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## **Assisting Vietnamese Mango Farmers to Capture Greater Benefits through Improved Supply Chain Management**

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### **Abstract**

In the developing countries, traditional supply chains for fresh produce are giving way to new supermarket-led supply chains. The rapid transformation in the fruit and vegetable sector is due to the meteoric rise of supermarkets, hypermarkets, superstores, neighborhood stores, convenience stores, and discount stores, which are impacting on smallholder farmers. This change is also impacting on both upstream and downstream market intermediaries through the demand for safe, high-quality produce that has been produced in a sustainable manner. Problems with procurement in traditional supply chains include few product standards, inconsistent supply, highly variable transaction costs, and limited market information. Supermarkets are now setting new procurement practices and supply systems which focus on reducing costs and improving quality to enable them to sell at lower prices. This will allow them to win over consumers and to obtain a larger market share. However, the ability of smallholder farmers, collector agents, and wholesalers in the Mekong Delta to meet safe food levels and the quality demands of domestic and overseas supermarkets can only be obtained through improving their production and supply chain practices. The implementation of new production and postharvest practices and the modernization of these supply chains may preclude many smallholder farmers from participating. Smallholder farmers must develop

risk minimization strategies, such as forming collaborative marketing groups, implementing new crop management and production systems, improving the packaging, and creating more efficient transport methods and handling practices to provide a safe, competitively priced, high-quality product. Understanding the supply chain and where to intervene are essential if farmers and all supply chain participants are to benefit. In this paper, we describe mango supply chains in the Mekong Delta, provide empirical data collected from surveys, and highlight improvements smallholder farmers have been making to achieve greater benefits.

**Keywords:** collector agents; consumers; mango farmers; retailers; supply chain; wholesalers

### Abbreviations:

- FAO – Food and Agriculture Organization of the United Nations
  - FMCG – fast-moving consumer goods
  - GSO – Government Statistics Office of Vietnam
  - HCMC – Ho Chi Minh City
  - MARD – Ministry of Agriculture and Rural Development
  - SIAEP – Southern Sub-Institute of Agricultural Engineering and Post-Harvest Technology
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## Introduction

About 85% of Vietnamese households are involved in some way in fresh fruit, vegetable, or flower production. Generally, these people are smallholder farmers who are currently experiencing dramatic changes in moving from a centrally planned economy to a market-led economy (Nguyen et al., 2004). Following key reforms introduced under the renovation strategy *doi moi*, implemented in 1986, the country has made remarkable progress across a broad range of socio-economic development goals. For example, the poverty rate has dropped from 58.1% in 1993 to 19.5% in 2006, but rural poverty remains high (Swinkels and Turk, 2006; Vietnamese Academy of Social Sciences, 2007). Much of the poverty reduction in Vietnam can be traced to the high rate of economic growth combined with integration into international markets, increasing agricultural exports, investments in infrastructure, and policies that encouraged agricultural and rural development (FAO, 2003).

## Materials and Methods

For this study, information was collected from the Internet and reports produced by the Ministry of Agriculture and Rural Development (MARD), the Government Statistics Office (GSO) of Vietnam, provincial government offices in the Mekong Delta, and surveys. Further information was obtained from published reports and databases of the Food and Agricultural Organization (FAO) of the United Nations and the World Bank.

A survey of supply chain participants was conducted by Vietnamese project staff at the Southern Sub-Institute of Agricultural Engineering and Post-Harvest Technology and the Southern Fruit Research Institute. Approximately 100 consumers and 560 retailers in Ho Chi Minh City (HCMC), 299 wholesalers and collector agents, and 97 mango producers in HCMC, Binh Thuan, Binh Duong, Ben Tre, Tien Giang, and Don Thap were interviewed from July 2005 to June 2006.

## Results

### Consumer Preference

The retail scene in Vietnam is undergoing a great deal of change. Supermarkets and department stores are growing in number and providing more modern services and products. Fast-moving consumer goods (FMCG) have experienced the highest growth rate, growing by 10% per year for the past four years (Vietnam Economy, 2007). Nevertheless, based on the quantities sold, employment, and location, the traditional retail markets and street vendors are still the major sellers of fresh fruits and vegetables (Moustier et al., 2006). Many farmers, collector agents, and wholesalers realize that consumer preferences and requirements are changing, but their knowledge of these changes is extremely limited.

The mango variety Cat Hoa Loc was the most popular variety with consumers, with 71% preferring to purchase and consume this variety, due to its attractive color, flavor, and perceived market prestige. About 76% of the consumers interviewed purchased from 1 to 3 kg of fruit, four to eight times per month. Most consumers purchased from the traditional retail market because it was easier to access, they were able to select individual pieces of fruit, and they had established long-term relationships with the vendor.

### Consumer Quality Ratings

Most consumers (69%) considered the origin of the fruit in making their decision to purchase. Some 69% of consumers purchased mangoes for prestige, 22% due to habit, and 8% due to marketing influences. Only 30% said that the purchase price was too high in comparison to their income. Prices did not fluctuate widely between seasons.

However, some 52% of consumers indicated that they had problems when selecting fresh mangoes at the point of purchase due to uneven ripening. Most consumers purchased mangoes based on color (37%) and overall appearance (21%), followed by size (20%) and flavor/smell (20%). For the majority of consumers (85%), the fruit size was adequate. A further 60% of consumers indicated that the color was good; but 25% indicated that the fruit should be more yellow in color, and 14% indicated that there was too much sap staining the skin. Some 14% indicated that the seed was too large. While 63% indicated that the flavor was good, 18% indicated that the fruit was not sweet enough, and a further 18% indicated that the smell could be improved. Although 71% of consumers indicated that the shelf life was good, 19% indicated that the fruit rotted too quickly and 13% indicated that the skin shriveled or withered too quickly.

### **Retailers**

All retailers surveyed in HCMC reported that consumers were becoming more fastidious in choosing fruit. This was attributed to the increase in living standards over the past ten years.

All of the street vendors surveyed saw their particular line of business as being a temporary job. Most vendors had been in this line of business for only 2 to 3 years compared to market retailers, fruit shops, and supermarkets that had been in business for 5 years or longer.

The three main mango varieties sold by retailers and vendors were Cat Hoa Loc, Cat Chu, and Ghep. Many vendors also sold green mangos. About 93% of retailers in HCMC purchased their fruit from the wholesale market. However, most of the higher-class fruit shops, supermarkets, and leading retailers purchased fruit directly from collector agents or growers in the Mekong Delta or other regions in Vietnam.

Many retailers experienced difficulties in obtaining good-quality fruit. Some 45% of retailers indicated that their suppliers did not meet agreed terms. Agreements were often broken in relation to the price, quantity, and product quality, and there was too much variation in size. All fruit purchased by the retailers was transported from the wholesale market to their place of business by either motorbike or tricycle, and as a result, 25% of retailers complained about the amount of damage inflicted during the transport of their fruit. Transport fees were usually negotiated between the retailer and wholesaler based on the annual quantity of fruit purchased. The majority of retailers (96%) believed that a 5–10% loss occurred during transport and a further 10% was lost during storage.

All contracts between retailers and wholesalers were verbal. Once the retailer received the goods, 85% of the payment was made to the wholesaler, with the remaining 15% paid at an agreed time. No fruit was sold by retailers to other retailers or vendors in other areas or regions of Vietnam.

Stem-end rot and anthracnose are the biggest causes of fruit loss during storage and sale. Retailers identified that markets and consumers were their most important sources of information, but the availability of information in these areas was limited. Many retailers indicated that the supply chain in which they were involved was the best place to obtain information on market problems and changes in fruit quality and quantity. The most profitable mango variety to sell for the supermarkets, fruit shops, and retail marketers was Cat Hoa Loc, followed by Cat Chu, and, for vendors, Ghep.

### **Wholesalers**

About 79% of the fruit wholesalers in HCMC had been in this line of business for more than 5 years. However, they were facing increased competition from provincial collector agents and wholesalers. Wholesalers indicated that the most profitable mango variety was Cat Hoa Loc. All wholesale contracts were made verbally, but if a wholesaler purchased a crop from a farmer, a contract was needed. Some 30% of the agreed value was paid directly to the farmer in cash at the time the transaction was made, with the remaining 70% paid when the fruit was collected. Discounting was common practice if the quality of the fruit received was lower than expected.

The major problems faced by the wholesalers when purchasing mangoes were the following: (1) 45% of suppliers did not deliver the quantity and quality at the agreed price, (2) 5% did not deliver fruit of a uniform size, and (3) transport problems associated with distance from the market were encountered.

When selling the fruit, the major problems faced by wholesalers were the following: (1) there was variability in price, particularly when markets were saturated (100%); (2) the fruits had to be transported over great distances (10%); (3) buyers did not adhere to their agreements on price, quantity, and quality (10%); and (4) market taxes were too high (10%). Fruit losses were high because rotten and shriveled fruit or ugly fruit had not been removed. Furthermore, where the fruit was stored for several days, there was a significant reduction in weight as a result of moisture loss and attack by rodents.

Wholesalers indicated that the most effective place and way for information to be exchanged was through other supply chain members, with all wholesalers suggesting that the phone was the most appropriate vehicle.

### **Transporters**

The majority of mango farmers in Tien Giang Province (72%) transported fruit by boat to predesignated collection points. Farmers paid for the transport cost, all the way to HCMC. These costs were deducted from the final payment made to farmers by collector agents or wholesalers. If the truck was stopped or inspected on the way to market, additional costs were usually incurred, which were also passed on to farmers. Fruit was usually transported to HCMC by

covered 10-ton trucks. Fruit was collected during the day from local markets or collector agents, the trucks packed to capacity, and the fruit transported to the markets at night, for trucks are only allowed to enter HCMC during the night.

### **Collector Agents**

Collector agents wanted fruit that was hard green. Depending upon the district, most collector agents graded the fruit so that they could (1) return the baskets to growers, (2) ensure there was no ripe fruit in the consignment, and (3) protect their business reputation for delivering the quality of fruit promised to their customers. Most collector agents packed fruit into 30- to 50-kg bamboo baskets. Two types of bamboo baskets were used: one basket was made from bamboo woven into a strong inflexible basket; the other was constructed from a thinner, softer, woven bamboo mat. Both baskets were lined with paper to stop abrasion marks appearing on the fruit. A layer of paper was also placed between several layers of fruit to prevent sap burns from occurring.

A fair price for the fruit was negotiated with the farmer depending on the following: (1) the prevailing market price on the day or the day before, (2) the level of supply in the market on any given day, (3) the variety, (4) the quality of the fruit, and (5) the prices set by other collector agents, wholesalers, and traders.

### **Farmers**

The majority of mango farms in the Mekong Delta (82%) were less than 1 ha in size. Most orchards (73%) produced 5 to 10 tonnes per hectare. Most farmers (96%) harvested the fruit themselves, with 76% waiting until the fruit was mature. However, 18% indicated that they often harvested immature fruit when market prices were high.

The indicators used by farmers to determine fruit maturity were many and varied, with 26% of farmers using days from fruit set, 18% using size and shape, 15% using a change in color, and 12% using the change in bloom on the fruit. Trees were strip-picked or harvested 3 to 4 times at intervals of 7 to 15 days. Fruit were harvested by hand. Fruit that was hard to reach was often left on the tree until it fell naturally.

Some 45% of farmers practiced some form of grading while the remaining farmers consigned largely ungraded fruit to market. Collector agents and farmers preferred to sell mixed grades, even though the farm gate price was lower. This was done so that farmers could sell the class 3 fruit which was difficult to sell alone. This added significant cost to all aspects of the supply chain and adversely affected the farmers' returns.

Most farmers believed that the shelf life of their fruit after harvest was adequate without any special form of storage. Most farmers (49%) believed

that the fruit would last for about 10 days, and 17% thought fruit would last for up to 15 days.

Most farmers (50%) used the same method to sell their fruit each year. Some 32% sold only to collector agents; 40% only to wholesalers; 13% to collector agents and wholesalers; 9% to collector agents, wholesalers, and retailers; 2% direct to retailers; and 4% to collector agents, wholesalers, and cooperatives. The main reason for selling to particular collector agents was the long-term relationship they had developed (32%). Most farmers believed that they received a fair price from collector agents/wholesaler and that there was little chance their fruit would be rejected. All farmers believed that there would be minimal damage to the fruit during transport from their farm to the market because of its hard green state. Farmers estimated that the amount of damage to fruit during transport to market was only 1–2%.

All farmers regularly used pesticides. On the basis of pesticide sellers' advice, the farmer's spray load had increased significantly from 26 to 37 sprays per year, whereas the mean number of insecticides used per farmer had increased from 2.6 to 3.9. Van Mele et al. (2001) found that pesticide expenditure was directly correlated with the expenditure on fertilizers, but there was no relationship between the amount of pesticides sprayed and yield. Around 20% of the insecticides used belonged to WHO toxicity class I, while most of the others belonged to class II. Only 10% of the participating farmers knew anything about integrated pest control and the use of natural enemies to control pests.

By far, the most destructive disease adversely affecting fruit quality and yield degradation was anthracnose (*Colletotricum gloeosporioides* and *C. acutatum*). Most farmers had been unable to control this disease due to the following: (1) large tree size, (2) inadequate spraying methods, and (3) a lack of understanding of the disease, its symptoms, the source of inoculum, the infection process, spread, and life cycle.

Pacllobutrazol, a plant growth regulator, was regularly used in combination with thiourea to enhance flowering.

## **Summary of the Mango Supply Chain Practices in Southern Vietnam**

Traditional mango supply chains in Southern Vietnam are long in terms of the number of participants and the number of times fruit is handled compared to developed countries. Fruit moves from the orchard to collector agents or a local wholesaler at the district level. Fruit is then transferred to either a wholesaler at the provincial level or directly to a wholesaler in HCMC, depending on the distance from the market. As the fruit moves along these



traditional supply chains, it is graded by each chain participant. Topping is a common practice, whereby better quality fruit in each grade is placed on the top of each basket. Very little or no cool chain practices are carried out. Packaging is in 35-kg baskets lined with paper. The top layer of high-quality, extra-class fruit and class 1 fruit are wrapped in paper with stalks attached. This is done to reassure customers that the fruit they are about to purchase is fresh. However, these stalks often break off during handling and transport, resulting in sap burns on the fruit. On average, 31% of the fruit suffers from sap burn.

Prices fluctuate widely as estimates of daily market volumes and prices paid on the previous day are exchanged between wholesalers and their upstream suppliers. Therefore, many farmers do not know what price they will receive for their fruit.

Many farmers are now realizing that mangoes are perishable fruits and traditional chains are rapidly changing. Wholesalers and collector agents at the district level are selling directly to supermarkets and high-quality retail shops in HCMC. As quality standards seldom exist for many supply chains, opportunistic trading practices are evident (Quinn et al., 2006). Verbal agreements between chain participants are not strictly enforced or adhered to, and there is little opportunity for formally addressing any disputes.

## **What Farmers Are Doing to Gain Greater Benefit**

In order to take advantage of emerging market opportunities in the modern retail market, smallholder farmers are forming collaborative marketing groups. These groups have the potential to empower smallholder farmers in a way that they cannot achieve acting individually.

The farmers participating in the project have analyzed their supply chains resulting in the following: (1) the development of action plans, which includes (a) implementing new integrated pest and disease management strategies to reduce the reliance on chemicals and to implement good agricultural practices, (b) a reduction of postharvest losses by applying new harvesting and packaging technologies to facilitate the transport of their fruit to market, (c) engaging with government and private companies to gain a greater understanding of their supply chains, and (d) building new supply chains that are more able to generate added value, greater benefits for themselves, and greater value for their customers; (2) the adoption of improved agronomic practices with the aim of reducing tree size, increasing the yield of high-quality fruit, improving their management of pests and diseases, and implementing strategic management plans to improve economic viability; (3) the implementation of new harvesting methods, which means harvesting fruit from trees into small baskets and

wrapping each fruit with paper (this has resulted in a 10% increase in class 1 fruit, but when marketed through the tradition supply chain, there was little increase in returns, but a greatly enhanced market share); (4) the adoption of new de-sapping processes to reduce sap burn resulting in a significant improvement in fruit quality; (5) the bagging of off-season fruit to reduce the incidence of pest and disease damage and eliminate the need for regular chemical sprays; (6) the development of quality guides that describe maturity indices and standards, grade/class standards, and quality defects which the farmers have set and will adhere to when they provide fruit to supermarkets in HCMC; (7) the development of single-layer tray packs and double-layer pattern packs to reduce fruit damage during transport; (8) the development of new handling, storage, and transport methods to reduce damage in transit and new stacking methods to eliminate carton crush and fruit damage.

Farmers in the Mekong Delta who implemented better on-farm practices earned 2.2 times that of non-adopting farmers. Farmers who implemented fruit bagging in the off-season earned 1.3 times that of those who did not bag fruit.

## Conclusion

Both vertical and horizontal integration must occur within a supply chain if the chain is to be more effective and more efficient. However, this can only be achieved where there are high levels of trust, open and effective communication, and information flows freely along the chain. The business culture which has operated in this region has been established over many years, and convincing farmers, wholesalers, and participants about new supply chain practices will take considerable time. Local culture also has a significant influence, for many participants feel that if something is not successful on the first attempt, it is easier to go and do something else rather than trying to analyze what went wrong and fixing it.

While some farmers participate actively in workshops and farmer field schools and demonstrations, the practical application in their orchards is another matter. Risk-reduction strategies need to be included in the training. This training should build farmer confidence to try new approaches. Microeconomic evaluations, scenario planning, and the development of business plans at the farm level are needed.

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