

Logistics Cost Structure for Mangosteen Farmers in Thailand

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Abstract

Mangosteen is a major Thai export produce which brings economic benefits to farmers. The objectives of this paper are to study the mangosteen supply chain in eastern Thailand and analyze the logistics cost structure for mangosteen farmers. The results show that the highest logistics cost consists of material handling such as post-harvest, grading, and handling, followed by transportation, procurement, customer communications, and inventory, respectively. In addition, we found that the logistics cost structure varies by the size of farms; also, the yield of mangosteens increases as the size of the farm increases. To reduce the logistics cost and increase the efficiency of logistics operations, mangosteen farmers should reduce non value-added activities and increase the utilization of resources during production, harvest, postharvest, grading, packing, storage and delivery. In addition, the integration of farmers and collaboration among farmers and collectors should be encouraged.

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1. Introduction

Mangosteens are one of the major fresh produce products exported from Thailand to many countries such as China, Taiwan, Japan, etc. At present, there is a problem with inequality of supply and demand. This indicates that there is a limitation in the logistics and supply chain of mangosteens in Thailand. Mangosteen production is seasonal and fragile; in each region, fresh mangosteens can be marketed for only for a few months each year. Fortunately, mangosteens are grown in two parts of Thailand, the south and the east. Hence, they can be distributed over a longer period of time, because mangosteens from the east are harvested before those from the south.

The logistics management is difficult because of the perishability and fragility of mangosteens. The stakeholders in the supply chain must be careful during the harvesting, grading, handling, and transporting to consumers. This increases the logistics cost to the stakeholders. If the upstream stakeholders handle mangosteens properly but the downstream ones do not, then the quality will deteriorate quickly before delivery to consumers. Another problem is that the price of mangosteens fluctuates due to several factors such as supply, demand, selling season, quality, etc. The price of premium-grade mangosteens can be up to ten times that of the lower grade. This encourages farmers to produce the premium grade. However they are very difficult to produce, for reasons which include climate variables, disease, insects, labor shortage, insufficient funding, and inadequate harvesting technology. There is wastage during harvest and postharvest as well. Factors such as climate, disease and insects are difficult to control. Hence, the

present focus is on the improvements that could be made to logistics management, such as by reducing waste, which would bring additional benefits to stakeholders, especially farmers.

2. Literature Review

Supply chain management has recently become a popular topic. The principles can be implemented in several industries, including agriculture. The stakeholders in the supply chain should be virtually integrated by establishing coordination, collaboration and sharing information throughout the whole supply chain so that the total system-wide costs can be minimized while the service level is satisfied [1][2][3].

Some recent research can be applied directly to farmers, such as studies of: analysis of key factors for a farmers choice of crop [4]; production costs of small-, medium- and large-size rice farmers in Bangladesh [5]; the relationship between farm size and performance in U.S. dairy farms [6]; producers and the changing production and marketing environment, to help farmers compete in the long run [7]; the integration among farmers and other parties in the same supply chain [8][9]; the role of contract farming in Latin America [10]; value addition and value creation to the rice supply chain [11]; and the improvement of production efficiency [12]. Weinberger and Lumpkin [13] stated that horticultural research and development should be encouraged to aid producers, especially in terms of genetic improvements, safe production systems, commercial seed production, postharvest facilities, and farming in an urban or peri-urban environment. Genova et al. [14] studied postharvest vegetable losses in Southeast Asia. Boselie et al. [15] investigated five cases of fresh produce supply chains in African and Asian supermarkets or for export markets in Europe. They analyzed the problems faced by small producers, as well as their competitive advantages. They found that small producers have difficulty meeting the requirement of supermarkets, and generally have inadequate investment; however, they tend to produce good quality produce and have a higher level of commitment to the crop because it directly affects their livelihood.

The demand management process in agri-food supply chains can be improved through collaboration across the supply chain. Increased collaboration, information sharing and joint planning between manufacturers and retailers helps retail food supply management become more efficient [16] [17].

Costs can be calculated in many ways. Activity-based costing (ABC) systems have been developed to improve the costing system, and claim to be more accurate than traditional costing methods [18] [19] [20] [21] [22]. Trienekens et al. [23] studied the fresh vegetable chain in Thailand, as well as the shipment of fresh fruit from South Africa and Ghana to the Netherlands. Ruben et al. [24] analyzed the transaction cost of the vegetable procurement system in Asian supermarkets by comparing case studies in Bangkok, Thailand, and Nanjing, China. Comparisons are presented of two major types of suppliers for TOPS supermarket in Bangkok: local wholesalers and preferred suppliers. They concluded that in the case of TOPS supermarket there are five aspects involved in the transition of wholesale procurement toward a preferred supplier arrangement: fixed investments, variable costs, economies of scale, governance costs, and opportunistic behavior. For fixed investments aspects, they considered quality and freshness, lead time, and out of stock and yield loss. The variable costs depend on the number of suppliers and distribution cost. Governance costs are contractual arrangements, information and search of partners, screening and monitoring of the quality control system, negotiation and enforcement. The opportunistic behaviors are asset specificity and risk. A preferred supplier has the benefits of economies of scale, high quality and freshness, low lead time, low out of stock and yield loss, low number of suppliers, low distribution cost, contractual arrangements, quality control systems, and low negotiation and risk factors; whereas the drawbacks include potential rejection of products, financial penalties, and high asset specificity. TOPS converted its regular suppliers into value-added suppliers by adding such activities as quality control, cutting, trimming and packing.

Furthermore, Rong et al. [25] analyzed the design and operation of a food distribution system to maintain optimal quality of fresh food throughout the supply chain, using a mixed-integer linear programming model. Their model considered quality degradation, temperature control, shelf life, and transportation lead times.

Several recent research reports are directly applicable to mangosteen farmers. Jaritngam [26] investigated a method of checking for defects in mangosteens. Rattanatraipob [27] studied methods to extend mangosteen shelf life. Other researchers who have studied the benefits of farmers groups and cooperatives are Kladpuang [9] and Bamrungcheep [8]. Focusing on the marketing and distribution of mangosteens, the Kenan Institute Asia [28] studied the potential for central market settlement in Chantaburi, and a distribution system for domestic and international markets. In addition, a survey of the mangosteen supply chain in Indonesia was carried out by Dimiyati

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