country, indicating that no concerted effort has been made to develop the market. Exports have so far been on an "on and off" basis.

### International prices

The litchi prices in every market vary widely from month to month, depending upon the county of origin (Cebeco, 2001).

### Export grades and standards

Although there are no official grades or standards, importers normally prefer large fruit with small seeds and bright red-coloured skin. An important requirement is the uniformity of size and weight of fruits.

Each importing country has its own norms for the quality parameters, but the generally acceptable quality parameters in the international market are as shown in Table 1. A distinction is also made between those varieties of litchi that leak juice when the skin is broken and those that retain the juice within the flesh. The latter are called "dry and clean" and are more highly priced.

**Table 1: General commercial requirements for litchi**

Criteria	Requirements
Appearance	Whole, fresh, clean, firm and free of pests, blemishes and mechanical damage
Skin colour and texture	Uniformly cherry-red to pink
Shape	Round and oval-shaped or heart-shaped
Size	Diameter: 25 to 35 mm Length: 25 to 40 mm
Weight	20 g and above
Pulp	At least 75 percent of the weight, juicy, translucent, white matter of pearl colour, sweet with a Brix level of about 17 degree, and should be easily removable from the seed

Different importing countries may also have specific requirements for the chemical and pesticide residues permitted. For example, France is sensitive to use of sulphur dioxide as a colour preservative and has set a tolerance at 10 mg/kg of pulp and 250 mg/kg for skin.

The Codex Standard for litchi (Codex Standard 196–1995) classifies fresh litchi into three classes on the basis of size, weight, shape, colour and skin texture: Extra class (superior quality), Class I (good quality) and Class II (satisfying the minimum requirements). Furthermore, the standard provides provisions for presentation, packaging and labelling (Table 2).



**Table 2: Requirements as per Codex Standard for litchi**

<b>Criteria</b>	<b>Requirements</b>
Size	Diameter Extra class: 33 mm (minimum) Classes I & II: 20 mm (minimum) Size variation in each package: 10 mm (maximum)
Quality tolerance	Extra class: 5 percent by number or weight Classes I & II: 10 percent by number or weight
Size tolerance	10 percent by number or weight in all classes

In addition, the standard also lays down the requirements for presentation (uniform) and packaging, marking and labelling, contaminants (heavy metals, pesticides residue) and hygiene, as per the standards established by Codex Alimentarius Commission.

Keeping in view the present scenario and the growing demand for Indian litchi in the international market, globalization, government economic policies and above all, the expansion in the area of litchi cultivated in the principal litchi growing states of the country, litchi exports from India are poised for a bright future.

### References

**APEDA.** 2005. Annual Report. APEDA, New Delhi.

**Cebeco.** 2001. Project report for setting up agriexport zone for litchi in Ramnagar, Uttaranchal, Cebeco India Pvt. Ltd., New Delhi.

**Gerbaud, P. (ed.).** 2007. Le litchi. *FruiTrop*, 2007(146): 3-20.

**DGCIS.** 2000. Export statistics. Director General of Commerce and Industries Services, New Delhi.

**Nainwal, N.C., Nath, V. & Das, B.** 2004. Litchi production and post-harvest management. Agri Export Zone, DASP (Uttaranchal), Haldwani, Nainital.

**NHB.** 2006. Annual Report. NHB, Gurgaon, Hariyana.

**Pandey, R.M. & Sharma, H.C.** 1999, The litchi. Indian Council of Agricultural Research, New Delhi.

## **Case studies of product quality improvement and supply chain management for stone fruit, mango and pomelo in Thailand, the Lao People's Democratic Republic and Viet Nam**

R.J. Nissen and A.P. George  
Queensland Department of Primary Industries and Fisheries  
Maroochy Research Station  
AUSTRALIA  
Email: Bob.Nissen@dpi.qld.gov.au

U. Noppakoonwong and P. Sripinta  
Department of Agriculture  
Chiang Mai  
THAILAND

U. Boonprakob  
Kasesart University  
Nakhonpathom  
THAILAND

M. Rankin  
University of Queensland  
AUSTRALIA

D.D. Nguyen  
Southern Sub-Institute of Agricultural Engineering and Post-Harvest Technology  
Ho Chi Minh City  
VIET NAM

M.C. Nguyen  
Southern Fruit Research Institute  
Long Dinh  
VIET NAM

L.D. Khanh  
National Institute of Plant Protection  
Hanoi  
VIET NAM

### **Abstract**

*Farmers in Viet Nam, Thailand and the Lao People's Democratic Republic represent about 30 percent of the total population living below the poverty line in Asia. For these poor households, implementation of food safety and good agricultural practices is especially resource demanding and expensive. Compared with developed countries, supply chains in the developing countries are longer and often include many more participants. Many of these supply chain participants are trying to implement new processes to deliver a higher quality product to the consumer. New processes being*

*trialled in the Mekong Delta and mountainous regions of Thailand, the Lao People's Democratic Republic and Viet Nam include: group production practices to improve product quality; investing in elite product lines and implementing new pricing strategies; developing domestic and international trademarks that distinguish their product on quality and food safety; improving product packaging; and, investing in cool storage facilities to maintain product quality. These new processes are designed to meet the consumer demand for higher-quality safe products.*

## **Introduction**

Developing countries play an important role in the world trade of fruit and vegetables. For example, Chile and Mexico account for 53 percent of the world trade in avocados, the Philippines and Brazil account for 62 percent of the world trade in mangoes (FAOSTAT, 2004; Hallam *et al.*, 2004). Exports of fresh fruit and vegetables from the developing countries are increasing, but competition will intensify and profits may decrease.

Within much of East Asia, a dual system of marketing exists; the traditional and the modern. The traditional system is composed of small farms with long supply chains that often include many participants. The average farm size in Viet Nam is 0.66 hectare per household; in Thailand it is 4.51 hectares; and in the Lao People's Democratic Republic the average farm size is 1.62 hectares (FAORAP, 2004; World Bank, 2006; GSO VHLSS, 2003).

Farmers need to grow high value crops to improve their disposable income. In Viet Nam, Thailand and the Lao People's Democratic Republic, peach, plum, mango and pomelo have been grown for many of hundreds of years using traditional farming and marketing systems. In 2004, Thailand produced 174 tonnes of peach and nectarine (George and Nissen, 2005b). For mangoes, Viet Nam produced 337 000 tonnes, Thailand 1 750 000 tonnes and the Lao People's Democratic Republic 3 000 tonnes (FAOSTAT, 2004). Currently, more than 80 percent of the mango, pomelo, peach and plums are produced from small individual village farms in these three countries.

In Viet Nam, most food is still marketed directly by small farmers or through small traders in traditional open wet markets (World Bank, 2006). In Thailand, the Lao People's Democratic Republic and Viet Nam, peach and plum are traditionally harvested before the fruit are fully mature. Fruit are harvested immature to reduce damage from fruit fly. Furthermore, extra firmness is needed to resist breakdown due to poor handling systems.

Many wet markets in Asia lack the necessary hygiene facilities to meet the growing demand for safe product. Producers must be highly adaptable, for inflexible producers will not be able to generate added-value to the supply chain and will be forced out of the industry. Producers must adopt new supply chain strategies that will deliver value for money to their customers and ultimately, the end consumer.

## **Methods and materials**

Studies on the peach, nectarine and plum supply chains in the three countries were undertaken from 1996 to 2006 for the Australian Centre for International Agricultural Research (ACIAR) under the “Adaptation of low-chill temperate fruit to Thailand, Laos, Viet Nam and Australia” project. Further studies of the mango and pomelo supply chains in the Mekong Delta were undertaken from 2005 to 2006 under the Collaboration for Agriculture and Rural Development (CARD) project “Improving Export and Domestic Markets for Vietnamese Fruit through Improved Post-harvest and Supply Chain Management”, funded by the Australian government.

These projects evaluated supply chain effectiveness and efficiency and ways to overcome limitations. They selected champion farmers in production regions, and set up demonstration orchards in villages and research stations. Knowledge and skills were then transferred via consultation workshops, participatory action field days and roving “show and tell” field days. This approach ensured that project objectives and sustainable outputs were achieved to enhance the socio-economic situation of the ethnic minority groups.

Several methods were used to collect baseline data. Relevant data and information on crop production, product quality, market prices, yields, economic, poverty and education levels were collected from the internet and reports produced by the Vietnamese Government Ministries, the Ministry of Agriculture and Rural Development (MARD), the Thailand Department of Agriculture, the Royal Project Foundation, Australian Government Overseas Aid (AusAID), Australian Government Department of Foreign Affairs and Trade (DFAT), the Food and Agriculture Organization of the United Nations (FAO) and the World Trade Organization (WTO).

Survey sheets were developed and tested to obtain information on the effectiveness and efficiency of supply chains. Once adjustments had been made to survey sheets, a full investigation via interviews of farmers, wholesalers and collectors was undertaken by the authors. Farmer survey supply chain information was split into four major components and further divided into subcomponents to facilitate collection of accurate information. These major components were: preharvest, post-harvest, sale of fruit and price and market information. Baseline surveys and interviews with over 150 farmers, 30 collector agents, 20 wholesalers or traders and 20 retailers (international and domestic) were undertaken for peach, plum, nectarine, mango and pomelo.

## **Results**

### **Matching varieties to the environment and markets**

Many supply chains in Thailand, the Lao People’s Democratic Republic and Viet Nam are longer and often include many more participants, compared with supply chains in developed countries. They may have up to ten participants.

To meet changing customers wants and needs, local farmers must improve their fruit quality. To begin with, it is essential to match the varieties farmers are growing to the environment and to their customers’ wants and needs. Production systems that have

high yields, produce high quality fruit and are environmentally sustainable are needed if farmers are to remain economically viable. Furthermore, the supply chain must maintain product quality and food safety.

For example, local peach and plum cultivars were originally selected from high-chill varieties in the People's Republic of China that are not well suited to the low-chill environments in which they are now growing. These poor quality varieties are losing market share to imported varieties from other countries, namely the People's Republic of China, Chile, and the United States of America. The local varieties are slender and ovate in shape, have a large pointed tip and suture bulge, green skin and flesh colour. Fruit are harvested in an immature state to eliminate fruit fly damage and facilitate transport to market. These fruit are considered by the customer as being less attractive when compared to the rounder, highly coloured, imported fruit. For example, in 2004, the Vietnamese H'Mong peach averaged 140 grams in size and received on average US\$0.22 per kg when compared to the highly attractive imported Chinese peach that averaged 200 grams and received a premium price in the Hanoi markets of US\$7.31 per kg.

Fruit quality and yields of locally selected varieties have decreased due to limited inputs and poor management regimes. For example, in Viet Nam, the average yield of a 5-year old, well-managed Tam Hoa plum tree is 80 kg per tree per annum. However, by 12 years of age and older, the average yield has dropped to about 20 kg per tree per annum. This reduction is due to low inputs of water, fertilizer, no pest control measures and poor management practices such as pruning and tree training, causing fruit quality to decrease dramatically. The average market price for Tam Hoa plum has dropped from US\$0.28 per kg in 1981 to US\$0.07 per kg in 2003. This price drop, coupled with low yield, has severely affected the viability of plum farms in Viet Nam.

Carefully selected varieties were introduced as part of an ACIAR project. These varieties were matched to the growing environment and the market. They had lower chilling requirements, producing fruit that were highly attractive, highly coloured, had higher sugar levels, better shape and matured during March to June. Marketing peach, plum and nectarine during this time provided the farmer with a competitive advantage. This advantage was due to the inability of other countries to produce peach, nectarine and plum at the same time. For example, prices received in Thailand for locally produced peach are very low (US\$0.63 per kg), compared with the introduced varieties that average US\$2.73 per kg. In the Lao People's Democratic Republic, introduced varieties have lifted farmer incomes from less than US\$235 per annum to between US\$4,680 and US\$6,240 per annum.

### **Asian supply chains**

Most farms are family-based and have established local personal relationships with collector agents, wholesalers and market agents. These relationships are not well structured and have failed to deliver benefits to any of the supply chain participants. Cooperative farming and coordination to access distant markets to purchase, process and sell products were even less developed.

**Viet Nam**

As compared with state-controlled farms, Viet Nam has now recognized the positive impact of commercial agricultural farms on the living standards of the rural poor; their income, employment, more favourable working conditions; the environment, and the ability to supply products suited to their target markets (Anh and Sakata, 2006). In the past, state farms were large, but now individual farms average just 0.66 hectare per household (GSO VHLSS, 2003). Most farmers have little knowledge of farming practices or marketing their product to national or international markets. Twenty seven percent of farms in Viet Nam grow perennial crops and are concentrated in mountainous regions where there is a lack of transport, infrastructure and unstable markets. They often grow many types of crops together in a mixed farming system. This system usually makes produce unsaleable due to the use of unregistered chemicals and spray drift for pest and disease control (Nissen, 2006a). Mixed farming systems were devised to spread risk and provide subsistence for farmers and their families (Anh and Sakata, 2006).

The AusAID CARD Project in the Mekong Delta worked with both mango and pomelo farmers. This project found that most mango farmers have large trees. Due to their large size, about 30 percent of the fruit is not capable of being harvested. Excessive tree size also compounds problems with fruit quality due to difficulties in harvesting and controlling pests and diseases. Trees are usually strip picked and fruit sold locally to collectors. Mango growers and collectors prefer to sell mixed grades of fruit, even though the farm gate price is very low (Nissen *et al.*, 2006b). Farmers view low grade fruit as a way of obtaining greater profits. As mangoes pass along the supply chain, they are graded by the collector agent then subsequently regraded by the trader and the wholesaler.

The project found that pomelo farmers regularly prune their trees to remove branches that show signs of greening disease, but knowledge on safe chemical usage was limited, causing concerns for food safety. Farmers are unaware of the quality requirements for chemical residues. Pomelo farmers sell approximately 15 percent of their fruit to a Vietnamese trading company and 85 percent to local collectors.

The majority of pomelo farmers share information, but many do not know the current price in the wholesale market. There is no readily available transparent information flows for both mango and pomelo on market price, volume and required fruit quality. Prices found in newspapers and quoted on the television are considered as reference prices only as they are considerably higher than those obtained by the farmer.

Prices vary during the year according to the variety and the volume of fruit marketed. For example, in 2006, prices for the highly prized mango variety *Cat Hoa Loc* ranged from US\$1.84 in the off-season to US\$1.12 per kg during the main production period (Nissen *et al.*, 2006c).

Many Vietnamese farmers believe that volume equals profit. The practice of selling low grade fruit is carried out at the local market level. This low grade fruit could not be sold if fruit were graded and sold to high-value markets. The AusAID CARD project found

that collector agents were not very selective in terms of fruit quality and offered a lower price compared to traders or companies that had quality standards.

Several Vietnamese trading companies have implemented quality and grade standards and offer a higher price to those farmers who can produce fruit that match their standards. Farmers who sold their fruit to Ho Chi Minh City wholesalers must grade their fruit and provide their own transport. About 90 percent of pomelo farmers leave the packaging to collector agents. Due to the robustness of the pomelo fruit, many farmers and collector agents believe that only 2 percent of fruit is damaged during transport to market, which is in 50 to 60 kg bamboo baskets.

### ***Farmer groups in Viet Nam***

Grower groups that have been formed are trying to obtain greater benefits for their members by obtaining higher returns. In the Mekong Delta, approximately 67 percent of the rural population is uneducated (GSO VHLSS, 2003). Whilst encouraging small farmers to form collaborative marketing groups has created greater economies of scale and reduced the number of participants in the supply chain, the benefits to individual farmers in the group appear to be tightly linked to education levels. Those with higher education levels appear to be better able to understand problems and to apply new technology to solve those problems. Other less educated farmers appear reluctant to change and favour traditional methods (Rankin, 2003).

For example, one group of mango growers with which the CARD project is working has implemented a new packaging system, improved the harvesting method, developed grade standards, and are in the process of developing an audit system to record fertilizer and chemical usage. All of these measures being implemented are to reassure their customers that their product is safe and of higher quality. They have integrated vertically by forming their own marketing company and assumed the role of collector agent and market agent. This group has successfully developed a trademark for their product with help from Vietnamese research institutes.

These improvements have come at a significant cost to the group. The costs of introducing these improvements can be 41 percent per hectare greater than the standard traditional practice (George and Nissen, 2004). While a seven-fold increase in net returns for Vietnamese farmers can be achieved through improving the production system (Nissen *et al.*, 2006a), by forming farmers into groups, even greater benefits can be achieved by increasing their bargaining power. However, while there has been a significant improvement in mango fruit quality, for example, a 10 percent increase in Class 1 fruit, farmers have not been rewarded by an increase in the farm gate price. In 2005, the average farm gate price during the peak production season was US\$0.70 per kg and for early season fruit US\$2.12 per kg (Nissen *et al.*, 2006c).

### ***Thailand***

In Thailand, the ACIAR stone fruit project focused on farmer and train-the-trainer training by setting up demonstration sites in conjunction with the Thai Department of Agriculture. Sites were initially set up on research stations and then expanded to include individual village farm plots. This approach was taken because local villagers lack the skills, knowledge and monetary resources to develop orchards and supply chains. The

Royal Project Foundation also assisted with research and development of these sites and helped implement quality control measures and financed the investment in infrastructure, packing equipment and materials, cool rooms and transport systems to enable high quality product to reach target markets (George and Nissen, 2005a; George and Nissen, 2006). The private marketing arm of the Royal Project Foundation, Doi Kham, provided the linkages between each site and the market (Nissen *et al.*, 2006b).

The process of developing a highly successfully supply chain has shown that both government and private investment is needed. This project is now being expanded to assist individual farmers and the formation of larger farmer groups at the village level.

### ***Farmer groups in Thailand***

At the hill tribe village Ban Kon in northern Thailand, a group of farmers has been trying to form a cooperative to grow peaches and nectarine, with mentoring and assistance from World Vision. Severe difficulties have been experienced by this group. The selection of champions to provide leadership was difficult to implement. Group members are not highly educated and lacked knowledge on how to analyse the situation and solve problems. Analysis and problem solving skills are essential for development of new production systems and supply chains, especially if they are to identify key achievable goals to assist the group to move forward from their present position. This position was a state of complete reliance on traditional varieties and orchard management systems, and a marketing system where they were exploited by collector agents due to a lack of market information and infrastructure. They received low prices for poor quality fruit, which caused the group to evolve and change.

Many local farmers grow the local plum variety Julie. This variety is very small, has very high acidity and has good yields, but very poor consumer acceptance. They also produced other local varieties of plum that are highly acidic. Fruit were not allowed to mature and were harvested in a green state. This was done to eliminate fruit breaking down from fruit fly. In 2004, local farmers received from US\$0.09 to US\$0.25 per kg for this variety at the regional markets. With the introduction of new peach and nectarine varieties and hill tribe farmer training in orchard management, they now receive six times more than the highest price for the local plum variety. In 2006, the farm gate price for the introduced peach variety Tropic Beauty averaged US\$1.56 per kg.

Even although the Ban Kon village group has made significant progress they still have a long way to go to produce high-quality extra grade fruit and develop a sustainable supply chain. At present, local collector agents have greater bargaining power. The captive producers are unable to develop their own supply chain due to a lack of quality assurance, infrastructure, a reliable transport system and limited marketing knowledge.

Farm sizes in these mountainous regions of Thailand are well below the national average of 5.6 hectares. ACIAR project studies have shown that net returns for introduced peach varieties in Thailand are US\$18 086 to 32 708 per hectare, at least seven times greater than upland rice.



### ***The Lao People's Democratic Republic***

In the Lao People's Democratic Republic, we selected champion farmers. The ACIAR project team then implemented best production strategies to develop demonstration sites in Xieng Khouang Province. New varieties were introduced and chemicals and fertilizer supplied. Site selection was based on environmental suitability for production, lack of competition and ease of getting the product to market. The demonstration sites were established to show that, with assistance, improved income and reduced environmental degradation could be accomplished. The major problem that the project encountered was the reluctance of the growers to thin their trees. Many farmers are very happy with returns for small fruit. Each tree had in excess of 1 000 fruit and farmers were receiving on average US\$0.78 per kg at the farm gate.

### **Discussion**

Many individual farmers in Thailand, the Lao People's Democratic Republic and Viet Nam feel they are still discriminated against, because they do not have detailed records that validate the market requirements for fruit quality and food safety issues. A few champion small-scale farmers are now marketing their fruit and developing their own supply chains. For example, in Thailand, a few growers produce 30 percent of their crop in the extra grade and 70 percent in Grade 1 categories. These are equal to or better than some imported product. In 2006, they received an average price of US\$2.35 per kg for their fruit (George and Nissen, 2006). These small-scale farmers still find it extremely difficult to implement quality control measures due to a lack of resources for grading and packaging, transport and handling, as well as knowledge on developing and maintaining a recording system for food safety.

Many traditional farmers do not grade their fruit because they believe that long-term relationships with collector agents provide significant benefits. These long-term relationships between farmers and collector agents have led farmers to believe that the collector agent will not reject any of the farmer's fruit, pay the farmer a higher price and the collector agent will provide low-cost transportation to the market (Nissen *et al.*, 2006b). Many small farmers sell directly to small traders in traditional open wet markets that lack necessary hygienic facilities. These supply chains are usually very fragmented and short, and wholesalers buying from the collector agents often control information on supply and demand (World Bank, 2006; Moustier *et al.*, 2003).

Changes are now taking place in Thailand and Viet Nam with large supermarkets and exporters playing a decisive role in defining how fruit is to be graded and marketed. At the grower level, smallholder production is now being replaced by large commercial units (farmer groups) or large individual contract growers. Project discussions with large supermarkets, have verified the trend to integrate chains with fewer players. These are being developed to enhance product traceability, compliance with good agricultural practices, hazard analysis and critical control point systems, which are not legally mandatory, but imposed by the buyer (Hallam *et al.*, 2004). Observations and information obtained on product specifications confirm that during times of high volumes, large supermarket and distribution enterprises enforce product specifications, but in times of product scarcity, product specifications are not strictly enforced. For example, the average mango price for the variety Cat Hoa Loc special grade in January

is US\$1.84 per kg. Fruit size in this grade can vary by about 100 grams or more and blemish marks are more apparent. However, in April, the average mango prices for special grade is US\$0.98 per kg, size grades have less variability and blemish marks are virtually non-existent.

On average, in Thailand and Viet Nam, production input costs usually account for 40 to 60 percent of the gross returns. With the implementation of new grading and packaging systems, a further 40 percent could be easily added to those costs (Nissen *et al.*, 2006c; George and Nissen, 2004). Implementing greater quality assurance standards will cause production and marketing costs to rise substantially. Without a significant increase in returns, implementation of high quality assurance standards will make it uneconomical for many individual growers to continue farming. Economies of scale and the cost of organizing efficient and effective supply chains with a limited number of players tend to mitigate against small-scale producers and exporters (Hallam *et al.*, 2004).

### Conclusions

There has been a proliferation in the number of food safety standards imposed by global retailers, trading blocks and private companies. These standards have structural difficulties and create bias against certain groups of exporters and producers (Hallam *et al.*, 2004; Aksoy and Beghin, 2005). In Thailand, the Lao People's Democratic Republic and Viet Nam, individual small farmers are at a distinct disadvantage. This is due to overproduction of poor quality fruit and marketing systems that do not adequately compensate farmers for producing high quality fruit. Many farmers and supply chain participants lack market intelligence, infrastructure and logistical knowledge to ensure fruit are safely handled to maintain product quality. Furthermore, many individual farmers appear to be unable to capture the benefits of producing high quality fruit, as the present marketing system and supply chains have many more participants compared to developed countries. Many supply chains are very long. Due to these factors, prices appear to be set at the lowest level in the supply chain by the collector agent (Nissen *et al.*, 2006b).

The three countries all suffer to varying degrees from instability in the fruit production sector. Compounding this instability is sequestered market information. Full disclosure is not practiced by each participant in the supply chain. This is carried out so suppliers can obtain a competitive advantage over other suppliers.

A critical element in setting up a successful supply chain is demonstrating benefits to the supply chain participants and the need to form groups to achieve better economies of scale and increased bargaining power. Work has to be conducted at both ends of the chain, the producer and the final customer. This work has to be executed simultaneously, as neglecting either end of the chain limits the ability of the producer to supply a product suited to the target market.

### References

**Aksoy, A.M. & Beghin, J.C.** 2005. Global Agricultural Trade and Developing Countries. World Bank Report. World Bank, Washington, D.C.

**Anh, V.T. & Sakata, S.** 2006. Actors for poverty reduction in Viet Nam. Institute of Developing Economies, Japan External Trade Organization.

**George, A.P. & Nissen, R. J.** 2004. Socio-economic report on temperate fruit production in Thailand, Lao PDR and Viet Nam. Report on ACIAR Project PN 2127, Adaptation of low-chill temperate fruits to Australia, Thailand, Laos and Viet Nam. ACIAR, Canberra.

**George, A.P. & Nissen, R.J.** 2005. Australian Centre for International Agricultural Research Project CIM 2001/27, Trip Report 2, 8<sup>th</sup> July to 3<sup>rd</sup> August 2005. ACIAR, Canberra.

**George, A.P. & Nissen, R.J.** 2006. Australian Centre for International Agricultural Research Project CIM 2001/27, Trip Report 2, 31<sup>st</sup> March-20<sup>th</sup> April 2006. ACIAR, Canberra.

**GSO, VHLSS.** 2003. *Viet Nam Household Living Standard Survey 2002*. General Statistics Office of Viet Nam, Hanoi.

**FAOSTAT.** 2004. Food and Agriculture Organization of the United Nations, Statistics Division, Rome. (also available at <http://faostat.fao.org>)

**FAORAP.** 2004. *Profile of the Lao People's Democratic Republic (Lao PDR) II. Farming system – Agriculture*. Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific, Regional Data Exchange System, Bangkok. (also available at <http://www.faorap-apcas.org/lao/index.htm>.)

**Hallam D., Liu, P., Lavers, G., Pilkauskas, P., Rapsomanikis, G. & Claro, J.** 2004. *The market for non-traditional agricultural exports*. Food and Agriculture Organization of the United Nations, Commodities and Trade Technical Paper 3, Raw Materials, Tropical and Horticultural Products Service Commodities and Trade Division, Rome.

**Hossain, M. & Kumar D.U.** 2003. Liberalisation of the crop sector. Can Bangladesh withstand regional competition? International Rice Research Institute, Centre for Policy Dialogue. Brief 4. September 2003. IRRI, Los Baños.

**Moustier, P., Dao, T.A. & Figuié, M.** 2003. *Food Markets and agriculture development in Viet Nam*. Hanoi, Markets and Agriculture Linkages for Cities in Asia (MALICA).

**Nissen, R.J.** 2006. Collaboration for Agriculture Rural Development Project 050.04 VIE Improvement of export and domestic markets for Viet Nam fruit through improved post-harvest and supply chain management. Second Six Monthly Report. June 2006. ACIAR, Canberra.

**Nissen, R.J., George, A.P., Broadley R.H., Newman, S.M. & Hetherington, S.** 2006a. Developing improved supply chains for temperate fruit in transitional Asian economies of Thailand and Viet Nam. *Acta Horticulturae*, 699: 335-344.

**Nissen, R.J., Nguyen, T.N.H., Nguyen, L.M.T., Rankin, M., Tucker, B. & Hofman, P.** 2006b. *Report on investigations into mango supply chains in Tien Giang Province, Mekong Delta, Viet Nam.* Collaboration for Agriculture Rural Development Project 050.04 VIE Improvement of export and domestic markets for Viet Nam fruit through improved post-harvest and supply chain management Report. ACIAR, Canberra.

**Nissen R.J., Hofman, P. & Rankin, M.** 2006c. Collaboration for Agriculture Rural Development Project 050.04 VIE Improvement of export and domestic markets for Viet Nam fruit through improved post-harvest and supply chain management, Project Trip Report 2, April-May. Volume 1. ACIAR, Canberra.

**Rankin, M.** 2003. Collaboration for Agriculture Rural Development Project Improving the performance of the fruit Industry in Tien Giang and Tra Vinh Provinces, Viet Nam. QA Workshop Report, May 2003. ACIAR, Canberra.

**Wattanuchariya, S. & Jitsanguan, T.** 1992. *Increasing the scale of small-farm operations in Thailand.* Department of Agricultural and Resource Economics Faculty of Economics and Business Administration, Kasetsart University, Bangkok, Thailand. Published by the Food and Technology Centre.

**World Bank.** 2006. *Viet Nam food safety and agricultural health action plan.* World Bank Report No. 35231-VN. World Bank, Hanoi.

## **Initiatives and issues in fresh fruit and vegetable supply chains in India**

M. Punjabi  
FAO India, New Delhi  
INDIA  
Email: meeta.punjabi@fao.org

V. Sardana  
Achievers Resources Limited  
New Delhi  
INDIA

### **Abstract**

*The organized retailing of fresh fruit and vegetables is highly evolved in many developing countries such as Kenya, Brazil and the People's Republic of China. In comparison, organized retail chains in fresh fruit and vegetables are relatively new in India, where fresh produce is marketed largely through traditional channels. However, this situation is changing very rapidly with the entry of prominent industrial groups such as Reliance, ITC, Godrej, Tata and the Aditya Birla Group. Based on interviews with corporate managers, organized fresh fruit and vegetable marketing systems can be categorized as: (1) developing retail outlets in metropolitan and business hubs in the rural areas for procurement of produce and selling fast movable consumer goods and agricultural inputs to farmers; (2) catering to the supermarkets by developing organized wholesalers; and (3) developing chains for export of fresh fruit and vegetables. Apart from these three models, fresh fruit and vegetable marketing may occur through cooperatives and state agencies. In-depth interviews with various stakeholders suggest that some of the key issues emerging are: the lack of farmers' awareness of post-harvest management; the lack of common grades and standards; failure to comply with the Agricultural Produce Marketing Committee Act for procurement from farmers; lack of trained manpower in the area of post-harvest management; enforcement of contracts between farmers and corporations; the lack of cold chain infrastructure; and competition from traders in the traditional market. These issues need to be addressed to facilitate the more efficient operation of fresh fruit and vegetable supply chains. These new initiatives are likely to bring about a great deal of dynamism in the traditional market by emphasizing quality issues, focusing on post-harvest management and market extension, the availability of quality inputs and formal credit for the farmers, and greater transparency in transactions in the current system.*

### **Introduction**

Organized retailing is a very recent phenomenon in India compared with other developing countries. By some estimates, organized retailing in India is about 4 percent of the total retail segment. However, the AT Kearney Global Retail Development Index, pegs the national average at 6 percent (AT Kearney, 2006). Organized retail market share averages in other Asian countries like the People's Republic of China and Viet Nam are much higher at 20 percent and 22 percent respectively. In South Africa, Brazil

and the United States of America, the figures touch 32 percent, 75 percent and 82 percent respectively.

Despite the slow start, the supermarket revolution in India is spreading at a phenomenal pace. According to the AT Kearney study, India tops the list of most attractive countries for international retail expansion. Every day, the press reports plans for new investment in the retail sector by a major Indian firm. According to the India Retail Report, the top ten players in the modern retail trade are likely to invest US\$18–20 billion in the next five years to generate as much as US\$50–60 billion in revenue by 2011. This investment will be made in the top 150 cities, although the impact will be visible in at least the top 500 if not more (Technopak Consulting Group, 2006).

Several Indian conglomerates are entering the retail foray. While 100 percent foreign direct investment (FDI) in retailing is not currently permitted in India, international giants are entering the market as joint venture partners with Indian firms. Reliance Industries and Bharti-Walmart are two of the biggest players. Other major players include ITC, Food World (JV of RPG Group of India and Dairy Farm International based in Hong Kong), Spencer, Godrej, Pantaloon (Big Bazaar and Food Bazaar), and Subhiksha. Most of the retail action is in the southern states of Andhra Pradesh and Karnataka, followed by other metropolitan centres like Delhi, Mumbai and Kolkata.

The most common retail format in the emerging chains is the neighbourhood store (with 2 000–5 000 sq. feet) focusing on fresh fruit and vegetables (FFV) and other food items. Other bigger formats such as supermarkets and hypermarkets also exist, but are much fewer in number. Because of the focus on FFV and food items, retail chains are making significant investments in developing supply chains for FFV. Fresh fruit and vegetables are an important category for the retail chains. In marketing terminology, the FFV segment is considered as the “destination category”, implying that FFV purchase brings the consumers into the stores (AC Neilson, 2003).

Supply chains developed by these supermarkets are well coordinated chains: a very different approach to marketing FFV as compared with the fragmented supply chains in the traditional market. Organized retailing in FFV is a new area for the country and there are many challenges in establishing such supply chains. Different models of FFV marketing are emerging given the backgrounds, strengths and interests of the firms.

Given these dramatic changes, it is important to understand the ongoing situation, the major issues and the key success factors in developing supply chains. In a country like India where a large mass of the population is dependent on agriculture, these changes are likely to have a profound impact on the agricultural economy because of the impact on the major stakeholders – farmers, traders and wholesalers in the traditional market. The overall impact of these changes depends on the share of modern value chains in the total FFV market and the extent of participation of small and marginal farmers in these chains. This paper focuses on the technical aspects, the nitty-gritty of setting up FFV supply chains at the ground level.

### Methods and data requirements

The study method is based on the rapid appraisal approach. Emergence of organized retailing in FFV is a very new phenomenon in India. As highlighted by Hu et al. (2002), in a situation where changes are beginning to emerge and published data is not available, rapid appraisal of the situation is an appropriate methodology. A rapid appraisal survey is a broad and preliminary overview of the organization, operation and performance of a food system or components thereof, designed to identify system constraints and opportunities. It can be used as a tool for identifying system dynamics, linkages and overall problems, which can then be examined more intensely during follow-up programmes (Holtzman, 1986). Rapid reconnaissance or rapid appraisal usually involves short periods of time in the field and it combines some elements of a formal survey, key informant interviewing and participant observation.

The data for this study was collected by the authors as rapid reconnaissance surveys of supermarket managers, post-harvest staff, farmers, traders and wholesalers in the traditional market, government officials and other key informants. The survey was conducted from September to November 2006 in all the major cities in India – Bangalore, Hyderabad, Delhi, Kolkata, Mumbai, Pune, Ahmedabad and Ludhiana. Information in leading newspapers and the press was used to substantiate the survey data.

### Current situation of fresh fruit and vegetable marketing in India

The traditional marketing of FFV in India is typical of a developing country. Several studies have estimated the loss of fresh produce due to poor post-harvest handling to be in the range of 30–40 percent of production (Singh *et al.*, 2002). In such a situation, it is important to understand the weaknesses of the current system and to see how modern supply chains can help to overcome these weaknesses.

Fresh produce in India is marketed mostly through regulated Agricultural Produce Marketing Committee (APMC) markets. Agriculture is subject to state intervention in India and, as such, the APMC Act is under the purview of the state government. APMC regulations require that the purchasing of fresh produce takes place in a notified market and with registered traders (commission agents). There are two charges levied on the marketed produce. First is the commission paid to the commission agent and second is the market tax which goes to the market committee as a payment towards using the premises and other capital works related to market development.

Supply chains for FFV tend to be multilayered which has implications for the farmers' share of the final consumer price; the quality of produce due to multiple handling; and for the marketing cost as the various agents add their costs. A typical supply chain for FFV is shown in Figure 1.

**Figure 1: Supply chain for FFV—traditional marketing approach**

**Farmers → Local Traders → Commission agents → Retailers → Consumers**

The local traders are the traders close to the farmers who procure the produce from the farms and bring it to the market. Commission agents are the wholesalers at the APMC market who sell the produce to the retailers. These retailers include roadside and neighbourhood stalls and kiosks and doorstep delivery by hand carts. The last link in the chain is the consumer.

Marketing through traditional means is characterized by very little attention to grading, sorting and storage, weak institutions and poor handling during loading, unloading and transport (Gandhi and Namboodiri, 2006). The high percent of post-harvest damage can largely be explained by such poor handling of the produce.

### **Emerging models in fresh fruit and vegetable supply chains in India**

Different models of FFV supply chains are emerging given the background, strengths and interests of the firms involved. The investment requirements also vary with the choice of forward or backward linkages.

The oldest models of FFV supply chains in India are the cooperative models initiated by the government. The first such initiative was HOPCOMS (Horticulture Producers Cooperative Marketing and Processing Society Limited), started by the Karnataka State Government (Premchander, 2002).

#### **Farm to fork**

As the name implies the “farm to fork” approach is based on investing in the complete chain from the input level to the front end retail. The main components of this model are: (i) rural business hub, (ii) distribution centre, and (iii) retail end.

The rural business hub is essentially a rural mall set up by firms in semi-urban and rural areas. These rural malls serve multiple functions: (i) provide inputs and farm support services including seeds, fertilizers, plant protection chemicals, extension support and other services such as lab testing, water testing, etc; (ii) cater to the rural market by selling fast movable consumer goods (FMCGs), food items and consumer durables to the rural consumers; and (iii) serve as procurement centres for FFV. The rural hubs of different retail firms have different names such as *Choupal Sagar* (ITC) or *Aadhar* (Godrej).

The distribution centre or collection centre is usually located in an urban area close to the stores. FFVs procured from the various rural hubs are collected at the distribution centre where the produce is graded, sorted, packed and sent to the retail outlets. As the retail chains are relatively new, the produce is procured from multiple sources including direct procurement from farmers, regional APMC markets and other preferred suppliers. Overtime, as the supermarkets develop their backend linkages, the tendency will be to source directly from farmers or preferred suppliers because it is difficult to have control over the quality of produce procured from APMC markets.

Finally, the last step in the chain is the retail store in urban areas. Godrej has been on the ground with its retail outlet *Nature's Basket* since 2002, Reliance set up its first set of stores *Reliance Fresh* in Hyderabad in November 2006. ITC's *Choupal Fresh* pilot



ventures were supposed to cater to the wholesalers, but a large number of clients were direct consumers. Their new stores will all be retail stores.

### **Organized wholesaling**

Some firms are specializing and investing in the wholesale sector to be able to supply quality produce to supermarkets, retailers and institutions. Essentially, the investment is focused on procuring, storing and distribution. The major initiatives in wholesaling are *Adani Agri Fresh* and the Germany-based company Metro Cash & Carry. As the government permits 100 percent FDI at the wholesale level, Metro is able to act independently in India.

Although these firms are specializing in wholesaling, their respective models are very different. *Adani Agri Fresh* operations are limited only to FFV. So far they are specializing in apples. They have set up state-of-the-art infrastructure for grading, sorting and cold storing apples in three locations in Himachal Pradesh, one of the main apple producing regions. They procure directly from farmers and store the fruit to capture the off-season demand. Because of their infrastructure, they can ensure the supply of quality apples for most parts of the year. Their main customers are likely to be supermarket chains where the requirement is for year-round supply of quality produce.

The operations of Metro Cash & Carry include wholesaling of all consumer items including food products. FFV is a part of their operations. Currently, they have stores in Bangalore and Hyderabad and plan to open stores in other metropolitan areas including Kolkata.

### **Front end retail stores**

Pantaloon group has several stores in many cities in the country. They have several retail formats for clothes, fashion accessories etc. Their outlets *Food Bazaar* and *Big Bazaar* deal in food items and FFV. FFV is a small part of their overall retail business. Given that their stores are spread across the country and FFV is a small part of their business, Pantaloon has not yet invested in developing direct linkages with farmers. In some cases, they lease out store space to agents who want to run FFV operations. Procurement in this case is likely to be from the local APMC markets and preferred traders.

Another regional convenience store chain is the *3Cs* group of Kolkata which plans to expand operations in the eastern region.

### **Export chains**

Exporting with GLOBALGAP certification is a relatively recent phenomenon in India. Two major initiatives on this front are *Namdhari's Fresh* and *Field Fresh*. *Namdhari's Fresh* started with exports, but now they also have retail outlets in India. The parent company of *Namdhari's Fresh* is Namdhari Seeds, which is a renowned seed company in India.

The firms selling with GLOBALGAP certification have to develop very tight chains to meet the certification requirements. Because of their seed operations, Namdhari Seeds has developed strong linkages with farmers over many years. In the case of the Bharti-

Rothschild initiative, they have leased land from the farmers and developed state-of-the-art infrastructure to meet the stringent quality requirements. Both firms have invested in state-of-the-art cold chain infrastructure, packing and grading houses, cold stores and refrigerated trucks, along with highly skilled post-harvest manpower to meet the quality parameters of the importers.

### **Issues in developing supply chains**

Developing fresh fruit and vegetable supply chains is a relatively new phenomenon in India and a very different approach from the fragmented traditional markets. In any new initiative there are bound to be challenges. Several issues were highlighted in the interviews with managers and technical personnel in the supermarkets.

One approach to present the issues would be to present a summary of the issues that emerged in the discussions. Another approach is to discuss the major steps in setting up the chain and analyzing the issues at each step. The latter approach is used because it serves the purpose of reviewing the requirements for setting up a chain, gives a comprehensive understanding of the major issues and provides insights into the steps taken by the supermarkets to overcome these challenges. The main steps in setting up a chain were identified as:

Step 1: Policy environment (APMC Act)

Step 2: Developing linkages with farmers

Step 3: Coordinating with farmers

Step 4: Procurement

Step 5: Post-harvest management

#### **Step 1: Policy environment (APMC Act)**

When supermarkets set up supply chains for FFV, they are making huge investments not only in setting up infrastructure at various levels, but also in developing linkages with farmers. To make such investments, there needs to be some level of confidence in the policy environment. The agricultural sector has traditionally been dominated by the government. For increased private sector participation, a fair playing field is a prerequisite.

One of the major hindrances is considered to be the APMC Act (Agricultural Produce Marketing Committee Act). Since the APMC is a state Act, the impact of the Act varies from state to state. The main issues with the APMC Act include restrictions on working within the market premises, which requires the produce to be unloaded and reloaded, leading to a loss of quality because of multiple handling and the time involved. Other factors include delays due to paperwork, paying the market tax and at times paying multiple market taxes when dealing with different APMCs within the state or from other states. Paying the market tax as such is not a major problem; the bigger problem is the time required to complete the formalities. Overall, the impact of the APMC Act ranged from minor frustrations to actually stalling improved FFV operations in some cases, even though investments in infrastructure for distribution centres had already been made. In the recent months, several states have modified the APMC Act to create a

more conducive environment for private sector investment. Nevertheless there are vested interests and in some states the process has been slower than others.

### **Step 2: Developing linkages with farmers**

Developing supply chains in FFV involves a lot of effort to develop linkages with farmers, especially in gaining the trust of the farmers and to motivate them to work with the supermarket. Some instances which emerged in discussion were that “if suited–booted executives show up in the village, it is not easy for the farmer to trust them.” Developing farmer linkages is relatively easier for the firms that have been involved with farmers over time, either through input supply or other means. For example, Godrej has been able to capitalize on the relationships developed with farmers through their input supply and animal feed ventures over many years. ITC also has relationships with farmers through their e-choupal initiative. However, a key difference is that while the e-choupal initiative was in the grain producing regions, the *Choupal Fresh* initiative is in the vegetable growing regions. In these regions, ITC is also working with a USAID team to set up linkages with farmers.

### **Step 3: Coordinating with the farmers**

The three aspects of coordinating with farmers are: (i) developing crop plans; (ii) ensuring availability of required inputs and services for quality produce; and (iii) purchasing from farmers.

When working with farmers in a region it is important to develop crop plans based on the location and traditional strengths of the farmers. An issue which came up in crop planning is that all farmers want to grow higher-value crops such as capsicum instead of tomatoes because of the higher unit price. This problem is usually handled by rotating crops grown by the farmers.

The second issue is of ensuring the availability of inputs. This includes physical inputs as well as extension advice not only on cropping but also harvesting and post-harvest management. The supermarkets usually work with other input suppliers for input supply and credit. Furthermore, supermarkets have done a good job in using agricultural graduates to provide information to farmers. For example, the *Aadhar* centre of Godrej has a soil testing laboratory and a good team of agricultural graduates to provide the required information regarding specific crops.

The final step in coordinating with farmers is the purchase of produce. Three key issues in procuring from farmers are “pole vaulting”, procuring graded produce and the procurement price. “Pole vaulting” or “mushroom buyers” were some phrases we heard while doing the research. Essentially, these are terms used when the farmer sells his or her produce to another buyer and not to the supermarket which has been assisting the farmer to grow the produce. If a buyer shows up willing to pay only Rp 1 higher per kg, the farmer will sell all his produce to that buyer. Some of the ways of handling this were to develop long-term relationships with the farmers. It was found to be helpful to sit with the farmers with a paper and pen and help him or her calculate the costs and returns of dealing with the supermarket. In working with the supermarket, a reduction in costs occurs because of the more targeted use of inputs based on soil testing results. Furthermore, the returns are higher because of the higher yield due to extension advice

on management practices provided by the supermarket's extension specialists. The overall calculation helps them to see the benefits of working with the supermarket in the long run.

Another important issue in coordinating with farmers is that of buying graded produce. The supermarkets buy graded produce, which causes two problems for the farmers: (1) the farmer is still dependent on the local trader to sell the rest of his crop; and (2) in selling all his produce to the local trader, he would get a higher average price. The supermarket takes the high quality produce (about 30 percent of total production), for which he gets a higher price. However, the price he gets for the rest of the produce is lower than average. Over time, as the amount of quality produce increases, this issue will become less important. Furthermore, as some supermarkets are diversifying into processing, potentially, they can buy all of the produce and use different quality produce to satisfy different market needs.

Finally, setting the price was the most important issue in procuring from the farmers. Based on our experience, the best option was to link the price to the market price. Setting the price before growing the produce did not seem to work very well because, for the farmer, the best alternate price is the market price at the time of selling the produce.

#### **Step 4: Procurement**

A good retail store for fresh produce needs to have a sufficient number of stock keeping units and a supply of quality produce in the stores at all times. The main challenges are going out of stock, empty shelves and "sleeping vegetables" (a term used for vegetables which are not very fresh). Since the supermarkets are dealing with small groups of farmers in remote locations, it is seldom possible for them to meet all their FFV requirements through direct sourcing from farmers. The variety of FFV required is large and produce is grown in different parts of the country. Hence, supermarkets are still relying on the traditional APMC market. They have ties with agents in the APMC market who ensure that they get the required variety of FFV for their stores. However, it is difficult to assure quality from the APMC market because there is no control over the production at the farm level. In discussing the supermarket procurement strategies overtime, Reardon *et al.* (2003) indicate that supermarkets usually have to develop procurement systems parallel to and outside of the traditional markets to meet their quality requirements.

#### **Step 5: Post-harvest management**

Three important aspects of post-harvest management are quality standards (grades, pesticide residue), post-harvest infrastructure and manpower. So far as quality and standards are concerned, there is a lack of standards and grades for fresh produce in India. The supermarkets establishing supply chains for FFV are setting up their own grades and standards and communicating these to the farmers working with them. In other countries of the world, where government grades and standards exist, the retail sector still has to invest in setting up their own quality standards because their quality requirements are higher than the government standards. Thus, in setting up supply chains in FFV, developing quality norms and communicating these standards to the farmers is crucial.

Post-harvest infrastructure refers to infrastructure for packing, grading, storage, transportation at the collection centre and at the retail outlet. In our survey of the retail chains in India, we found supply chains with varying levels of sophistication ranging from low-investment infrastructure to state-of-the-art cold chains. In the low-investment chain, the distribution centre is simply an open space for grading, sorting and packaging. Common trucks are used for transportation and the retail outlets also do not have refrigeration for the produce. On the other hand, the high-investment chains include sophisticated distribution centres, highly skilled manpower for grading and sorting, reefer trucks and refrigeration at the retail outlets.

The low investment could very well signify the first phase in the evolution of more-sophisticated supply chains. ITC, for example, is tied up with Ingersoll Rand, a consulting firm specializing in technological innovation to provide cold chain technology. So far as refrigerated trucks are concerned, the size of trucks in India is small and it is not economically viable. The high import duty for imported trucks is an issue which needs to be addressed.

Finally, from discussions with technical experts at the ground level, it was evident that there is not enough manpower in the country to manage post-harvest issues adequately. Training in post-harvest management has not received much attention in the past and needs to be addressed immediately. More importance on post-harvest management should be incorporated into extension programmes to enable farmers to meet the requirements of the supermarkets.

### Conclusion

It is evident that the modern value chains developed by the retail sector are a welcome change from the traditional marketing approach. After years of putting numbers and percentages on post-harvest losses, for the first time, some concrete investments are being made to minimize these losses. Some key areas for the government to encourage their efforts include:

- **Providing a conducive environment for private sector investment.** Modifying the APMC Act will go a long way towards encouraging private sector investment. Several state governments have achieved a great deal of success on this front, but more effort is required.
- **Setting standards for FFV.** In other countries where organized retailing is widely prevalent, the retailers have set up their own FFV standards that are higher than the government standards. It is very important for the private sector to meet quality requirements to be competitive in the new food law regime. The government needs to work with the private sector to develop standards for quality and food safety.
- **Post-harvest management, farmers, skilled manpower and infrastructure.** Historically, post-harvest management has not been given much attention in government extension programmes. In a changing market, post-harvest management needs to be an important part of the government extension programmes if farmers are to participate in modern value chains and to meet the quality requirements of the

supermarkets. From the field surveys, the shortage of post-harvest manpower emerged as a crucial issue. In the coming years, this issue is going to be critical and needs to be addressed immediately. Finally, the supermarkets are investing in post-harvest infrastructure. Incentives for investing, for example, through lower import tax for reefer trucks, will encourage more investment in this area.

- **Developing linkages between small farmers and the retail sector.** The government sector, donor groups and non-governmental organizations can facilitate the development of linkages between small farmers and supermarkets. It is important to initiate projects with public–private partnerships that encourage the involvement of small farmers in modern value chains by providing training in post-harvest management and by collaborating on input supply and credit. The supermarkets are at the stage where they are setting up farmer linkages which are likely to continue in the long run. Initiating such projects will ensure the participation of small farmers in modern value chains.

Finally, the changes brought about by the retail revolution are likely to have far-reaching implications for the stakeholders in this sector including farmers, wholesalers and traders in the traditional market, as well as small retailers. The extent of the impact will depend on the share of organized retail in FFV marketing and the involvement of small and marginal farmers in these modern value chains.

### References

- AC Nielson.** 2003. “Fresh” alternatives at retail. Available at [http://www2.acnielsen.com/pubs/documents/2003\\_q4\\_ci\\_fresh.pdf](http://www2.acnielsen.com/pubs/documents/2003_q4_ci_fresh.pdf)
- AT Kearney.** 2006. Global retail development index. Available at [www.atkerney.com](http://www.atkerney.com)
- Holtzman, J.S.** 1986. Rapid reconnaissance guidelines for agricultural marketing and food system research in developing countries. International Development Working Papers 30, Department of Agricultural Economics. Michigan State University. East Lansing.
- Gandhi, V. & Namboodiri, N.V.** 2006. Fruit and vegetable marketing in India: consolidated study of wholesale markets in Ahmedabad, Chennai and Kolkata. CMA publications No. 221. Indian Institute of Management. Ahmedabad.
- Hu, D., Reardon, T., Rozelle, R., Timmer, P. & Wang, H.** 2004. The emergence of supermarkets with Chinese characteristics: challenges and opportunities for China's agricultural development. *Development Policy Review*, 22: 557-586.
- Premchander, S.** 2002. Cooperative for sale of fruits and vegetables: a success story of urban horticultural marketing. HOPCOMS (Horticultural Produce Cooperative Marketing Society), Sampark, Bangalore.
- Reardon, T., Timmer, P., Barrett, C.B. & Berdegue, J.** 2003. The rise of supermarkets in Asia, Africa and Latin America. *American Journal of Agricultural Economics*, 85(5): 1140-1146.

**Singh, H.P., Negi, J.P. & Samuel J.C. (eds).** 2002. Approaches for sustainable development of horticulture. DAC, MOA. New Delhi.

**Technopak Consulting Group.** 2006. India retail report. Technopak Consulting Group. New Delhi.

**Reardon, T., Timmer, P., Barrett, C.B. & Berdegue, J.** 2003. The rise of supermarkets in Asia, Africa and Latin America. *American Journal of Agricultural Economics*, 85(5): 1140-1146.

**Singh, H.P., Negi, J.P. & Samuel J.C. (eds).** 2002. Approaches for sustainable development of horticulture. DAC, MOA. New Delhi.

**Technopak Consulting Group.** 2006. India retail report. Technopak Consulting Group. New Delhi.

## **Demand trends and their impact on supply chain innovation<sup>6</sup>**

D.R. Hughes  
Imperial College  
UNITED KINGDOM  
Email: Profdavidhughes@aol.com

### **Abstract**

*Consumers are unrelenting task masters. They want it all – products with lower prices, more convenience, better taste, good for their health, good for their appearance and what is more, cause no harm to the environment and are sustainably produced. Consumers, however, are not one homogenous group and increasingly, retailers are acknowledging this through their tiering of supermarket own-labelled fresh food products, viz. **good** (retail parlance for cheap), **better** (regular), and **best** (premium). Emulating the blue chip fast moving consumer goods (FMCG) firms (e.g. Unilever, Nestlé), the challenge is to identify key consumer segments in these target markets and to identify what each segment most values and is willing to pay for. This requires a high degree of customer understanding that has not been evident in the past, where most fresh produce suppliers had little idea of whether a few shoppers bought a lot or a lot of shoppers bought a few. Research evidence clearly indicates that companies or organizations that work closely with their suppliers and customers are financially more successful than those that don't. This is particularly the case for fresh foods whereby the innovation task is a shared supply chain responsibility for each and all actors in the chain. A seed company can breed premium taste, but this attribute has no consumer value unless growers produce it optimally, and distributors and retailers provide the degree of supply chain excellence and integrity that ensures it reaches the shopper in prime condition.*

### **Introduction**

Modern retailing is characterized by the ubiquitous supermarket, whereas traditional retailing embraces the “wet market” and corner “mom and pop” stores. Now, which one of these retailers knows most about his or her customer? Who knows the most about their product? The traditional retailer is unlikely to know where the original product came from, if it was imported (i.e. not local) and he or she probably wouldn't care. What is the point about that? It concerns me when I think that modern retailing, which has done a fabulous job overall, has focused on supply chain development, on efficiency, on reducing costs and streamlining, but failed to understand the shoppers' needs adequately. I would suggest, particularly for fresh produce, where an individual deals every day with the same customers, they amass an immense knowledge about what that particular customer needs. This is my general thesis, an analogy, an evolution. It strikes me that in the fresh produce industry we are emerging from the swamp. We are just dragging ourselves out of the primordial goo and often, even for relatively sophisticated fresh produce distributors and indeed for retailers, they are often unaware

---

<sup>6</sup> The following paper is an edited transcript of a presentation delivered to the International Symposium on Fresh Produce Supply Chain Management



of who their specific customers are. They are still working out, “Do a few buy a lot?” or “Do a lot of shoppers buy a few?” They know how much they sell in a week, but in terms of drilling down, to “Who buys what?” they are only just becoming aware.

From a fresh produce distributor’s point of view, we are still working out who our competitors are. We tend to think that if you are in, say, the United Kingdom and if you are in the berry business, the competition is the Netherlands or Belgium, and not other fruits, or indeed Del Monte or Cape Pineapple in a convenient pack: this is the competition.

We are in this strange world in the fresh produce industry where often the price is highest when the quality is lowest and vice-versa. You know what I mean? When is the price highest in many importing countries? When the fruit is out of season. When is the quality lowest? When the fruit is out of season. When is the product bursting with flavour? During the main harvest period when we quite literally give it away.

Frequently quality and availability are inconsistent. One thing about the Cayenne pineapple to which Denis Loeillet referred to was its consistency: it was consistently acidic; it was consistently unripe. It was consistently difficult to prepare, and yet, on a regular basis, we put it out there and then looked disappointed if it didn’t sell. Well, thank the Lord that the super sweet version came on! Even more, thank the Lord that someone took that rather awkward skin off it, because if our product doesn’t meet the consumers’ aspirations on taste and on lifestyle, then price isn’t an issue – they won’t buy at any price if it’s rubbish!

Product development, as I look around the industry, is often focussed on agronomic and supply chain benefits, you know, extending shelf life. That was the great thing. How far can we extend the shelf life so we can get that disappointing flavour to last even longer? Or on packaging or reducing varieties to lower unit cost – well, what about consumers? Where are the consumer benefits? Picking up on some marketing principles – delivering the right product, the right time and the right place, I think we have often got the wrong product in the wrong form at the wrong price in the wrong location. Clearly we have to learn from world class competitors. We have got to work out who they are and they are probably not in our industry. What food marketing is all about is trying to work out what people value and are willing to pay for. Now that is tough. I travel a lot. I was in Hong Kong recently and there on the shelf I found a square watermelon. Now, that’s useful; well, maybe if you want square watermelon sandwiches! I am pleased that somebody put a lot of time and effort into that, and it was selling for a modest US\$180. Bargain! Moving away from fresh produce, I was working in Seoul the other day and what did I see on the retail meat shelf? – a cow’s foot, and what’s more, a really nice one. It was priced at a modest US\$80. Isn’t it interesting how value varies by country? In the UK, a cow’s foot is a cost to the meat industry and has no consumer value.

The real challenge in the fresh produce industry, particularly if we are export orientated, is to work out what people do value and are willing to pay for, because demand isn’t unidimensional. In fact, it is the reverse: I think it’s bipolar. As you know, clearly we are in a global world. In the United Kingdom, you can buy a Chinese Fuji apple any day of the week. Now, three years ago that wouldn’t have been the case. So, is it all about

globalization? Well, interestingly, and thank the Lord, for fresh produce, there is an increasing demand for local: “I want to buy the local one and I want to pay a premium for doing so.” If customers want to pay more, you shouldn’t disappoint them.

We work, often to many peoples’ surprise, in a high-tech industry, but also in what can be best described as a high touch industry. We want to deal with people who understand what they are selling and are willing to give us the story associated with what we buy. This is the downfall of modern supermarkets where it is a real challenge to find anybody in the store who knows anything about the product; thus the advantage for traditional retailers and also for emerging new independent retailers. Is demand strongest for new and improved products? Well, traditional products increasingly attract the attention of consumers yearning for past taste experiences.

What about ready-to-eat? This is a real challenge in the food industry in many countries. We want it now. But, we want it natural and unprocessed. Do you see the tensions here? Big companies like McDonalds have had to respond from the basic burger offer to fresh sandwiches made in front of you.

Is it all about fast food? Well, not in some countries, and increasingly, too, there is a slow food element. During the week, I want it now and I want it fast and I want it on the run. But during the weekend, I want to sit down with my family and friends and enjoy the food, and when I am in that mood, I want to know more about it. Where was it produced? Who produced it? What is the story associated with it? Is there any romance?

Is it just me or friends and family? Again, we have got to come to terms with consumer demographics. In the United Kingdom, just under one third of all households are one person. Don’t even speculate what they do in the evening. Whatever they do, they do it by themselves. These individuals don’t have a lot of need for a watermelon or a pineapple.

Is it all about low price? If you listen to the retailers you get a sense that it is, because it’s all about, “Price, price, price and let’s get the price down, down, down”, but there are two clear areas of growth in most markets. One is the very low priced – in Tesco language, the value end – and the other is the premium priced product, in Tesco language, the finest end. As producers, we have to work out which ones we shall target, or in most cases, which products have we got for the finest and which for the value? This is great news for fresh produce, because, with modern retailing, the focus is on all-year availability. I’m in the berry business and 365 days a year you need that product on the shelf. In the developed country markets, we are starting to regain interest in seasonality. As you wander around the supermarkets of the world, you can hear people saying, “When is it at its very best? When do you get the real new potatoes? When will it be just bursting with flavour?” and that presents us with great opportunities.

Is it all about scale? Well, to a degree, but then also, in Europe it is about small scale and artisan or craft production. I think we are moving from open supply chains – back to the supply chain theme of the conference – towards closed supply chains where there is a known provider of genetics through a seed, selling to possibly a club of farmers, to maybe an exclusive retailer, through to known shoppers and consumers.

What do consumers want from their food and drink products apart from low prices? We want low prices. Sometimes we want astonishingly low prices, but we want more. In some markets, but not all markets, consumers have the latitude to be able to pay more for more. In the United Kingdom, we see increasing interest in environmentally friendly products. Was this product produced in an environmentally friendly way? Do I have to feel guilty about buying it? What about its impact on global warming? What about the reduction of food miles? Actually, I think fresh fruit is under pressure here. My wife, for example is uncomfortable buying berries air-flown from Chile to the United Kingdom. I do think it will have a commercial impact. When I'm working in say, New Zealand, I am saying, "I bet fresh chilled New Zealand fish will not be air-flown to British markets by 2010." There will be sufficient consumer concern about it by then. Consumers will be saying, "No, let's grow the fish at home." Mind you, food miles, *per se*, is a rough and ready, often inaccurate way of measuring environmental impacts. Increasingly, our measures will become more sophisticated like "carbon footprint" measures.

There are other esoteric attributes of food, these so-called credence attributes like "environmentally friendly". What about sustainability? I call it the Schlosser effect after Eric Schlosser. Some of you might have read *Fast Food Nation*. What is its GMO (genetically modified organism) status? If I were talking to a meat conference we would be concerned about animal welfare and fair-trade. There is a growing body of consumers who are concerned about this, and I am afraid that the bar is going up. What we don't want to see is intensive production practices that harm the environment. (With reference to an aerial photograph.) On the left-hand side is a part of southern Spain in 1974, and 30 years later this is the same part of southern Spain in 2004. Look at the white bit on the right. Do you know what it is? This is an area where we get winter vegetables and fruit, from Spain for Northern European markets. It's plastic. In a little over 30 years we have managed to take several thousand kilometers and completely carpet it in plastic. I can see consumers saying, "We don't like that. That can't be right. Can you imagine how much pesticide we pour onto that concentrated area of land?" We are moving away from this level of intensity and this sort of interest in the environment is just growing and growing and growing. What I see are mainline retailers in a number of countries starting to use their credentials on the environment and on other credence areas like animal welfare, fair-trade and food miles, to position themselves in different parts of the market.

For example, Waitrose is a small niche retailer in the United Kingdom with about 4 percent market share; pretty small, although it does better in fresh produce. With regards to its fresh produce, domestically and increasingly internationally, it wants to have its growers accredited under LEAF, Linking the Environment and Farming. This is environmentally friendly fresh produce. Let's take Marks & Spencer – an up-market retailer just like Waitrose – they want the brand Marks & Spencer to stand for all the good things about the environment, about sustainability, about low residues, about treatment of animals, etc. They don't want little labels identifying this. They want me as a shopper to know that when I buy from Marks & Spencer, it's guilt-free and it's good for the environment.

I am associated with a company called KG Fruits which is a farmer-owned berry company in the United Kingdom. Last season, one of our farmers was taken to task by one of the major television channels, because it was found that the grower had underpaid two of his foreign workers who had come into the United Kingdom to pick strawberries. It was headline news. Unfortunately, he was supplying strawberries through us to Marks & Spencer. The very next morning we had the chairman of Marks & Spencer on the phone to us saying, “That’s it; this is your last chance. If this happens again, if there is any adverse publicity about your treatment of suppliers, then we will de-list you.” This is serious stuff and, in the high income markets, the bar on environmental and social sustainability will go up and up and up, and have an impact on everybody here who is importing to that market.

Is it just in the United Kingdom? No. If I look at an emerging and very successful natural food retailer in the United States of America, Whole Foods, they are doing exactly the same. There is a whole story linking the food to where it came from. “The folks behind the food, Kudu farms nestling in the beautiful Carp Valley” da-da-da-da “is grown by” and so associating the farmer with the retailer. That is the sort of powerful imagery for consumers and shoppers.

What about consumers’ concerns about food production practices? This is important. Apart from low prices, what else do they think about? Let’s go into northern Europe in 2020 – when the consumer will shake hands with the citizen. Remember, that you can be a consumer and you want cheap, good-tasting food and as a citizen, say, you are somebody who is concerned about global warming. I think they will be one and the same by 2020. You have got to watch out in our business for special interest groups. If you take complete lunatics who don’t want to be influenced by anyone, they have a particular agenda, an environmental agenda and they want to drive that. We in the industry have to listen to these special interest groups, particularly the ones who are willing to listen to us, and see what their story is. As we become more aware of climate change I think it will just heighten consumer concerns about the environment. How was food grown and what is its impact on global warming? Some governments – for example, my own in the United Kingdom – are intent on raising the bar on environmental sustainability. European farmers are slow, but they are not stupid; they have suddenly become aware of the implications of food miles. Five years ago they didn’t know what food miles were. Now they see it as a great opportunity to stop product coming into Europe, so it has become a “non-tariff barrier” and they will push that agenda.

Leading-edge retailers are seeking to gain competitive advantages from their green positioning. For mainline manufacturers, CSR, which is corporate social responsibility, is moving up the agenda. I was working two weeks ago in Switzerland with Nestlé. If we take their new product which is called Nespresso, then it is a completely closed supply chain, from working as they are – the largest food manufacturer in the world – to working with small-scale coffee growers in Latin America and taking it all the way to the point of consumption. So, even the big companies are getting into it.

Organic market potential: I think as we see this sort of move towards increasing concern about the environment, Marks & Spencer are saying to us that “by 2008 we want you to

be residue free”. The minute that happens and it will, then all the competitors will ask for the same and the bar will go up and the gap between organic and conventional will get smaller and smaller. Is there a market for organic? Certainly, but it is starting to look more and more like conventional products.

What about GMO developments? Well, Europeans are still much concerned about it, but I think their concerns will reduce over time, particularly, for example, as they notice that GM has a positive impact on the production of, say, energy crops, rather than food crops. GM corn can be converted into energy. Furthermore, the environmental case for GM will strengthen over time as we become more aware of drought intolerance and the lack of water. How can we increase production levels at a time when water supplies are going down? For major exporting countries and firms and for the industry overall, you can't have a leadership position in the market by saying, “We are number two in food chain integrity or we are number two in environmental responsibility.” That is just not possible.

What sort of value chains should we have? Value chains are all about consumer pull, rather than producer push. We know what sort of value chains we want. We want short, fast, transparent, seamless, collaborative ones. Too often, they are complex, price-driven, confrontational, disjointed and opaque. Times are changing from supply push to demand pull. We are moving from an era where one size fits all, from where the Cayenne pineapple suited everybody – actually, it suited nobody – and we are moving from a commodity market environment to a consumer segment environment. There are millions of us out there as consumers and we are not all the same. I see the research and development focus shifting from this great push on input traits like increasing yields and disease resistance to consumer-led output traits such as taste, size and shape and health benefits. This is what it should be about, but it will move from open access supply chains to more closed loop supply chains, where there is a known genetics provider, where there are clubs of farms, where there may be an exclusive retailer, and a group segment of consumers who particularly want a particular product and are willing to pay a premium for it.

We are moving from price-based competition to a more sustainable innovation-based competition, and it's not just innovation in products. It is also innovation in value chains, innovations in processes, innovations in finance. Whereas promotion means “price cutting”, promotion will mean “product benefiting, communicating”. When retailers talk about promotion, it means price reduction. As a supplier, you are never quite sure whether you should say “Yippee!” or cry when you are told your product is going on promotion. I think we are moving from promotion means price-cutting to promotion means explaining-the-particular-benefit-of-our-product-to-a-particular-segment-of-consumers. Let's hope the profit driven by squeezing supplier margins moves towards profit from category growth. Good retailers already understand that. We are in an era not of dependence, but of interdependence where we link arms in the supply chain and all the research that you can get hold of that looks at this area shows that those who work closely with their suppliers and with their customers are financially more successful than those who don't.

