



SUPPLY CHAIN AND LOGISTICS MANAGEMENT FOR EXPORTING THAI FRESH MANGOES: A CASE STUDY OF JAPANESE MARKET WITH AN OPPORTUNITY FOR ASEAN MARKETS

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Abstract:

The main objective of this research is to study supply chain and logistics activities of exporting fresh mangoes under that study of farmers, consolidators, and exporters exporting mangoes from Central and Northern provinces of Thailand. Methodologies used rely on survey, observation and interviews. Tools such as questionnaire, in-depth interview, and non-participation observation were used.

The result of this research revealed that Ban Phet Nam Phung Group at Uthaitхани province was the best fresh mangoes producer among 13 grower groups with 87.25 percent of target products for export purpose. There were five groups reached above the average of 66.27 percent. In supply chain, 35 percent of fresh mangoes from consolidators were exported to upper markets and 65 percent were exported to lower markets. For logistics activities, there are six logistics activities occurred in exporting process with composed of transportation, material handling, receiving and storage, customer service, inventory management, and packaging. Total logistics cost was 72.44 Baht per kilogram and transportation cost was the highest among others, accounted for 60.83 Baht per kilogram or 83.97 percent of total logistics cost.

Based on findings, it is recommended that stakeholders and involved government sectors should prioritize the capability of group growers in order to help the most critical one by exchanging knowledge and discussing occurred problems for export purpose. Reducing transportation cost is recommended in exporting fresh mangoes. Apart from Japanese market, ASEAN market is huge market and is suggested to farmers, consolidators, exporters, and government to pay more attention to. Future research direction should focus on enhancing growers and consolidators' capability to increase their fresh mangoes production under export purpose in supply chain and reducing logistics costs for ASEAN markets in export process to become competitive at international level.

Keywords: mangoes, exporting, supply chain, logistics, management

Introduction

Mangoes account for nearly half of all tropical fruits produced worldwide. Thailand became the third top producers of mangoes, mangosteens, and guavas in the world at approximately 2.55 millions of tons during 2010-2011, estimated from The Food and Agriculture Organization of the United Nations. In Thailand, mango production for exporting was the top production compared to others in 2010 (Likhitwitayawuid, 2011). Competing countries for exporting Thai fresh mangoes are Philippines, Mexico, Australia and Taiwan. Thai mango is one of the most

important export fruits of the country. The latest world total value of exported Thai fresh mangoes during January-July 2012 was 778.30 million baht. The major export destinations are ASEAN, Japan, United States of America, and European Union (27). Table 1 represents the major regional destinations for exporting Thai fresh mangoes. ASEAN market has been the major destination for exporting fresh mangoes, accounted for 45.85 percent of total value in 2011 and extremely high growth rate of 59.02 percent in 2011. Vietnam, Malaysia, Singapore, Indonesia, Myanmar, and Laos are six out of ten ASEAN members listed in the first 15 major destinations in exporting Thai fresh mangoes in 2012, as shown in Table 2. Japan is the second in both Table 1 and 2.

Table 1. Major Regional Destinations for Exporting Thai Fresh Mangoes

Country	Value: million baht			Growth rate (%)		
	2010	2011	2012 (Jan.-Jul.)	2010	2011	2012 (Jan.-Jul.)
ASEAN(9)	201.80	320.90	414.50	-0.91	59.02	32.85
Japan	201.90	220.70	198.10	15.70	9.30	14.99
U.S.A.	1.70	0.40	0.50	-51.63	-76.94	3766.14
EU(27)	16.00	17.60	15.80	18.83	10.07	35.22
World total	505.20	699.90	778.30	4.26	38.53	31.78

Source: ICT Center with Cooperation of the Customs Department

Table 2. 15 Major Destinations for Exporting Thai Fresh Mangoes

Country	Value: million baht			Growth rate (%)		
	2010	2011	2012 (Jan.-Jul.)	2010	2011	2012 (Jan.-Jul.)
1. Vietnam	76.50	176.42	284.21	14.38	130.62	62.55
2. Japan	101.91	220.68	198.11	15.70	9.30	14.99
3. South Korea	44.37	80.62	105.87	92.42	81.72	81.57
4. Malaysia	73.68	86.19	96.93	-15.32	16.97	12.56
5. China	19.90	35.03	22.17	-2.35	76.00	12.95
6. Singapore	15.13	13.96	18.49	-3.47	-7.70	88.37
7. Indonesia	13.31	10.76	12.28	67.43	-19.14	16.34
8. Germany	8.75	9.52	11.87	24.02	8.88	86.74
9. Hong Kong	14.06	14.39	9.64	-39.16	2.34	-19.76
10. Russia	0.01	1.58	4.14	-99.88	17,025.00	1,322.66
11. Netherland	3.75	1.81	2.23	80.76	-51.72	24.27
12. Switzerland	0.98	3.25	2.01	87.02	230.18	58.89
13. UAE	0.70	1.79	1.61	589.73	156.68	63.88
14. Myanmar	3.73	3.01	1.60	410.43	-19.49	221.23
15. Laos	19.42	30.49	1.02	-18.62	57.02	-96.61
World total	505.20	699.90	778.30	4.26	38.53	31.78

Source: ICT Center with Cooperation of the Customs Department

From the forecast Thai fresh mangoes production for exporting in 2010 in Table 3, if the Central and Northern region of Thailand were grouped into one main fresh mangoes producer, it would be the highest fresh mangoes production of the country, accounted for approximately 32.50 percent. Thus, this study focused on both regions in the areas of logistics and supply chain management for farmers, consolidators, and exporters. In 2010, the 23,458 ton of Thai fresh mangoes was exported to international markets (Likhitwitayawuid, 2011). Therefore, 60.34 percent of total forecast production was exported.

Table 3. Forecast Thai Fresh Mangoes Production for Exporting in 2010

Region Planted Mangoes for Exporting in Thailand	Production (Unit: Ton)	Percentage (%)
North	10,845	28.00
Central	1,700	4.50
East	12,100	31.70
North-East	10,290	27.00
West	3,380	8.80
Total	38,815	100.00

Source: Thai Mango Growers Association (2010)

Recently, the study of supply chain and logistics management is becoming increasingly important role for post harvest agricultural products since fresh mango is considered as perishable product which requires proper handling. Traditionally, marketing, distribution, planning, manufacturing, and the purchasing organizations along the supply chain operated independently. These organizations have their own objectives and these are often conflicting. Recently, the concepts of supply chain and logistics management have been widely interested since its concepts are a strategy through which such integration can be achieved effectively. With the well management of supply chain and logistics activities, every player in the supply chain can lower its cost and increase its customer services level (Lambert et al., 1998). The supply chain and logistics management is a strategic model that integrates business operations and the administration of key processes in the supply chain from the development of products to the marketing in order to meet the customer needs.

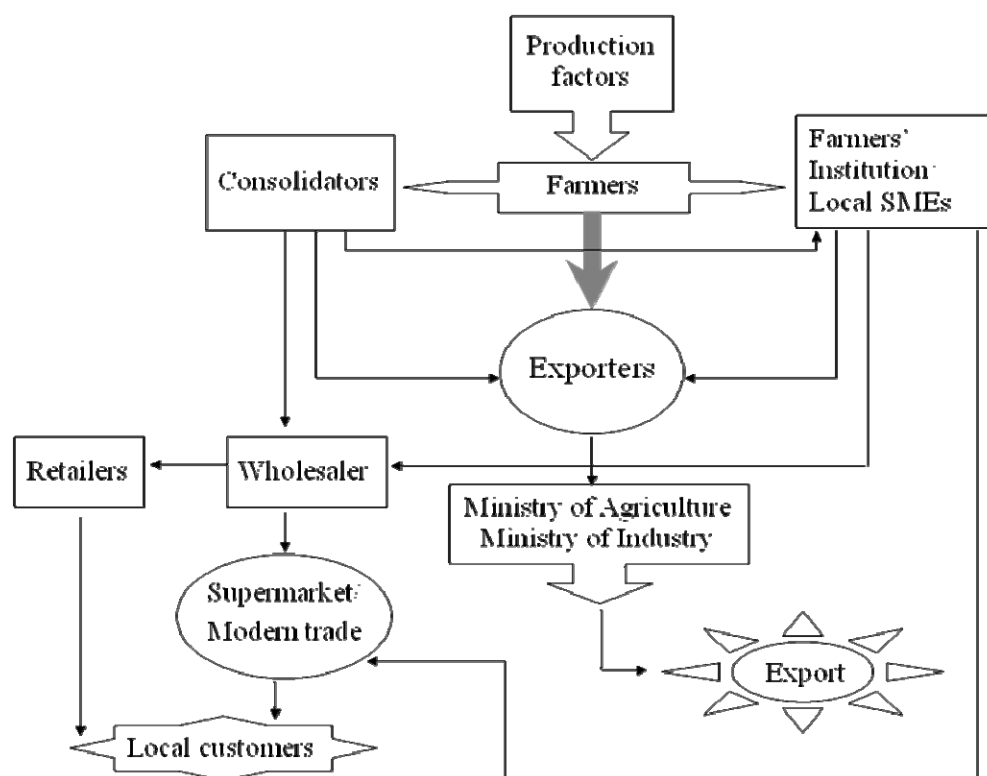
Supply chain management (SCM) is now recognized as one of the major developments in business thought for the 21st century. Originally, SCM was viewed as a summation of operational activities in functional areas such as purchasing, operations management, and logistics. Today, SCM is increasingly seen to be a strategic, highly integrative management area that exceeds any single functional perspective. Other authors, for example, Lummus et al. (2001) contended that SCM includes logistics flows, customer-order management, production processes, and the information flows necessary to monitor all the activities at the supply-chain nodes. Min and Mentzer (2000) saw SCM as being composed of two components--an integrated business philosophy and implementation actions; these authors emphasized that SCM extends the concept of 'functional integration' beyond a firm to all the firms in the supply chain, and that each member of a supply chain contributes to the competitiveness of the chain. Lambert et al. (1998) also contended that the objective of SCM is to maximize competitiveness and profitability for whole supply chain, including the end-customer.

At the same time, definitions of various SCM perspectives and domain are maturing. As defined by the Council of Supply Chain Management Professionals (CSCMP), SCM

encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, SCM integrates supply and demand management within and across companies.


Cooper and Ellram (1993) defined SCM in terms of the analysis and management of the entire network, from the supplier through to the ultimate customer, with a view to achieving the best outcome for the whole system, while Lambert et al. (1998) defined SCM as “an integration of key business process from end user through original suppliers that provides product, service and information that add value for customers and other stakeholders”. Van der Vorst (2004) also defined that SCM is the integrated planning, co-ordination and control of all business processes and activities in the supply chain to deliver superior consumer value at less cost to the supply chain as a whole whilst satisfying requirements of other stakeholders in the supply chain (e.g. government and NGO’s).

This review of definitions suggests that SCM is a business philosophy that strives to integrate the activities, actors, and resources of channels from the point of origin to the point of consumption. This means that SCM involves different kinds of dependencies in and between companies in channels from manufacturers or suppliers to the end customers. In agribusiness, this industry is clearly very interested in the achievements of SCM and in implementing a ‘best practice’ SC scenario. Figure 1 shows the supply chain of fresh fruits in Thailand (Likhitwitayawuid, 2011). The key players are farmers, consolidators, farmers’ institution and local SMEs, exporters, wholesalers, retailers, government, supermarkets and local customers.



Source: Likhitwitayawuid (2011).

Figure 1. Supply Chain of Thai Fresh Fruits



In 1986, the American Council of Logistics Management (CLM) defined logistics management as ‘the process of planning, implementing and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods, and related information from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements’. In addition, the Council of Supply Chain Management Professionals (CSCMP) defined logistics management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption to meet customers’ requirements.

Historically, logistics has been considered an issue deserving modest priority in each organization. Nowadays logistics is seen as a value-adding process that directly supports the primary goal of the organization, which is to be competitive in terms of a high level of customer service, competitive price and quality and in terms of flexibility in responding to market demands. Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfillment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers. Logistics management is an integrating function, which coordinates and optimizes all logistics activities, as well as integrates logistics activities with other functions including marketing, sales manufacturing, finance, and information technology. In logistics activities, key logistics activities and supporting logistics activities are divided (Stock and Lambert, 2001) and presented in Table 1.

Table 4. Logistics Activities

Logistics Activities	
Key Activities	Supporting Activities
<ul style="list-style-type: none"> • Transportation • Inventory management • Order processing • Customer service • Demand forecasting • Purchasing • Warehousing and storage • Reverse logistics 	<ul style="list-style-type: none"> • Parts and service support • Plant and warehouse site selection • Material handling • Packaging • Logistics communications

Source: Stock and Lambert, 2001

Sirisuwanakij and Somboonwiwat (2007) studied the logistics planning of exporting Thai fruits by exploring activities: grading, packaging, checking, shipping and warehousing. Critical problem was the lack of containers during the peak season. In recent years, several researchers studied logistics and supply chain for many kinds of industries, particularly in manufacturing industries; however, few studies have done for post harvest agricultural products. Therefore, this study aims to study supply chain and logistics activities of farmers, consolidators, and exporters involved in exporting Thai fresh mangoes.



Methodology

The supply chain and logistics management for exporting Thai mangoes from a study of farmers and exporters in Central and Northern provinces in Thailand studied fresh and ripe Nam-Dok-Mai mango postharvest exported to Japan as a case study since during the past until 2011 the value of Nam-Dok-Mai mango exported to Japan was the highest. The study covered 13 major farmers and consolidators planted their mangoes in central and Northern provinces in Thailand with the main objective for exporting.

Data came from secondary data and primary data. Mainly for primary data, qualitative method was used. Data collected from farmers and consolidators relied on survey, observation and interviews. For exporters, questionnaire, in-depth interview, and non-participation observation were used.

Results, Discussion and Conclusion

Among 13 groups of farmers and consolidators planted their mangoes in Central and Northern provinces in Thailand, results revealed that Ban Phet Nam Phung Group at Uthaitхани province was the best producer with 400 ton of fresh mangoes production with export purpose, 349.00 ton passed for exporting which accounted for 87.25 percent of target mangoes production for exporting as presented in Table 5. There were five groups reached above the average of 66.27 percent. However, there were six grower groups whose percentages of target products for exporting were lower than 50 percent.

Table 5. Fresh Mangoes Production for Export Purpose and Volume for Exporting of 13 Growers

Farmers/Growers/Consolidators	Production with Export Purpose (Unit: ton)	Volume Passed for Exporting (Unit: ton)	Percentage for Exporting (%)
Group 1: Ban Phet Nam Phung, Uthaitхани	400.00	349.00	87.25
Group 2: Noen Maprang, Phitsanulok #1	1,600.00	1,356.00	84.75
Group 3: Muang, Phetchabun	160.00	122.00	76.25
Group 4: Sam Ko, Ang Thong #1	3,125.00	2,345.00	75.04
Group 5: Noen Maprang, Phitsanulok #2	1,560.00	1,100.50	70.54
Group 6: Praw, Chiang Mai	300.00	192.30	64.10
Group 7: Viset Chai Charn, Ang Thong	1,000.00	550.00	55.00
Group 8: Mae Taeng, Chiang Mai 2	300.00	140.80	46.93
Group 9: Sam Ko, Ang Thong #2	160.00	72.25	45.15
Group 10: Song Khon, Saraburi	200.00	57.10	28.55
Group 11: Chon Dean, Phetchabun	300.00	79.00	26.33
Group 12: Wang Thong, Phitsanulok	440.10	69.10	15.70
Group 13: Nong Phai, Phetchabun	200.00	24.65	12.33
Total 13 Groups	9,745.10	6,457.70	66.27

Figure 1 represents the supply chain of volume of Nam-Dok-Mai mangoes aimed for exporting in each player, which were planted in the Central and Northern region of Thailand. For exporting to upper markets, supply chain shows that 35% of Nam-Dok-Mai mangoes grown under export purpose could pass the export standard to exporters. However, 85% of 2,615 tons were exported to upper markets and the export volume to Japan was the highest. For exporting to lower markets, supply chain shows that 65% of Nam-Dok-Mai mangoes from private consolidators under export purpose could pass the export standard to markets. Still, 86% of 4,925 tons were exported to lower markets and the export volume to Malaysia and Vietnam was the highest. The rest, nearly 15 %, of each market were sold to domestic markets.

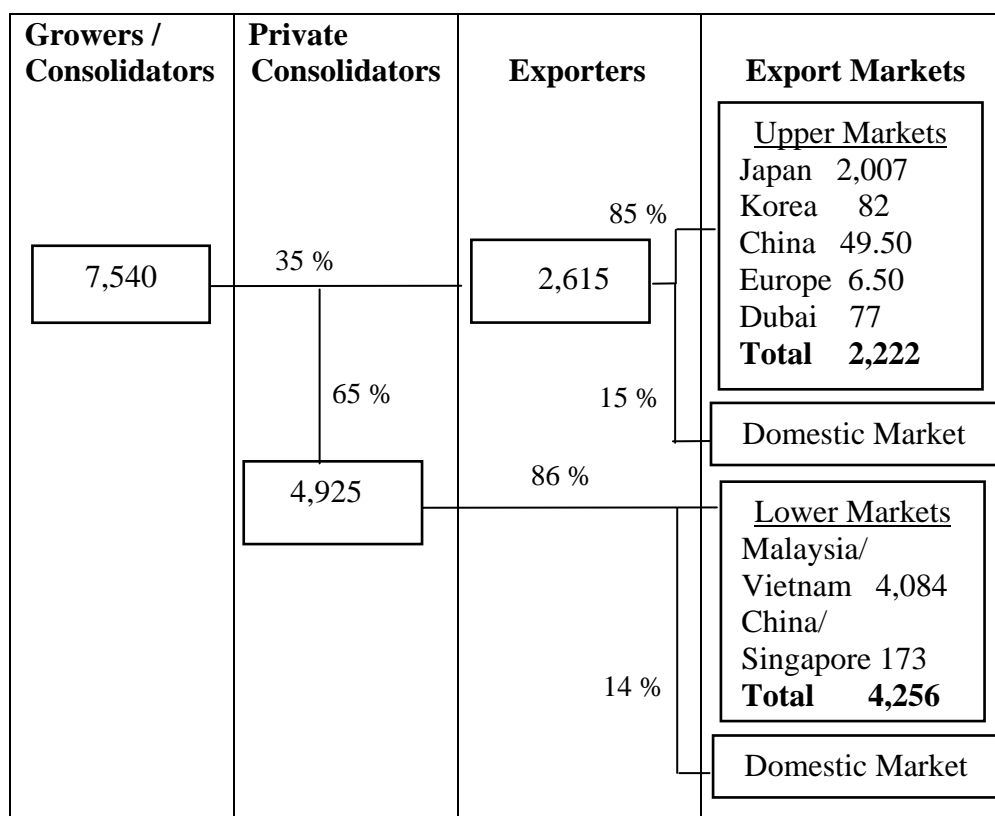


Figure 1. Supply Chain of Fresh Mangoes Exported to Upper and Lower Markets

After studied the exporting process for exporting Nam-Dok-Mai mangoes to Japan, this study found six main logistics activities which are transportation, material handling, receiving and storage, customer services, inventory management, and packaging, presented in Figure 2. From Figure 2, at the consolidate area, mangoes are transferred from supplier to exporters involve in transportation activity. Once mangoes entered into the production process in the factory (receiving process, checking quality, sorting by size, put in the basket for VHT process and dipping process), these activities are analyzed as material handling activity, receiving and storage activity and customer services activity. Then mangoes are transferred to Quarantine Area for packing which is packaging activity. After packed in the packaging, mangoes will be arranged on the pallet and waiting for the flight time or voyage time at controlled temperature room which involve in inventory management activity. At the end, mangoes are transferred to airport or seaport for exporting which is transportation activity.

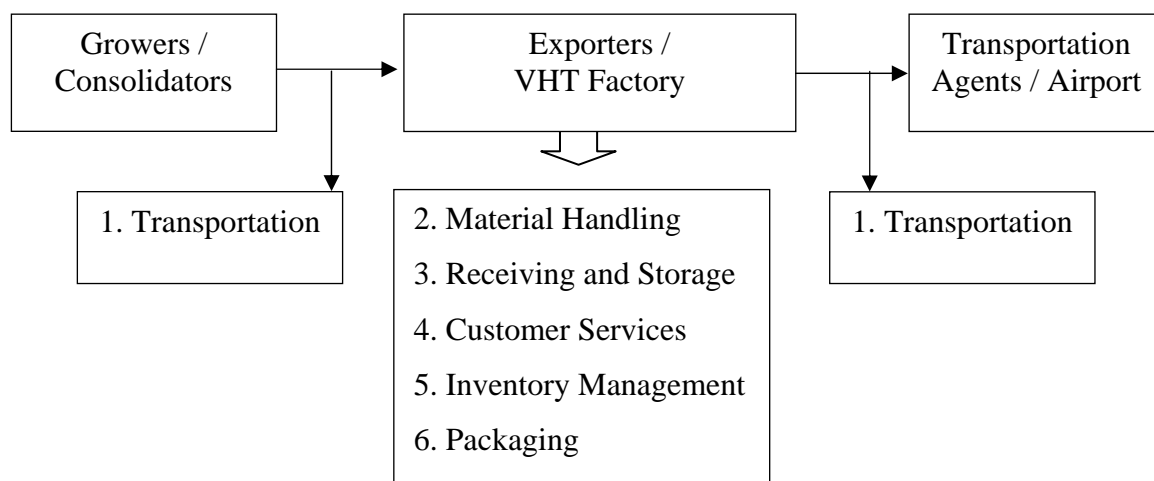



Figure 2. Logistics Activities in Exporting Fresh Mangoes

The logistics costs for exporting Nam-Dok-Mai mangoes planted in Central and Northern Provinces in Thailand to Japan was 72.44 Baht per kilogram, presented in Table 6. Among six activities, transportation cost at 60.83 Baht per kilogram was the highest cost, accounted for 83.97 percent of total logistics costs. Transportation cost of exporting Nam-Dok-Mai mangoes was quite high due to the air transportation cost which is about 55.00 Baht per kilogram. However, most of exporters exported fresh mangoes insisted in using air freight to transport their products to Japan due to the short duration of transportation time.

Table 6. Logistics Costs for Exporting Nam-Dok-Mai Mangoes

Logistics Activities	Costs (Bath per Kilogram)	Percentage (%)
1. Transportation	60.83	83.97
2. Material Handling	1.69	2.33
3. Receiving and Storage	0.65	0.90
4. Customer Services	0.14	0.19
5. Inventory Management	0.12	0.19
6. Packaging	8.99	12.41
Total logistics costs	72.44	100.00

In conclusion, although Ban Phet Nam Phung Group at Uthaitхани province was the best producer among 13 groups of study, accounted for 87.25 percent of its target production for exporting, there were five groups reached above the average of 66.27 percent. However, there were 6 groups whose percentages of target products for exporting were lower than 50 percent. Under supply chain of Nam-Dok-Mai mangoes exported to upper and lower markets, it shows that 35% of mangoes grown under export purpose could pass the export standard to exporters. However, 85% of 2,615 tons were exported to upper markets and the export volume to Japan was the highest. For exporting to lower markets, supply chain shows that 65% of mangoes from



private consolidators under export purpose could pass the export standard to markets. Still, 86% of 4,925 tons were exported to lower markets and the export volume to Malaysia and Vietnam was the highest. The rest, nearly 15 %, of each market were sold to domestic markets. In exporting process, six main logistics activities were found which are transportation, material handling, receiving and storage, customer services, inventory management, and packaging. The logistics costs for exporting Nam-Dok-Mai mangoes to Japan was 72.44 Baht per kilogram. Transportation cost of 60.83 Baht per kilogram was the highest cost among six logistics costs. It was quite high due to the air transportation cost.

In management view, this study recommend stakeholders and involved government sectors to prioritize the capability of group growers in order to help the most critical group first to exchange knowledge and discuss occurred problems. As transportation cost was the highest cost for exporting, reducing transportation cost is recommended. Apart from Japanese target market, ASEAN market is alternative huge market and is suggested to farmers, consolidators, exporters, and government to pay more attention for higher opportunity. Future research direction should focus on enhancing growers and consolidators' capability to increase their fresh mangoes production under export purpose in supply chain and reducing logistics costs for ASEAN markets in export process to become competitive at international level. In addition, supply chain performance of exporters (Kantabutra *et al.*, 2010) and supply chain governance such as trust and relations between growers and exporters should be included to study for ASEAN markets in the near future (Zhang and Aramyan, 2009).

Acknowledgments

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References

1. Cooper MC, Ellram LM. Characteristics of Supply Chain Management and the Implications for Purchasing and Logistics Strategy: *Int. J. Logist. Manag.* 1993; 4(2): 13-24.
2. Kantabutra S, Hasachoo N, Kalaya P. Supply Chain and Logistics Management for Exporting Thai Mangoes to Japan, International Conference on Agriculture and Agro-Industry (ICAAI2010) in Food, Health and Trade, Chiang Rai, Thailand, November 19-20, 2010.
3. Lambert DM, Cooper MC, Pagh JD. Supply Chain Management: Implementation Issues and Research Opportunities. *Int. J. Logist Manag* 1998; 9(2): 1-19.
4. Lambert DM, Pohlen T. Supply Chain Metrics. *Int. J. Logist. Manag.* 2001. 12(1): 1-19.
5. Likhitwitayawuid K. Thai Fruit Situations for Domestic and International Markets in 2011. Office of Agricultural Economics. Ministry of Agriculture and Cooperatives, Thailand.
6. Lummus RR, Krumwlede DW, Vokurka RJ. The Relationship of Logistics to Supply Chain Management: Developing a Common Industry Definition. *Indus. Manag. Data. Syst.* 2001; 108(8): 426-431.
7. Min S, MENTZER JT. The Role of Marketing in Supply Chain Management. *Int. J. Phys. Distrib. Logist. Manag.* 2000; 30(9): 765-787.
8. Sirisuwanakij T, Somboonwiwat T. Logistics Planning for Thai Fruits Export. Proceedings of the 7th Industrial Academic Annual Conference on Supply Chain and Logistics Management: Supply Chain Management on Demand, Thailand, November 15-16, 2007.



9. Stock JR, Lambert DM. Strategic Logistics Management 2001. 4th ed. McGraw-Hill, New York.
10. Thai Mango Growers Association. Thai Mango Growers Association Bulletin 2010, 1(1), January – March 2010.
11. Vorst JGAJ, van der. Supply Chain Management: Theory and Practices 2004, 2-18. In: Camps T, Diederens P, Hofstede GJ, Vos B. eds. The Emerging World of Chains & Networks, Elsevier, Hoofdstuk 2.1.
12. Zhang X, Aramyan LH. A Conceptual Framework for Supply Chain Governance: An Application to Agri-Food Chains in China. China. Agric. Econ. Rev. 2009; 1(2):136-154.