SUPPLY CHAIN COLLABORATION IN THE MANAGEMENT OF NAM DOK MAI MANGO EXPORTS FROM THAILAND TO JAPAN

by

SUPAJIT PANICHSAKPATANA

A thesis submitted to the University of Newcastle upon Tyne

in partial fulfillment for the degree of

Doctor of Philosophy

NEWCASTLE UNIVERSITY BUSINESS SCHOOL

University of Newcastle upon Tyne

May 2013

ABSTRACT

This thesis aims to develop the supply chain collaboration in the management of fresh Nam Dok Mai mangoes for exports to Japan. To accomplish the research aim, three main objectives are addressed; 1) to provide an overview of existing supply chain of Nam Dok Mai mangoes in Thailand and to identify strengths and weakness in the supply chain; 2) to analyse supply chain collaboration between growers and exporters in the production of mangoes for export to Japan; and 3) to provide recommendations to the government and related agencies on sufficient supply chain management for fresh mango exports. Following a theoretical review, the study employs a conceptual framework for the study of collaborative supply chain that differs from the traditional concepts used in the manufacturing industries literature. The thesis framework presents concepts of supply chain collaboration used for an agro-food industry focusing on the perishable products.

The discussion and analysis based on the six case studies of mango export companies which are the main exporters in Thailand. Semi-structured interviews are conducted to gather data from growers and exporters. A cross-case analysis is applied to examine the collaboration and to compare similarities and differences among six companies. The developed theoretical concepts of supply chain collaboration are discussed in the cross-case analysis to determine the good collaborative practices between growers and exporters in each case study. The outcomes of this analysis contribute to the introduction of grower-exporter collaboration in agro-food supply chain. The results demonstrate that information sharing, decision synchronization, relationship and trust are the keys to improve production capability. Incentive alignment can provide the motivation for increasing growers' performances. Traceability can be determined as a critical issue for product quality improvement in terms of

food safety. The collaboration can increase production efficiency. The consistency in good performance can develop trust and long-term relationship in the supply chain. Thus, the value in collaborative supply chain has a positive impact on the agribusiness in terms of increasing competitive advantage.

ACKNOWLEDGEMENTS

So many people and several organisations have contributed to the completion of this doctoral thesis. They have supported me and my work in various capacities during my PhD study, and I would like to take this opportunity to express my deep and sincere gratitude to all of them. It would not have been possible to write this thesis without the help and support of these kind people around me, to only some of whom it is possible to give particular mention here.

This thesis would not have been complete without the help, kind support, and, patience of my principal supervisor, Prof.. Stephen Hughes, who provided valuable guidance and supervision throughout my PhD study. I also would like to thank my co-supervisor, Dr.Tom McGovern for his useful advice for my thesis.

Several organisations contributed support to my research, and without them it would have been virtually impossible to complete this thesis. I would like to express my gratitude to Research Development Agency (ARDA), which provided a scholarship for my PhD study. I gratefully acknowledge Department of Agriculture (DOA), Department of Agriculture Extension (DOAE), and National Bureau of Agricultural Commodity and Food Standards (ACFS) for their assistance in accessing information, and managing the field surveys.

I would like to express my appreciation to all persons who have kindly offered me their time when I collected necessary information for my research. My sincere thanks are given to Mr. Wichian Kamjaipai, Assoc.Prof. Hirokazu Higuchi, Suriyon Thunkijjanukij, Assoc.Prof. Somyot Chirnaksorn, Dr.Supranee Impithuksa, Mr.Udorn Unahawutti, Ms.Sunantha Puangsema, and Mr.Manop Kaewwongnukul.

I would like to express my sincere gratitude to my family for their unfailing love, encouragement and support throughout this long and often difficult period of research and writing. My greatest respect and thanks go to my parents, Prof. Supamard and Sukjai Panichsakpatana. I am very grateful for my mother. Her love and understanding encouraged me to work hard and pursue a PhD study abroad. My special gratitude expresses to my father, who provides me advice, continuous support, and always guides me to wisdom. Dad, you are

always my professor, my prototype, and my pride. My appreciation also goes to my brother, Naim Satapol, as well as my cousins in Thailand.

Above all, I would like to express my deep gratitude to my boyfriend, Tae Nantawut. His unconditional love, and great encouragement made us continue pursuing the PhD together. I do realise that these past several years have not been easy, both academically and personally. I heartily thank Tae for has always been by my side and supported me in every aspect of my life during my good and bad times. I am deeply appreciated his help, sacrifice, and great patience at all times. I feel that what we both learned a lot about life, fulfilled our ambition to achieve our PhD together, and to live life to the fullest.

Pursing a PhD research is a long and difficult experience. It is like climbing a high mountain, step by step, accompanied with hardships, frustration, encouragement and trust with help and support from many people. Reaching the peak brought me delightfulness, but the experiences along the journey were the most valuable. I deeply appreciate my family, friends, and those people who help, support, and encourage me till the end. You make my PhD very meaningful.

TABLE OF CONTENTS

LIST OF FIGURES

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 4

Chapter 5

Chapter 6

LIST OF TABLES

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 7

Chapter 1

Introduction

1.0 Introduction

This chapter aims to explain the general problematic issues of logistics and supply chain management in the Thai food industry. Since the study focuses mainly on Thai mango exports, Thai mango cultivars and the mango industry in Thailand is presented. The research problem, research objectives and benefits, scope of study, research methodology, limitation of the study and research contribution are discussed. Finally, an overview of thesis structure is described in order to clarify the step of presentation in accordance with the framework of this research.

1.1 General statement of the problem

Thailand has established itself as one of the biggest producers of agricultural food products. According to the World Trade Organisation (WTO), Thailand is ranked as the eighth largest food exporter in the world (WTO, 2006). The Thai government launched the national development plan, known as "the kitchen of the world", in order to enhance the competitiveness of the Thai food industry. However, a key problem of the future competitiveness of Thailand is inefficient logistics. The total logistics cost of the country is estimated as high as 16-19% of GDP compared with the cost which is below 10% in developed countries. Moreover, the logistics cost in the agricultural sector in Thailand is as high as 21-25% of GDP (NESDB, 2007). It has been concluded that though Thailand developed in the production of the agricultural products, the development in Thai logistics in this sector is still in the third world level (Sorat, 2008).

Unlike other products, supply chain management for the food industry mainly emphasises shelf life, food safety, traceability and hygiene, in addition to the inventory cost saving and the transport speed. Accordingly, the logistics costs of different kinds of products in Thailand vary greatly. According to the Ministry of Transportation, the logistics cost of seafood products are 6.17% of total sales whereas the logistics cost of fruits and vegetables products are much higher at 15.25% (Sorat, 2008). The lack of effective supply chain management from the upstream to the downstream production of

Thai fresh fruits and vegetables results in high class products in farms producing durians, mangoes, and mangosteens, ending up as low class products in the market. This is in contrast to the products of developed countries whose products are fresh, hygienic, and beautifully neat in packaging.

1.2 Thai Fruit and Vegetable Trades in Global Market

In Thailand, the fruit and vegetable sector creates great opportunities for rural development, poverty abatement, and export diversity. In recent years, products of fruits and vegetables show explicitly strong growth in global food sectors (TRF, 2008). This growth expansion has been driven by urbanisation, rising income, and changes in consumption preference. As a result of lifestyle, Thai people recently consume less vegetables and fruits per person than before, so public health concern has become an important issue nation-wide. In sequence, the Thai government has tried to encourage healthy consumption behavior by promoting more fresh fruits and vegetable intake following WHO and FAO recommendation that minimum fruit and vegetable consumption for well-being should be approximately 400 grams per day or 146 kilograms per year (WHO/FAO, 2004). With this promotion, the growth of domestic market of fruits and vegetables has increased.

This national emphasis has exposed problems in the Thai fruits and vegetables that include labor cost, production cost, lack of technology know-how, and poor information flow. In Thai fruit production, problems are mainly low product quality, high cost of production, and pesticide contamination. The Thailand Research Fund (TRF, 2008) found that Thai fruits for domestic consumption were of low quality since most high quality products were selected for exports. However, the fruit processing industry for export still suffered from scarcity of good raw material and, late delivery from farms. Quality of products frequently did not meet export market demand. Consequently, the government sought to enhance fruit export by investing in research mainly on genetic plant development in order to obtain off-season cultivars and to minimise production cost rather than focusing on supply chain management. With less supply chain development, researchers, growers, traders, and other related stake holders in the supply chain did not have much collaboration.

To improve the supply chain of fruit industry, the government formulated a strategic policy on 16th June, 2009 for developing Thai fruits for exports from 2010 to

2014. 6 potential fruits were selected to be counted in the strategic plan; durian, longan, mangosteen, mango, rambutan, and long kong. Strategic goals of these products are to increase product value from 90,000 million THB in 2007 to 100,000 million THB in 2014; to maximise yield profit from 4,605 THB per rai in 2007 to 8,000 THB per rai in 2014 (1 rai = 1,600 square meters); and to increase export values from 29,685 million THB in 2007 to 40,000 million THB in 2014. Fiscal investment was arranged: 880 million THB for production development, 274 million THB for domestic market development, and 475 million THB for global market development (Fruit Development and Management Committee, 2009). With the government support, the supply chain management for Thai fruits has thus become a national strategic concern.

1.3 Mango Industry in Thailand

1.3.1 Production and Major Export Markets

Mango is major Thai fruit exports that plays an important role in the Thai economy (Wangsinthaweekhun, 2007). For example, mango occupies the largest planting area compared to other Thai fruits. Approximately 90% of mango yield is for domestic consumption while the rest is for the global market (DOAE, 2010). The export values of mango can be categorised in decreasing order of fresh mango, dried mango, and canned mango respectively. Among the problems of product quality of the exported mangoes are, poor transport handling and inconsistent volume of the mangoes in each package. There are no such problems in the production of canned mango compared to fresh mango. This has resulted in the exported volume of canned mango increasing every year.

According to consumption preference for fresh produces, fresh mango exports create more value than canned mango. As referred to earlier, in recent years, fruit and vegetable consumption has become an important part of diets towards healthy living. Rapid expansion of fresh fruits and vegetables has been driven by consumer behaviour increasingly in favour of freshness, healthy food alternatives, variety, convenience, and availability all year round (Rathanachaleat et al., 2008). Unlike canned mango whose markets are to Europe and United States, fresh mango markets are mainly limited to short distance market in Southeast Asia. An export market that prefers fresh produces than canned.

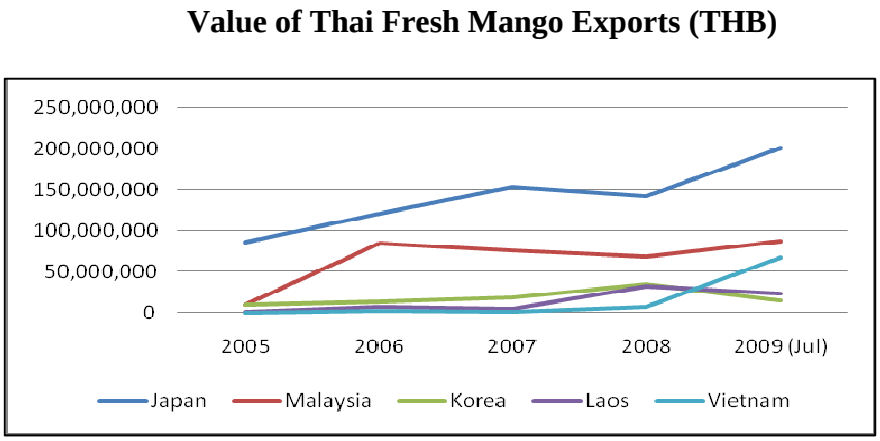

Figure 1. 1: Values of Thai Fresh Mango Export

Source: Office of Agricultural Economics (2009)

The major export markets for Thai fresh mangoes are Japan, Malaysia, Republic of Korea, Laos, and Vietnam while the markets for canned mangoes are Europe, Australia, Japan, and United States. According to Figure 1.1, the outstanding high value of Japanese market demonstrates that Japan dominates the export market of Thai fresh mango. Although Thai mango plantations have the largest area, the increase in value of fresh mango exported to the Japanese market is not as high as expected. (DOAE, 2010). One reason about this might be due to the difference between price of mango sold at farm site for domestic market and Japanese market has becomes less in recent years (Figure 1.2). Moreover, Japanese consumers are well-known for their high standard of hygiene and sanitation. As a result, Thai mango exports have to meet strict hygiene restrictions required by the Japanese government such as Plant Protection Law and Enforcement Regulations, and Agreement on the Application of Sanitary and Phytosanitary Measures: SPS (Wangsinthaweekhun, 2007).

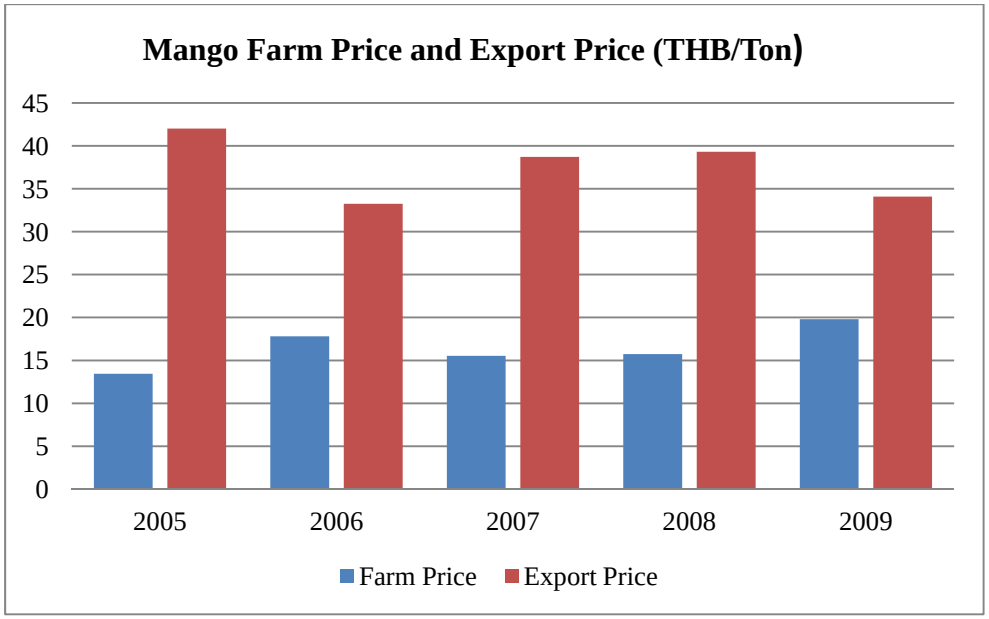

Figure 1. 2: Price of mango sold at farm site for domestic market and Japanese market

Source: Office of Agricultural Economics of Thailand (2010)

1.3.2 Thai Mango Cultivars

Mango is a unique fruit which has many cultivars with different characteristics. In Thailand, there are ten significant mango cultivars; Nam Dok Mai, Nang Klang Wan, Rad, Thongdam, Okrong, Phimsen Daeng, Chok Anan, Mahachanok, Khiaosawoey, and Kaew. However, only some cultivars are selected for exports.

The research for this thesis focuses on the supply of Nam Dok Mai which is the most well-known Thai mango cultivar. Among the five mango cultivars for exports, Nam Dok Mai is mostly supplied and promoted to global market especially the Japanese market.

1.3.3 Supply Chain Activities and Problems of Export Production

Supply chain activities such as raw material collection, transportation, and packaging affect export price of the products. Nochai (1988) studied Thai mango export markets for three major importing countries; Malaysia, Singapore, and Hong Kong by interviewing growers, collectors, and local retailers.

The study found that influential factors of demand are price and exchange rate. A study of factors affecting domestic consumption of mango and Thai mango export by Sunee (1989) found that domestic production was based on climate which affects optimum temperature for plant growth. Demand of domestic market was based on population size, price of product, and season while that of global market responds to price and exchange rate. Similarly to other agricultural product, mango production for exports is mainly controlled by climate which causes inconsistency in production quantity and product quality (Wangsinthaweekhun, 2007). For a sustainable export market, production planning, information sharing and technology transfer are of prime importance in a supply chain responsible for environmental impacts, market-driven responsiveness, and all-year-round product availability.

Product quality and food safety control are the most important issues in export agricultural production. Since Thai exports are conducted under bilateral Free Trade Agreement (FTA) trade partners such as Japan have to regulate standards for quality control of imported products. In Thailand, many small growers and SMEs (Small and Medium Enterprises) are lacking awareness in food safety and production hygiene. This results in low product quality which does not reach export market standard and requirements (DOA, undate). To enhance competitiveness in the global market, Good Agricultural Practice (GAP) was introduced to standardise farm practices. GAP in Thailand contains eight principles; 1) safety of water supply, 2) production site, 3) pesticide and agrochemical usage, 4) product storage and transportation, 5) data records, 6) pest-free products, 7) quality management and 8) harvesting and post-harvest management (Chuanpis A., undated) Growers have to receive GAP certification approved by the Department of Agriculture for their export production as illustrated in Figure 1.3. Nevertheless, Thailand GAP system may not cover the whole Maximum Residues Limit (MRL) of some other countries. MRL is the maximum concentration of pesticide residues in export products accepted by the import country. Japan in particular, issues its own MRL as many as 818 items in which some values are lower than global MRL of Codex Alimentarius Commission (Uthai, 2009). The task of Codex Alimentarius Commission is to develop food standards, guidelines and related texts such as codes of practice under the Joint FAO/WHO Food Standards Programme. Considering Japan's MRL, GAP is very essential and even stricter if growers produce for exports Japanese market (see Chapter 3).

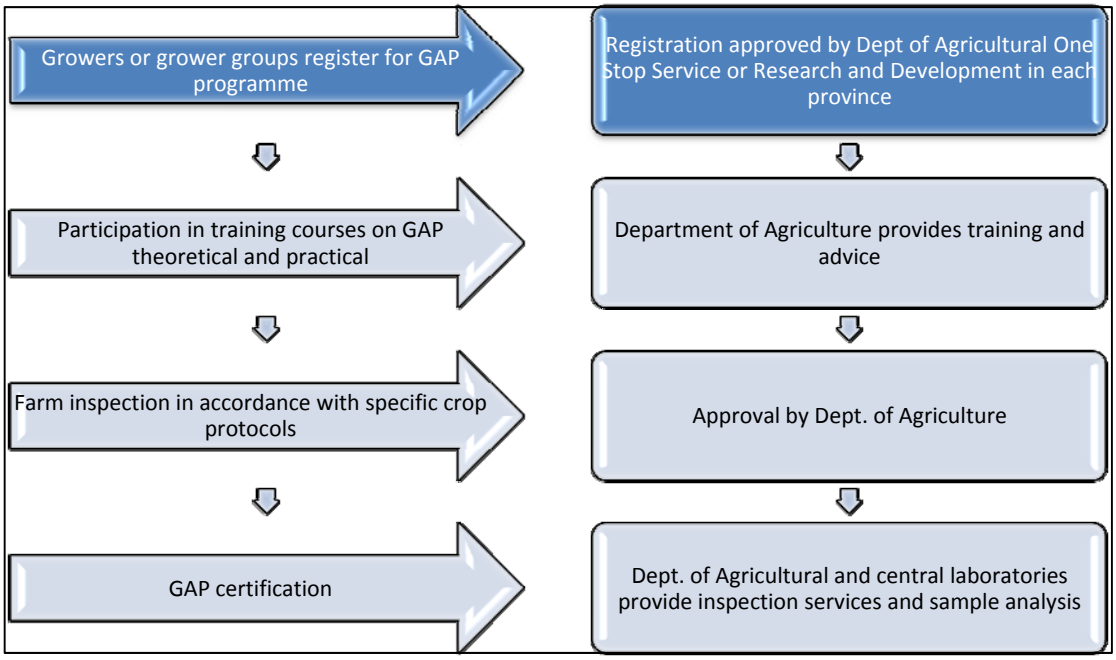

Figure 1. 3: Thailand GAP scheme

Source: DOA (undate)

In addition to product qualification and product availability, the cost of transportation is also a concern for mango export. Most exporting countries transport their products by sea to Japan, while Thailand exports its products mainly by air resulting in high cost of products on the shelf (Chareanwanich et al., 2000). The use of air transport is due to small volumes of qualified mango products for the Japanese market. To pack a sea freight container, large amounts of mangoes are required. In addition, the exporting mangoes to be shipped by sea should have the same maturity level, otherwise the problem of product quality might occur at the end. To enhance Thailand competitiveness, the study of collaboration in the mango supply chain is needed to efficiently produce high quality products at the upstream (growers) and effectively supply products to customers at the downstream (Japan).

1.4 The Research Problem

Although Thailand is well-known in fruit exports for both volume sales and product quality, income from these exports remains problematic due to the unreasonably high cost of logistics and supply chain. Since the Thai economy has relied mainly on agricultural products, the problem of logistics and supply chain management has affected

not only the agricultural sector but also the whole related sectors from downstream to upstream operations management.

Although the management of producing and exporting mango is complicated, the successful exporting of mango is important to the economic development of Thailand due to its constant demand and high market value. As highlighted earlier, a key export market for mango is Japan. However, Japanese customers require very high standard of hygiene and sanitation. The supply chain management from upstream to downstream for exporting mango to Japan should be geared in order to produce and deliver high quality product that meet customer demand.

However, the supply chain management of mango in Thailand is not well developed. The current view of supply chain and supply chain collaboration needs to be reconsidered since most mango researches mainly focus on logistics activities rather than collaboration in supply chain management. Therefore, the supply chain of exporting mango for Japanese market, in particular, needs to be investigated. In addition, this study of the collaboration between grower and exporter in mango supply chain could be useful for the supply chain practices of other fruits and other perishable produces.

Thai mango industry has been developed for exports since it has higher value than the domestic market. However, exporting fresh mangoes still has many disadvantages especially inconsistent products in terms of both quality and quantity. In considering fresh mango supply chain for exports from upstream (growers) to downstream (exporters), a number of issues can be identified:

1. Product quality does not meet customer's requirement or demand.

2. High costs of production results in high cost of products in the market place and low income of growers.

3. Growers require more knowledge and skills for effective production management, good post-harvest management, and appropriate product handling.

4. Most Thai exporters deliver product by airfreight instead of sea freight resulting in high cost of transport.

5. Exporters require more constant production and high product quality from growers while growers require more reasonable and negotiable grading system from exporters.

6. Growers and exporters require more collaboration and trust for stronger and longer term of relationship by encouraging growers to have contract farming agreement.

Therefore, the study examines the ineffective interactions in supply chain activities that cause the problematic cooperation between grower and exporter, which directly affect the product quality and operations cost. In this research, not only the aspects of supply chain management and supply chain collaboration are of concerned but also aspects of product quality for export are also considered since the study aims to develop the supply chain collaboration of Thai mango for export in order to enhance the competitiveness in global market.

1.5 Research Objectives

The objectives of this study are

- To empirically review the existing supply chain of Nam Dok Mai mangoes in Thailand and to identify strengths and weakness in the supply chain
- To analyse supply chain collaboration between growers and exporters in the production of mangoes for export to Japan
- To provide recommendations to the government and related agencies on improving supply chain management for fresh mango exports

1.6 Scope of Study

As the emphasis of the research is to analyse the efficiency of supply chain management, the researcher selects the central, Eastern, Northeast, and North region of Thailand which occupies the most mango plantation in Thailand and provides the greatest volume of mangoes for trade. In Thailand, there are 792 groups of fruit growers. The most groups (159 groups) are pineapple growers, the second largest are 92 groups of mango growers that 78 of whom are registered as community enterprises (Promsupa, 2001). According to the Thai Mango Growers Association, only 29 groups of mango growers are regular exporting producers (Promsupa, 2001, KMITT, undate). Of this number, the majority of 19 groups are located in Central, Northern, North Eastern and Eastern regions. Therefore, the study focuses on these 19 groups of mango growers as active exporting producers.

The study also investigates mango exporters as an important tier in the supply chain. According to Department of Agriculture, there are 47 exporters who export mango to the Japanese market. However, only eight exporters own Vapor Heat Treatment (VHT)

machines, including two machines from government sectors, are available. Since Japan has a restriction prohibiting insects particularly fruit flies, the Japanese Plant Protection Division and Thai plant quarantine have a mutual agreement in VHT facilitation. This requires fresh mangoes exporting to Japan to undergo the VHT process (DOAE, undate) in order to follow international plant quarantine, eliminate fruit flies, prevent fruit withering, and avoid chemical residue. Any exporters who fail to follow VHT regulations might be discharged from the Japanese market. The number of VHT machines in Thailand is limited due to high investment costs. As a result, only the larger exporters own VHT machines (see Chapter 3). The six exporters are selected as the main exporters who own VHT plant and regularly process the VHT for fresh mango exports to Japan (DOAE, 2010). Therefore, the research of this thesis focuses on these six exporters who own VHT machines.

1.7 Research Methodology

This research incorporates two types of inclusive primary data collection of field survey and interviews, and secondary data from empirical studies particularly supply chain management regarding to perishable products and supply chain collaboration. To achieve the research aim and objectives, the first field survey and in-depth interviews are primarily conducted in order to provide an overview of existing supply chain of the Nam Dok Mai mangoes industry. In-depth interviews are conducted with growers, exporters, and experts in different areas from national institutions, government agencies and organisations such as Strategy Division in the National Economic and Social Development Board (NESDB), Department of Agriculture (DOA), Department of Agriculture Extension (DOAE), Thai Mango Growers Association, and Graduate School of Agriculture, Kyoto University, in order to identify the strengths and weakness of the supply chain, and to examine the key problematic activities causing supply chain inefficiencies. The data which is obtained from the interviewees is applied to the design of semi-structured interviews. This used to explore and analyse the supply chain collaboration between growers and exporters as the key research theme in this study.

The second field work and semi-interviews are developed for case studies of six mango exporters in order to explore supply chain collaboration between the buyer (an exporter) and their suppliers (growers). The case study technique is selected to discuss the research findings referring to the theoretical factors of supply chain collaboration

mechanism. Furthermore, the cross-case analysis is utilised to analyse the similarities and dissimilarities of the cases in order to discuss the factors of collaboration which can effectively apply to the supply chain collaboration of exporting fresh Nam Dok Mai mango to Japan comparing the academic theory and the practices.

1.8 Limitation of the Study

Since the mango business is very dynamic with high competition, the number of active groups of mango grower and the number of mango exporters are frequently changed. Most existing growers are ones who possess high skill in growing mango for exports. Due to the different geographic location of each region and variation of climate in each year, experienced growers have to build up their own skill and techniques in high quality mango production, such as techniques in stem pruning, fruit wrapping, plant nutrient applying, and pest control. On the other hand, mango exporters need to deal with the growers and customers. Exporting mangoes need to reach Japanese customer's requirements on one hand and the Japanese government restriction on the other. This means the exporters have to have mangoes in a standard size, flawless skin, and disease free which have to be accomplished by using fertilisers and chemicals whereas Japan has strong restriction of MRL. In case of any residue contaminated products being found in Japan, the exporter responsible will be put on the black list and be required to leave the market. However, the black list exporter might re-enter the market with different name of enterprise. This made the record of exporter name list change frequently. To make the research valid in data collection, the researcher decided to select the list of mango growers from Thai Mango Growers Association, the list of mango exporters from DOA.

1.9 Research Contribution

This research will be beneficial to three individual sectors. First, this research analyses the supply chain of Thai mango for exports and then develops practices to be more collaborative in supply chain management and more competitive in global market. This, in turn, will be very beneficial to the mango growers as much as 347,000 individual mango growers in Thailand (see Chapter 4 in detail). Second, the research could be implemented the supply chain management of the agricultural sector in Thailand focusing on fresh fruit export as a real practice. There are as many as 1.16 million households

engaged directly in farming activities of the six major economic fruits as their main income-generating channel, representing 60% of the nation's overall orchard farmers. The six major economic fruits are longan, durian, mango, mangosteen, rambutan and longkong (Fruit Development and Management Committee, 2009). In addition, the research could be an approach for neighboring countries due to similarity of the products characteristics and product origins and due to similarity of the supply chain with small growers who has no bargaining power and can develop themselves through assistance of the government strategy.

1.10 An Overview of Thesis Structure

Chapter 1: Introduction

The thesis consists of eight chapters. Chapter 1 shows the overview of Thai mango supply chain and clarifies the problematic issues along the supply chain and scope of the study. The analytical framework for this research then can be drawn as shown in Figure 1.4.

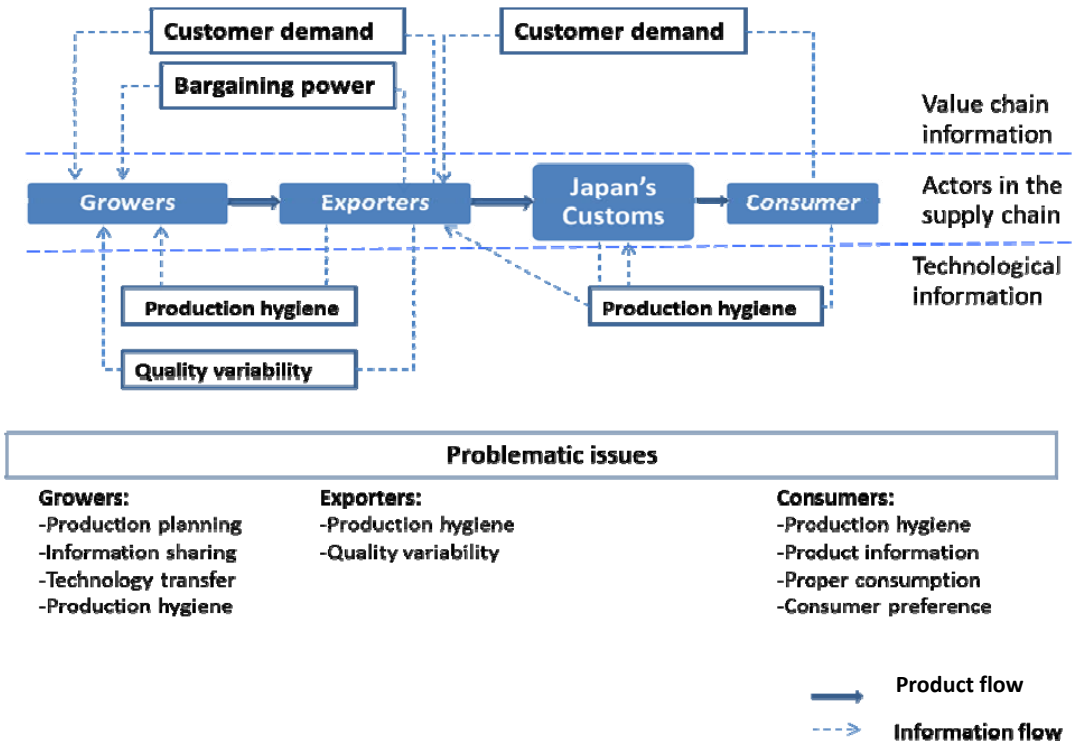

Figure 1. 4: Analytical framework for the research

Chapter 2: Supply Chain and Perishable Products

Chapter 2 is a literature review starting from the principles of supply chain management in order to provide the definition, concepts, and advantage. In addition to this, the supply chain for perishable produces is described since it is necessary to manage the supply chain considering the limitation of time and perishability of products. Collaboration in the supply chain is important to alter fresh food quality and food safety control. The structure and types of supply chain collaboration are stated including the mechanism of collaboration. It is necessary to examine the basic and detailed of the supply chain collaboration processes and mechanism as the aim of the research is to develop the supply chain collaboration of Thai mango exporting to Japanese market since a key point of supply chain integration is the collaboration of chain members within the supply chain. The research gap generated from the literature reviews is stated at the end of this chapter.

Chapter 3: Thai Mango Exports and Supply Chain Limitation

Since this study focuses on Japanese market as the consumer, Chapter 3 therefore begins with Japanese consumer behaviours which brought to the Japanese import regulations, and illustrates the picture of Japanese market, and demand particularly the fresh fruit imports. The historical background of Thai mango exports to Japan is presented in order to develop the greater understanding of current situation including encountered problems and difficulties which obstruct the export efficiency. One of the most important problematic issues which greatly affect the Thai mango supply chain is production hygiene resulted in very strict rules, regulations and laws of fruit export to Japan. The latter part of this chapter, therefore, describes on procedures for importing food and agricultural products and exporting process of Thai mangoes to Japan. In addition, inconsistent product quality and production hygiene are among the main problematic issues of the growers' side in the supply chain. In order to cope with these issues, Good Agricultural Practice (GAP) is introduced in this chapter. Finally, supply chain of Thai mango export and limitation are concluded.

Chapter 4: Role and Policy of Thai Government

In developing countries where most producers are small growers, problematic issues along the supply chain may not be solved by the mechanisms within the chain itself like in developed countries. Accordingly, it is important to understand how the government realises the issues, how solving process is initiated and how the government improves the supply chain through its role with what kind of policy. Chapter 4, therefore, begins with government policy of Kitchen of the World in 2003. This policy was phased out in 2008 with strong momentum to Thai food produces in global market. This brought out Thai Fruit Development Strategy for 2010- 2014. Before strategy implementation, this chapter illustrates the picture of world fruit production and global trade growth, mango production, global trade, and situation of Thai mango during strategy commencement period. The chapter, then, elaborates on government's strategic development for Thai fruits industry in detail. In order to solve the mentioned problematic issues systemically, collaboration between government sector and Thai Mango Growers Association was brought in. At the end of the chapter, the problems and barriers of Thai mango export is again clarified together with Thai government mission to mango export development.

Chapter 5: Research Methodology

The research methodology chapter begins with the research objectives and framework. It is essential to explore different aspects of qualitative and quantitative research, and then to compare the method which suit to this study. The research framework is presented and described at the beginning of the chapter. To review and analyse a mango supply chain management and a supply chain collaboration between growers and exporters, the essential data are collected from both in-depth interviews and semi-structured interviews respectively. The in-depth interviews with growers, exporters, experts and government authorities in related area are conducted in order to thoroughly explore a mango supply chain and profoundly identify the strength and weakness for the supply chain management focusing on the problematic issues which cause the inefficiency of the supply chain. Then, the semi-structured interviews are conducted in order to systematically analyse supply collaboration and relationship between growers

and exporters. Main categories of the semi-structured interview related with research objectives are demonstrated. A case study approach and cross-case analysis are selected for this research in order to examine and analyse the supply chain collaboration as the key research theme.

Chapter 6: Mango Supply Chain in Thailand: Research Findings

This chapter presents the research findings and discussion from field trip observation and in-depth interviews. An overview of supply chain management of Nam Dok Mai mangoes for export to Japan is stated focusing on the problematic issues within the supply chain. Besides, an overview of Thai mango growers and exporters are introduced in order to develop the context of supply chain collaboration in the next chapter. The strength and weakness of the overall supply chain is discussed at the end of the chapter.

Chapter 7: Agricultural Supply Chain Collaboration: Case Study of Nam Dok Mai Mango in Thailand for Exporting to Japan

This chapter demonstrates the research findings and analysis from semi-structured interviews. Six cases of mango export companies own VHT plants are analysed in terms of supply chain collaboration approach in each case. This analysis allows the coalition of academic literature to analyse the contrast between academic and practice. Then, the cross-case analysis is examined in terms of their similarities and differences. The discussion is developed at the end of this chapter.

Chapter 8: Conclusion and recommendation

This chapter concludes all findings which stated by the research objectives. Research contribution and implication are stated for both in terms of theory and practice. The limitation of this study is outlined. Recommendation provided from the thesis is expected for greater development of Thai mango supply chain for export in the near future. The thesis structure is concluded in Figure 1.5.

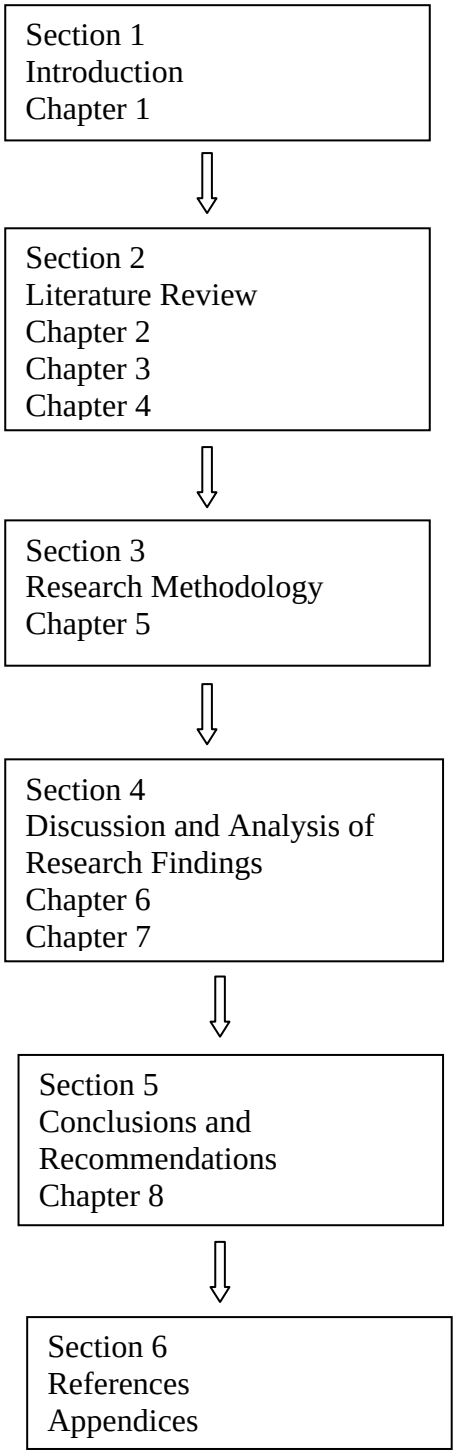

Figure 1. 5: Thesis structure

Chapter 2

Supply Chain and Perishable Products

2.0 Introduction

In the past, the problem of stocking shelves was managed by maintaining high levels of all products in order to ensure an adequate supply whilst producers focused on their supply, rather than on customer demand, by pushing their products into the supply system. To date, as business has become tougher and more competitive, service-driven systems are substituting the old inventory-driven systems (Eastham et al., 2001). Producers try to achieve the lowest possible production costs in order to gain cost advantage. Suppliers try to provide products which are perceived to have the best differentiated values in order to gain value advantage. In order to gain competitive advantages, supply chain management helps to connect the marketplace, the distribution network, the manufacturing process and procurement activities, to give customers the highest service level with the lowest cost (Christopher, 2005).

This chapter aims to examine the supply chain of perishable products, especially supply chain collaboration which is the key factor of success in the supply chain. The end of the chapter presents various practices of the agro-food supply chain in developing countries.

This chapter begins with the concepts of supply chain management and the agro-food supply chain of perishable products, focusing on time-based competition versus perishability since time is the most crucial factor of a perishable product's value. Supply chain collaboration is therefore of special interest in the management of perishable products. This chapter will also review empirical studies of supply chain collaboration in the fresh produce industry and agro-food supply chain in developing countries, including Thailand. Finally, the outcome of the literature review and details of the research gap will be reported.

2.1 Concepts of Supply Chain Management

Although the term “supply chain” is not new and many people talk about and try to define the concept, there are many definitions offered by different authors. A theory, in use for decades, was introduced by Forrester (1958) to identify the integrated nature of organisational relationships in distribution channels. He produced a computer simulation of the flow of order information and its influence on the production and distribution performance of each channel member throughout the system. After a period of research development, including analytical techniques, he forecasts that there would be recognition of a pioneering management scheme, which would be the first to improve perceptions of the interrelationships between separate company functions and between the company and its market, its industry and the entire economy. What Forrester identified became the key management issue that illustrates the dynamic factors associated with what we recognise today as supply chain management.

The term “supply chain management” has become well-known over the past ten years. Many companies and articles on manufacturing, distribution, marketing, customer management or transportation include this term or related ones (La Londe, 1997, Ross, 1998). In spite of the popularity of the supply chain, many different views of the concept remain. Mentzer (2001) gave the definition that a supply chain is a set of companies which are directly linked by an upstream to downstream flow of products, services, finances and information from a source to a customer. Meanwhile, Christopher (1992) claimed that the supply chain has now become the value chain, as he defined the supply chain as a network of organisations involved in upstream and downstream processes and activities that add value to products and services. This value chain concept was developed by Michael Porter, who stated that each stakeholder should analyse all activities with a view to judging how these provided the value that the customer required. Taking into account the need to gain competitive advantage, the value chain principal was strategically applied to supply chain management in order to improve performance and enhance competitiveness in the global market. However, in the concept of value chain modularity in global economy, suppliers and customers can be easily linked and de-linked, causing a very fluid and flexible network structure due to large volumes of information flow across the inter-organisational boundary (Gereffi et al., 2005). Cox (1999)noticed that the value chain was in parallel with the supply chain and also referred to the flow of revenue from the end customer of any product and service, which produced

the revenue stream for each stage of the supply chain. Therefore, the supply chain and the value chain exist in a primary exchange relationship (Cox, 1997, Cox, 1999)

Gattorna and Walters (1996) stated that the objective of the supply chain concept was to synchronise customer needs with the material flow from suppliers so that the contrary requirements of high customer service, low cost of operations and inventory might be balanced. Wilson (1996) concluded that supply chain theory was concerned with the associations in the chain, from the primary producer to the final consumer, with the intention of minimising the transaction costs incurred within the chain. However, the management and collaboration of the supply chain has become increasingly important in recent years as companies attempt to maximise market opportunities and minimise distribution and inventory costs which result from fundamental changes in customer tastes and preferences. Therefore, the paradigm of supply chain management is a networking conceptualisation of value chain optimisation, integrating the best value-adding competencies of all the supply chain members.

Although the concepts of the supply chain vary, the main goals of companies are similar in that the most successful companies have either a cost advantage or a value advantage or combination of the two. Cost advantage contributes to a lower cost profile whereas value advantage contributes to product differentiation which offers a competitive advantage. Thus the focus of supply chain management is on the management of relationships, in order to accomplish a more profitable outcome for all supply chain members (Christopher, 2005) since the “competition” is obsolete (Moore, 1996) and the “co-opetition” is currently move forward (Brandenburger and Nalebuff, 1996, Cox, 1999).

2.2 Supply Chain Management for Differential Advantage

The creation of customer value is one approach to supply chain management. To achieve the creation of customer value, a differential advantage is created to enhance customer satisfaction and improve profitability for the long-term success of the company (Mentzer et al., 2001). Day (1994) describes two approaches for accomplishing a superior competitive position. The first is the competitive-forces approach, which highlights the intensity of competition in an industry and the competence required to achieve and defend a position of low cost or differentiation in an attractive market segment. The

second is the capabilities approach, which emphasises the development and preservation of distinctive skills and resources that empower the company to deliver superior customer value or deliver value more cost-effectively. Distinctive capabilities can be classified in three ways. The first is capabilities that can be deployed inside-out, which are activities with an internal force that interacts with external forces. The second is the reverse, outside-in capabilities, which focus on anticipating market requirements, monitoring competitors and developing long-term relationships with customers, suppliers and channel members. The last classification is spanning capabilities that integrate both the inside-out and outside-in capabilities. However, the emphasis of supply chain management is on creating a differential advantage for the ultimate customers of the supply chain. Thus, it is critical for the company to monitor customer linking capabilities and to utilise market capabilities in order to serve the end customer more effectively and efficiently for greater competitive advantage for the supply chain as a whole (Mentzer et al., 2001).

2.3 Agro-Food Supply Chain of Perishable Produce

Although supply chain management has successfully played an important role in the motor industry for decades, the agro-food industry follows the same concept, especially among the world's leading food manufacturers in developed countries (Ruben et al., 2006). Developing countries have also attempted to implement the concept of the supply chain within the agricultural sector. Supply chain management has been implemented within the agricultural sector for developing a network of long term relationships throughout the whole chain for food supply. The key factors to success are the management of both tangible and intangible flows. Tangible flow is the flow of materials and goods from the farm through to the end customers. Intangible flow is the flow of information between planters, manufacturers and end customers (Rushton et al., 2006). In the food production chain, material flows from the primary producers (e.g. growers and farmers) to the customers via manufacturers, processors, retailers and caterers. As the agro-food industry is now much more reactive to the customer's perceived requirements, the agro-food chain has become more closely integrated as shown in Figure 2.1 (Knight et al., 2002).

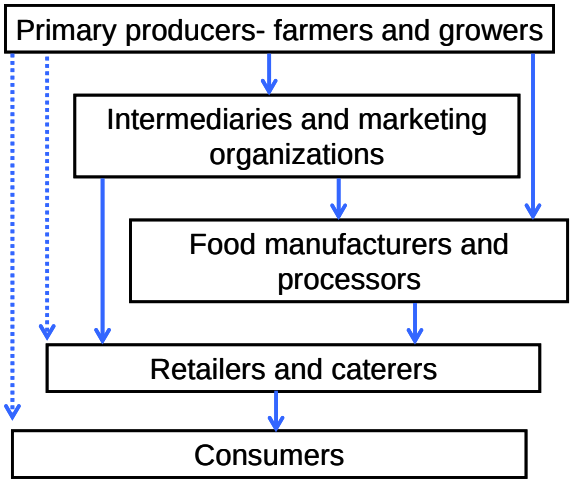

Figure 2. 1: The relationship and flow of materials in the food supply chain

Source: Knight et al. (2002)

Aramyan et al. (2006) classified the agri-food supply chain into two categories: one, supply chains for fresh products such as fresh fruits and vegetables and two, supply chains for processed food products such as canned food products, dessert products, etc. This research focused on supply chains for fresh agricultural products, specifically mangoes. Since the major production processes for this product are producing, storing, packing, transportation and trading, there are many stakeholders that correspond to those in the supply chain, namely growers, wholesalers, exporters and retailers. The supply chain of fresh products has many specifications, which distinguishes them from other types of supply chain. The following is a summary of specific aspects of the agri-food supply chain, by Van der Vorst (2000) and Van der Spiegel (2004):

- Shelf-life constraints for raw materials, intermediates and finished products, product perishability and changes in product quality level while progressing through the supply chain.
- Long production processing time for new or additional products through the supply chain.
- Seasonality in production.
- Global resourcing requirement for seasonal supply of products.
- Requirement of conditioned transportation and storage.

Changeable process yield in quantity and quality due to seasonality, biological variations and factors associated with weather, pests and other biological hazards.

- Limitations of storage-buffer capacity, when products or materials can only be stored in special containers.
- Governmental restrictions regarding environmental and consumer-related issues.
- Sensory physical characteristics of the product, such as appearance, taste, odour, colour, size and image.
- Additional features: e.g. convenience of ready-to-eat meal.
- Product safety: need to increase consumer awareness regarding both product and production methods, e.g. reduction of food risk for consumers.
- Perception of food quality related to food applications, e.g. marketing or advertising of brands is significantly influential on perception of quality.

According to the characteristics of the agro-food chain listed above, it could be said that food quality and environmental issues have a great influence on the performance of the agro-food supply chain. Particularly with fresh products, their perishability applies forces on the supply chain and quality management. To a retailer, fresh is a product segment, whereas in logistics, a fresh product is perishable. When the industry refers to "perishable" food, it is generally perceived that the products are sensitive to temperature and can degrade over time (SITPRO, 2009). Customers want to purchase products of the right quality, which controls market demand and dictates the timing of distribution and marketing. The ordering of fresh products has to be precise, otherwise there is the problem of product waste due to decay, so all the activities in the supply chain for perishable foods should be time-sensitive and considerate to alterations in temperature.

2.4 Time-Based Competition versus Perishability

In supply chain management, time does not only represent cost but also refers to the extended lead time that carries a customer service penalty. Longer lead times also imply a slower response to customer requirements and, as a result, this combination of high costs and lack of responsiveness raises a concern over product decay. In all industrial markets, customers are increasingly time-conscious as they value time. This is also reflected in their purchasing behaviour because they are more likely to source from

suppliers with the shortest lead times who can meet their quality requirements. In spite of time-based competition, the cost of time is basically the additional costs that a customer must incur whilst either waiting for delivery or whilst pursuing alternatives. Christopher (2005) categorised three significant pressures that affect the growth of time-sensitive markets as follows:

- Shortening life cycles
- Customers' preference for minimised inventories
- Inconsistent markets making reliance on forecasts risky

2.4.1 Life Cycle of Perishable Produce

In the case of perishable produce, the concept of a product's life cycle has been well demonstrated. As shown in Figure 2.2, there is a pattern of sales from launch through to final decline. A feature of seasonal fresh fruits which have a short product life cycle is that timing is critical, to launch the products to meet marketplace demand at peak quality of the products, otherwise demand will clearly be significantly reduced.

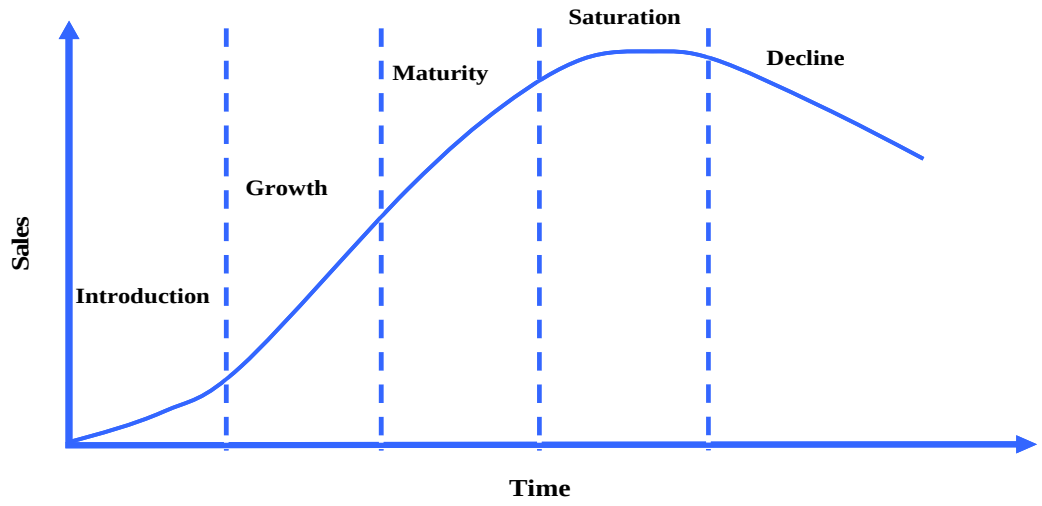

Figure 2. 2: The product life cycle

Source: Christopher (2005,p.146)

Figure 2.3 illustrates the effect of late market entry and being slow to meet demand. If the products are introduced late to the market, the shelf life and value of the products will be decreased. Nonetheless, time-to-market is not the only prominent factor; responsive ability is also influential in gaining competitive advantage. Once a product has been launched on the market, the ability to respond rapidly to changes in demand is

equally essential. The lead time to re-supply a product indicates the ability of a company to meet demand during the product's life cycle. It is apparent that if companies can accomplish a time reduction in the order-to-delivery cycle, they will gain a greater advantage over their slower competitors (Christopher, 2005). In the case of perishable goods, dealing with short product life cycles and limited response times are challenges for companies because if the companies do not succeed in managing either time-to-market or order-to-delivery factors, they will encounter loss of both products and profits.

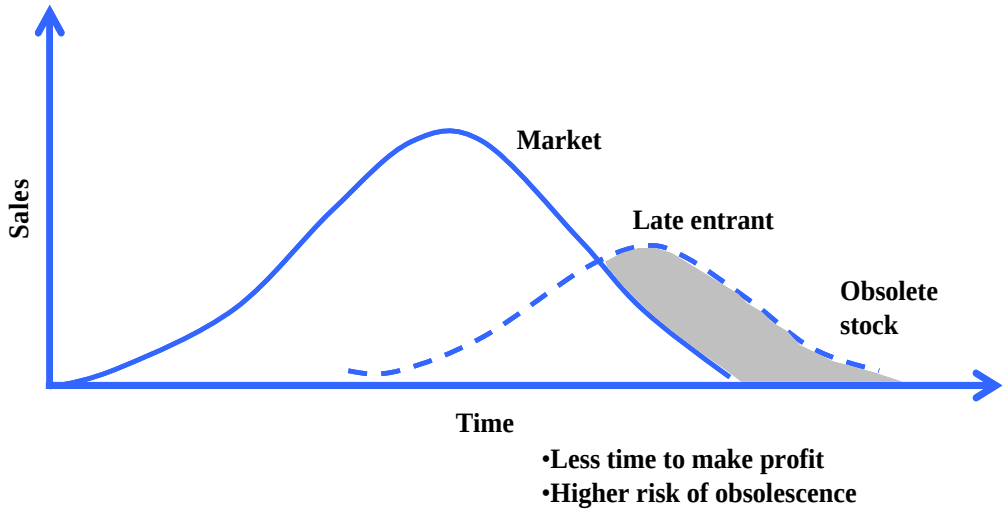

Figure 2. 3: Shorter life cycles give rise to critical timing

Source: Christopher (2005, p. 147)

2.4.2 Time and Loss of Perishable Product Quality

Unlike non-perishable products whose qualities do not change over time, perishable products suffer a decrease in both product quality and value due to time and unstable temperatures. Perishable products account for the majority of product losses in the grocery retail industry. These losses amount to approximately 15 percent of the turnover of perishable goods, due to damage, spoilage and expiry, and that is much higher than for non-perishable products (Ketzenberg and Ferguson, 2003, Deniz et al., 2004). The great amount of product losses due to perishability is the main driver for retailers to create competitive advantages in order to attract customers, aside from pricing strategies (Thron et al., 2007). The quality of the range of perishable products offered is the main

reason that many customers select one supermarket over another (Heller, 2002). At present, this should be considered to be the driving force behind a company's profitability. The global market for perishable products is growing due to changing lifestyles. On account of their fragility and limited shelf life, managing perishable products is complex and involves much higher risks compared to the management of non-perishable products.

2.4.3 Product Quality and Harvesting Time

In the case of exotic fresh fruits (e.g. mangoes) and stoned fruits (e.g. fresh peaches), Schepers and Kooten (2006) mentioned that the supply chain could minimise product loss by harvesting and selling at an early stage when the products were unripe. Nonetheless, this also implies that customers should leave the fruit for days until it ripens. As a result, there remain a number of low frequency customers who have been disappointed by this. To increase the consumption of fresh products, pricing, promotion and product quality are all driving forces. Consequently, the distribution of fresh but perishable products has more conditions to meet than with non-perishable products. Many additional attempts have been made to prevent quality loss in supply chain activities such as storage, transportation and display on retail shelves. Storage timing and temperature regulation are essential to minimising product loss and are of particular concern for meeting or exceeding expected quality at retail or in coping with a larger geographical distance between the locations of producers and retailers.

2.4.4 Information Sharing in Control of Perishability

Considering further studies of the perishable supply chain, Ketzenberg and Ferguson (2005, 2003) were the only researchers to study information sharing within the context of perishability. They studied the benefits of centralised control and increased demand transparency in a serial supply chain involving a perishable product. They found that a perishable product supply chain benefited the most from sharing information or having a centralised control when product shelf life was short, batch sizes were huge,

demand uncertainty was high and the damage due to a mismatch in supply and demand was also high.

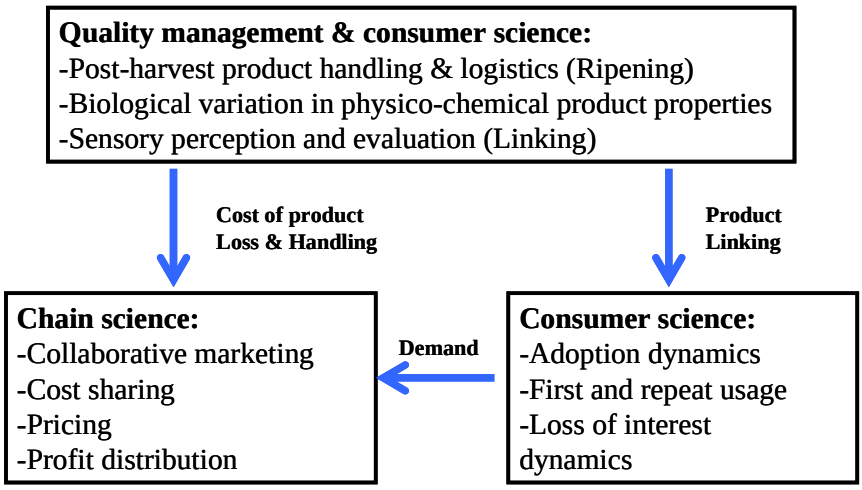

Figure 2. 4: System Dynamics model illustrating a scenario of "ready-to-eat" positioning to create value for retailer, trader and grower in a fruit product chain.

Source: Schepers and Kooten (2006)

2.4.5 System Dynamics Model using a "ready-to-eat" Scenario

In order to maximise the profitability of a perishable product, quality management aims to provide attractive products to customers at minimum cost in terms of product handling and product loss. From Figure 2.4, Schepers and Kooten (2006) used the consumption of mangoes as an illustrative example for the case of a perishable exotic fruit. It demonstrated that customer preferences affected the usage dynamics and then created demand. Within chain-management science, collaborative marketing, including pricing and cost sharing, could produce the right incentives for chain members to realise a practicable business in the exotic-fruits sector. The approach of this model was different from the classical logistics approach where product loss was minimised at all times and considered to be the most critical factor; the results of this model showed that product loss due to over-ripeness in the retail stage should still be approved and even optimised because customer behaviour did not count in logistical calculations. Moreover, product

loss could be considered alongside the optimal positioning of perishable food in order to gain the maximum profit possible under the circumstances (Schepers and Kooten, 2006).

In another study, Luitjes and Westra (2004) studied a ready-to-eat mango chain by using an Aladin simulation with a demand-responsive chain with five links: production location, importer, distribution centre, retail outlet and customer. They considered the perishability according to three elements: quality aspects, surrounding conditions and acceptance limit. They found that the most critical factor for mangoes was ripeness, which was dependent on the temperature. Between the ready-to-eat moment and the acceptance limit was two days shelf life. Over-ripe mangoes were not accepted due to quality loss.

To date, many exotic fruits are harvested early at an unripe stage for long-term transport to distant retailers. If the fruits ripen too early, plant hormones (e.g. ethylene) will trigger autocatalytic ripening processes and, from this, the whole fruit cargo could be lost en route. As a consequence of early harvesting, the fruits generally do not reach the proper stage of ripeness even when the customers buy these fruits and so they may be dissatisfied with the taste. If the vertical supply chain participants cooperated at the ripening stage of the fruits and controlled the ripening factors, the outcome could be optimised for all chain members and the customers would be satisfied with the products.

2.4.6 Mature Supply Chain and Emerging Supply Chain

Mowat and Collins (2000) noted that customer satisfaction and acceptance were different between a mature supply chain and an emerging supply chain. In a mature supply chain, the reputation of a fruit line depends on the importer, the wholesaler and the retailer's experience of customer satisfaction and acceptance. Their skills and experience have a great impact on the different price among competitors. However, in an emerging supply chain, external quality is a major aspect in price differentiation as stakeholders often lack knowledge and experience. For instance, Australian fruit gained a market advantage over New Zealand fruit due to their perceived quality. In order to compete in the market, New Zealand supply chain members needed to focus on internal quality improvement in order to respond to the unfavorable product comparison compared with Australian supplies and to improve the market's perception of their own quality.

2.4.7 Product Information

For fruit products, key success factors are customer satisfaction and acceptance (Brug et al., 1995). Satisfaction occurs when a new fruit meets or exceeds the customer's expectation at the point of sale or during consumption and acceptance occurs when a satisfied customer become a repeat purchaser (Swan and Combs, 1976). In New Zealand, when considering customer satisfaction with a view to increasing sales volume, a label is now placed on the product packaging which indicates the stage of fruit ripeness. This provides alternatives to the customers, who can select between fruit which is ripe enough to be consumed on the date of purchase or immature fruit for future consumption (Ruben et al., 2006). In addition, information and knowledge about the impacts of seasonal substitute fruits such as mangosteen, rambutan and durian are important. Without coordinating such information in the supply chain management strategies, market growth could collapse through oversupply. With information flow in the supply chain, an agriculture industry can be transformed from a particular production orientation to a whole-of-chain marketing orientation.

2.5 Supply Chain Collaboration

2.5.1 Definition

In the past, supply chain collaboration was known as "business partnership" and for a small business which is not familiar with the terms "supply chain" and "collaboration", this will be more comprehensible as "business dealing". In this sense, supply chain collaboration means the collaboration of members along the supply chain. However, the concepts for supply chain collaboration are not as well defined as they should be (Howeg et al., 2005). A supply chain begins with the flow of a product from suppliers to producers until it reaches consumers. There are various processes along this production line which have three important links: product, information and money. Therefore, supply chain collaboration was first developed as a result of coordination between stakeholders and gradually it has been developed to a level of cooperation level where there is collaboration between stakeholders throughout the supply chain.

Mentzer et al. (2001) defined supply chain collaboration as

‘. . . a means by which all companies in the supply chain are actively working together towards common objectives, and is characterised by sharing information, knowledge, risk and profits. Sharing entails understanding how other companies operate and make decisions, and goes much deeper than cooperation. Collaboration is mutual goal-setting that goes far beyond a written contract.’

Simatupang and Sridharam (2008) defined supply chain collaboration as

‘. . . the process of working together among independent firms (two or more companies) along a supply chain in delivering products to end customers for the basic purpose of optimising long-range profit for all chain members and creating a competitive advantage.’

Supply chain collaboration can range from a shallow transaction to a highly integrated close relationship (Goffin et al., 2006) Closeness of relationship depends on information sharing and risk distribution between the partnerships. Furthermore, the sustainability, success or failure of the supply chain collaboration is essentially determined by the level of trust, commitment and bargaining power (Monczka et al., 1998a) which will affect the efficacy of logistics on cost, time and quality.

There is evidence to show the effectiveness of supply chain collaboration. In the 1970s, Japanese auto makers dealt with their trading partners by knowing each other’s manufacturing costs, sharing common objectives and by having a willingness to share risk. This collaborative approach gave the Japanese auto-makers as much as a 22% manufacturing cost advantage. This evidence shows the advantage of collaboration based on trust and commitment in the supply chain relationships (Lewis, 2000, Dyer and Ouchi, 1993).

2.5.2 Importance and Benefit of Supply Chain Collaboration

The objectives of collaboration in the supply chain are many, depending on the level of mutual trust, commitment and bargaining power. With various objectives in inter-organisational relationships such as sharing of vision, information, resource investment, risk responsibility, achievement of mutual goals, decision making, planning and problem solving (Phillips et al., 2000, Lee and Billington, 1992, Spekman et al., 1988), there are many benefits to be obtained from the relationships. With collaboration, partnerships can gain the advantage through better performance, better competitiveness,

knowledge creation capabilities, revenue enhancements, cost reductions, pricing and increased operational flexibility to cope with high demand uncertainties and market diversity (Hogarth-Scott, 1999, Malhotra et al., 2005, Fisher, 1997)

Mentzer et al. (2001) divided the benefits into two: financial benefits and non-financial benefits. Financial benefits include the following:

- reduced inventory
- improved customer service
- more efficient use of human resources and
- better delivery through reduced cycle times.

In addition to these financial benefits, non-financial benefits resulting from collaboration include the following:

- faster speed to market of new products
- stronger focus on core competencies
- enhanced public image
- greater trust and interdependence
- increased sharing of information, ideas and technology
- improved shareholder value and
- competitive advantage over other supply chains.

2.5.3 Types of Collaboration

Collaboration can be achieved in many ways depending on the objectives of the relationship. Collaboration may be developed through strategic alliance, joint ventures or even virtual collaboration. Types of collaboration are described as below:

- **Strategic alliance**: This collaboration consists of two or more partners sharing resources, knowledge and capability for enhancing the competitiveness, such as in new technology dissemination, new market penetration, avoiding government control etc. (Speckman and Sawhney, 1990)
- **Joint ventures**: The objective of traditional joint ventures is to develop new market opportunities in which the firm, looking for a new market, often provides goods or services, marketing strategies and financial capability

whilst the local party contributes with market knowledge, labour and access to public and private sector networks (Collins and Doorley, 1991).

- **Cooperative arrangements**: The rationale behind these cooperative efforts is focused on the collaboration and sharing of resources for better competitiveness, survival or efficiency, etc. through redesigning of the processes and products (Cousin, 2002). The objective of cooperative efforts is to shift from mere contractual arrangements to a more trusting relationship between the parties (Kumar, 1996).
- **Virtual collaboration**: This collaboration is made by independent entities (such as suppliers and customers) that are linked by telecommunication technology to form a virtual team. It is boundary-less communication. With this virtual collaboration, it is possible to develop a radical new product (Malhotra et al., 2001).
- **Vertical, horizontal and lateral integration**: In order to reduce logistics and administration costs for individual organisations or to improve procurement terms through group purchasing power or to decrease the fixed costs of indirect labour, horizontal integration is formed. This integration consists of two or more unrelated or competing organisations (at the same level of the supply chain) producing similar products or different components of one product, forming a cooperative association to share resources such as warehouse space and manufacturing capacity (Simatupang and Sridharan, 2002). Vertical integration takes place at different levels of the supply chain. The integration between producer and distributor enables better physical and information flows, improvements in the trade-off between the level of service and average stock levels, more economical inventory management control and better transportation systems (Caputo and Mininno, 1996). Lateral collaboration combines the benefits and sharing capabilities of both vertical and horizontal integration. Integrated logistics and inter-modal transport are examples of an application of lateral integration that aims at synchronising carriers and shippers of multiple firms in a seamless and effective freight transport network (Simatupang and Sridharan, 2002, Mason et al., 2007).

2.5.4 Supply Chain Collaboration Mechanisms

Simatupang and Sridharam (2008) present five elements in the mechanism of supply chain collaboration: collaborative performance system, information sharing, decision synchronisation, incentive alignment and innovative supply chain process. The details of these topics are presented below.

Collaborative Performance System (CPS): Simatupang and Sridharam (2008) define a Collaborative Performance System as

'. . . the process of devising and implementing performance metrics and targets that guide the chain members to assess and improve both overall performance and individual performance. Performance metrics and targets drive how the chain members behave in attaining collaborative objectives and ultimately the supply chain success'.

The chain members need to jointly determine specific collaborative objectives characterised in terms of outcomes rather than actions, measurable and quantifiable, clear as to a time frame, challenging yet attainable, written down and communicated to all necessary participating members.

CPS often consists of objectives, metrics, target specificity, an explicit time period and performance feedback. An individual chain member is then encouraged to define its own strategy to achieve performance targets based on local market conditions, competition, operating technologies and resources. A balanced scorecard measurement and management system may be used to facilitate collaboration within and between organisations. The balanced scorecard framework describes strategy in terms of strategic objectives, measures, targets and initiatives (Kaplan and Norton, 2002).

Information Sharing: Information sharing enables the chain members to improve performance by capturing and disseminating timely and relevant information to enable decision makers to plan and control supply chain operations. Effective information sharing provides a shared basis for synchronous actions by different functions across interdependent firms (Whipple et al., 1999). Quality of information sharing is determined by relevancy, accuracy, timeliness and reliability. Advanced information technology such as decision support systems, enterprise resource planning and the internet can be

used to convey up-to-date data about demand planning, product movements, workflow, costs and performance status.

Decision Synchronisation: Independent chain members usually have their own self-interests with limited ability to make individual decisions, probably due to a lack of information and/or knowledge to capture, store, process and decide. Decision synchronisation is the ability to link knowledge and decision rights and to provide synergistic benefits to the chain members. It encourages the chain members to have a sense of belonging in which all decisions work toward a common goal of serving the end customers.

Decision synchronisation may refer to joint decision making in both planning and operational contexts. These joint decisions are used to guide logistics processes inside an individual chain member firm. The planning context integrates decisions about long-term planning and measures such as selecting target markets, product assortments, customer service levels, promotion and forecasting. The operational context integrates order generation and delivery processes, which might be in the form of a shipping schedule and replenishment of the products in the stores.

Incentive alignment: One of the most important problems of supply chain collaboration is the motivation of its participating members to create value that benefits all the members. Incentive alignment refers to the process of sharing costs, risks and benefits amongst the participating members (Simatupang and Sridharan, 2002). This scheme motivates the members to act in a manner consistent with their mutual strategic objectives, including making decisions that are optimal for the overall supply chain and revealing truthful private information. It covers calculating costs, risks and benefits as well as formulating incentive schemes such as pay-for-performance and pay-for-effort (Simatupang and Sridharan, 2002).

Chain members usually commit to the collaborative efforts if they can realise and capture relevant benefits that contribute to their future survival (Kaplan and Narayanan, 2001). Benefits of collaboration include both commercial gains (such as increased sales) and performance improvement (such as lowered inventory costs) (Corbett et al., 1999). Incentive alignment also involves risk sharing among the chain members in managing demand, supply and price uncertainties (Fisher, 1997). Setting and applying appropriate incentives (such as rewarding responsiveness and sharing the costs of markdowns)

motivates the chain members to take decisions that align with the achievement of supply chain profitability (Simatupang and Sridharan, 2002).

Innovative Supply Chain Process: The supply chain processes need to be as flexible as possible in order to respond to the variety of customer requirements at minimum costs with respect to supply capacity. To create flexibility, the chain members can redesign the distribution system, product, production process and inventory management to be cost-effective and flexible to match supply with different conditions of customer demand (Fisher, 1997; Simchi-Levi et al., 2003). Innovative supply chain processes enable the chain members to ensure the swift flow of goods along the supply chain from new product development and demand planning to order fulfillment, at minimum cost.

2.5.5 Value of Information Sharing in the Integrated Supply Chain Relationship

Currently, supply chains are concerned greatly with uncertainties, such as increased inventories and distortion of demand forecasts since these have a direct impact and are mismatched with supply chain processes (Liu and Kumar, 2003). The distortion disseminates and, then, magnifies greatly in each stage of the supply chain; this is known as the bullwhip effect which was defined as one of the biggest causes of supply chain inefficiencies (Lee et al., 1997a). Information sharing is acknowledged to be an effective way in dealing with this bullwhip effect and in reducing uncertainties occurring in the supply chain (Liu and Kumar, 2003). Therefore, it is recognised to be one of the most important issues for successful supply chain management (Bowersox et al., 2000, Handfield, 2000, Handfield, 2002, La Londe, 2002, Kwon and Suh, 2004) since information sharing has a significant effect on minimising supply chain costs and in enhancing a competitive advantage (Drucker, 1992, Li and Lin, 2006, Li et al., 2006, Shin et al., 2007, Cheng, 2011). Some principal objectives, of information sharing, are to accelerate the flow of information (Chow et al., 2007, Xu et al., 2001) to maximise the efficiency and effectiveness of the supply chain; and, amongst inter-organisational members, to respond more rapidly to customers' changing demands (Li and Lin, 2006). This is crucial in the maintenance of good relationships (Cheng, 2011). With efficient information sharing throughout supply chains, demand information flows upstream from

the point of sale, whilst product availability information flows downstream in a systematic manner (Lee and Whang, 2001, Yu et al., 2001). This can ensure that the correct information is available, at the right time and in the right place for the right dealing partner (Liu and Kumar, 2003). Accordingly, the supply chain partners can optimise the supply chain management by making better decisions on collaborative activities such as better production planning; and managing the capacity allocation (Huang et al., 2003, Cheng, 2011) Therefore, the information sharing creates not only efficiency in the collaborative supply chains, but also enhances the supply chain's competitiveness as a whole.

With regard to inter-organisational information sharing, both partners benefit from greater information base of each party, consequently competitiveness since information is a source of competitive advantage (Drucker, 1992, Mentzer et al., 2000). The parties tend to collaborate together if they realise that cooperation with each other, will add benefits or value to this inter-organisational relationship. In addition, Cheng (2011) found that, through its positive influence on relational proclivity and connectedness, the relational benefits influenced remarkably inter-organisational information sharing. On the contrary, the effects of relational benefits on inter-organisational information sharing are compromised by its negative influence on power symmetry when the relational benefits of the involved parties are so great that dysfunctional conflict amongst them is endured and considered to be acceptable towards accomplishing better information sharing (Cheng, 2011). However, Cheng (2011) argued that benefits were considered not only to be shared but the risks were considered also, since the supplier partnership the supply chain included sharing necessary information with respect to the limitations related to time and distance along with the benefits and risks which accompanied the relationship. The supply chain partnership leads to increased information flows, decreased risk and uncertainty, and a greater profitable supply chain. As such, the customer acquires, in a shorter time, a higher quality and cost-effective product (Fiala, 2005). Accordingly, both partners in such relationship begin to value relationships (William and Diana, 2007, Cheng, 2011) as long as the value, derived from collaborative relationships, and benefits each party.

According to Lee (2000), information sharing is the foundation of supply chain integration since decisions on the level of integration, are related strongly with decisions on what information should be shared and how it should be shared. Companies have to

carefully decide which supply chain partners they should be integrated closely since the level of integration is based on various factors such as the firm's capabilities, the complexity of products, and corporate culture (Cooper et al., 1997, Sivabrovornvatan, 2006). Besides determining with whom companies should integrate, it is essential to consider how a company's activities are related to those of their partners, and deciding on what information should be accessible (Cooper et al., 1997). A good practice in enhancing information sharing is to develop a positive and strong connection in the supply chain such as opportunities to interact, to assist each other, and channels for communication (Cheng, 2011). Continuous and honestly open communication between/amongst supply chain partners minimise/ eliminate any degree of uncertainty and/or misunderstandings (Moorman et al., 1993, Kwon and Suh, 2004). Therefore, in order to achieve the competitive advantage in the supply chain as a whole, collaborative behaviour and activities need to be encouraged so that value-based relationships can be established amongst the members (Wang and Wei, 2007, William and Diana, 2007, Cheng, 2011)

2.5.6 Buyer-Supplier Relationships and the Power within

Since the relationship focus concerns the behaviour of both buyer and seller to maintain the relationship, the power within such relationship derives from the interpersonal interest and respect which appears to meet a personal need of the buyer and seller to be valued by the other party (Meehan and Wright, 2012). Benton and Maloni (2005) argued that the power relationship's satisfaction was a useful part of supply chain strategy which had to be developed with accurate and complete information. With regard to inter-organisational relationships, firms must comprehend their supply chain partners in all aspects including comprehension of the sources, imbalances, and consequences of power such that the most advantageous use/disuse of power can be leveraged to achieve supply chain performance and satisfaction of the supply chain members. Power can be used as an approach to promote supply chain integration since power has an influence on factors that are crucial to the buyer-supplier relationship such as cooperation, commitment, trust, compliance, conflict, and conflict resolution. Maloni and Benton (2000) demonstrated empirically the importance of power within the supply chain as follows:

Power plays an important role in the supply chain, and the various sources of power have different effects on inter-organisational relationships in the chain. Thus, both the power source and the power target must be able to realise the presence of power, and then adapt supply chain strategy for power influences.

A greater buyer–supplier relationship will improve performance throughout the chain. Supply chain integration is considered to be a key trigger of corporate strategy and promotes the need for a greater understanding of the integration process.

Exploitation of the supply chain by the power partner may lead to controversy and under performance, then harming the power holder. Moreover, a sensible use of power may serve to benefit the power holder.

Influences of power on the buyer–supplier relationship and consequent effects of this relationship upon supply chain performance reveal the potential of power as a tool to promote integration of the supply chain and enable higher levels of performance. This performance benefit provokes the power holders to take a second look at their positioning of power within the supply chain strategy and promotes a more conscious and considerate use of power.

Benton and Maloni (2005) stressed that the supply chain relationship of buyer-supplier primarily drives satisfaction of supplier rather than performance. Although the suppliers should be more concerned with their performances even in an environment of supply chain integration, the suppliers appears to be more concerned the nature of supply chain relationship rather than performances. The suppliers appear to conceive that as long as they can continue their relationship with the manufacturer, their performance will be generated as a natural output. Accordingly, if the power holder attempts to promote satisfaction, a relationship-driven supply chain strategy should be considered rather than a performance based strategy since the former strategy generates the additional benefit of enhancing performance for both parties who aim to thrive in such a competitive global environment.

With regard to the power within the buyer-supplier relationship, Meehan and Wright (2012) argued that power was a property of relationships developed from two-way interaction. Origins of power depend on the relative position of the knowledge, product/service quality, and relationships. However, the relative nature of power can cause pressure and conflict in the relationship. If the supplier does not have greater knowledge than the buyer, the latter may provide knowledge-sharing mechanisms to

compensate the power asymmetry. From knowledge sharing with the buyer, the supplier might attempt to strengthen relationship and such action could reduce the relative knowledge gap. In addition, the importance of relationship length, honesty, empathy, and fairness greatly emerged as factors which maximised the other party's ability to influence them. This was because both parties had a high desire to collaborate with trustworthy relationships. To gain competitive advantage, therefore, suppliers within existing relationships with the buyer should have more power than their competitors as they are perceived as a trusted source, and the information tends to be valued more (Meehan and Wright, 2012).

Nonetheless, the different viewpoint regarding the negative view of power within the relationship reveal that not all relationships result in joint benefit that they are not all based on mutual trust as they always require to be, and that trust alone cannot be depended upon (Blois, 1998, Campbell, 1997, Earp et al., 1999, Kalafatis, 2000, Svensson, 2001, Hingley, 2005). Consequently, the positive relational factors such as trust, commitment, collaboration, and mutuality are considered to be a gap in the relationship in terms of the role of power and the management of power asymmetry. Hingley (2005) emphasised that acceptance of power asymmetry was a key first-step to a successful relationship in supply chain collaboration particularly in the agri-food supply chain. Suppliers are advised to be capable of operating within the conditions of imbalanced power and reward. In considering the issue of power and reward, relationships are rarely fair since not all parties are equally active in commitment to a relationship (Gummesson, 1996, Kumar, 1996, Hingley, 2005). Such imbalanced partnership arrangements appear to offer preferably the most to the more powerful supply chain partner and, consequently result in unevenly shared benefits (Christopher and Juttner, 2000). In order to deal with the issue of power asymmetry, Davies (1996) suggested that, one channel member was normally in charge and, regardless of the background context of unavoidable imbalance, other channel members, who wished to collaborate to mutual benefits, had to focus on joint satisfaction of common objectives.

Accordingly, the trend is to develop exclusive relationships with fewer, favoured, single source or devoted partnerships. In this way, suppliers are described as locked or tied-in (Grunert et al., 1997, Larson and Kulchitsky, 1998) to a form of vertical channel quasi-integration (Howe, 1998, Hingley, 2005). The number of suppliers is minimised in order to confirm consistency rather than depending on the varying qualities and

specifications of different suppliers engaged in incessant renegotiation of prices and terms. Hingley and Lindgreen (2002) and White (2000) mentioned that suppliers were extensively accepting of the state of asymmetrical power imbalance as long as they could perceive a reasonable proportion of the maximised relationship value, and/or this method, of doing business, was preferable to alternative routes to market where higher transaction costs were inherent (Hingley, 2005). According to the case studies in agri-food supplier-retailer relationships conducted by Hingley (2001), although power is noticeably imbalanced in agri-food relationships, in favour of retailer buying organisations, this does not compulsorily lead to a state of instability, rather the opposite is true, with the existence of many long-standing vertical supply chain relationships. Hingley (2001) identified that agri-food industry relationships were concerned with power-dependency. However, power asymmetry and unfairness does not mean that suppliers are reluctant to enter into and continue with relationships with the major multiple retail chains since this remains the largest and most consistent market outlet for UK agri-foods.

In order to achieve efficient supply chain collaboration, the relationship issue should be considered to be a crucial factor in developing a proper supply chain strategy. Therefore, this thesis examines the relationships of buyer-supplier as one factor in analysing the supply chain collaboration mechanism. It is important to investigate whether and how the suppliers (growers) and buyers (exporters) value and manage their relationships in order to improve collaborative performances.

2.5.7 Supply Chain Contract and Contract Farming

Supply chain contract have been extensively studied in operations management, economics, and marketing science literatures (Lariviere, 1999, Tsay and Lovejoy, 1999)The format of supply chain contracts vary in and across industries (Wang, 2002). However, the principal objectives of supply chain contracts are to maximise the total profit of the supply chain, to minimise the costs of overstock/understock, and to share the risks among the chain members (Tsay and Lovejoy, 1999, Arshinder et al., 2008). The contracts counter double marginalisation by minimising the costs of all supply chain members and total costs of the supply chain when the members coordinate as against the costs incurred when the members work independently. From utilising the supply chain contracts which provide intensives to all members, these supply chain members are able

to coordinate with greater management of supplier-buyer relationship as well as risk management (Arshinder et al., 2008).

The supply chain contracts normally designate the parameters (e.g. quantity, price, time and quality) within which a buyer places order and a supplier fulfils them (Arshinder et al., 2008). For optimal supply chain performance and relationship, the different types of contract are specified for different conditions. In buyback contract, the buyer is allowed to return the unsold inventory to some fixed amount at agreed prices (Arshinder et al., 2008). The manufacturers accept the returns from the retailers when the production costs are sufficiently low and demand uncertainty is not too great (Padmanabhan and Png, 1995). In the revenue-sharing contracts, the supplier proposes the buyer a low wholesale price when the retailer shares fraction of the revenue with supplier, which supports partners in selecting order quantities that are optimal for the holistic supply chain (Giannoccaro and Pontrandolfo, 2004, Cachon and Lariviere, 2005). In the quantity flexibility contracts, the supplier and the buyer accepts some of the inventory and stock out cost burden. The supplier accepts the change in quantity ordered from the buyer after observing the actual demand. The buyer consigns to a minimum purchase and the supplier certifies a maximum coverage (Tsay, 1999). These types of contracts are described as a response to certain supply chain inefficiencies (Lee et al., 1997b, Arshinder et al., 2008).

2.5.7.1 Concepts of contract Farming

In an agricultural supply chain, a contract refers to an agreement in which one firm produces products for another firm, however both parties maintain separate identities and long-term profit objectives (Mighell and Jones, 1963b, Johnson et al., 1992). The concept of contract farming has increasingly gained attention in the light of liberalisation of agro-food markets and the requirement for more stringent supply chain coordination (Kirsten and Sartorius, 2002, Da Silva, 2005).

Eaton and Shepherd (2001) defined contract farming as an agreement between one or more farmer(s) and a contractor for the production and supply for agricultural products based on forward agreements, regularly at predetermined prices. According to Eaton and Shepherd (2001), contract farming is recognised by different variants like centralised model which is a company-farmer arrangement; outgrower scheme which is

organised by government or public sector/joint venture; nucleus-outgrower scheme engaging both contract farming and captive farming the contracting agency; multi-partite arrangement engaging many types of agencies; intermediary model where middlemen are engaged between the company and the farmer; and satellite farming referring to any of the above models (Singh, undate).

Singh (2006) defined contract farming as a system for the production and supply of land based and allied produce by farmers/primary producers under forward contracts, the essence of such arrangements being a commitment to provide an certain pre-agreed agricultural products of a type, at a specified time, particular price, and in specified quantity and quality to a known buyer. The contact farming basically comprised of four issues which are pre-agreed price, quality, quantity or acreage (minimum/maximum) and time. The concept of contract farming can be described as a halfway house between individual farm production and corporate farming (Singh, 2000).

Hueth et al. (1999) have classified three distinct functions of contracts in agriculture; 1) the contracts are served as coordination devices which allow individual actor to make decisions aligned with decisions of the partner(s); 2) the contracts are used for performance motivation by providing incentives and penalties for each contract partner in order to encourage partners to comply with the agreement; and 3) the contract clarifies financial risk allocation since smallholder farmers are usually risk-averse (Rosenzweig and Binswanger, 1993), the contractor endures most of the risks instead of farmers.

According to Johnson et al. (1992), the types of supply chain contracts in agriculture are differ by1) the share of management, resources, and risk enduring provided by each party involved, and 2) the method of payment and/or profit sharing used. Mighell and Jones (1963a) proposed a typology of contracts in agriculture. This typology are categorised as market-specification contracts, production-management contracts, and resource-providing contracts.

The marketing contract is a pre-harvest agreement between farmers and contractors on the conditions governing the sale of the crop/animal. The contractor reduces the farmer’s uncertainty of locating a market for the harvest, while the grower continues to endure most of the risk of production activities. This contract reduces the cost of gathering and exchanging information regarding demand, quality, timing and price, therefore reducing uncertainty and the concomitant market risks (Bijman et al.,

2009, Poole and Frece, 2010). The price list is guaranteed by the contractor in return for delivery by the farmer of a specific quality and quantity of the products at a predetermined place and time (Johnson et al., 1992).

The production-management contract provides more control to the contractor than the marketing contract since the contractor will inspect production activities and specify input usage. At this stage of contract, the vertical coordination between farmer and contractor is high as the farmers agree to follow the conditions provided by the contractor such as input regimes and precise production methods. As a result, the contractor endures the risks of the production outputs due to the decision rights. This type of contract is typically utilised when the quality of the output depends on the type and quality of inputs, when production have to be intensely coordinated with processing, and when inputs provision minimises production costs for the farmer and thereby purchasing costs for the contractor (Bijman et al., 2009, Poole and Frece, 2010). Pricing can be fixed or based on market price list at the time of delivery with a production management contract Johnson et al. (1992).

The resource-providing contract differs from the first two contracts as the contractor maintains ownership of the products. This involves the greatest strength of managerial control by the contractor comparing to other contracts. In addition to providing the guaranteed price and stringent production guidelines, this contract includes contribution of major production inputs by the contractor (Johnson et al., 1992, Poole and Frece, 2010).

The schemes of contract farming originally proposed for more commercially oriented, more greatly capitalised, and more professional farmer (Poole and Frece, 2010). The three types of contracts differ in their main objectives regarding extends of vertical coordination, risk transfer, and particularly the transaction cost reduction (Minot, 1986, Bijman et al., 2009).

Singh (undated) claimed that contract farming actually varies based on the nature and type of contracting agency, technology, nature of crop/produce, and both local and the national context. The contracts could be classified into three types; 1) procurement contracts under which only procurement conditions are specified; 2) partial contracts wherein only some of the inputs are supplied by the contracting firm and produce is bought at pre-agreed prices; and 3) total contracts under which the contracting firm supplies and manages all the inputs on the farm and the farmer becomes a supplier of

land and labour (Singh, undate). However, the relation and importance of each type of the contract varies from product to product and over time and these contract types are not mutually exclusive (Hill and Ingersent, 1987, Key and Runsten, 1999). The first type is commonly referred to as marketing contract, the other two are recognised as types of production contract. Scott (1984) stated that there is a systematic link between product and factor markets under the contract arrangement as contracts generally require specific both product quality and quantity.

Singh (undated) stressed that there are three pillars of a contract arrangement; coordination, motivation, and transaction costs. It is essential to concern contract design as a multi-criterion decision problem. Some basic rules of contract design involve 1) coordinating to minimise production costs which means applying either price signals or instructions, 2) balancing decentralisation and centralisation in farm decisions which causes problems like moral hazard and hold up, 3) minimising or sharing risk and uncertainty, 4) minimising the costs of pre/post contractual opportunism (adverse selection and moral hazard) by various mechanisms of allocating contracts and monitoring them like other party endures part of the costs, social pressure, incentive structure, or group contract/incentives (moral hazard), and by rationing and screening farmers so that the farmers can reveal their true contract type by choosing certain contracts; group contracts, and individual risk rating/information collection before contract is actually signed (adverse selection), 5) encouraging group or cooperative action among farmers to lower costs and ensure greater compliance, 6) motivating long-term contracts to avoid hold up problem, 7) balancing pros and cons of renegotiation of contracts over time, 8) minimising direct costs of contracting, and 9) using transparent contracts (Bogetoft and Olesen, 2002, Singh, undate).

Contract farming concept is theoretically beneficial to small farmers (Key and Runsten, 1999, Eaton and Shepherd, 2001) such as access to input and output markets, lower market risks, access to credit, and access to technology transfer. The concept is also beneficial to processing and trading customers such as higher regularity of supplies, more homogeneous products, greater product quality, more flexibility, and lower costs when compares to the traditional plantation system (Bijman et al., 2009). Besides, the concept of intensive and penalties compliance introduced in contract farming can help improve product quality as there are problems of adverse selection and moral hazard in any contact arrangement resulting in underinvestment or defrauding by any of the parties

(Wolf and Ligon, 2001, Singh). Accordingly, the concept of the contact farming has been intensively promoted in the developing countries by various agencies due to the efficiency of coordination and quality control in vertical system, and equity benefits of this hybrid system (Glover, 1992b, Singh, undate).

2.5.7.2 Contract Farming System in Thailand

Singh (undated) stated that contract farming as a vertical coordination mechanism is only a response to a situation of market failure and bases on commodity/crop/sector dynamics which are liable to change anytime, particularly in globalised and liberalised world. If the market conditions for a crop/commodity change, the contract farming can eventually discontinue when the market becomes efficient (Singh, undate). However, Ornberg (2003b) debated that there are many indications that contract farming can maintain even in the presence of competitive markets as has been the case in the developed countries or even in Thailand.

Accordingly, Singh (2006) studied a contact farming system in Thailand and found that though contract system brought to higher income and employment in the beginning (Williams and Karen, 1985, Leisinger, 1987, Benziger, 1996), the relations between firms and farmer have worsen over time and the system results in ecological and economic degradation of local production systems. Singh (2006) pointed out that it is important to realise the role of the state in either encouraging or discouraging the agribusiness firms and in protecting the producers in contract situations (Asano-Tamanoi, 1988, Christensen, 1992, Benziger, 1996) since most of the studies found contracts inequitable, short-term, and ambiguous.

In Thailand, contract farming is concerned as a key element of the Thai government's development plan which indicates a strategy of "private-led integrated agricultural development" (Glover, 1992b). Comparing to the countries in Asia, Thailand is probably has the most extensive experience with contract farming, in the widest range of crops. Thailand also has not only the highest degree of private sector involvement in contract farming but also the highest concentration of foreign direct investment in agriculture and a gro-industry (Singh, 2006). Burch (1994) noticed that the role of the state in promoting contract farming is seldom analysed in a literature which usually focuses on the relationship between the agribusiness companies, the main proponents of

contract farming, and those farmers who produce commodities under contract. However, there is some evidence to believe that contract farming in Thailand has been implemented and managed differently, which has resulted in better overall agricultural growth, and development effects through the shift to high value crops (Benziger, 1996). Still, this is argued that the contract farming system has not effectively operated due to the defaults by farmers or companies. This results in the withdraws by the companies to reduce their dependence on contract procurement due to the problems of raw material supply, quality, and general control (Singh, 2006).

The contract farming in Thailand was introduced in most cases by the private sector, then the government play a major role in terms of establishing broad policy directions for diversification and supporting private sector activities through institutions such as the Board of Investment (BOI), National .Economic and Social Development Board (NESDB, undate-b), and Agri-cultural Land Reform Office (ALRO). Furthermore, there are two other departments of the government Ministry of Agriculture and Cooperatives (MOAC) and Ministry of Finance (MOF), which promote contract farming through their own agencies, namely Department of Agricultural extension (DOAE) and Bank for Agriculture and Agricultural Co-operatives (BAAC) respectively (Singh, 2006).

With respect to the National Strategic Plan of Thailand, it was only the sixth plan that a lead role was proposed to private agribusiness, including the contract farming system. The sixth plan notes and recommends regarding the production and sale of agricultural products, "Contract farming has proved viable and should be further promoted, on condition that the provisions of such agreements are amended to be more effective and beneficial to all parties concerned" (NESDB, undate-a). The seventh plan developed this policy regarding contract farming further by clarifying it and contriving its promotion. The target of contract was changed at the departure from the sixth plan to the seventh plan as the it seemed to emphasised on group contracting as against individual farmer contracts. A big change in policy occurred when the eighth and ninth plans have not mentioned any issue related to contract farming (Singh, 2006).

Though there is no explicit mention of contract farming in the eighth and ninth national plans, individual departments are still implementing it on the ground. The MOAC, through its DOAE, still continues training in contract farming for farmers and local government officials including aspects of guidelines for contract farming implementation such as types of products suitable for certain kind of contracting

arrangements, familiarity with the contract farming system, supervision of contractual arrangement, special financial assistance to companies undertaking contract farming, and process of implementation of the contract farming project in terms of coordination between public and private sectors and alternatives of relevant area and farmers. The success factors of contract farming project are a clear understanding of the contract farming concept and an actual need for it, physical proximity between producing and processing areas, stringent adherence to quality standards and honesty and sincerity of all parties involved. This assigns specific roles and responsibilities to farmers, farmer groups, companies, and government agencies to cooperate with each other for the successful project. In addition, the issues of suitable types of systems of contract farming for different types of products, advocates farmer organisations rather than individual farmers, and multiple outlets have to be concerned (MOAC, 2002, Singh, 2006).

Singh (2006) reviews the contract farming system in Thailand that the contracts are still bias against the farmer and companies rely on intermediaries to work with farmers. Though the government has helped famers by promoting competition, this was found to the extent of benefits for farmers only. For instance, in the case of potato production in northern Thailand, the government provided capital in the farm sector via loans of Bank for Agriculture and Agricultural Cooperatives (BAAC) for contract farmers. This effort was not really effective since it only helped the companies as they could rely on state money to grant farmers. The lessons for the promotion of contract farming are summarised; 1) considering for adequate rationale for contract farming in terms of market failure for the crop/variety/quality; 2) the unique crop technology; 3) ascertaining the market for the products; 4) ascertaining the benefits for farmers (yield/incomes); 5) selection of farmers to prevent a problem of adverse selection; and 6) establishing trust with farmers in order to prevent moral hazard problem (Singh, 2006).

2.5.8 Traceability in Agro-food Supply Chain

Since a number of food crises such as food-and-mouth disease, and BSE, Bovine Spongi form Encephalopathy (cow disease), during the past decade, the importance of food safety schemes has been intensively concerned. The necessity of sufficient traceability systems to prevent such crises has highlighted the need for reconsidering and updating traceability systems currently implemented in the food sector (Folinas et al.,

2006). This trend of needs has been realised by several market-pull factors including increasing global demand for food products originating from diverse sources, high incidence of food-related health hazards and increasing concern over the impacts of genetically modified organisms (GMOs) on the human food chain and the environment (Opara, 2002). To meet consumer demands for consistent supply of top quality, food safety, and public confidence in the food chain, the design and implementation of full backward and forward traceable supply chains from farm to end-customer has become a necessity of the holistic food quality assurance system since farmers, postharvest handling operators, marketers, research practitioners and policy makers need good understanding of the concepts and implications of supply chain traceability for developing and implementing appropriate technological interventions in order to meet consumer demands for traceable agricultural supply chains (Opara, 2002).

Folinas et al. (2006) also describes the differences of the traceability efficiency between the general term and the agro-food supply chain that in general, the efficiency of a traceability system normally bases on the ability to accurately gather safety and quality related information, whilst in the agro-food supply chain, the efficiency of a traceability system bases on ability to track and trace each individual product and distribution (logistics) unit, in a way that allow continuous monitoring from primary production to final consumer. Therefore, the traceability in the food supply chain refers to the ability to trace and pursue a food, feed, food producing animal or substance through all processes of production and distribution Folinas et al., (2006.)

Since the awareness needs of information sharing play a major role in traceability system, the traceability information flow in the supply chain can be distinguished in two types: one step up-one step down flow model and aggregated information flow model (Folinas et al., 2006). In one step up-one step down model, the information of traceability is preserved in each stage of the supply chain while other follows the product at the next stage of the chain. Consequently, the final customer cannot access to all the information and can receive only the essential basic information. In aggregated information flow model, this model is implemented when aggregated information follows the product all the way to the retailer point of sale. The consumer can have immediate access to information related to all the stage of the production in the chain, from farm to fork. This model is usually implemented for organic products, fresh food products (Folinas et al., 2006).

Even though many models have been proposed for supporting traceability information, each view model views the issue from a different perspective. Physical traceability, quality information management and batch dispersion remain as major key points that the proposed models suggest (Folinas et al., 2006). Jansen-Vullers et al. (2003) suggested a four elements structure for traceability: 1) physical lot integrity, which determines the traceability resolution; 2) collection of tracing and process data; 3) product identification and process linking; and 4) reporting/system data retrieval. Folinas et al. (2006) also suggested the four main features of integrated traceability system are; 1) adequate "filtering" of information; 2) information extracting from databases that already exist for supporting food quality and safety standards such as HACCP, ISO, GAP, and GMP; 3) harmonisation with international codification standards EAN-UCC; and 4) harmonisation with internet standards and up to date technologies; as the system must be able to file and communicate information related to quality and origin of the product, and consumer safety.

Opara (2002) mentioned that traceability in agro-food supply chain of new agricultural economy is a preventative strategy in food quality and safety management since the new agricultural economy is characterised by two main features; 1) greater concentration/intensity of farms into smaller numbers with large sizes and increasing influence of contract farming; and 2) the evolution of integrated supply chains connecting producers and consumers. Opara (2002) also defined the six important elements of traceability which constitute an integrated agro-food supply chain traceability system; 1) Product traceability which defines the physical location of a product to facilitate logistics and inventory management, product recall and dissemination of information to consumers and other stakeholders in the supply chain; 2) Process traceability which determines the type and sequence of activities that have affects the product during the growing and postharvest; 3) Genetic traceability which determines the genetic constitution of the product; 4) Inputs traceability which identifies type and origin of inputs such as fertiliser, chemical sprays, irrigation water, and the presence of additives and chemicals used for the preservation and/or transformation; 5) Disease and pest traceability which traces the epidemiology of pests, and biotic hazards that may contaminate food and other ingested biological products derived from agricultural raw materials; and 6) Measurement traceability which relates individual measurement results through an unbroken chain of calibrations to accepted reference standards (Gardner and Rasberry, 1993).

Traceability implementation can add value to the overall quality management system by providing the communication linkage for identifying, verifying and isolating sources of noncompliance to agreed standards and customer expectations (Opara, 2002). An efficient traceability system is able to connect all the different techniques, which use in the different stage of the supply chain, to integrate product monitoring system since the techniques and methods used for collecting, defining, and transferring the detailed uniqueness of the product might vary in each stage of the chain. To achieve such system, the standard of data collection method and the structure of the message have to be applied for thoroughly gather and precisely transfer the data (Folinas et al., 2006).

Direct benefits of traceability system in the agro-food supply chain are supply chain optimisation, product safety, and market advantages (marketing advantages/competitive business advantages) since an efficient and effective system transmitting accurate, timely, complete, and consistent information about products through the supply chain can significantly reduce operating costs and can increase productivity (Regattieri et al., 2007). From a consumer perspective, traceability helps build trust and increase confidence in the food system. For the grower and postharvest operators, traceability is part of an holistic cost-effective quality management system that can also assist in continuous development and minimisation of the impact of safety hazards through rapid determination and isolation of sources of hazards (Opara, 2002)

2.6 Collaboration in a Perishable Produce Supply Chain

Collaboration in a supply chain is a perpetual arrangement between producers, processors, retailers, traders and purchasers about what and how much to produce, the quality of products, safety conditions, time of delivery and price. The coordinated supply chain often involves an information exchange and sometimes also deals with finance and technology facilitation. This collaboration is usually initiated through investment by the chain leaders who are mostly private traders and food companies. So, collaboration in the supply chain has characteristics of both partnerships and joint interests. By contrast, the relationships in an open supply chain are usually restricted to business activities only, due to difficult contractual relationships and less loyalty between merchants and purchasers. As an institution, a coordinated supply chain has to compete with fragmented markets as well as with the company that controls the supply chain (C. Van der Meer, 2006).

2.6.1 Necessity of Collaboration

In the past, slow growth in the food market caused producers and retailers to consider product flow strategies that could generate greater efficiencies and economies to increase their profits. New forms of competition were partnerships and joint ventures that aimed to share information and communication. Cooperative businesses opposed the concept of the supply chain, with participants working altogether along the chain. Companies strategically positioned themselves in relation to others in order to increase their margins. However, among large-scale suppliers of fresh produce, if a company did not participate in major chains, then business growth was restrained. Moreover, the internationalisation of raw material supply needed greater coordination than ever before. For instance, customers demanded fresh fruits to be available all year, compared to the seasonality of the domestic fruit market. Also, the growth in both the demand and the supply of fresh products increased 'just-in-time' distribution and this stimulated retailers and suppliers to work cooperatively (Wilson, 1996).

The concept of the collaborative supply chain is well suited to meet the logistic requirements of modern food markets, especially for both fresh and processed perishable food. The collaboration is useful for improving both safety and quality controls. It is more efficient and effective than control solely at the end of the supply chain. Because companies cannot control each single product which is sold; they require complete quality and safety management. In the fresh produce industry, product losses can be especially high due to limited shelf life and uncoordinated supply. Both demand for regular daily fresh products and supply for retailers can only be successfully achieved through collaboration in the supply chain. Consequently, the suppliers who can successfully manage the supply chain will obtain a better market position as this will more closely accomplish economies of scale and scope. Furthermore, successfully managing risk needs coordination among producers, suppliers, retailers, exporters and purchasers. Often advantages include a combination of these benefits. Companies, therefore, use a coordinated supply chain as a tool in their competitive strategies, such as labeling, branding and sales promotion for enhancing a sustainable competitive advantage (C. Van der Meer, 2006).

2.6.2 Advantages of Collaboration

Nonetheless, a sustainable relationship depends on trust and so supply chain members should be empowered to synergise their strengths to supply and improve the market. Palmer (1994) declared the advantages of collaboration as follows:

- Improvement of price stability
- Better financial returns
- Greater ability of each supply chain member to supply and reach market requirements
- Contribution of economies of scale and marketing support

Trust and relationship development should include margin determination, holistic supply chain management and market discipline improvement. As a result, transaction costs decrease since trust and partnership diminish the need for expensive negotiation and contracts. The ability to trust partners and to share information is now one of the most controversial issues of supply chain theory. If this ability is appropriately used, technology can be devoted to facilitating the various distribution channels throughout the chain, rational system planning can generate profits and reduce costs and communication can be developed to clarify organisational goals. Information technology, for instance, can facilitate the linkage of separate businesses to achieve related tasks. The retailer can use information from automation technology to reduce administration costs by maximising stock-turn, thus carrying fewer stock-outs. For the supplier, information technology can improve market intelligence and promise product volume and accurate investment. For the customer, the resulting benefits are greater product availability, less stock-outs, fresher products with a longer shelf life and more cost savings (Wilson, 1996). Without good information and technology systems, a number of supply chain initiatives fail because of poor communication of expectations. As shown in Figure 2.5, relationship management has an impact on all areas of the supply chain and its performance (Handfield and Nichols, 1999).

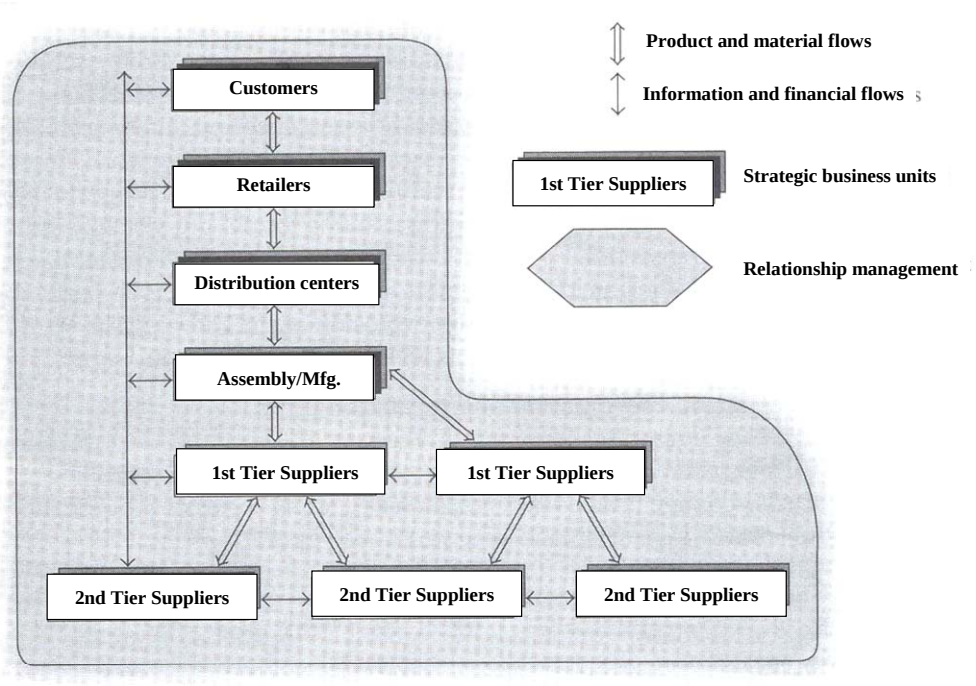

Figure 2. 5: Integrated Supply Chain Model

Source: Handfield and Nichols (1999)

2.6.3 Disadvantage of Collaboration

In the agro-food industry, information technology and advances in food processing and post-harvest management have intensely modified the development of retailing and global sourcing. Trade liberalisation has contributed to a swift growth of the international food trade, especially for vegetables, fisheries products and fruits (Diop and Jaffee, 2005, Hallam et al., 2004). However, partnerships are not the ultimate relationships they are expected to be. Shaw (1994) disputed that partnerships were not a solution for margin redistributions and returns. Power relationships were indeed dominant in the supply chain. Pragmatically, a partner with more power may attempt to take much of the collective beneficial surplus that results from synergies among the participants involved. Relationships in collaborative supply chains were usually limited to transactions only as there were scarcely contractual relationships and little loyalty between merchants and purchasers (Van der Meer, 2006). Still, cooperation exists as long as there is a mutual competitive advantage. Wilson (1996) also claimed that strategies

might be shared whilst goals might be diverse but objective-setting almost always led to arguments and shareholders often wanted their own profits.

2.7 Empirical studies of Collaborative Supply Chains in the Fresh Produce Industry

Shared information, collaboration and recognition of mutual interests within the supply chain are the underlying principles for sustainability. A study of the fresh potato supply chain found that decreasing profitability and increasing business uncertainty were the critical concerns for growers and merchants. Vasileiou and Morris (2006) identified a need for the major retailers to create social capital to generate confidence and trust in order to secure a sustainable future in the supply chain. Effective supply chain management needs trust, shared values and a cooperatively beneficial relationship among stakeholders as a means of minimising both transaction costs and business risks (Vasileiou and Morris, 2006).

In the fresh produce industry, a specific consideration that influences the coordination of the supply chain is trust because this is essential to the monitoring and control of agreements on collaborative actions by stakeholders. However, trust functions best when it is based on the skills required for each specific part of the supply chain: retailers earn the customers' trust by providing best service, best quality and best prices; shippers earn the retailers' trust by making timely deliveries and producers earn the shippers' trust by providing best quality and healthy products.

Although there are studies (Vasileiou and Morris, 2006) which showed that collaboration and trust were essential for a successful supply chain in the fresh produce industry, Blackburn and Scudder (2009) argued that in the supply chain for some fresh products, coordination was not needed. Their study of supply chain strategies for melons and sweet corn demonstrated only a loose link between the responsive supply chain segment and the efficient segment. This implied that each segment could be designed without a major impact on the other or on the general quality of the product. The concept of marginal cost of time was introduced as a tool to analyse the supply chain strategy for fresh produce, in this case melons and sweet corn. For perishable products whose value loss could not be stabilised but which continued to lose value at a linear rate, a model was developed for the perceptive chain segment that could be used for optimising the supply chain. However, this model could only be applied to other products with similar time-

value patterns. Other fresh products with different cost and time profiles, such as tomatoes and bananas, are often harvested before maturity and allowed to ripen to their peak quality post-harvest, unlike melons and sweet corn that reach their peak value at the time of harvesting. Therefore, the supply chain strategy for fresh products has to be variable, due to the different time-value profiles of particular perishable products.

Relationships in the perishable produce industry are unique. The perishable nature and the volume of the products involved mean that trust and collaboration between supply chain partners is very important. In a study of the supply chain for bananas in the UK grocery market (Wilson, 1996), the smooth running of the supply chain was due largely to the collaboration of three companies: J Sainsbury, the second largest UK grocery retailer; Mark Multiples, an operating division of M&W Mack, the UK's largest privately-owned distributor and importer of fresh products and Noboa, a major family-owned plantation in Ecuador. The philosophy in this case was to reassure customers of the product quality, which was sourced through growers. A long term relationship was arranged with the retailer, Sainsbury's, in which the suppliers were asked to classify their top producers of bananas into four groups, ranging from *not suitable* to *acceptable* to *preferred* and, at the top, *nominated*. Sainsbury's then identified the most compatible growers, with which to develop a direct collaboration. To maintain growth in the fresh produce market, which had become more competitive, Sainsbury's had been considering its producer and supplier relationships and the costs of distribution. Consequently, Sainsbury's had been travelling the fresh produce world establishing relationships, creating supply programs and auditing quality.

Since the quality and taste of bananas from different regions or cultivars are different, it was crucial to find the bananas which met customer specifications. Bananas were provided a sell by date which allowed them two days on the market shelf before being removed. So every activity of the supply chain was recorded so it could be completed within the limited time line. Also, the stage of banana ripeness had to meet the exact specifications of the retailer; bananas which did not qualify by reason of colour or maturity would be sent back. It is interesting that banana packing required limited staff within limited areas; the underpinning philosophy was that these tiny areas were fully productive, condensed and controllable. So the concept of 'just-in-time' could be used within every small shack as the packing houses could adapt the daily programme requirements to a manageable volume. From these condensed activities, it was possible to

distinguish the specific staff who packed each hand of bananas, as each box was labeled with the packing house code and a colour code for each packer in each packing house. This process was good for quality control and traceability, fully satisfying the requirements of the 1990 Food Safety Act.

Another good practice of this banana supply chain was the sharing of useful information. The plantation and packing house managers were regularly informed about UK banana market developments, giving a clear insight into the UK retail business. Hence planning, collaboration and investment reinforced a smooth and sustainable product flow. There are apparent economies of information in minimising the amount of time spent in bargaining for and auditing the product quality, providing opportunities for a better developed control over the product supplied. Besides, the ability to trust and share previously undisclosed information through the chain is one of the most challenging aspects of supply chain theory.

In the framework of supply chain management, collaboration and cooperation are central factors to effective supply chain management (DPIE, 1998) but in new agricultural industries, competition is more prevalent than cooperation both among stakeholders at the same level in different supply chains and between stakeholders at different levels of the same supply chain. In addition, factors such as low entry barriers, high transportation costs, unstable supply and sales, various product ranges, diverse market needs and the presence of exit barriers conspire to disintegrate new agricultural industries (Porter, 1980). To enhance competitiveness in the agro-supply chain, particularly for fresh produce, collaboration and cooperation should be drawn to the attention of all supply chain members. The prerequisite for accomplishing cooperation is that all stakeholders in the supply chain realise that economic benefits can flow from selectively focusing on meeting customer needs.

The concept of supply chain management has progressed from neoclassical theories of the company to a new prototype for business, where competition matches channel against channel and where supply chain partners integrate skills and resources which none of the stakeholders would be able to independently achieve. The fruit and vegetable supply chain has traditionally been isolated but recent decades have seen structural changes that suggest that it is possible to increase collaboration in the fresh produce supply chain in the future (Wilson, 1996).

2.8 Agro-food Supply Chain in Developing Countries

In developing countries, supplying agricultural produce to the global market is commonly their main income. To reduce the cost of the products, new knowledge has been developed in the areas of planting, harvesting, post-harvest handling and transportation. Among these, packaging techniques are essential in order to prolong shelf life and to maintain the quality of the products, since duration between farm and customer is very sensitive to product quality (Ruben et al., 2006). For the above reasons, collaboration in the supply chain became very important in these countries, in order to improve prospects for sustainability in terms of market and information access and resource management. Agro-food supply chains and networks are therefore crucial for providing market assessment for producers.

However, for rural development in developing countries, Ruben et al. (2006) argued that the increasing integration of the agro-food chain in local and cross-border areas could be both a threat and challenge. Poor farmers could be evicted from the trade because of the difficulties of access to both the market and information, since they have limited access to technical and market information, reducing their opportunities (Harris-White, 1999). To bridge the gaps between local economic development and global chain integration, a suitable device for more distribution of the value-added factor is necessary to enable farmers and producers in developing countries meet both business requirements and trade standards.

In developing countries, the arrangement for collaboration in agro-food supply chains resembles that in industrial ones but the market penetration level of coordinated supply chains is greatly decreased. Coordinated supply chains are extensively found in small production divisions meeting export market demands, particularly in perishable products and sensitive processed products delivered to industrial countries. These collaborative chains are slowly developing in the perishable products market for domestic supermarket divisions, international hotels, contemporary restaurants and food processing industries. In the large commodity and traditional food markets, the collaborative chains are still not well organised. Even though coordinated supply chains are increasingly widespread in both developing countries and industrial countries, small-scale farmers in developing countries still have only a small share (Van der Meer, 2006).

2.9 The Practices of the Agro-Food Supply Chain in Developing Countries

2.9.1 Brazil

In Brazil, developing an instrument for the agro-food supply chain was a core challenge for the government. Sustainable agriculture then became the principle concept for production. This included organic agriculture, minimum-tillage cultivation, integrated cropping systems and improving sanitary measures. The government took action in global negotiations on export promotion. Supply chain coordination was then encouraged, particularly from within academic circles, by urging the supply chain members to establish their own bureaucracy in order to become less dependent on governmental adjustment. The commencement of supply chain organisations depended on sectorial chambers that represented all participants in specific production chains. Issues of integral chain performance were brought to chamber discussions with a view to developing chain sustainability to increase customer satisfaction in terms of price and food quality (Neves et al., 2000, Zylbersztajn and Filho, 2003). The most critical aspects of the agro-food supply chain in Brazil were infrastructure and logistics as they caused crucial bottlenecks for chain integration. Supply chain partnerships were essential to sustainable development, especially to strengthen the economic transition from intensive environmental use to less-intensive but more effective production systems. However, cooperatives tried to integrate the chains and enhance a collaborative process of rural development by bringing small farmers together in order to improve access to the market as well as to add value to their products

2.9.2 Kenya

Meanwhile, in Kenya, local farmers often faced many constraints to development; for instance, agricultural investments were inadequate and unbalanced compared to the industrial sector; famers had insufficient information to access the market that contributed to poor bargaining powers and the international standard in global trade at WTO level favored multinationals and the developed countries rather than small farmers in developing countries. Kenya's National Federation of Agricultural Procedures (KENFAP) encouraged farmers to participate in international trade by building institutional capacity and self-organisation, enabling farmers to improve their bargaining

power and to learn from international practices. Developing networks and partnerships would further improve market access. The active support of policy makers from both national and international sectors was also recommended by KENFAP (Kariuki, 2006).

Another study of an agro-food supply chain in Kenya is in the fish industry. Competition between the domestic and the export market was unequal due to the comparatively high prices paid in the global markets and the related power of manufactures. Efforts to export fish had caused a reduction in local availability. Small-scale enterprises monopolised the upper part of the supply chain from fishermen to manufacturing. This part of the supply chain was notable for a lack of efficient quality measurements and control, for monopolistic or oligopolistic members and for defective market information. Traditional domestic fish markets had been marginalised due to a purchasing-agent system of manufacturers. Fishermen then became more dependent on loans from the purchasing-agents to provide access to facilities such as boats and fishing gear, which decreased the fishermen's power to negotiate on price. The fishermen finally became victims of unequal power distribution in the supply chain. The increasing number of small-scale fishermen led to over-fishing and the use of illegal means. Many market failures could be noticed in the fish supply chain. Downstream, between manufacturers and export markets, there was clear information on price, quality, quantity and standards whereas upstream, between fishermen and manufacturers, fishermen did not have the ability to negotiate prices with the purchasing agents. This demonstrated a defective information flow that placed the fishermen under the influence of pricing by purchasing agents. Also, because of the interlocked market, there was a commitment to sell fish to the purchasing agents who provided loans for fishing facilities. Furthermore, environmental issues were critical since the lake was public property but individual fisherman only focused on maximising personal output. Meanwhile, the government preferred to focus on contributing to global trade rather than on enforcing effective restrictions for protecting the natural resources. In order to create a more competitive market as well as to provide supply chain sustainability, it was important to improve financial systems to enable fishermen to acquire loans. The government should have been involved in developing quality standards and control. The supply chain then required a governance system to effect collaboration (Schuurhuizen et al., 2006).

2.9.3 Nigeria

Another challenge for developing the ago-food supply chain is conspicuous in the cassava industry in Nigeria. In general, agricultural production in Africa was very unproductive, due to lack of access to land, low technology and poor environment in terms of poor soil fertility, unpredictable rainfall and unfertile ecosystems. Agricultural production also suffered from marketing forces and constraints to achieve economies of scale. Transaction costs of agriculture products in Africa were very high: even goods imported from Europe into African rural centres might be cheaper than locally produced goods, distributed over broad distances to the centres. Cassava was a greatly valued crop in Africa and had recently become the most valuable root crop in Nigeria.

Cassava production provided a good example of the difficulties that local producers encountered in developing agro-food chains focusing on adding value and creating fair rewards for labour input. Many small-scale cassava producers added to the high transaction costs. Cassava has high water content and is therefore easily spoiled so it was essential to add value to the product to extend its shelf life. The market was competitive because the product was the raw material for further industrial processing. Without formal quality control, it was mainly the secondary processors and intermediaries who took advantage of the profits.

Cassava producers were very independent; they were not coordinated and there were no agencies to operate any form of control over the producers or marketers. As a result, there was no selection process for the products, e.g. by colour, and packaging was poor. Since cassava was produced from many small units, each individual grower had no control over prices. Therefore, the key to pricing in this market was the principle of demand and supply. Not only were farm supplies critical but so were quality control and standards, because there was no official quality control on cassava-based produce or processing methods, nor was there any concern with hygiene or nutritional quality or other aspects relating to food safety.

To develop a sustainable agro-food chain for the cassava industry, three major perspectives had to be considered: quality assurance, improvement in producing and processing capacity and strategies to overcome market limitations. In this case, to create a sustainable agro-supply chain, it was essential to support an increase in the scale of processing at the farmer’s level: training for entrepreneurship skills for farmers was also important to enhance bargaining power. The government should have launched a policy

to improve quality control regulations and banking facilities. Regional partnerships and global collaborations could have been of assistance in creating the circumstances for an efficient cassava supply chain and network, contributing to food safety for both domestic and international markets (Oyewole and Philip, 2006).

2.9.4 China

In Asia, China is one of the biggest food exporters. China now pursues a greater contribution to world food safety however, the developmental process of food supply has typical features of “pollution first and then alleviation”, implying that the process is associated with critical problems of safety and pollution. At present, when a food product has entered the market and customer demand is increasing, agro-food supply chain management becomes the main issue because many problems in the food supply chain cannot be referred to either a specific company or link in the chain. From primary agricultural production to food distribution, the production process lacks control, e.g. there are too many fertilisers, pesticides and applied animal medicines, causing both food contamination and environmental pollution. Many food processing companies do not have essential processing facilities with the worst case being that many products are illegally produced in unlicensed workshops without fundamental sanitary conditions.

With regard to food distribution, most products are transported through roads but specialised vehicles are very scarce and the food warehouses are generally too small. Because of the problematic food distributing system, loss of food quality is significantly high and the food is also contaminated during poor circulation. Nevertheless, in order to meet the food safety and quality criteria required for exporting, China has established a supply chain especially for the international markets in which food safety and circulation are better organised. This specialised supply chain has been developed for exporting perishable food, in particular fruit and vegetables, because these have a higher position than animal products in the dietary structure of China with its vegetarian culture. The production of fresh fruit and vegetables is relatively advantaged and this represents a large proportion of food exports from China. With government concern for an improved agro-food supply chain, the concept of agricultural industrialisation is being promoted. The Chinese government is attempting to promote coordination between food processing manufacture and farmers to equalise agricultural production and to assure the income of

farmers. In production, chemical residues and environmental pollution are alleviated through technical guides and contract farming. Meanwhile, the government is devising schemes to push agricultural collaboration and increase productivity.

In conclusion, the state of the agro-food supply chain in China can be classified in three ways, as follows: a) the agro-food supply chain is wholly unsustainable, as the supply chain is not integrated and profits are not rationally allocated along the chain. There are still food safety concerns and serious pollution in the food industry; b) China attempts to improve food supply chain management, agricultural industrialisation and government guidance on food safety and c) the food supply chain is improving step by step however, there are still problems of both food safety, due to chemical residues, and cargo damage, due to poor transportation (Xuewen, 2007).

2.9.5 Thailand

Research has recently been conducted into the development of the agro-food supply chain for fresh fruit and vegetables in Thailand (Buurma and Saranark, 2006). It was found that the development of an agro-food supply chain initiated by a retail company had less beneficial effects for smallholder relationships and less sustainability than that initiated by an export company. The two studies, on a retail company and an export company, were performed under different institutional and economic conditions. TOPS Thailand, which has superstores nation-wide, was set-up as a retail company and the study was conducted in a period of economic crisis in Thailand. Thai Fresh is a large export company which was studied during a period of business prosperity for exotic fresh fruit and vegetables sold in Europe. TOPS Thailand needed supply chain development for business competition, risk management and beneficial return. Reduction in transaction costs and food safety were the other main strategic interests and, as a result of these, many smallholder producers had to abandon their planting areas. Thai Fresh, on the other hand, surveyed the market with both institutional and legal aspects in mind. Its main strategic interests were in the introduction of quality systems and the establishment of its competency.

Consequently, it was found that many smallholder producers succeeded in improving their performance up to global standards of good agricultural practices (GAP) whereas wholesale traders refused to participate in the global supply chain for exotic

fruits and vegetables. The results of this study lead to the assumption that supply chain development based around an export company provided better perspectives for smallholder involvement and sustainability than supply chain development based around a retail company. There was no best practice for TOPS retailers however, TOPS superstores agreed to adopt the GAP certification system that inspects the production system of the growers and issues a certificate from the Department of Agriculture, Ministry of Agriculture and Cooperatives (DOA).

The collaboration between public and private sectors finally resulted in the establishment of a regional post-harvest centre in Ratchaburi province, which is located in the western part of Thailand, which became a knowledge centre for educating and training growers in post-harvest technology for fresh vegetables. This built capacity specifically for the smallholders who formerly had a minor role in supply chain development. These two cases in Thailand demonstrate that social aspects such as values, perceptions, visions and strategies of supply chain stakeholders represent an essential dimension in supply chain development. The outcome of this study proposed that policymakers and business partners should acknowledge these impacts and include them in the process of strategic decision making for agro-supply chain development.

2.10 Outcome of the Literature Reviews - the Research Gap

2.10.1 Summary of the Literature Reviews

The beginning of this chapter highlighted the differences between an industrial supply chain and a perishable supply chain. The supply chain for perishable products has many specifications, which distinguishes it from other types of supply chain. The important characteristics of perishable products are their short product life cycle and that they are delicate and require controlled conditions of storage and transport. These lead to the conclusion that perishable supply chains are more complicated than other types of supply chain.

The limitations of perishable supply chains have been discussed in the literature review. Supply chain involves many organisations in the integration of raw materials, the transportation of goods and delivery to the customer (section 2.4). Customers want to purchase products of the right quality, which controls market demand and dictates the

timing of distribution and marketing. Ordering of fresh products has to be precise in order to reduce waste due to decay, therefore, the supply chain for perishable foods should make provision for temperature or time sensitive foods.

Following on from the above discussion of the literature reviewed, this research focusses on the significance of supply chain collaboration. The literature discusses why collaboration plays an important role within supply chain management and how supply chain collaboration represents value to the buyer in order to establish a good relationship with suppliers (section 2.6). During the collaborative processes, the partners need to share information, joint planning and joint performance in order to create a competitive advantage through these mechanisms. The transactional benefits of the supplier-buyer relationship are that it can enhance knowledge and lead to a long-term relationship. Supply chain collaboration is also necessary to promote communication, trust and respect, skills and knowledge-sharing.

This chapter also mentions the implementation of agro-food supply chains in developing countries. In order to establish an agro-food supply chain in a developing country, government support is required since agricultural investment was inadequate and unbalanced compared to that in the industrial sector. Furthermore, farmers had insufficient information to access markets leading to poor bargaining power (section 2.9).

The following table shows the summary of literature reviews related to research objectives and research gap.

Table 2. 1: The summary of literature reviews

Research Objective	Empirical Research	Authors	Outcomes	Research Gap
1. To empirically review the existing supply chain of Nam Dok Mai mangoes in Thailand and to identify strengths and weakness in the supply chain	Concept of supply chain management and its advantages	Forrester,1958, La Londe,1997, Ross, 1998, Mentzer et al, 2001, Christopher, 1992, Wilson, 1996, Gattorna,1998, Day, 1994		This research focused on supply chain collaboration in perishable products. Most of literature reviews attempted to apply the supply chain concept to industrial products. There are very few researches addressed to investigate supply chain in perishable product.
	Supply chain for perishable products	Rushton, 2006, Knight, 2002, Aramyan, 2006, Van der Vorst, 2000, Van der Spiegel, 2004	Tangible and intangible flows are the key factors to success of supply chain management, classified the agri-food supply chain are fresh products and processed food products, specific aspects of the argi-food supply chain	
	Identification of Perishable product	SITPRO,2009, Christopher, 2005, Ketzenberg and Ferguson, 2003, Deniz etal., 2004, Onderstejin, 2006	Excusive meaning and the difference characteristic of perishable product and non-perishable product	
	The differences between argo-emerging supply chain and mature supply chain	Mawat and Collins, 2008		

Research Objective	Empirical Research	Authors	Outcomes	Research Gap
2. To analyse supply chain collaboration between growers and exporters in the production of mangoes for export to Japan	Definition of supply chain collaboration.	Mentzer et al 2001, Simatupang and Sridharam, 2008, Goffin et al., 2006, Goffin et al., 2006, Monczka et al., 1998a, Lewis, 2000, Dyer and Ouchi, 1993	The classification of key factors of supply chain collaboration mechanism particularly in perishable product.	There are only a small numbers of research that address collaboration within an agricultural supply chain. These empirical studies only focus on the collaboration between the organisations such as exporter and importer. **Therefore, research gap of this study concerns the supply chain collaboration of grower and exporter on a vertical supply chain collaboration.** However, there have been a limit numbers of research studying the collaboration between grower and exporter. From this, a key question that needs to be addressed is 'what are the key factors to enhance the competitive advantage of Thai mango supply chain
	Importance and benefit of supply chain collaboration	Lee and Billington, 1992, Spekman et al., 1988		
	Type of collaboration	Speakman and Sawhney, 1990, Lorange and Ross, 1991, Collins and Doorley, 1991, Cousins, 2002, Kumar, 1996, Byrne, 1993, Malhotra et al., 2001, Caputo and Minino, 1996, Mason et al, 2007, Kaplan and Norton, 2002, Whipple et al., 1999, Kaplan and Narayanan, 2001, Corbett et al., 1999, Fisher, 1997, Fisher 1997, Simchi-Levi et al., 2003,		
	Value of information sharing	Liu and Kumar, 2003, Lee et al. 1997, Bowersox 2000, Handfield et al. 2000, Handfield 2002, La Londe 2002, Kwon and Suh, 2004, Drucker, 1992, Li and Lin, 2006, Li et al., 2006, Shin et al., 2007, Cheng, 2011, Chow et al, 2007, Xu et al., 2000, Li and Lin, 2006, Lee and Whang 2001, Yu et al. 2001, Filala, 2004, Cooper et al., 1997, Sivabrovornvatan, 2006	The implementation of information sharing in supply chain	

Research Objective	Empirical Research	Authors	Outcomes	Research Gap
	Buyer-Supplier Relationships and the Power within	Hingley, 2005, Meehan and Wright, 2012, Maloni, 2005, Maloni and Benton, 2000, Gummesson, 1996, Kumar, 1996, Christopher and Jüttner, 2000, Grunert et al. 1997, Larson and Kulchitsky, 1998, Howe, 1998, Hingley and Lindgreen, 2002, White, 2000, Hingley, 2001	Trust and relationship factors for developing supply chain collaboration	
	Contract farming	Lariviere,1999, Tsay and Lovejoy, 1999, Wang, 2002, Arshinder et al., 2008, Padmanabhan and Png, 1995, Giannoccaro and Pontrandolfo, 2004, Cachon and Lariviere, 2005, Lee et al., 1997, Mighell and Jones, 1963b, Johnson et al., 1992, Kirsten and Sartorius, 2002, Da Silva, 2005, Eaton and Shepherd, 2001, Singh, 2006, Jueth et al., 1999, Bijman et al., 2009, Poole and Frece, 2010, Minot, 1986, Hill and Ingersent, 1987, Key and Runsten, 1999, Scott, 1984, Bogetoft and Olese, 2002, Wolf and Ligon, 2001, Glover, 1992b, Ornberg, 2003b, Williams and Karen, 1985, Leisinger, 1987, Benziger, 1996, Asano-Tamanoi, 1996, Burch, 1994	A key factor of collaboration between growers and exporters	
	Traceability in agro-food supply chain	Folinas et al., 2006, Opara, 2002, Jansen-Vullers et al., 2003, Regattieri et al., 2007	A regulation for export fresh product.	
	Advantages and disadvantages of collaboration	Palmer, 1994, Wilson, 1996, Handfield and Nichols, 1999, Diop and Jaffee, 2005, Shaw, 1994, Van Der Meer, 2006		
	A study of fresh potato supply chain	Vasileiou and Morris, 2006, Zuurbier, 1999	Trust, shared value and minimising transaction costs and business risks	

Research Objective	Empirical Research	Authors	Outcomes	Research Gap
	Supply chain strategies for melons and sweet corn	Blackburn and Scudder, 2009	the coordination was not needed for some fresh product. However, this research focused only a loose link between the responsive supply chain segment and the efficient segment.	
	A study of the supply chain for bananas in the UK grocery	Wilson, 1996	Trust and collaboration between supply chain partners is important	
	Argo-food supply chain in developing countries	Ruben et al., 2006	Planting, harvesting, post-harvest handling, transportation and packaging techniques are essential in order to prolong shelf life and maintain product quality.	
			Also the increasing integration of the argo-food chain local and cross-border areas could be a threat and challenge.	
		Harry-White, 1999	The difficulties in accessing to both the market and information have reduced farmer's opportunities.	

Research Objective	Empirical Research	Authors	Outcomes	Research Gap
	The practices of the Agro-food Supply chain			
	Brazil	Zylbersztajn and Filho, 2003, Neves and Scare, 2006	To enhance quality standard of organic agriculture by integrated group of grower	
		Rodriguez, 2006		
	Kenya	Kariuki, 2006	KENFAP encouraged farmers to participate in international trade. In order to improve farmer's bargaining power	
	Fish industry in Kenya	Schuurhuizen et al., 2006	The supply chain required a governance system to enhance the collaboration	
	Cassava in Nigeria	Oyewole and Phillip, 2006	Enhancing quality assurance, improvement in producing and processing capacity to overcome market limitations.	

Research Objective	Empirical Research	Authors	Outcomes	Research Gap
	Food safety in China	Xuewen, 2007	Establish food-chain between food processing manufacture and farmers	
	The development of agro-food supply chain for fresh fruit and vegetables in Thailand	Buurma and Saranark, 2006	The two studies of a retail company and an export company reviewed that the development of retail company had less beneficial effects for smallholder relationships and less sustainability than that initiated by an export company.	

2.10.2 Research Gap

The aim of this chapter is to identify the research gap from the empirical studies. Supply chain collaboration plays an important role in satisfying customer requirements at lowest cost. Although there are several research studies that address the issue of collaboration within the supply chain, almost all of them focus on industrial supply chains. Conversely, there is only a small numbers that address collaboration within an agricultural supply chain. In addition, these empirical studies only focus on the collaboration between the organisations such as exporter and importer. Therefore, the research gap concerns grower and exporter collaboration on a vertical supply chain collaboration. Most of the literature on supply chain collaboration is from industrial organisation, but there has been little research into the perishable supply chain collaboration between grower and exporter. From this, a key question that needs to be addressed is ‘what are the key factors to enhance competitiveness for the mango supply chain?’

In order to examine mango supply chain collaboration, key factors of collaboration have been developed:

1. Information Sharing
   1.1 Collaborative Performance System (CPS)
   1.2 Performance Status
   1.3 Production and Demand Planning
   1.4 Knowledge Sharing
2. Decision Synchronisation
3. Incentive Alignment
4. Supply Chain Contracts
5. Traceability
6. Transaction cost management
7. Relationship

This list of factors will be used for investigating mango supply chain collaboration; the results of this will be presented in Chapter 7. The next chapter will discuss mango exportation to the Japanese market.

Chapter 3

Thai Mango Exports and Supply Chain Limitation

3.0 Introduction

The previous chapter reviewed the literature regarding the principles of supply chain management and the concepts of supply chain collaboration in the agro-food industry. The research gap in supply chain collaboration in agricultural fresh products was introduced. To examine the supply chain of Nam Dok Mai mango, it is necessary to apprehend the historical background of Thai mango exports and its constraints inclusively in order to thoroughly analyse the current supply chain management.

This chapter aims to explain from the historical background to the current situation of Thai mango exports to Japan including the problems and limitations which obstruct the export efficiency. This illustrates the statement of problem regarding the Thai fresh mango industry for exports to Japan. The chapter begins with Japanese consumption behaviour which leads to the particular requirement of consumption demand. Since Japan is a food importing country, it has a long experience of regulating the import of food products (Jonker et al., 2005). Therefore, this chapter will examine the problems associated with Thai agricultural exports into the Japanese market starting in the 1990s when Thai fresh mango was firstly exported to the Japanese market in 1987. The next section will then present information about Thai mango cultivar and the Japanese market, exporting processes, and Good Agricultural Practice (GAP) in Thailand. At the end of the chapter, the supply chain of Thai mango exports and its limitation are described.

3.1 Japanese Consumption Behaviour for Agricultural Products

This section expresses viewpoint of end- customer. The characteristics of customer's consumption are presented. This is essential to enhance the competitiveness of Thai's mango industry as the end-customer plays an important role in the free market.

3.1.1 Agricultural Products in an Manufacturing Circumstances

Japan is a country with a high consumption rate and high purchasing power. Being an industrialised nation has resulted in a constant decline in the size of its domestic agricultural sector owing mainly to a shortage of local new-generation labour (Minister of Agriculture, 2012). Consequently, domestic agricultural products are generally higher in price than their overseas counterparts due to labour shortage in new- generation since the annual output of many of Japan's domestic agricultural products has failed to meet consumer demand and the rate of food self-sufficiency in Japan will stabilise at low-level in the future. According to this, cooperation of Japan and Asian countries will become more important in the future (Arikawa, 2010).

Generally, Japanese people are known for their national traits of diligence, cleanness, organisation, neatness, honesty and commercial mindset (Agriculture and Agri-Food Canada, 2010a). These character traits have long been a major driver behind Japan's highly successful global presence of its products, for instance, Japanese agricultural products are mass-produced in an industrial manner with as much precision and symmetry as possible in order to facilitate effective and convenient packaging. These products are intentionally made to have similar sizes, flawless skin and attractive colours. The strenuous efforts made to obtain these qualities have resulted in a higher market value and great popularity among consumers as well as retailers. These domestic vegetable and fruit products are of preference among Japanese consumers and are frequently purchased as gifts on different occasions, as well as being personal consumption items. A wide cultivars of vegetables and fruits, such as tomato, strawberry and other leafy vegetables, are domestically planted and treated through the above-mentioned industrialised manner. These attractive-looking agricultural products are marketed in either large department stores or leading supermarkets whereas those with inferior quality are sent to small grocery stores along streets or alleyways or to street retail vendors with selling prices that are almost 50% cheaper. For instance, apples with asymmetric and unattractive shapes, or poor-looking cucumbers with naturally unorganised bending that are unable to fit into supermarket packaging, are a familiar sight in these lower-end market outlets (Division of Agricultural Commodity and Food Standard Policy, 2010a).

In addition, perennial labour shortage and high labour costs drive Japan to turn its technological and engineering proficiency into various practical automatic agricultural

inventions that have influenced its agricultural activities. For example, the entire process of bean sprout cultivation, from the first step to final packaging, is fully automated. Under such a manufacturing circumstances, Japan usually expresses concern for food safety whenever imported green beans are infected with certain plant diseases (Anderson, 2011). This is because partial infection in some bean sprouts can further spread and cause damage to the whole package. If the infection is found prior to final packaging, all the infected portions will be removed. The use of an automated sizing/packing machine is common among not only fruits but also vegetables, evident in the case of sweet peppers, available with precisely equal weights in each bag (Division of Agricultural Commodity and Food Standard Policy, 2010a).

3.1.2 Consumption Curiosity, not Nationalism

The manufacturing circumstances as mentioned above are current familiar environment among Japanese consumers. Unlike in the past, a marked shift in consumer attitude towards imported goods is evident (International Market Bureau, 2010, Salsberg, 2010). Japanese consumers no longer adhere to nationalism and welcome foreign goods provided that the quality of those imported goods are not materially different from their familiar domestic products, such as packaging quality and flawless vegetable/fruit skin. To date, imported food products have become an integral part of daily life in Japan. Japanese consumers have long recognised the presence of food imports in their lives and have familiarised themselves with those food items. The Japanese are typically food enthusiasts in search of new food formats and flavours. Owing to these contributing factors, Japan's domestic food market welcomes foreign food products.

Restaurant and food retailing businesses in Japan are also characterised by this consumer behaviour. As a result, new traders should consider this consumer behaviour in order to either gain a foothold in the Japanese market or to either differentiate their products from those currently available or provide products of superior quality (Division of Agricultural Commodity and Food Standard Policy, 2010a, Agriculture and Agri-Food Canada, 2010b).

3.1.3 Health and Food Safety

Health and food safety are concerned as paramount important issues in Japanese consumption behaviour. Japanese consumers are able to have quick access to informative sources of purchasing products so they are typically sensitive to information, tend to express obvious concerns over food, and health related hazards, and eventually discontinue their purchase upon their acquisition of any information on food contamination. Concrete examples of this behaviour include the case of contaminated Gyoza and frozen food items imported from China in early 2008. The incident led to widespread apprehension and concerns among Japanese consumers over the quality and safety standards of Chinese food imports (Yoshida, 2008). Unlike China, Thailand enjoys a stronger image as a credible food manufacturer and exporter with a proven track record of successful high-quality maintenance; there are still tremendous opportunities ahead for Thai traders in the Japanese market.

Table 3.1 below presents information illustrating that food and health have become important concerns among Japanese consumers especially the elderly. Since Japan is now becoming an aging society, the purchasing power belongs to these citizens. Currently, the value of products in this category exceeds 6,500 million JPY yearly with a 6% to 10% growth rate.

Table 3. 1: : Companies that invested in food for the elderly (ranked by selling value, million JPY).

Company	2007	2008	2009 (forecast)	Note
Q.P.Co., Ltd	1,319	1,392	1,459	Toromi food
The Nisshin Oillio Group Co., Ltd	925	1,112	1,231	Nursing Meal
Forica Foods Co., Ltd	910	930	949	Nursing Meal
Maruhachi Mutamatsu. Inc	350	400	420	Nursing Meal
Yayoi foods Co., Ltd	441	443	446	Nursing Meal
Nichirei Co., Ltd	327	334	341	Nursing Meal
Wakodo Ltd	385	525	549	Nursing Meal
Meiji Dairies Co., Ltd	271	323	383	Nursing Meal
Tokiwa Kanpo Phamaceutical Co., Ltd	271	323	383	Nursing Meal
Hakujyuji Co., Ltd	235	252	271	Nursing Meal
Nitto Best Co., Ltd	230	242	254	Nursing Meal
Total	5,693	6,292	6,680	(Retail price)

Source: Division of Agricultural Commodity and Food Standard Policy (2010a)

3.1.4 Packaging as Value Adding

The good design of product packaging can add more value to the products. Good packaging is expected to protect/prevent damage to the content inside, and to preserve its natural freshness as its important feature. The size of the packaging should be created to be suitable for the small size of the typical Japanese family (Arandilla, 2011). In addition, the product detail and instruction should be attached with the packaging such as cooking instructions, storage advice, nutrients, manufacturing and expiry dates and the amount of calories per serving. Among the latest developments in product information on packaging, is the inclusion of carbon footprint information recently introduced by major food manufacturers for the purpose of promoting environmental awareness among their customers (Division of Agricultural Commodity and Food Standard Policy, 2010a).

To summarise the Japanese consumption behaviour for agricultural products, Japanese consumers currently become more familiar and accept the foreign food products than the past. This provides more opportunities for foreign countries to export food products to Japan. However, it is not easy to penetrate to Japanese market since Japanese consumers have particular demand of product quality. The consumers greatly concern the high standard and quality of the food products particularly food safety and hygiene. According to this particular requirement of customer demand and Japanese restriction and law regarding food safety and chemical contamination, Thai growers, exporters, and the government have to develop product quality in order to meet the Japanese standard. Not only the product quality has to be concerned, but also the proper packaging needs to be considered in order to add more value to the core product.

3.2 Problems over Thai Agricultural Imports in the Japanese Market During the Initial Period (1990s)

Export of Thai mango to Japan began in the 90's period. During that time, Dr. Vichien Kamjaiphai (1991) was the first officer working as First Secretary of Agricultural Attaché for the Office of Agricultural Affairs (Royal Thai Embassy, Tokyo, Japan). An in-depth interview with him together with his report (Kamjaiphai, 1991) detailed the history of Thai fruits and vegetables which imported to Japan and the problems over the product import. It was disclosed that the Japanese have a positive attitude towards Thailand and viewed it as a nation making good progress in development efforts, with natural attraction and an abundant and highly affordable food supply. This positive public perception of Thailand among the Japanese is a direct result of intensive PR campaigns run by Thai governmental agencies in Japan through the Japanese mass media. The newspaper and TV which frequently features Thailand in their documentary or Q&A programs with broad variety of Thai agricultural products such as orchid, fruit or traditional Thai cuisine, greatly contribute the good image of Thailand among Japanese. These factors lead to an influx of the Japanese into Thailand and also lead to an opportunity to increase the consumption of Thai fresh vegetables and fruits varieties. Besides, many former Japanese expatriates in Thailand continue to consume Thai vegetables and fruits after their return to Japan. These factors enhance the great chance for Japanese food importers to import Thai vegetables and fruits to meet the high

demands of their local consumers (Kamjaiphai, 1991). However, exporting vegetables and fruits to Japan is obstructed by legislative constraints and quality challenges. The encountered problems and constraints encountered are listed below:

3.2.1 Plant Quarantine Legislation

This problem involves the control of infectious diseases and insect pests harmful to fruit quality (Table 3.2 and 3.3). Major insect pest species found from Thai fresh fruit exports into Japan are oriental fruit fly (*Dacus dorsalis* Hendel) and melon fly (*Dacus cucurbitae* coquillett). Despite a great demand for Thai fruits among Japanese consumers, particularly fresh mangosteen or other fresh fruits other than mango (such as papaya, custard apple, sapodilla and rambutan), only six cultivars of tropical fruits are currently qualified for being imported into Japan, consisting of Nang Klang Wan mango, grape, young coconut, banana with green peel, pineapple and durian. Fresh fruits other than these six cultivars are required to import in frozen form at controlled temperatures equivalent to, or below -17.8^{o}C or 0^{0}F, or alternatively in processed form such as canned, salted, dried or candied.

Table 3. 2: Certification of plant at country of origin by Japanese plant quarantine

Country of origin	Fruit species
Australia	Orange
Canada	Sweet cherry
Chile	Grape
China	Melon
Hawaii	Papaya
Israel	Sweet orange, grapefruit
New Zealand	Sweet cherry, nectarine
Philippines	Mango
South Africa	Orange, lemon, grapefruit
Spain	Lemon
Swaziland	Orange, grapefruit
Taiwan	Ponkan, tankan, orange, mango, papaya, lychee
Thailand	Mango
USA	Sweet cherry, nectarine, wheat

Source: Kamjaiphai (1991)

Table 3. 3: Main prohibited articles sent into Japan

Prohibited country	Main prohibited articles	Pest and disease
Europe, Middle East and Near East, Africa, Australia, Brazil	All fresh fruits including pineapple, coconut and banana un-husked walnut	Mediterranean fruit fly, Codling moth
USA (including Hawaii), Canada, New Zealand	Fresh fruits e.g.: apple, pear, peach, plum, sweet cherry, un-husked walnut, wheat, barley	Codling moth, Hessian fly
Hawaii	All fresh fruit including pineapple, coconut and banana	Oriental fruit fly, Melon fly
China, India, Iran, Burma	Fresh fruits e.g.: apple, pear, peach, plum, sweet cherry, un-husked walnut	Codling moth
Tahiti, Easter, New Caledonia, Papua New Guinea, Australia	Fresh fruits e.g.: citrus, papaya, star fruit, guava, avocado, passion fruit, mango, rose apple, annona, kiwi fruit, ripe banana	Queensland fruit fly

Source: Kamjaiphai (1991)

3.2.2 Unstable Size/Weight

Certain fresh fruits marketed in Japan such as orange, apple, and persimmon need to be packaged on the basis of a weight-grading system with size identification on the containing box (such as S, M, L and LL). This practice is not only understandable among retail vendors and consumers but also convenient for selling-price determination. Kamchaiphai (1991) mentioned the cause of size identification for packaging that the first lot of Nang Klang Wan mango imported to Japan in 1987 was fail in size classification. The packaging with L-size-identification contained many different sizes of mangoes. This failure of grading and sizing caused time consuming to Japanese vendors since they have to reweighting and unpacking the products.

3.2.3 Inconsistent Quality of the Product

Another problem is an inconsistent product quality. Even though the first lot of imported Nang Klang Wan mangoes with its noticeably large size, tight skin, and

attractive colour that made it differentiate from Filipino counterpart, the quality of the mango afterwards was constantly decline and became unacceptable among Japanese retail vendors due to its smaller size, slack skin, unattractive colour, and sour taste. This problem regarding inconsistent product quality worsens the Japanese consumer perception of Thai mango to be inferior to Filipino counterpart. Besides, the anthracnose infection developed black marks on mango skin after displaying on shelf for a few days. This therefore led to telephone complaints to the Office of Agricultural Affairs at the Royal Thai Embassy from both Thai expatriates living in Japan and Japanese consumers. They complained about Thailand for exporting rotten mango. The inferior mango quality caused a trading loss among Japanese importers in their first Thai mango ventures.

3.2.4 Packaging

Packaging is considered as one of the most important issue particularly for fresh fruits. Aside from the protection of perishable fresh fruits from damage inflicted through the transportation period, right from orchard to consumer, packaging also provides the necessary information on the content inside. For example, packaging attaches label of product detail indicating that the content inside is Nang Klang Wan mango (VHT) from Thailand (as country of origin), being exported to Japan, together with the quantity and size of the fruit.

With regards to quality, although Thailand has potential for manufacturing high-quality packaging, the function performance of transportation and the storage environment was found inferior to the intended quality target. This is evident in the case of Thailand's first delivery of Nang Klang Wan mango to Japan. Upon arrival in Japan, the packaged product was transferred to cold storage where it was placed in a 6-7 stack arrangement for ripening purposes or/and waiting for distribution. With humidity inside the cold storage, the packaging on lower stacks became dented, causing damage to the tops and bottoms of those vertically positioned fruits inside.

As stated above, a part of fruit purchases by Japanese consumers is made for gift-giving purposes. The fruit gift is usually foam-wrapped, placed in either a cardboard box or a thin wooden box before wrapping and finally tying with ribbon. At a minimum, the fruit gift is put in a plastic box or rattan basket. In case of one fruit in a bunch is broken, consumers view the whole bunch as a defective product and not worth their purchase.

Moreover, well-designed packaging can be performed as product advertisement apart from product container.

3.2.5 Unpredictable Product Volume

The inefficiency of annual product volume forecast is another obstacle of fruit exports. This prevents Japanese importers from conducting business since fruits in demand at the time of their order placement are sometimes unavailable. In addition, an insufficient fruit inventory results in delivery failure although Japanese importers make order placements in advance. In the latter case, Thai exporters sometimes solve the problem by providing low-quality substitutes, leading to frequent complaints filed by those importers through the Office of Agricultural Affairs.

3.2.6 Reliable Contact Source in Thailand Sought by Japanese Importers

Office of Agricultural Affairs revealed that it is difficult to identify a reliable contact source of providing accurate information and facilitating effective and fruitful trading. In order to solve the problem, the Office of Agricultural Affairs advice Japanese importers to contact the Department of Agricultural Extension or the Department of Agriculture in Thailand. However, Japanese importers prefer to directly contact Japanese expatriates living in Thailand to acquire the information since Japanese importers usually want to see fruit products and farm management before making a negotiation with fruit producers directly in person (Kamjaiphai, 1991).

3.2.7 Lack of Information nor Knowledge Sharing regarding Thai Exports

Unlike Thai exports, Japanese goods informatively respond to their consumers by labeling necessary information attached with the products. The information is provided to consumers promptly after unpacking. From the consumer viewpoint, this practice by Japanese manufacturers suggests their quality-oriented mindset to ensure that high quality products will be delivered to end consumers without any queries. The information provided by Japanese-made-products includes, for example, manufacturing site, raw materials and a short description of the processing method. For food products, the

information given includes cooking and consumption instructions, and the nutritional value per serving.

On the contrary, the products imported from Thailand do not provide such detail. An example of failure to provide the necessary product information among Thai exports occurred during the first day of the grand launching ceremony of imported Nang Klang Wan in Shibuya. All provided mangoes for free tasting sessions were all sour because they had been imported unripe and, at the time of the ceremony, were still in need of further storage for ripening purposes. The Japanese did not know the criteria to identify the ripe and ready-to-eat mango. This is similar to Thais who find it hard to differentiate between raw 2,000-THB-worth hard-peel muskmelon (netted melon) from the ripe one. As such, Thais frequently consume raw muskmelon by mistake as there are no visible signs indicating that the fruit is ripe (such as a sweet smell and softer peel). Actually, one can find out whether any muskmelon is ripe and fit for consumption by gently pressing the bottom part. The bottom part of the muskmelon is naturally covered by thin peel. When the bottom part is soft, it suggests that the fruit is ripe and ready for consumption. Therefore, providing product information to consumers serves a very useful function. However, a book titled “Fruit in Thailand” with its full detailed information later released by the Department of Agricultural Extension has proven highly useful for Japanese importers.

3.2.8 Agricultural Export Competitor

It is true that Thailand’s export of vegetables, fruits and flowers has been facing competition from other countries with similar agricultural export products such as China, Taiwan, the Philippines and Malaysia. Since the early presence of Thai mango in the Japanese market, the Philippines have strengthened their mango market position in Japan for fear of losing their existing market share. As a result, the Philippines have successfully enhanced their mango quality (despite using the same VHT technique as the Thai mango) and marked down prices to the extent that it is sold at considerably more competitive prices than Thai mango. In addition, there are other mango-producing countries that have become major players in the Japanese market such as Mexico, thereby intensifying the competition. Moreover, Japan has been growing mango since 1990. With a host of challenges that are detrimental to Thai agricultural export performance in

the Japanese market, quality and service improvement among Thai exporters is of considerable importance.

3.2.9 Seasonality

Season is also a crucial factor. Throughout winter until early spring in Japan, lasting between December and May, vegetables in Japan are very expensive with an almost 100% price hike. During this time of year, three small-sized cucumbers are sold at 300 JPY (approximately 100 THB) due to higher manufacturing costs by using glasshouse plantation and plastic sheets to cover and control soil temperature. Also contributing to higher prices is the fact that only certain fruits, such as orange or apple, are available during the period from inventory stocks. Under such circumstances, and because of these factors in combination, foreign vegetables and fruits are in great demand. Some countries, like New Zealand, can export large volume of agricultural products to Japan during this period.

3.2.10 Kenko (Old Age Generation) Boom

This word is popularly referred to in Japanese society. At present, the Japanese are highly health-conscious. Contributing factors behind this health consciousness are the fact that the majority of the Japanese population are of old age, and this is coupled with their solid financial status and fears that their relatives might not take care of them in time of illnesses. Japanese elderly therefore try their best to stay healthy. Among their efforts include having punctual and regular health check-ups, doing physical workouts and sporting activities, and strictly refraining from food contaminated with chemical residues. Therefore, chemicals used in vegetable and fruit plantation must comply with rules and regulations imposed by Japanese authorities. As it is obvious that there are difficulties in exporting agricultural products to Japan, Thai exporters may view Japan as a difficult choice and prefer other exporting destinations with easier access.

3.2.11 Total Consumer Satisfaction

Consumers with high purchasing power normally purchases that best meet their preferences, personal preference and total satisfaction. Therefore, it is essential for exporters to best respond to the demand and taste of Japanese consumers. Without total

satisfaction provided and maintained by Thai exporters, Japan can turn to other substitute sources. For instance, Japan can import durian through Singapore, mangosteen from Malaysia, banana and mango from the Philippines and vegetables from China or Taiwan. Under such circumstances, Thailand has to maintain its existing vegetable and fruit market share in Japan and realises that the Japanese possess high purchasing power. Japan's domestic production of many of its own agricultural products also has been a cause for concern. Among them are orchid, coffee, Japanese rice or even vegetables (such as asparagus). When Japan achieves a point of self-reliance in terms of the domestic output of agricultural products, Thailand may find the tough situation to cope with.

3.3 Fruit and Vegetable Demand on the Part of Japanese Consumers

There is a strong demand for mandarin orange, strawberry, apple, grape, banana, watermelon, pear, persimmon and peach, most of which can be grown domestically (Schmitz and Seale, 2002, Division of Agricultural Commodity and Food Standard Policy, 2010b). There are a number of contributing factors that can help secure further consumer confidence and increase the selling prices of Thai agricultural imports in the Japanese market. Value addition and product diversification, such as processed fruit/vegetables, packaging improvement, the provision of complete and accurate product information including agricultural produce source/origin, use of chemicals and fertilisers in plantation, are all important factors.

Statistics from 2008 indicate that the total value of fresh and processed fruits imported from countries worldwide into Japan amounted to approximately 389,777 million JPY. In 2008, Thailand was ranked fourth as the major provider of processed fruit for the Japanese market, with a trading value of approximately 9,557 million THB. The major processed Thai fruit exports serving Japanese consumers were at that time candied fruits and canned pineapple. Thai fresh fruit exports in 2008 consisted of mango, banana, mangosteen, durian and young coconut.

In 2009, the total export value of Thai vegetables and fresh, chilled and frozen fruits shipped to Japan exceeded 100 million USD, accounting for 14.2% of Thailand's national overall export volume for the year. The figures represented a 9.4% annual growth against 2.1% recorded in 2008.

According to the Department of Export Promotion (2010), the export target for Thai fresh fruit and vegetables to Japan was set at 753.18 million USD at 5% year-on-year growth. As of the 2010 export trend, first-half total export volume was at 552,102 tons and total export value was 368.31 million USD, accounting for 7.74% year-on-year growth when compared to their 2009 counterparts. The figures mark a 48% achievement of the total fruit and vegetable export target for 2010 and constitute 0.3% of Thailand's national gross export value for 2010. Major export destinations with an annual market growth were China (18.20%), Japan (13.68%) and the United States (16.92%). Major export destinations with a declined market demand were Hong Kong **)**-16.89%) and Indonesia (-8.44%).

In consideration of the export performance breakdown by product category, the first-half of 2010 saw a 5.94% year-on-year growth in the export value of fresh, chilled, frozen and dried vegetables, with a total export volume of 109,000 tons and a total export value of 111.20 million USD. Comparatively, fresh, chilled, frozen and dried fruits registered a 8.53% year-on-year growth in export value based on the total export volume of 443,102 tons and the total export value of 257.10 million USD. Major export markets were China, Japan, Hong Kong, the United States and Indonesia, collectively accounting for 67.52% of the overall export market for Thai fruit and vegetables for the period. The other export market with strong expansion was Vietnam, with sales increased as high as 24.21%.

3.4 Thai Mango Cultivars

Mangifera indica Linn known by the common name, mango, is native to southern Asia, especially eastern India and Burma (CRFG, 1996). Although mango was found to originate in India and Burma, it entered Thailand for centuries and then became a native plant Since there was no clear evidence regarding how and when mango was brought to Thailand, it was believed that India and Thailand were associated in terms of trade and culture, and that mango was introduced to Thailand along with Buddhism, which is now Thailand's national religion. Mango cultivars in the tropical continent were found in India, Burma, Malaya, and Thailand. According to the Department of Agriculture for Thailand, there are 174 Thai mango cultivars (Watanawan, 2007) which are classified into three categories: 1) mango for consuming at raw or immature stage; 2) mango for

consuming at ripen or mature stage; and 3) mango for processing. In terms of exports, there are many factors affecting the selection of mango cultivars such as mango characteristics, mango cultivation and availability, customer's preferences, and customer's consumption behaviour (Ngamsak et al., 2000).

According to research by the Thailand Research Fund, there are five potential mango cultivars for exports: Nam Dok Mai, Mahachanok, Chok Anan, Kaew, and Rad. These cultivars are categorised by the size of fruit and its seed, skin thickness, skin colour, flesh density, and flesh colour. The study found that Kaew has the thickest skin and the most flesh density. Chok Anan has the most flesh and has the brightest flesh colour. Nam Dok Mai is the heaviest with the thickest flesh, the thinnest skin and has the brightest skin colour. Mahachanok has the longest shape, the smallest seed, and the most red and yellow skin colour. Rad has the most yellow flesh colour (Ngamsak et al., 2000). However, Japanese consumers have preferences regarding the size and shape of Nam Dok Mai and Rad; the skin colour of Nam Dok Mai, Mahachanok, and Rad; the flesh density of Nam Dok Mai; and the flesh colour and taste of Nam Dok Mai. In general, Japanese consumers prefer Nam Dok Mai and Mahachanok the most in terms of flesh colour and sweetness (Ngamsak et al., 2000). A picture of Nam Dok Mai is shown in Figure 3.1 and a picture of Mahachanok is shown in Figure 3.2.

Figure 3. 1: "Nam Dok Mai" mango cultivar

Source: Office of Agricultural Affairs (2010)

Figure 3. 2: "Mahachanok" mango cultivar

Source: Office of Agricultural Affairs (2010)

3.5 Thai Mango in the Japanese Market

Mango is now one of Japan's favourite fruits. In the past, Japanese people consumed an average of only 114 grams of fresh fruit per person per day. In other words, with a family size of three-six people, this was about 10 kg per family per year. In terms of average annual expense, it was equivalent to 40,000 JPY (14,500 THB), or only 141 JPY for buying one fruit item in the supermarket. At the present, Japanese people tend to spend less on buying fresh fruit due to the increase in their overall cost of living. The alternative way of buying fresh fruit at a lower expense is to consume fresh fruit juices, processed products and sweets. However, to date, Japanese people consume mango twice as much as in the past. For instance, the amount of mangoes that were imported in 2002 was 8,890 tons and this was increased to 13,293 tons in 2007. In relation to consumption frequency, Japanese consumers in the 50-year-old age range are the most frequent buyers (Prachachart News, 2008).

Japan granted permission for importing Thai mangoes in 1987. According to records by the Department of Agriculture for Thailand (DOAE, 2013), Japan's International Cooperation Agency (JICA) dispatched Japanese plant quarantine experts to study the possibility of applying Vapor Heat Treatment (VHT) and VHT machines for exterminating fruit flies**.** In 1986, Japan allowed the importation of Nang Klang Wan mango cultivar, which successfully passed VHT, then in 1992 there were three more

mango cultivars allowed to be imported to Japan; Nam Dok Mai, Rad, and Phimsen engDa. The latest mango cultivar allowed to import in 2006 was Mahachanok for celebrating the 60th anniversary of King Bhumibol Adulyadej of Thailand succeeding to the throne. To date, Phimsen Daeng is rarely cultivated so it is rarely exported, while the Thai mango exported to Japan the most is Nam Dok Mai (85%) followed by Mahachanok and Rad (15%), (Office of Agricultural Affairs, 2010). The Japanese strictly regulates agricultural practices regarding the type, and use of some specific chemicals such as chlorpyrifos and propiconazole are strictly prohibited. All other practices must follow the Maximum Residue Limits (MRL), issued by the Japanese government. The responsible agencies for controlling these practices are: the Department of Agriculture; the Ministry of Agriculture and Cooperatives; the Thailand and Plant Protection Division of the Ministry of Agricultural, Forestry and Fisheries, Japan.

Though Japan imposes very strict regulations, this market has strong purchasing power and it is widely opened for high standard products. Moreover, this market is growing continuously. For greater competitiveness, the producers have to understand the demand on quality and perishability, and the purchasing culture of their customers. For Japanese people, the judgment criteria for purchasing mango are: freshness 84.3%, reasonable price 82.9%, appearance 47.3%, seasonal availability 40.1%, place of origin 38.7%, size and weight 35.5%, and ripeness 27.9%. Nonetheless, Japanese people do not clearly understand the proper way of consuming mango especially the proper practice of keeping and consuming mango. For instance, mango should not be kept in a refrigerator unless it has been cut open, since it will produce some light acid taste. Therefore, there should be an information tag including storage instructions and the proper date for eating since there can be misunderstandings regarding the ripeness of Thai mango since yellow skin is not an indication of the ripeness for some cultivars. Thai mango sold in the supermarket is normally displayed on the shelf with only its protective package, as shown in Figure 3.3. The ripeness indication might be essential for Nam Dok Mai. Besides, consumption behaviour should be seriously concerned since Japanese people consume mango by neatly cutting its flesh into dice shapes as shown in Figure 3.4, while Malaysian people smash mango to consume it as fruit juice rather than in pieces. More information about the consumption behaviour of the Japanese market is still needed in order to inform better production and marketing.

Figure 3. 3: Thai mango display in Japanese supermarket

Source: Office of Agricultural Affairs (2010)

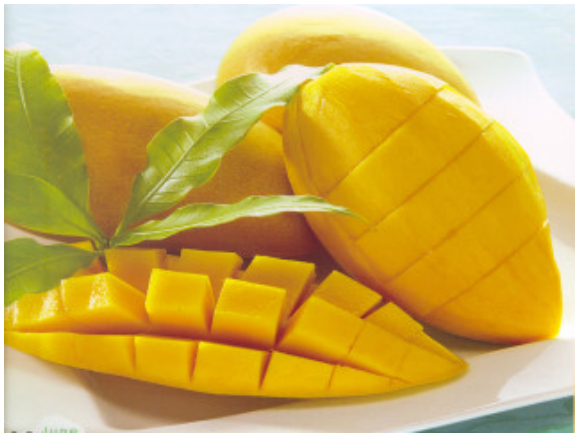

Figure 3. 4: Mango consumption style of Japanese people

Source: Office of Agricultural Affairs (2010)

.

Japanese people are familiar with the yellowish Filipino mango with its small fruit size with sweet and sour taste, and also of the Sunset and Apple mangoes from Mexico with red skin, yellow flesh, slightly strong aroma and mild sweet taste. The Mexican and the Filipino mangoes occupy the main market share of 40.5% and 31.1% respectively, whereas Thai mango is third with only a 12.0% market share. However, Japanese consumers are gradually familiarising with the Nam Dok Mai mango, and the favour of its taste is increasing. Mahachanok, another Thai mango cultivar with skin and flavour similar to red mangoes, is currently in favour with the Japanese consumer because of its taste and its cheaper price compared to mangoes planted in Japan.

Mango in Japan has a high consumption rate in spring and summer. According to the Royal Thai Embassy Tokyo, the mango import value in 2006 was the highest ever, at 4.93 billion JPY, which had increased by 10.5%, while the import volume had increased by only 2% in 2007. Japan mainly imports mangoes from Mexico, the Philippines and Thailand. The factors affecting the import of mangoes in the Japanese market includes the sale growth of mango juice and sweets, which are popularly consumed by women. The mango import season from Thailand starts in November, but the highest import rate is from March to May, since this period is the Thai mango season. However, the importing season might last until July in a year of high yield. The highest consumption period is from June through to August, which is summer in Japan and when Japanese seasonal fruits are also introduced into the market. It is not only mangoes from other countries in the Japanese market that Thai mangoes have to compete with but also Japanese fruits, and they challenge the market share of the Thai mango.

The agricultural counselor who is the ambassador for Thailand in Tokyo recommended that better competitiveness in the fruit market in Japan depended largely on the consistency of quality, availability and marketing promotion. Still, Japan has imported Thai mango at the amount of 4,252 tons, equivalent to only 453 million THB. In fact, the demand from the Japanese side for both mango and mangosteen largely exceeded the supply from the Thai side but only a small amount of Thai fruit could meet the quality standards set by the Japanese side. This turned in less available cost for production campaign. In addition to this problem, the punctuality of product delivery and

chemical contamination were also the two main causes behind a low supply of mangoes to Japan (Prachachart News, 2008).

To enhance competitiveness, Thai mango growers formed a group in 2009, namely the Thai Mango Growers Association. The main purpose of the association was to increase the marketable yield for all year round export focusing on the Japanese market. The Ministry of Agriculture and Cooperatives for Thailand has supported contract farming agreements between growers and exporters for ensuring consistent yields and exports in order to earn a stable income for growers, to control chemical usage and residue, and to standardise farm management by using Good Agricultural Practises (GAP). Traceability could be achieved from the farm to the end market regarding food safety and hygiene.

3.6 Procedures for Fruit and Vegetable Export to Japan

Importing tropical vegetables and fruit into Japan still remains difficult due to the stringent rules and regulations in plant diseases, insect pests and chemical residues issued by the Japanese government in conjunction with the strenuous efforts taken to best safeguard their consumers' health. In accordance with government policy, concerned Japanese governmental agencies enforce Plant Protection Law and Food Sanitation Law to strictly control and screen fresh vegetables and fruit imported from several countries of origin, including Thailand. The Thai fresh fruits qualified for import are banana, pineapple, sweet tamarind, coconut, mangosteen and mango. Mango and mangosteen, in particular, are required to receive VHT to eliminate oriental fruit fly in conformity with Japanese import regulations (Division of Agricultural Commodity and Food Standard Policy, 2010b).

3.6.1 Japanese Sanitation Laws Governing Plants, Animals and Food

Controls of sanitation and the standards of plants, animals and food in Japan are governed by the following three major laws (Division of Agricultural Commodity and Food Standard Policy, 2010b):

3.6.1.1 Plant Protection Law:

The law aims to control and prevent plant diseases and insect pests that are potentially harmful to domestic agriculture from entering into and spreading in Japan. In accordance with the provisions of the law, bringing certain plants or parts of certain plants, including soil, into Japan is prohibited. Among other provisional requirements, the law also requires that diseases and insect pests be eliminated from imported plants to prevent their spread. These plant imports are subject to inspection by the Japanese authorities before entry.

3.6.1.2 Domestic Animal Infectious Diseases Control Law:

The law controls and prevents animal diseases (including those potentially communicable to humans through animal and food carriers) from entering into and spreading in Japan. The law involves animal disease control, implementation of prevention and elimination measures while also overseeing animal health, animal feed, meat-based food products for human consumption and their manufacturing processes.

3.6.1.3 Food Sanitation Law:

The law is intended for the control of food standards and safety. It also governs food processing sanitation, food distribution, food import procedures; standards for food additives, food intoxication and food preservatives based on risk assessment principles.

Sales and distribution of agricultural and food products in Japan could also be governed by other relevant laws:

Food Sanitation Law: The law prohibits the sale and distribution of food and products contaminated with food intoxication or food preservatives or those food items harmful to consumers.

JAS Law: The law regulates and controls product labeling in direct relation to quality. The provisions of the law are applied to agricultural products generally sold and distributed to consumers.

Measurement Law: The law regulates and controls an identification of net weight on product labels sealed on the container.

Act against Unjustifiable Premium and Misleading Representation: The law provides regulations and controls to prevent the use of unclear, incorrect or misleading descriptions of product properties/quality.

Health Promotion Law: Under the provisions of the law, product labeling associated with nutrition is regulated and controlled and has to meet applicable standards.

3.6.1.4 Responsible Agencies:

The main governmental agencies in charge of enforcement of the above laws are:

Ministry of Agriculture, Forestry and Fisheries: Law enforcement is implemented through the following agencies: Food Safety and Consumer Affairs Bureau, Plant Protection Division, Animal Health and Animal Product Safety Division, Labeling and Standard Division (JAS Law).

Ministry of Health, Labour and Welfare (MHLW): Law enforcement is implemented through the following agencies: Pharmaceutical and Food Safety Bureau, Office of Imported Food Safety Division, Inspection and Safety Division, and Department of Food Safety.

3.6.2 Import Rules and Regulations

Plant Protection Law and Food Sanitation Law govern fresh fruit import standards. Under the provisions of Plant Protection Law, plant roots with remaining soil are barred from entry. Fresh fruit qualified for import must be free of insect pests such as Mediterranean fruit fly, the Colorado leaf beetle, and the citrus burrowing nematode. Imported fresh fruit is subject to inspection at plant protection stations.

Under the provisions of Food Sanitation Law, imported fresh fruit is subject to inspection at plant protection stations to detect food additives and chemical residues (MRLs: Maximum Residue Limits).

With regards to trade barriers, importing fresh fruit into Japan complies with the rules and regulations of the World Trade Organisation (WTO) without the imposition of any extra trade barriers. However, Japan is known for its stringent regulations on agricultural and food imports. All agricultural products and food items seeking entry into Japan are subject to close inspection.

3.6.3 Procedures for Importing Food and Agricultural Products

- Prior to importing fruit and vegetables into Japan, it is advisable to study rules, regulations, restrictions, conditions and exemptions in relation to plant sanitation established by the Japanese authorities. (Plant Protection Station, 2013)
- In the case of food products, it is recommended to seek advice from a consulting agency under MHLW located at the import station. Issues to be discussed with the consulting agency cover processing/manufacturing standards, ingredients and the necessary inspection by the Thai governmental control agency.
- Importers of plant or animal products or food products with plant or animal based ingredients are required to submit an application to the plant quarantine station or the animal quarantine station for inspection. Supporting documents to be submitted together with the application are certificates issued by concerned Thai governmental agencies (Department of Agriculture – plant and plant-based products; Department of Livestock Development – meat and meat-based products; Department of Fisheries – fishery and seafood-based products).
- The plant/animal quarantine station authorities inspect the imports accordingly.
    - In cases where the inspection result is “Pass”, Inspection Certificates are issued to importers.
    - In cases where the inspection result is “Fail”, the authorities instruct importers to return, destroy or take other actions against the unqualified imports in accordance with relevant laws.
- After the imports have successfully passed the inspection at the plant/animal quarantine station, importers are allowed to continue the process by requesting permission from MHLW’s food quarantine station. At this stage, a notification form must be submitted together with other supporting documents.
- MHLW authorities check the submitted documents.

- In cases where the MHLW's opinion is that no additional inspection is required, importers are given either a Certificate of Notification Processing or a Certificate of Passing Inspection. Importers are then eligible for proceeding to the custom clearance stage.
- In cases where the imports require additional inspection, the authorities carry out inspection in accordance with relevant laws.
    - In cases where the inspection result is "Pass", either a Certificate of Notification Processing or a Certificate of Passing Inspection is issued to importers.
    - In cases where the inspection result is "Fail", the authorities instruct importers to eliminate, return or transform the unqualified imports for other purposes. The procedures of importing food and agricultural products to Japan are illustrated in Figure 3.5.

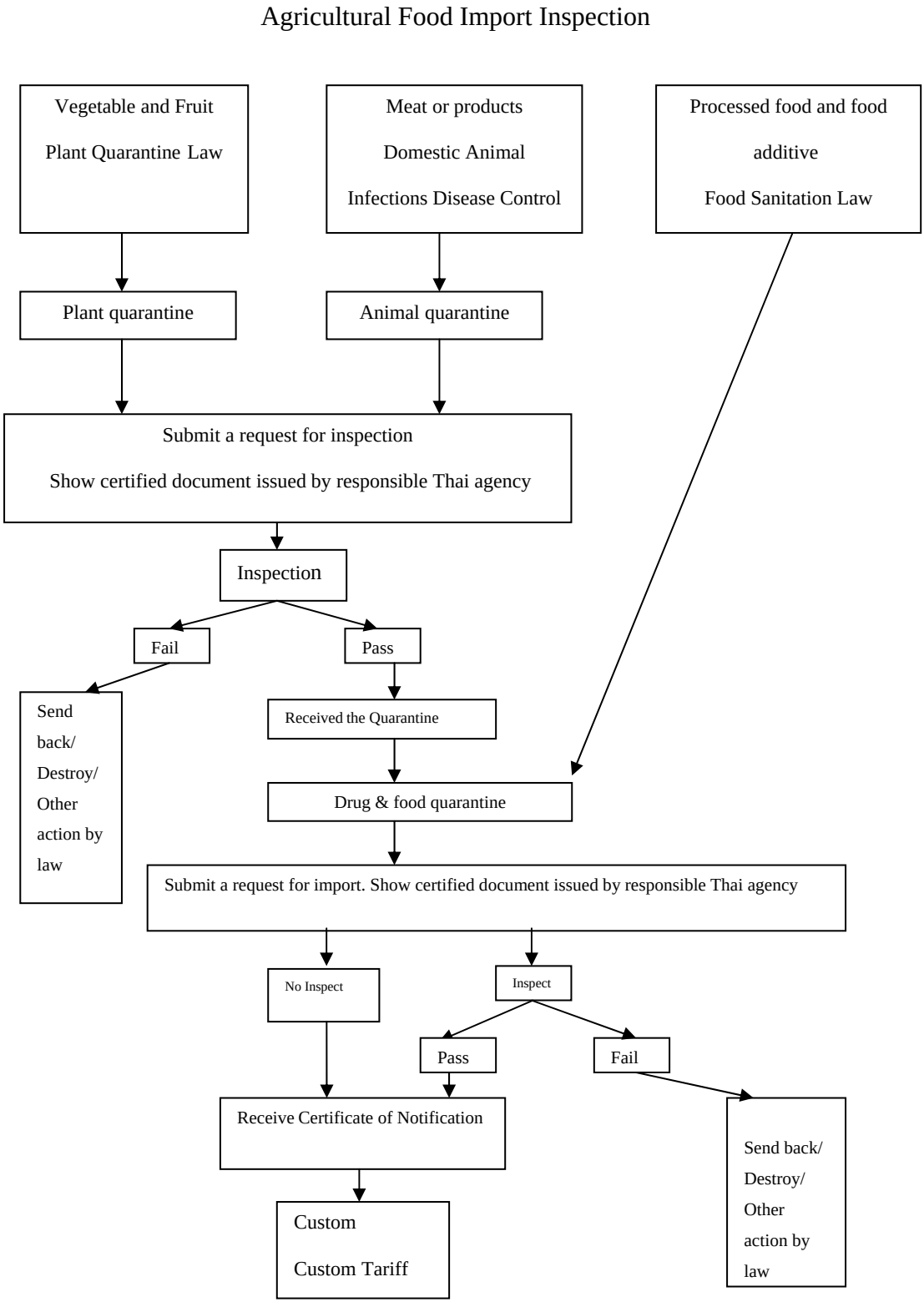

Figure 3. 5: Inspection of imported agricultural food by Japanese regulation

Source: Diversion of Agricultural Commodity and Food Standard Policy (2010b)

3.7 The Exporting Process of Thai Mango to Japan

3.7.1 Vapour Heat Treatment Process (VHT)

With the Japan import measure, the only permitted mango cultivars are Nam Dok Mai, Rad, Phimsen Daeng, Nang Klang Wan and Mahachanok. The mangoes must be treated with hot steam vapour for controlling fruit fly. The VHT is needed to kill oriental fruit fly (*Bactrocera dorsalis* Hendel), and Melon fruit fly (B. *cucurbitae* Coquillett) at a temperature of 47°C for 20 minutes. At the early stage of VHT, mango has to be heated at 43°C with relative humidity 50-80%. Then, after the mango's temperature reaches 43°C, the relative humidity has to be more than 95%. To finish VHT, the mango is finally sent to a cooling process via blowing or spraying. The VHT processes are shown in Figure 3.6.

Figure 3. 6: Process of Vapour Heat Treatment

Source: Office of Agricultural Affairs (2010)

The purposes of the VHT process are: 1) to follow international plant quarantine; 2) to limit the breakout of fruit flies; 3) to penetrate the Japanese market with Thai fruit; 4) to add value to Thai fruit and maximise the grower's income; 5) to effectively eliminate fruit flies; 6) to prevent chemical residue; 7) and to prevent fruit withering (DOAE, undate). Nonetheless, VHT services in Thailand are very limited since there were only three VHT service centres in 2002; two of them were provided by the Department of Agricultural Extension (DOAE) in Bangkok and Chiang Mai and the other

one was owned by a private company. During the season of exporting mango to Japan, the VHT service centres experience over-capacity problems since another Thai fruit, mangosteen, also needs VHT processing within this season. Similar to Thai mango exports, mangosteen exported to Japan also need to be certified with VHT processing as well. The overlapping of the harvesting seasons causes a bottleneck in the process (Homasawin, 2002)

3.7.2 Exporting Process

The processes related to exporting mango, such as the VHT process, VHT machine qualification, product packaging and packing, and import inspection, all have to follow the regulations of the Thai plant quarantine and the Japanese Plant Protection Division. Since Japan has high standards of food safety and hygiene, the exporting processes are rigidly conducted as shown in Figure 3.7. Regardless of following regulations, the export company can be blacklisted and then banned from the market.

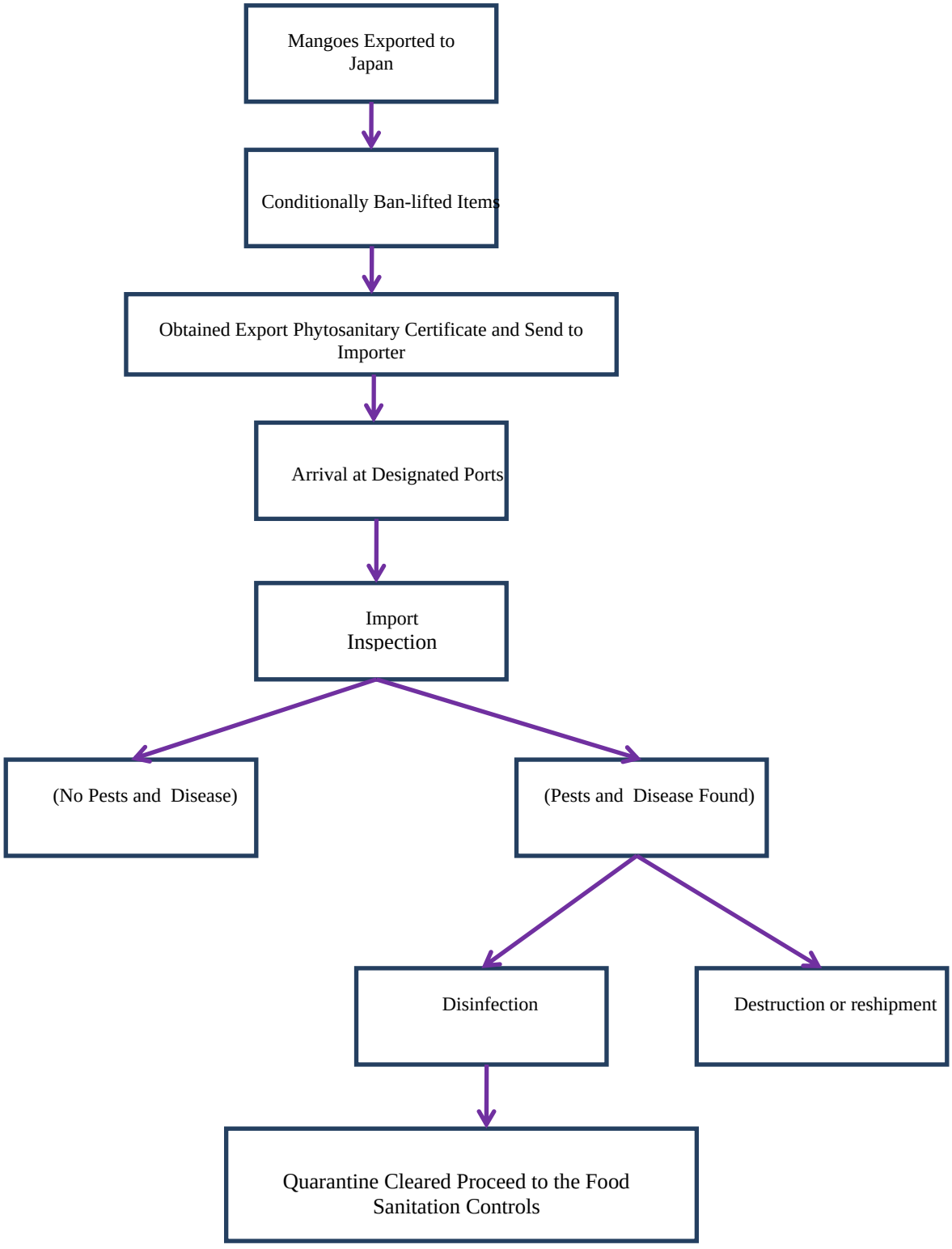

Figure 3. 7: Process of mango export to Japan

Source: Plant Protection Division 1995 (Yabuki, 1998)

There are three ministries responsible for mango imports in Japan: the Ministry of Finance (MOF) working on tariffs; the Ministry of Agriculture, Forestry and Fisheries (MAFF) responsible for plant quarantine; and the Ministry of Health, Labour and Welfare (MHLW) responsible for food safety. In Japan, mango is classified as a prohibited item due to fruit flies. Even though five Thai mango cultivars are allowed for import, they are classified as "conditionally ban-lifted items" due to the restriction of Thai fruit flies. Since the government of both Thailand and Japan agree on the process of disinfection by using VHT machines to eliminate fruit flies, Japanese inspectors in Thailand have to ascertain the products after the VHT process by randomly checking the products before issuing the Phytosanitary Certificate, which is compulsory for declaring products at Japanese customs. Without this certificate, the products are rejected. In cases where any fruit flies are found, the products are also either rejected or detained. The transportation process might be suspended until the cause of infection is clarified and the effective solution is managed. In cases where there are problems with packaging or labeling, the suspected package will be terminated as shown in Figure 3.7.

After the inspection by MAFF, the products are transferred to the duty of the MHLW Inspector who takes responsibility for contamination, chemical residue, and labeling. The MHLW Inspector makes a sample from every ten shipments, before the products are delivered for sale in the supermarket. If the sampling products are found to have any contamination higher than the maximum levels pesticide residues, the products are banned from the market. According to the Japan National Standard, there are two hygiene inspections namely pesticide standards, and food additive standards. The maximum levels for pesticide residues in imported mangoes were issued in 1997. For food additive standards, four antifungal chemicals, namely Diphenyl, Orthophenyl, Thiabenzene, and Imararil, are acceptable for using in food. However, the use of these chemicals must be recorded (Yabuki, 1998).

3.8.3 Laboratory Registration under Japan's MHLW

The Ministry of Health, Labour and Welfare in Japan considers granting registration to qualified overseas laboratories, whose analysis results are recognised by Japanese authorities and used to seek entry permission for food imports. State-run laboratories (official laboratory) and private laboratories (registered laboratory) are

eligible for MHLW registration. The MHLW will accept the lab analysis results from those MHLW-certified laboratories for the purpose of facilitating the food import permission process. However, such an acceptance of laboratory analysis results by the MHLW does not cover microbiological analysis results.

The Office of Agricultural Affairs in Tokyo is a Thai governmental agency directly responsible for coordinating the above-mentioned laboratory registration with the MHLW. Thai eligible laboratories must be those having had prior certification by concerned Thai governmental agencies (in this case, the National Bureau of Agricultural Commodity and Food Standards: ACFS) as either an official laboratory or a registered laboratory. Any interested laboratory in Thailand having not been certified by the ACFS may inquire such a prerequisite certification service directly from the ACFS so as to be further eligible for registration with the MHLW.

At present, there are in total 19 MHLW-certified laboratories in Thailand, consisting of nine state-run laboratories (official laboratory) and 10 private laboratories (registered laboratory) (Division of Agricultural Commodity and Food Standard Policy, 2010b).

3.9 Good Agricultural Practices (GAP)

3.9.1 The Concept of Good Agricultural Practices

Recent years has seen rapid change in the global food economy, and the concept of Good Agricultural Practices (GAP) has developed regarding the concerns and responsibilities of a wide range of stakeholders in food production and consumption in food security, food safety, and environmental quality (FAO, undate). These stakeholders consist of governments, food processing and retailing industries, growers, and consumers, who inquire to meet specific objectives of food quality and safety, production efficiency, livelihoods, and environmental benefits for both the medium and long term. GAP provides methods to reach those objectives. These methods are applied in the scope of farming systems and scales of production units, together with a contribution of food security, which is facilitated by ancillary government policies and programmes. GAP adapts relevant knowledge for on-farm production and post-production processes by addressing environmental, economic and social sustainability. This results in healthy

food and non-food agricultural products. The Food and Agriculture Organisation of the United Nations (FAO) has initiated a process of consolidation by gathering different developments and debating on GAP in order to make members aware of issues and opportunities in further GAP elaboration and impeccable adoption by growers. Roles of the FAO may be to support this development with inclusive professional expertise and to advise governments on their policy implications and scientific validity. An agreed framework of GAP principles, comprehensive indicators and practices will support and guide debate on national policies and actions, and on the preparation of strategic plans so that all stakeholders can benefit from the application of GAP in the food chain (FAO, 2003).

At present, GAP is formally perceived as an international regulatory framework for minimising the risks of using pesticides, the consideration of public and occupational health, and concerns regarding the environment and food safety. The improvement of a food chain approach to food quality and safety has intellectual implications for both agricultural production and post-production practices and opportunities arise to apply the sustainable use of resources. Many growers in developed and developing countries already apply GAP by using sustainable agricultural methods such as conservation agriculture, integrated pest management and nutrient management. The private sector has been promoting the use of GAP through informal codes of practices and indicators improved by food retailers and processors to arouse consumer demand for wholesome food that has been sustainably produced. This trend may introduce incentives for GAP adoption by growers due to new market opportunities that provide more capacity for their production (FAO, 2003)

3.9.2 Good Agricultural Practices in Thailand

The Department of Agriculture for Thailand (DOA) defines GAP as “an approach for agricultural production in terms of quality and safety control”. Standard requirement has to be met for hygiene, safety, and pollution free. The yield process must be safe for both farmers and consumers in addition to yield cost-effectiveness, and resource optimisation.” For example, in the case of good agricultural practices for mangoes, the DOA has to determine the planting area, soil characteristics, area climate, water resources, suitable mango cultivar, soil preparation particularly for the selected mango

cultivar, fertiliser and chemical usage, proper storage of fertiliser and chemical substances, plant pruning and thinning, and integrated techniques of pest control. Chemical usage and pesticide protection are serious concerns, especially the type of substance, rate of application, and precaution of chemical application before plant harvest, post-harvest techniques for prolonging product freshness and preventing pest and disease, ripening technique, grading and sorting technique, product storage, and product packing and handling. The DOA records these activities in order to evaluate a grower's farm management and production processes. A qualified grower could get GAP certification and then be permitted to produce for exports. In the process of GAP certification, the DOA and DOAE (Department of Agricultural Extension) jointly operate projects supporting the production of various crops by inviting growers to participate in project activities such as farm management training, tracking records of farm inspection, and GAP practices in real farm settings. If growers appropriately manage their farms and follow GAP, they will be certified. This certification is very beneficial to growers as they have credit to sell products more easily. Since consumer perception of product quality means food hygiene, proper product size and colour, good taste, and residue free items; potential stakeholders such as intermediaries, agricultural cooperatives, and groups of farmers who have contract farming with big retailers or exporters in the food chain have to be qualified in more product quality assurances beyond GAP (DOAE, undate).

To date, many countries raise the issues of pest contamination in agricultural products such as plant louse contamination in orchid, and the high rate of chemical residues such as sulphur dioxide and methamidophos contamination in longans. These issues are trade barriers. Thus, the DOA introduced GAP to growers in order to promote the application of GAP in their agricultural produce such as crop yield, livestock, and fishery so that consumers have a greater acceptance of product quality. The DOA also legislated against some chemical substances used in pest control such as monocrotophos, methyl parathion, and methamidophos. Other permitted chemicals are rated differently in different countries since each country attempts to restrict the highest Maximum Residue Limit (MRL). For example, the Japanese government legislates especially for food safety and hygiene by frequent random inspections. In cases where over rated residue is found, the product would be strictly treated. If the product were detected again, the product and its source would be banned. Currently, there are 21 kinds of Thai fruits and vegetables

that are strictly controlled by this regulation. Therefore, GAP should be seriously considered within the production process (DOAE, undate).

3.10 Supply Chain of Thai Mango Exports

There are many actors or stakeholders in the Thai mango supply chain as shown in Figure 1.4 in Chapter 1. To draw the real picture of the supply chain in detail, there are more stakeholders involved in the chain than those shown in Figure 1.4. For instance, there are suppliers who provide many inputs for the growers to make mango plantations succeed. Before the product can flow to Japanese customs, it has to be inspected by the Department of Agriculture (DOA) in order to get a Phytosanitary Certificate etc. Along the supply chain of Thai mango exports, there are eight stakeholders altogether: 1) manufacturers/suppliers of agricultural inputs; 2) growers; 3) intermediaries; 4) exporters; 5) Department of Agriculture; 6) forwarder and freighter; 7) Japanese customs; and 8) importers (Figure 3.8). Detail of the supply chain will be discussed in Chapter 6.

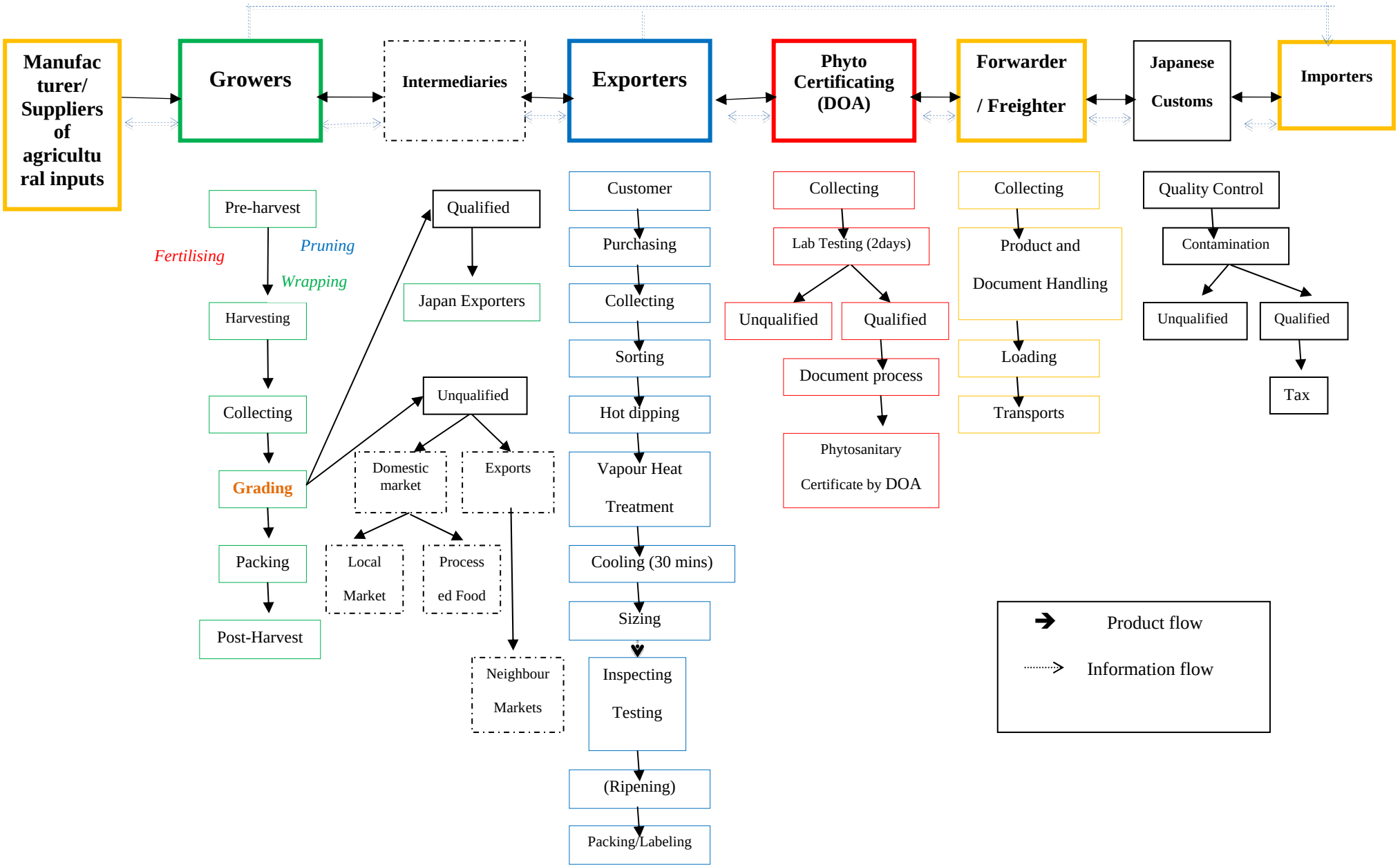

Figure 3. 8: Supply chain of exporting Thai fresh mango to Japan

3.11 Limitation in the Supply Chain of Thai Mango Exports

To date, there are 347,000 individual mango growers in Thailand. The total mango planting areas equal 2.354 million rai (377 thousand hectares) with yield producing areas of 1.907 million rai (305 thousand hectares) and they produce yields of 2.374 million tons annually. Most production (about 90%) is for domestic consumption (DOAE,2010) Thai mangoes for export are quite minimal due to some limitations as described below.

3.11.1 Unstable Production Volume

The production volume of Thai mango is over supply during the in-season period and over demand during the off-season period. Since the know-how of off-season mango production is complicated, the production of mango during this period is still not as attractive to the growers especially those who are not members of the Mango Growers Association. The production volume, then, affects product collection since the mangoes collected from different growers have different quality particulary maturity levels. In this case, the collection needs more days than usual in order to fill up one well-equipped container. Moreover, this problem will further affect the post harvest management and transportation handling.

3.11.2 Technical Know-How and Information Sharing

The timing of the production yield is not consistent with customer demands, for instance, the demand of the Japanese market is all year round while the supply from Thai growers is limited to during the off-season period, which is from June to October. Many growers lack the knowledge, skills, and techniques for producing off-season mangoes for export. Only big growers can afford off-season since this kind of production requires more investment than in-season production. Moreover, the global warming situation greatly troubles agricultural production. An uncertain climate from global warming disturbs the production process and planning. Mango production needs proper weather conditions for certain growing periods, which directly reflect in either high or low quality of products or even being infected by disease. Anthracnose is a very common mango

disease easily occurred in an improper environment. It is a chronic problem in mango production in Thailand causing problems in exporting. Thai growers therefore need the necessary information to manage their production planning such as meteorological data, and market demands from reliable sources. To date, Thai growers lack strength in networking and group arrangement in order to handle the problems of production properly and effectively. This poor production management results in inadequacy in both product quantity and quality for exports in the off-season period.

3.11.3 Product Quality

One of the most prominent factors to cause difficulties in exports, especially to the Japanese market, is the problem of product quality such as imperfect skin, mismatch of product's size either too large or too small, and an undesirable taste, which is too sour. Ineffective farm management might cause poor product quality since many growers have improper production areas and inefficient irrigation. Many growers lack the knowledge and skills to produce high quality products for exports. Some special techniques are needed for producing high quality mangoes such as pruning, controlling the plant size and shape, managing the soil fertility, managing the plant at the vegetative period and production period, and the appropriate use of biological and chemical substances. Another factor that causes low product quality is incompetent post-harvest management, especially poor product handling. Damaged products have to be sold in local markets instead of international markets.

3.11.4 Production Hygiene

Contamination is one of the most serious problems for mango exports (Agricultural & Processed Food Products Export Development Authority, 2008). Mango products are sometimes contaminated with chemical residues exceeding the criteria of trading partners. However, most contaminated products are found in Thailand or occasionally at the trading destination. Exporters have to suspend purchasing from suspected growers. Cases where residue is detected above the set criteria more than twice

at the same destination, suspected exporters are suspended from sending products into the country.

3.11.5 High Cost of Production

To date, costs of production have increased especially costs of fuel, high quality fertiliser, pesticide, skilled labours, and freight for local and international markets. These are great obstacles to growers in producing mangoes for export. On the contrary, the market price at the country of destination has not changed much. This factor has decreased the competitiveness of Thai mango exports (FAOSTAT, 2008b).

3.11.6 Transportation

Since most Thai mango exports are delivered by air, this high cost of transport impacts the high price of the product at the end. Thai exporters used to export fresh mangoes to Japan by sea in the past. However, the products often perished during transport due to the problems of the product's quality, inappropriate post-harvest management, low quality of containers, and inconsistent temperature control. Freight management therefore needs improvement and freight facilities should be provided, especially the provision of temperature controlled containers appropriate for prolonged product transportation, and insurance for shipping damage. Without the aforementioned conditions, Thai exporters prefer air freight even though the cost of transport is much higher than sea freight. According to Suttikhun (2008), the cost of air freight is estimated at 55 THB/kg whilst the cost of sea freight is approximately 7 THB/kg. This causes disadvantages to Thai mango exports in comparison with other competitors such as the Philippines, Mexico, and India. These countries gain advantages in terms of better shipping facilities and cheaper costs of transport. With better conditions along with a better supply chain management, their products can reach Japan by sea within two days on average (Chareanwanich et al., 2000) whereas it takes ten days from Thailand to reach Japan.

3.11.7 Qualification of Exporter

Exported fruit and vegetables to Japan needs very qualified exporters since the products need to pass the stringent laws and regulations. Unqualified exporters affect the image of Thai exporters as a whole. In Japan, the classical products sold in famous department stores always come with classical packaging and product information together with outstanding quality. Thai mangoes sold in Japanese supermarkets still need some study and improvement in this matter.

3.11.8 Ineffective Collaboration

Growers still have a limited network and ineffective collaboration so the products then disperse over different production areas and vary in quality. This is also a problem for traders to collect and classify the products. Another problem is the lack of information sharing between growers and traders and this causes misconceptions about production planning in terms of both quality and quantity. As a result, not only the product quantity is inconsistent, but also the density of the producing areas is not well planned. This becomes difficult for setting marketing plans and penetrating new markets. Furthermore, fresh mango has a short product life cycle as a nature of perishable product and is also sensitive to disease. Thus, effective marketing planning and product handling have to be improved.

3.12 Conclusion

According to the research first objective which is to provide an overview of existing supply chain of Thai mango exports to Japan and to identify limitations in the supply chain, this chapter has provided an overview of existing supply chain of Thai mango exports to Japan and identified the limitations and the key problematic activities causing ineffectiveness in the supply chain.

The Japanese market for Thai fruit and vegetables is still very promising. The annual growth rate of these exported items in 2009 reached 9.4% against 2.1% in 2008. However, some important export problems and constraints remain to be solved. First, chemical residues: chemical residues are the most frequent problem which causes the loss

of market opportunities due to extra time loss of more inspection process by Japanese authorities for potential chemical contamination. With careless practice in GAP and inspection before export, chemical residues undermine Thailand's competitiveness for agricultural exports to the Japanese market. Second, stringent import regulations: as a consequence of stringent import rules, regulations and measures imposed by Japanese authorities, Thai exporters need to strictly follow import requirements by means of quality control through the entire manufacturing cycle right from farming through to the processing plant. Third, Japanese consumer preferences: as Japanese consumers place considerable importance on food quality such as freshness, taste, product source, packaging source, etc, fruit and vegetable exports bound for Japan require efficient handling systems and post-harvest management to best preserve their natural quality through the entire manufacturing and transportation period and up until final delivery to the target consumers. Fourth, stable quantity and quality requirements by Japanese importers: Japanese importers require both a regular supply and stable quality over each given period to gain price competitiveness superior to local produces and imports from other countries.

There are many limitations of the Thai mango supply chain export to Japan starting from the production process up to customer consumption. Many problems can be found along the chain, such as inconsistent product quality and quantity, production hygiene, the qualification of exporters, transportation, and ineffective collaboration. Another problem is transportation which causes high cost and time consuming. Since most Thai mango exports are delivered by air, the production cost is therefore comparatively higher than those delivered by sea. The cost of air-freight from Thailand to Japan is estimated at 55 THB/kg, whilst the cost of sea freight is approximately 7 THB (Suttikhun, 2008). This causes disadvantages to Thai mango exports compared with other competitors such as the Philippines, Mexico and India. Apart from far cheaper costs of transport, the products from these countries can reach Japan by sea within two days on average whilst it takes ten days to reach Japan from Thailand. From the aforementioned problems and limitations, it is essential to improve the capability of Thai mango production in order to deliver the qualified products to meet customer demand. Thai government realise the necessity of production development and focus on production hygiene and food safety due to the Japanese stringent rules, regulations, and

law. To enhance the competitiveness of Thai mango exports, the Thai government formulate a policy and fruit development strategy particularly on improving the grower's production efficiency.

The next chapter will explain the role and policy of the Thai government on Thai fruit development strategy with an emphasis on Thai mango exports to Japan and how the Thai Kitchen to the World policy is related to the Thai fruit development strategy for 2010-2014 in order to provide recommendations to the government and related agents on sufficient supply chain management for fresh mango exports as stated in the third objective. The latter part of the chapter will explain the relationship and mutual benefits between the Thai government and the Thai Mango Growers Association.

Chapter 4

Role and Policy of the Thai Government

4.0 Introduction

The previous chapter discussed Thai mango exports to Japan and identified limitations in the supply chain. It began with Japanese consumption behaviour and demand and described Japanese market, Japanese customer demand, Thai mango cultivars for exports, exporting process, and Good Agricultural Practice (GAP) in Thailand. At the end of the chapter, it explained about the supply chain of Thai mango exports and its limitation.

Fruit is one of Thailand's main agricultural exports. Out of a total of 6.5 million farmer households countrywide, approximately 1.923 million households, or 30%, are currently engaged in fruit orchard activities as their major source of income generation. Nationwide, a total area of approximately 8.176 million rai (1.3 million hectares) is exploited for fruit orchards, for total annual crop yields of approximately 7.486 million tons out of 57 fruit species. This generates an annual main income of approximately 90,361 million THB to feed Thai countryside orchard farmers. In addition, the domestic fruit crop yields are one of the nation's main exports which gain income to the nation approximately 29,685 million THB each year (Fruit Development and Management Committee, 2009).

This chapter aims to review the role and policy of the Thai government on the Thai fruit industry, with emphasis on Thai mango export development and on supporting the establishment of the Thai Mango Growers Association in order to find recommendations to the government and related agents on sufficient supply chain management for fresh mango exports as stated in the third objective. Before discussing the background to the Thai fruit industry development strategy, the chapter begins with the government policy of Kitchen of the World, which is directly related to the commencement of the Thai fruit development strategy. This is then followed by: a discussion on the subsequent expansion of fruit production and commerce; Government’s

strategic development for the Thai fruits industry; the relation between the government sector and the Thai Mango Growers Association; and the government mission concerning Thai mango export development.

4.1 Government Policy for the Kitchen of the World Project

Thai cuisine is well known internationally and is among the best five cuisines, namely Italian cuisine, French cuisine, Chinese cuisine, Japanese cuisine and Thai cuisine (Top ten list, 2010). Apart from Thai cuisine, these have been well promoted, organised and have been set standard and quality. Japan, for example, eventually has the organisation to Promote Japanese Restaurants Abroad (JOR, 2011). In the case of Thai cuisine, it was not until the year 2003 when the Prime Minister, Mr. Thaksin Shinawatra launched the "Kitchen of the World" project on April 4, 2003.

In order to stimulate the economic growth of the country, the government set national–strategies for five main industries (automotive, electronics and ICT, food, fashion, and high value added services). Food industry was focused on Thai cuisine ready-to-eat (RTE) products and new food sectors with high value added. Since Thailand was considered as an important food exporter in the global market, Thailand was one of the world's leading food exporters, both in raw material and preserved foods (UK Trade & Investment, 2010). The government then set up the project "Thailand is kitchen of the world". This project became value creation for Thai foods worldwide (Economic Information Division, 2005, Econ News Newspaper, 2005, R. Limchupatipa, 2005, Infothaifood, 2010).

On April 4, 2003, Thai Government set one important target in order to develop the country into a "Kitchen of the World". The government appointed the then Deputy Prime Minister Mr. Somkhit Chatusriphithak as Chairman of the Working Committee in order to set in place the system for expanding qualified Thai restaurants in foreign countries in order to promote a good image, Thai tourism, Thai food product, and other products related to the agro-industry. Later, on June 18, 2004, The Committee of Development of Thai food and Thai Kitchen to the World were appointed under the supervision of Deputy Prime Minister Mr. Chaturon Chaisang. The committee operated with two sub-committees: Thai Food Development Sub-committee; and the Thai Kitchen

Development Sub-committee (Economic Information Division, 2005, Econ News Newspaper, 2005, R. Limchupatipa, 2005, Infothaifood, 2010).

4.1.1 Strategies and Targets for Thai Restaurant Expansion

The project target of "Kitchen of the World" was to set Thai cuisine to be number two in world cuisine popularity within a five year period (Economic Information Division, 2005). The objectives of the project were to export Thai-taste in fresh foods, raw materials, and condiments, as well as goods and services such as the products of One Tambon (village) One Product (OTOP). This was based on Thai restaurants based in 6,954 locations worldwide (as of July 2004) (Econ News Newspaper, 2005). In addition, Thai restaurants would be developed to be a channel for the promotion of the Thai lifestyle image in order to create favour for Thai culture in the long term and to support tourism in Thailand. The government allocated operation cost 500 million THB for the fiscal year 2004-2006 (Econ News Newspaper, 2005) and had the following targets:

Thailand would become one of the biggest five global food exporters within a three-year period with global trust at the highest level of confidence in food and health safety.

- Expansion of Thai restaurants to 20,000 restaurants within the year 2008. This would lead to, in turn, the expansion of exported items such as raw materials and condiments for making Thai cuisine.
- Promotions of genuine Thai restaurants to the global market with high quality standards.
- Support Thai restaurants in foreign countries to be a place of public relations for tourism, cultural shows, and the markets for OTOP product.

(Economic Information Division, 2005, Econ News Newspaper, 2005, R. Limchupatipa, 2005)

With the above-mentioned targets, the policy framework was set as follows:

- Focus on an offensive operation to achieve the goal of 20,000 restaurants worldwide within the year 2008 with a starting number of 6,954 restaurants in 2004.

- Focus on concurrent operations worldwide with strong teamwork highlighting the existing market expansion and new market potential.
- Public relation campaign on Thai food and cooking methods to be recognised and appreciated worldwide.
- Focus on action-oriented integration in all relevant agencies.

(Economic Information Division, 2005, Econ News Newspaper, 2005, R. Limchupatipa, 2005)

4.1.2 Project Outcome during 2004-2006

In 2005, the government provided a budget of 2,500 million THB for the project (Jiamsawad, 2005). The target was to expand Thai restaurants from 6,954 in 2004 and 9,183 in 2005 to 12,000 restaurants in 2006, with an expectation that the popularity of Thai cuisine would became second in the world (Table 4.1). The expected outcome was both quantitative and qualitative. Quantitatively, the outcome was expected to achieve an expansion in the number of Thai restaurants, franchises, restaurant groups, and hotel groups. Qualitatively, it was expected that the number of Thai restaurants receiving the logo "Thai Select", which was the logo the Thai government provided for standard quality restaurants, would be increased. The Prime Minister Award was also granted for the top class restaurants in foreign countries (Figure 4.1).

Figure 4. 1: Logo of "Thai Select"

Source: National of Food Institute (2006a)

Table 4. 1: Number of Thai restaurants in the year 2005 and 2006.

Region	2005	2006	Difference	Percentage increase
USA	4,101	4,920	819	20
Europe	2,287	2,860	573	25
Australia	1,377	1,790	413	30
Asia (excluding middle east)	1,246	2,120	874	70
Middle East	104	170	66	60
Africa	68	140	72	100
Worldwide	9,183	12,000	2,187	30

Source: National Food Institute (2006b)

The expansion of Thai restaurants worldwide resulted in an increase of the food export volume. For example in 2006, with the increase in 12,000 Thai restaurants, this resulted in an increase of annual export volumes of the following items: shrimps including fresh shrimp; boiled shrimp; frozen shrimp and processed shrimp up to 33,200 million THB; fruits including frozen fruits, coconut and papaya up to 3,280 million THB; and vegetables up to 2,280 million THB. (National Food Institute, 2006b)

4.1.3 Paradigm Shift of Kitchen of the World

Although the "Kitchen of the World" project continually developed from 2004 to 2006, there were still many main problems to be solved especially in investment, difficulties in bank loaning, lack of skillful chefs, marketing, and a lack of integrated operations among different sectors. The Deputy Prime Minister, Mr. Chaturon Chaisang, admitted at the end of the year 2004 that the project had encountered the problem of continuity in operation, which was affected by a shift in the management at policy level and a lack of personnel. This resulted in the project not reaching the target of 20,000 Thai restaurants in the year 2008. Providing the logo "Thai Select" to the qualified restaurants also fell far behind the target. This might have affected the development of many authentic restaurants (Manager Online, 2004).

On 19 September 2006, Thailand faced a coup d'état staged by the Royal Thai Army. It was the first coup attempt in the country for 15 years and came after Thailand

had been in political crisis for almost a year starting from September 2005 (Lagi et al., 2011, BBCNews, 2006, Jullavech, 2008). The Council for Democratic Reform (CDR) at that time drafted an interim charter and appointed the retired General Surayud Chulanont as Prime Minister. The elections were held again on 23 December 2007. Since then, the elected governments had been continually under instability. From 23 December 2007 to 1 August 2011, Thailand had three Prime Ministers under different political parties. The continuity of the policy on the Kitchen of the World project was therefore unavoidably affected, especially the target of having 15,000 Thai restaurants in 2007 and a final target of 20,000 restaurants in 2008.

During late 2006, the global food crisis occurred. (Lagi et al., 2011) Food price rapidly increased, caused by droughts in grain-producing nations and rising oil prices. This resulted in general escalations in the costs of fertilisers, food transportation, and industrial agriculture. Then, the world food prices dramatically increased in 2007 and also in the first and second quarters of 2008 (Figure 4.2) creating a global crisis and causing political and economic instability and social unrest in both developing and developed nations (Headey and Fan, 2008, Von Braun, 2008a, Von Braun, 2008b, Smith and Edwards, 2008, BBCNews, 2008) This situation was apparently in favour of Thailand since severe droughts or floods did not affect the country.

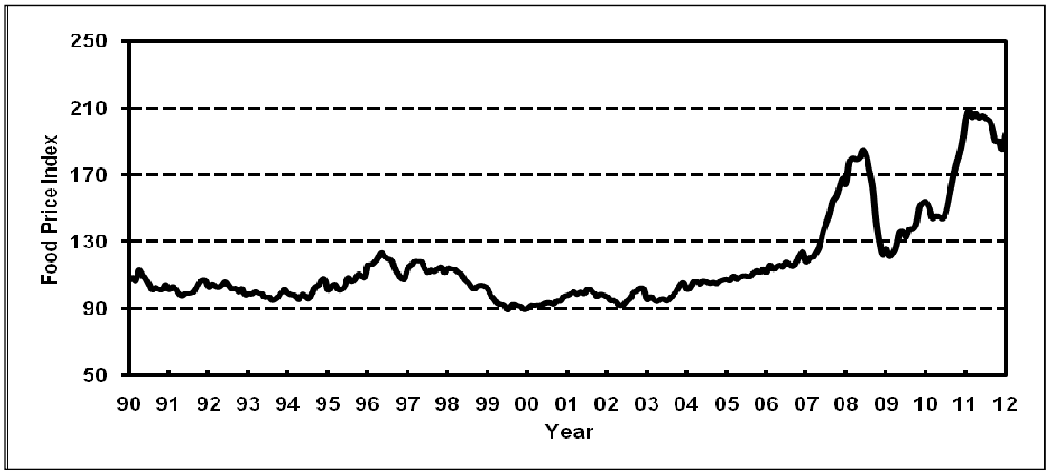

Figure 4. 2: World food price index, 1990–2011.

Source: FAO (2011)

From the food crisis, Thailand greatly realises the importance of food security. The National Food Board then agreed at the first meeting on 20 August 2009 to set three strategic frameworks for driving Thai food management: food security; food quality and food safety; and food study. The Board clearly stated that Thailand had the policy to create stability in the country's food in order to motivate the contribution of Thailand's Kitchen of the World. With overall figures, Thailand was ranked 7th for food producer in the world (UK Trade & Investment, 2010) and 13th for global food exporters (Chaoprayanews, 2009). With individual categories, Thailand was the first among global rice exporters with 10 million tons of export annually (Thai Rice Exporters Association, 2011). Thailand was the leader in international exports for several processed products. For example in 2008, Thailand export markets were located worldwide (Figure 4.3). For its export achievements, Thailand was the first and fifth globally in exporting shrimps and processed chicken, respectively (UK Trade & Investment, 2010, PPWFDC, 2010, Thai Broiler Processing Exporters Association, 2011). Since Thailand's natural resources are central to its comparative advantage in the food processing industry, with more than 80% of the raw materials used being locally sourced at low prices, there were approximately 10,000 food-processing companies located all over the country (UK Trade & Investment, 2010, Thai Food Processors' Association, 2011). Thai ready-to-eat (RTE) food also became more popular overseas. Therefore, the processed fruit and vegetable products were also among the global leaders with product exceeding 1.3 million tons per annum (Table 4.2).

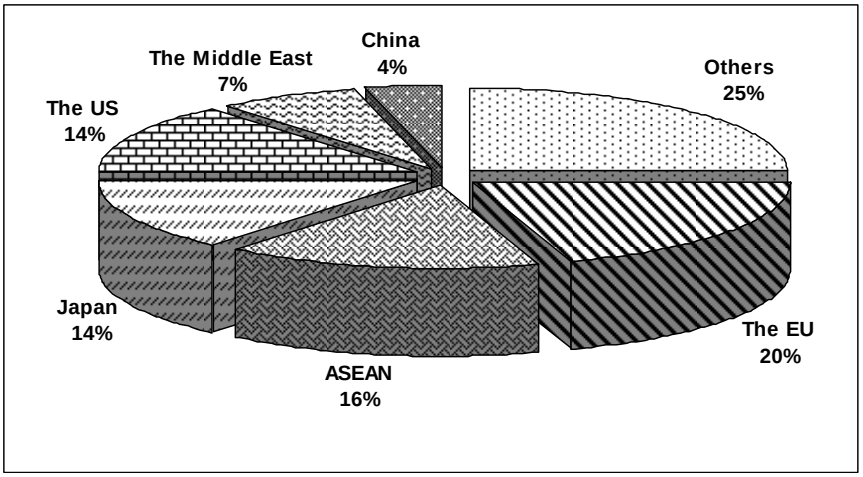

Figure 4. 3: Thailand's major food export markets in 2008

Source: National Food Institute (2006)

Table 4. 2: Thailand's major processed food export volume and value during 2005-2008

Products	2005		2006		2007		2008	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Canned Fish, Seafood and Tuna	661,874	1,535	697,477	1,700	644,215	1,785	697,730	2,456
Processed Fruit and Vegetable Products	1,176,159	909	1,445,077	1,069	1,260,765	1,138	1,303,579	1,356
Food Ingredients and Ready-to-Eat	248,184	327	259,114	365	307,492	483	330,235	629
GRAND TOTAL	2,086,217	2,772	2,401,668	3,134	2,212,472	3,405	2,331,544	4,440

Quantity: Tons, Value: Millions USD

Source: Thai Food Processors' Association (2011)

According to the aforementioned food production capability of Thailand, the paradigm of Kitchen of the World has been shifted to a self-sufficient food economy

where the production bases have diversified to many areas rather than being monopolising by large food industries.

In September 2010, the Minister of Industry, Mr. Chaiwat Banwatana, advised that support for the Kitchen of the World project would be reduced from the original budget requested for phase two, which was primarily set at more than 1,000 million THB. The government planned to financially support systems of industrial food development as priority, such as product quality development, staff development, and promoting some other projects to penetrate the world market in parallel with improving farmers' crop production. This policy would provide more benefit to Thai people in various sectors. The Kitchen of the World project one was successful and could proceed by itself since the Government expected to support the project only on necessary issues. The future plan was to encourage the development of the food industry as a whole system with the three related ministries in industry, commerce, and agriculture and cooperatives (Siamrath Newspapaer, 2010).

4.2 Thai Fruit Development Strategy for 2010 – 2014

One of the successes in the “Kitchen of the World” project was a rapid increase in the number of Thai restaurants overseas within a relatively short period of time. The policy contributes significantly to a higher export volume of Thai indigenous agricultural raw materials and authentic Thai spice products. In addition, as Thai agricultural products and OTOP selection items have all been made the highlights of PR campaigns and road show events organised across the world’s major cities. The perception of the Kitchen of the World policy among foreign consumers is not only limited to Thai restaurants overseas, but also expands to all general food-related imports from Thailand. Therefore, the Kitchen of the World is referred to as high-quality products from Thailand among global consumers.

One concrete example is the United Kingdom, where the policy for “Kitchen of the World” was first revealed on foreign territory through the organisation of the Thai Taste – Thai Best event on August 31, 2003. During the event, Mr. Somkhit Chatusriphithak, the then Deputy Prime Minister, awarded the Thai Select logo to 15 qualified Thai restaurants. These selected Thai restaurants have subsequently promoted

not only Thai food but also Thai tourism and OTOP products. During the same visit, Mr. Somkhit and Sir Terry Leahy, TESCO CEO, also mutually agreed on an OTOP fruit promotion campaign to be run during May and June each year, which falls during fruit harvest time in Thailand. In addition, a memorandum of understanding (MOU) was signed by the permanent secretary to Thailand's Ministry of Agriculture and Cooperatives and Sir Terry Leahy for mutual efforts to market Thai agricultural product in the United Kingdom. Moreover, Mr. Somkhit's negotiation with Mr. Mohammad Al Fayed, the owner of Harrods Department Store, resulted in another MOU similar to that signed with TESCO. Other British businesses interested in importing Thai products include Marks & Spencer and the Grampian Food Country Food Group. Marks & Spencer expressed a keen interest in spa, food, fashion and organic food products from Thailand. The Grampian Food Country Food Group, a major UK chicken importer then making its debut presence in the convenience food sector, was enthusiastic about importing agricultural products under the Royal Project and organic food products from Thailand (Economic Information Division, 2005)**.**

The "Kitchen of the World" policy has had a significant positive impact on the growth performance of Thai restaurants and some Thai agricultural products. In a move to further gain the benefits of the successful policy, Thai government managed to strategically devise the Kitchen of the World policy to a larger extent by entering into the frontier of other Thai agricultural products with proven international competitiveness, essentially Thai fruits, thereby leading to the emergence of the Thai fruit development strategy for 2010 to 2014.

4.2.1 World Fruit Production Before Strategy Implementation

4.2.1.1 Global Production

In consideration of the global fruit harvest area, China was the number one occupier of fruit-producing land area, totaling approximately 10.54 million hectares and accounting for 20.50% of the world's total fruit harvest area. China reports constant expansion of its fruit harvest area by as much as 9.20% annually, followed respectively by India, Brazil and Spain. Globally, Thailand's fruit harvest area size of 836,720

hectares was ranked the world's fifteenth, with an annual expansion of approximately 1.4% (Table 4.3).

Nevertheless, with regard to the tropical fruit category separately, Thailand's ownership of the harvest area was ranked eighth in the world, following India, Brazil, Nigeria, Iran, Indonesia, Mexico and the Philippines. In terms of fruit harvest area expansion, Thailand, however, was ranked fifth after Iran, Indonesia, Vietnam and the Philippines.

As far as crop yields are concerned, 2006 annual statistics indicate that the global fruit crop yields totaled 526.49 million tons. Approximately 17.74 % of the world's total crop yields were harvested in China, making the country the world's top producer of fruit products. India was the second, followed respectively by Brazil and the United States (Table 4.4). However, when taking into account those crop yields harvested in all the member states of the European Union (EU27), the European Union would be the world's second largest producer of fruit product, having a 12.96% share of the global crop yields. With regard to tropical fruit, Thailand reported 11.50% growth in crop yields over a three year period, or equivalent to 3.8% per annum on average, and was ranked third globally following Indonesia and the Philippines whose crop yield growth over the same three year period was recorded at 16.40% and 13.57%, respectively.

Table 4. 3: Harvested areas of fruits from the top 20 countries in 2003 and 2006

Rank	Area	2003		2006		Change (+/-)	
		Hectare	Percent	Hectare	Percent	Hectare	Percent
1	China	9,652,335	19.20	10,540,480	20.50	888,145	9.20
2	India	3,905,875	7.77	3,952,619	7.69	46,744	1.20
3	Brazil	2,428,603	4.83	2,397,387	4.66	- 31,216	- 1.29
4	Spain	1,836,316	3.65	1,855,800	3.61	19,484	1.06
5	Uganda	1,803,594	3.59	1,822,838	3.54	19,244	1.07
6	Nigeria	1,715,000	3.41	1,742,000	3.39	27,000	1.57
7	Iran	1,149,513	2.29	1,354,010	2.63	204,497	17.79
8	Italy	1,305,363	2.60	1,220,540	2.37	- 84,823	- 6.50
9	Indonesia	1,015,582	2.02	1,166,596	2.27	151,014	14.87
10	USA	1,258,791	2.50	1,161,142	2.26	- 97,649	- 7.76
11	Mexico	1,161,098	2.31	1,151,675	2.24	- 9,423	- 0.81
12	Turkey	1,055,316	2.10	1,106,107	2.15	50,791	4.81
13	Philippines	1,045,456	2.08	1,092,935	2.13	47,479	4.54
14	France	1,001,544	1.99	971,541	1.89	- 30,003	- 3.00
15	Thailand	803,220	1.60	836,720	1.63	33,500	4.17
16	Russia	813,600	1.62	765,700	1.49	- 47,900	- 5.89
17	Pakistan	676,341	1.35	751,892	1.46	75,551	11.17
18	Colombia	630,912	1.26	681,612	1.33	50,700	8.04
19	Argentina	474,706	0.94	481,662	0.94	6,956	1.47
20	Vietnam	450,900	0.90	481,304	0.94	30,404	6.74
	Others	16,075,978	31.99	15,886,824	30.90	- 189,154	- 1.18
Total 203 countries		50,260,043	100	51,421,384	100	1,161,341	2.31

Source: FAOSTAT (2008a)

Table 4. 4: Fruit production from the top 20 countries in 2003 and 2006

Rank	Area	2003		2006		Change (+/-)	
		Quantity (tons)	Percent	Quantity (tons)	Percent	Quantity (tons)	Percent
1	China	78,202,665	15.94	93,409,500	17.74	15,206,835	19.45
2	India	42,095,600	8.58	43,524,551	8.27	1,428,951	3.39
3	Brazil	35,776,774	7.29	37,735,723	7.17	1,958,949	5.48
4	USA	29,111,246	5.93	27,327,534	5.19	-1,783,712	-6.13
5	Spain	17,958,622	3.66	16,513,900	3.14	-1,444,722	-8.04
6	Italy	15,189,601	3.10	17,812,032	3.38	2,622,431	17.26
7	Mexico	14,470,904	2.95	15,384,729	2.92	913,825	6.31
8	Iran	13,251,411	2.70	13,847,646	2.63	596,235	4.50
9	Indonesia	13,234,969	2.70	15,405,828	2.93	2,170,859	16.40
10	Philippines	11,959,914	2.44	13,582,296	2.58	1,622,382	13.57
11	Turkey	11,833,270	2.41	12,563,040	2.39	729,770	6.17
12	Uganda	10,367,650	2.11	9,730,729	1.85	- 636,921	- 6.14
13	France	9,584,813	1.95	9,681,700	1.84	96,887	1.01
14	Nigeria	9,287,000	1.89	9,873,500	1.88	586,500	6.32
15	Ecuador	7,820,519	1.59	7,536,405	1.43	- 284,114	- 3.63
16	Egypt	7,757,139	1.58	8,195,966	1.56	438,827	5.66
17	Thailand	7,756,512	1.58	8,648,256	1.64	891,743	11.50
18	Argentina	7,596,750	1.55	8,350,839	1.59	754,089	9.93
19	Colombia	6,901,476	1.41	7,909,609	1.50	1,008,133	14.61
20	South Africa	5,869,659	1.20	5,690,054	1.08	- 179,605	- 3.06
	Others	134,654,747	27.44	143,772,214	27.31	9,117,467	6.77
Total 208 countries		490,681,241	100	526,496,051	100	35,814,810	7.30

Source: FAOSTAT (2008)

4.2.1.2 Fruit and Processed Fruit Trade Growth

In export volume terms, countries in the Americas were collectively the world's top exporter of fruit and processed fruit product in 2005, with as much as 24.90 million tons shipped overseas, translating into 40.12% of the total crop yields available for the global fruit trade (Table 4.5). Europe was ranked second with a share of 30.61% of the total fruit exports worldwide for the year. However, in consideration of the export volume growth recorded over a five year period (2000 – 2005), Asia and Africa saw a strong growth of as much as 42.40% and 42.28% respectively, when compared to a mere 9.50% registered by Europe.

Table 4. 5: Exported amount of fruit and processed fruit product in 2000 and 2005.

Area	2000		2005		Change (+/-)	
	Quantity (million tons)	Percent	Quantity (million tons)	Percent	Quantity (million tons)	Percent
Africa	3.35	6.48	4.77	7.69	1.41	42.28
America	21.36	41.28	24.90	40.12	3.53	16.56
Asia	8.70	16.82	12.40	19.97	3.69	42.40
Europe	17.35	33.53	19.00	30.61	1.64	9.50
Oceania	0.97	1.89	0.99	1.60	1	1.48
Total	51.77	100.00	62.08	100.00	10.31	100.00

Source: FAOSTAT (2008a)

The export value of fruit and processed fruit product tends to increase worldwide, as evident from a 42.82% increase over the five year period (2000-2005), equivalent to 8% per annum on average. Globally, Europe reported as high as 18,165 million USD in export value, making it the world's top earner from fruit export activities and representing 47.20% of the world's overall fruit export value. The Americas were ranked second for its export value performance yet reported the lowest growth in export value at 19.94% over the span of five years, or an average of 4% per annum. Comparatively, Asia shared only 14.14% of the world's overall fruit export value while its growth in export value, on the contrary, was as high as 12% annually (Table 4.6).

Table 4. 6: Exported value of fruit and processed fruit product in 2000 and 2005

Area	2000		2005		Change (+/-)	
	Million USD	Percent	Million USD	Percent	Million USD	Percent
Africa	1,052.82	3.91	1,697.78	4.41	644.96	61.26
America	9,974.53	37.01	11,963.30	31.08	1,988.77	19.94
Asia	3,404.67	12.63	5,442.66	14.14	2,037.99	59.86
Europe	11,771.42	43.68	18,165.57	47.20	6,394.15	54.32
Oceania	744.47	2.76	1,218.08	3.16	473.61	63.62
Total	26,974.91	100.00	38,487.39	100.00	11,539.48	42.82

Source: FAOSTAT (2008)

As for global market demand, the overall fruit and processed fruit product imported by countries worldwide in 2000 amounted to 44.58 million tons. The figure jumped to 59.06 million tons in 2005. As much as 75% of the overall fruit imports worldwide were in the form of fresh fruit. Fresh fruit demonstrated an average import growth of approximately 7% annually. When fruit import value is considered on the basis of the overall categorised breakdown worldwide, the total value of global fresh fruit import topped 22,433 million USD in 2000 and reached 33,672 million USD in 2005, equivalent to about 73% of the world's total fruit import value, representing approximately 10% annual growth on average (Table 4.7 and 4.8).

Across all items in fruit and processed fruit imports worldwide, fruit juice had the highest demand second only to fresh fruit. The volume of fruit juice imports worldwide in 2000 and 2005 was reported at 9.63 million tons and 11.57 million tons respectively, equivalent in value to approximately 6,408 million USD and 9,557 million USD respectively. Fruit juice represented approximately 20% of the overall import volume and value of fruit and processed fruit product worldwide.

Table 4. 7: Imported amount of fruit and processed fruit product in 2000 and 2005.

Items	2000		2005		Change (+/-)	
	Million tons	Percent	Million tons	Percent	Million tons	Percent
Fresh fruits	33.46	75.06	44.88	75.98	11.41	34.10
Fruit juice	9.63	21.62	11.57	19.59	1.93	20.04
Dried fruits	0.41	0.93	1.30	2.20	0.88	214.63
Preserved fruits	1.06	2.39	1.31	2.23	0.25	23.58
Total	44.58	100.00	59.06	100.00	14.48	32.49

Source: FAOSTAT (2008b)

Table 4. 8: Imported value of fruit and processed fruit product in 2000 and 2005

Items	2000		2005		Change (+/-)	
	Million USD	Percent	Million USD	Percent	Million USD	Percent
Fresh fruits	22,433.24	72.93	33,672.26	72.93	11,239.02	50.10
Fruit juice	6,408.25	20.83	9,557.50	20.70	3,149.25	49.14
Dried fruits	1,152.84	3.75	1,876.77	4.06	723.93	62.79
Preserved fruits	764.36	2.49	1,066.79	2.31	302.43	39.56
Total	30,758.71	100.00	46,173.34	100.00	15,414.63	50.11

Source: FAOSTAT (2008b)

In consideration of fruit-exporting countries worldwide in 2008, Thailand was the world's top performer with 203,127 tons in its export volume, followed by China, which managed to export 188,960 tons of its fruit product during 2008 (Table 4.9). When looking at the fruit export value, China however, reported an achievement of 125.94 million USD, making it the world's number one fruit exporter, while Thailand gained 94.13 million USD from its fruit export business, therefore ranking it second in the world. Thailand's lower export value of its fruit product was attributable to the considerable differences in market prices determined by the two countries. Namely, fruit exports from China were sold at 666 USD per ton while those from Thailand were charged at 463 USD per ton. The remaining top ten fruit exporting nations, other than China and Thailand, were Kenya, the United States, Australia, South Africa, Malaysia, Indonesia, Singapore and the Philippines (FAOSTAT, 2008b)

Table 4. 9: Top fruit export countries, ranked by value, in 2008

Rank	Area	Quantity (tons)	Value (1000USD)	Unit value (USD/ton)
1	China	188,960	125,940	666
2	Thailand	203,127	94,133	463
3	Kenya	15,673	17,555	1,120
4	USA	13,501	17,527	1,298
5	Australia	3,903	13,072	3,349
6	South Africa	4,059	8,793	2,166
7	Malaysia	16,923	5,995	354
8	Indonesia	9,520	5,956	626
9	Singapore	1,365	2,117	1,551
10	Philippines	877	1,418	1,617
11	Netherlands	315	897	2,848
12	Senegal	516	715	1,386
13	Pakistan	1,038	672	647
14	Egypt	10,881	667	61
15	Ethiopia	1,535	354	231
16	Burkina Faso	3,355	339	101
17	China	888	327	368
18	Japan	332	320	964
19	Spain	148	274	1,851
20	Haiti	299	216	722

Source: FAOSTAT (2010)

4.2.1.3 Tropical Fruit Production and Trade

There are approximately 3,000 tropical and subtropical fruits species worldwide. Approximately 500 of which are found in Asia. Southeast Asia has about 120 major and 275 minor species of tropical and subtropical fruits and nuts, although nearly 200 species remain undeveloped and underutilised (Fabro, 2006).

Banana, a tropical fruit species, constitutes almost half of the world's overall tropical fruit crop yields and has up to seven times greater export volume when compared to that of the rest of the species of tropical fruits worldwide. In 2009 alone, the world's total banana export volume stood at 18.32 million tons (FAOSTAT, 2010). Due to the difference in its trade conditions in comparison with other tropical fruits, the FAO separately conducted a specific data analysis for bananas. Therefore, the information on the global tropical fruit situation presented in this chapter does not include banana.

World production of tropical fruits was estimated at 67.7 million tons in 2004, about 2.5% more than in 2003 (Table 4.10). Mango was the dominant species with a global output of 24.3 million tons and contributed to 36% of the world's tropical fruit production. World production of pineapples reached 15.5 million tons or 23% of tropical fruit production, followed by papaya at 8.5 million tons (12.6%) and avocado at 3.3 million tons (4.8%). The minor tropical fruits, such as lychee, durian, rambutan, guavas and passion fruit, recorded an output of 16 million tons in 2004, representing an annual growth rate of 3% in 2004 and accounted for 24% of total tropical fruit production.

The Far East dominated in the production of mango, pineapple and papaya in 2004, accounting for 72%, 52% and 46% respectively of world production. The region also accounted for the major share of minor tropical fruit outputs globally. Latin America and the Caribbean was the next major tropical fruit-producing region, accounting for 62% of the global avocado output, 37% of world papaya production, 29% of pineapple, and 17% of mango production.

Tropical fruit is important to the food security of developing countries from both a nutritional standpoint and through their contribution to export earnings and income. The bulk of the tropical fruit produced (approximately 90%) is consumed domestically. A further 5% is traded as fresh fruit, and a similar proportion is traded as processed products. Despite the proportionately small quantities traded internationally, the value of trade is significant. In 2003, fresh tropical fruit exports generated approximately 2.3 billion USD, and processed fruit represented an additional 1.6 billion USD, including 1.1 billion USD for only pineapples. The value of international trade for tropical fruit (fresh and processed) is estimated at just over 4 billion USD in 2004 (FAO, undate).

Table 4. 10: Production of tropical fruit during 1999 – 2004, thousand tons

	1999-01	2002	2003	2004	Change 1999-2004
MAJOR FRUITS	46,457	50,899	50,425	51,599	11.07
Mangoes	22,254	24,554	23,864	24,337	9.36
- India	10,184	11,345	10,800	10,800	
- Thailand	1,598	1,750	1,750	1,750	
- Mexico	1,548	1,413	1,362	1,655	
Pineapples	14,540	15,114	15,053	15,480	6.46
- Philippines	1,581	1,636	1,696	1,700	
- Thailand	2,200	2,035	1,700	1,700	
- China	1,234	1,244	1,348	1,475	
Avocados	2,634	2,998	3,106	3,276	24.37
- Mexico	909	897	905	1,040	
- Indonesia	138	238	256	270	
- USA	192	181	213	200	
Papaya	7,029	8,232	8,401	8,505	20.99
- India	1,670	2,590	2,600	2,600	
- Brazil	1,444	1,598	1,600	1,600	
- Mexico	705	689	720	791	
MINOR FRUITS	13,370	14,913	15,612	16,102	20.43
- Philippines	2,978	3,200	3,300	3,300	
- Indonesia	1,353	2,210	2,832	3,200	
- India	2,850	2,800	2,900	2,900	
TOTAL PRODUCTION	59,827	65,812	66037	67701	13.16

Source : FAO (undate)

Based on the 1999-2004 statistics for tropical fruit export volume, export-oriented crop yields expanded by up to 73.34% over the span of five years. Major fruits, consisting of mango, pineapple, avocado and papaya, posted an average annual export growth of approximately 13%. Each of the major fruits achieved an export growth of more than 40% over the five year period. Among all the major tropical fruits, papaya had the strongest growth in export volume during the half decade. In line with major tropical fruit, minor tropical fruit also saw a considerable growth in export volume by approximately 190%. The majority of major tropical fruit was exported from fruit-

producing countries in the South America region, India and the Philippines. Thailand was the world's number one exporter of minor tropical fruit during this period (Table 4.11).

Table 4. 11: Exported amount of tropical fruit during 1999 – 2004

Kinds	1999-01 (1,000 tons)	2002 (1,000 tons)	2003 (1,000 tons)	2004 (1,000 tons)	Change 1999/2004 (%)
Main fruit	1,681	2,131	2,187	2,773	64.96
Mango	484	568	801	840	42.68
Pineapple	834	1,071	1,194	1,371	64.38
Avocado	251	355	331	401	59.76
Papaya	112	137	160	235	109.82
Minor fruit	138	286	312	400	189.85
Total	1,820	2,417	2,798	3,173	73.34

Source: FAO (undate)

4.2.2 Mango Production and Global Trade

4.2.2.1 FAO Outlook at Mango Production before Strategy Commencement Period

According to the FAO medium term outlook for tropical fruit, mango production was projected to reach 28.77 million tons by 2014, accounting for 35% of world tropical fruit production, of which 69% would be produced in Asia and the Pacific, 14% in Latin America and the Caribbean, and 9% in Africa (Table 4.12). India was expected to remain the world's largest mango producing nation, accounting for 40 % of total global output, with a production forecast of 11.66 million tons. Production in Thailand, the largest mango-producing nation in Southeast Asia, was forecast to increase to 2.10 million tons from 1.75 million tons in 2004.

Table 4. 12: Actual and projected mango production - thousand tons

	Actual		Projected	Annual Growth Rates	
	1992-94	2002-04	2014	1992-94 to 2002-04	2002-04 to 2014 (%)
World	19495	24252	28768	2.2	1.7
Developing Countries	19428	24103	28610	2.2	1.7
Africa	1950	2514	2698	2.6	0.7
Latin America	2707	3825	4138	3.5	0.8
Brazil	573	844	892	3.9	0.6
Mexico	1115	1510	1867	3.1	2.1
Asia and Pacific	14819	17630	19788	1.8	1.2
India	10108	10982	11664	0.8	0.6
China	177	219	264	2.1	1.9
Pakistan	807	1060	1125	2.8	0.6
Philippines	417	965	1129	8.8	1.6
Thailand	1060	1750	2103	5.1	1.9
Developed Countries	67	148	158	8.3	0.6
USA	3	3	3	-0.2	0
Israel	13	26	37	7	3.4
South Africa	29	73	106	9.6	3.8

Source: FAO (undate)

Mango exports in 2004 increased by a modest 5%, following a massive increase of 41% in 2003, to reach 840,241 tons. Latin America and the Caribbean continued to dominate and their fresh mango exports accounted for more than 50% of the world total in 2004. Mexico, with an export volume of 190,000 tons was the largest exporter, followed by Brazil with 140,000 tons. The other major exporting region was the Far East, where shipments were dominated by India at 180,000 tons, the second largest mango exporting country in the world in 2004. India also dominated the processed mango trade (Figure 4.4).

World mango imports were projected to increase by 1.4% annually to reach 844,246 tons by 2014 (Table 4.13). The United States and the EU were expected to dominate imports. Net imports by the EU were projected to grow by 2.5 % annually to reach 223,662 tons in 2014, while for the United States, growth was projected at 1% annually reaching 309,115 tons in 2014. There was a pronounced seasonality to the European market, with large quantities imported during the second (April-June) and

fourth (October-December) quarters. Although France, the Netherlands and the United Kingdom should continue to be the primary import markets, Spain might emerge as a more important import market player. Although the volume of mango imported to Japan was not a significant amount, the growth rate for the year 2014 was quite promising at 3.43%.

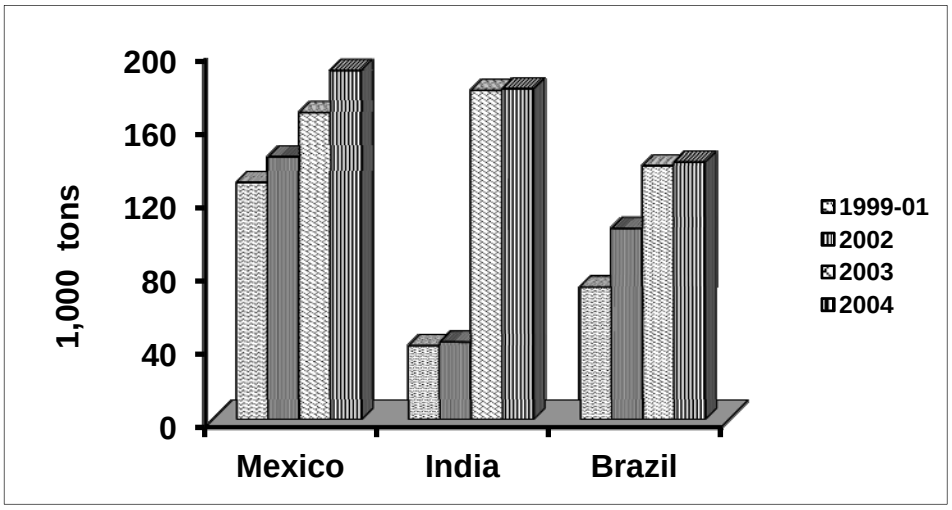

Figure 4. 4: Exports of mango during 1999 to 2004

Source: FAO (undate)

Table 4. 13: Actual and projected mango imports – thousand tons

	Actual		Projected	Annual Growth Rates (%)	
Country/Region	**92-94**	**02-04**	**2014**	**92-94 to 02-04**	**02-04 to 2014**
World	**269**	**728**	**844**	**10.48**	**1.35**
Developing Countries	**95**	**256**	**364**	**10.41**	**3.26**
Africa	0	4	4	25.08	-0.52
Latin America	2	9	13	16.52	3.62
Near East	42	119	164	11.1	2.92
Far East & Pacific	60	135	193	8.4	3.32
Developed Countries	**1734**	**472**	**480**	**10.52**	**0.15**
Europe	62	166	173	10.3	10.38
EC (15) Incl.Intra -Trade	60	221	290	13.84	2.53
EC (15) Excl.Intra-Trade	47	157	224	12.76	3.3
Netherlands	18	82	109	16.16	2.67
France	11	29	31	10.18	0.52
United Kingdom	12	28	39	8.66	2.93
USA	103	276	309	10.31	1.04
Japan	8	11	15	2.38	3.43

Source: FAO (undate)

4.2.2.2 The Thai Mango Situation During the Strategy Commencement Period

The year 2008 was the time when the dynamics of the Kitchen of the World policy began to decline and the Thai government (who were at the transitional political period) was interested in expanding new market frontiers for Thai agricultural product. State statistics for the year indicate that Thai mango gained a strong foothold in global production with exceptional annual crop yields of 2.374 million tons, then Thailand became the world's third largest mango producer (FAOSTAT, 2008a) The annual crop yields of Thai mango for the year actually surpassed the FAO projection of 2.103 million tons to be achieved in 2014 (Table 4.12 and 4.14). In 2008, India was ranked the world's top producer of mango with crop yields reaching 13.649 million tons. China was second with crop yields of 3.977 million tons. Indonesia and Mexico were the fourth and fifth largest producers of mango with crop yields of 2.013 million tons and 1.855 million tons respectively. However, the total crop yields of all the Southeast Asian mango-producing

countries (Thailand, Indonesia, the Philippines and Vietnam) for the year were second only to their Far East counterparts.

In terms of global mango export performance in 2008, assessed by the FAO, the mango export value was included with the export value of mangosteens and guavas. Thailand's annual income generated from mango exports in 2008 was ranked sixth in the world (37.37 million USD). The world's top-five earners in mango exports in 2008 consisted of India, the Netherlands, Brazil, Mexico and Peru, with export values of 224.98, 145.07, 119.12, 111.21 and 64.13 million USD respectively (Figure 4.5). In consideration of mango export volume, Thailand was then ranked seventh in the world (61,608 tons) after India, Mexico, Brazil, the Netherlands, Peru and Pakistan, whose export volumes stood at 274,854, 226,083, 133,944, 94,646, 82,696 and 69,324 tons respectively.

Table 4. 14: Global production of mango in 2008

Rank	Area	Production ($1000)	Production (tons)
1	India	3,323,492	13,649,400
2	China	968,290	3,976,716
3	Thailand	578,085	2,374,170
4	Indonesia	490,175	2,013,120
5	Mexico	451,761	1,855,360
6	Pakistan	427,005	1,753,690
7	Brazil	281,145	1,154,650
8	Philippines	215,247	884,011
9	Bangladesh	195,461	802,750
10	Nigeria	178,721	750,000
11	Egypt	113,572	466,436
12	Yemen	94,451	387,906
13	Kenya	93,612	448,631
14	Viet Nam	90,091	423,764
15	Cuba	86,487	355,200
16	Peru	78,579	322,721
17	Haiti	71,829	245,298
18	Madagascar	53,567	210,000
18	United Republic of Tanzania	53,567	300,000
20	Democratic Republic of the Congo	50,753	208,440

Source : FAOSTAT (2010)

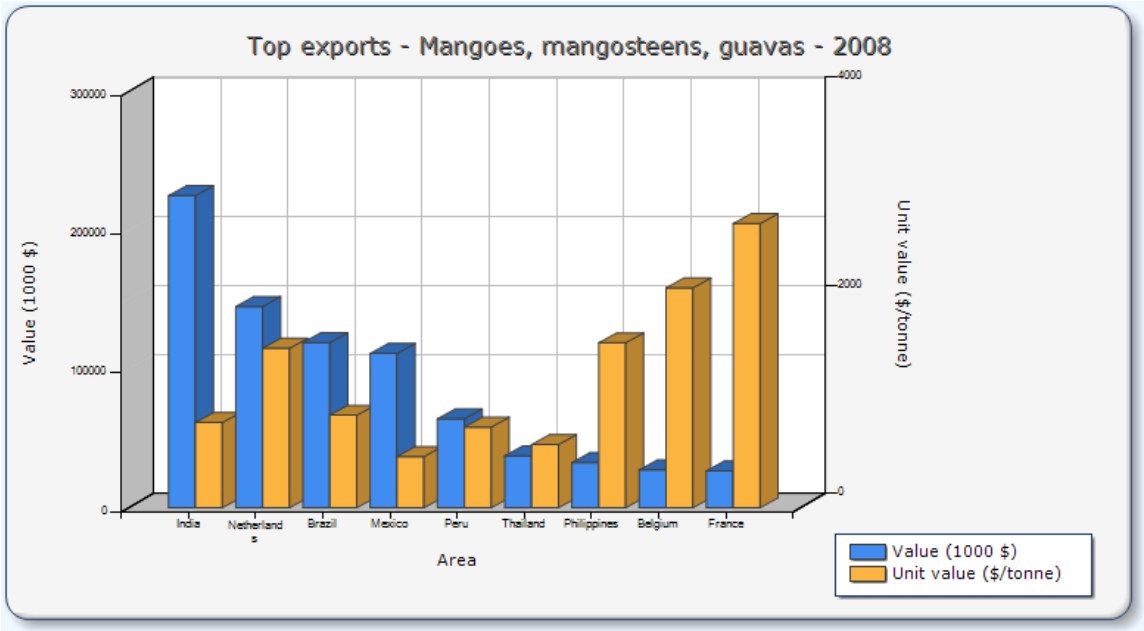

Figure 4. 5: Top countries' exports for mangoes, mangosteens and guavas in 2008

Source: FAOSTAT (2010)

With regard to the value of mango export, it is noticeably that the price of mango exports per ton during the year varied considerably from country to country. Mango exports from China had the highest price of 3,087 USD per ton (FAOSTAT, 2010). European nations exported their mangoes at over 1,500 USD per ton, as evident from crop yields from France, Belgium, Spain, Germany and the Netherlands, whose charges were 2,731, 2,113, 1,989, 1,626, and 1,533 USD per ton respectively. Comparatively, Thai mango exports were sold at only 607 USD per ton while mango exports from the Philippines had an exceptional market price of 1,585 USD per ton (Figure 4.6).

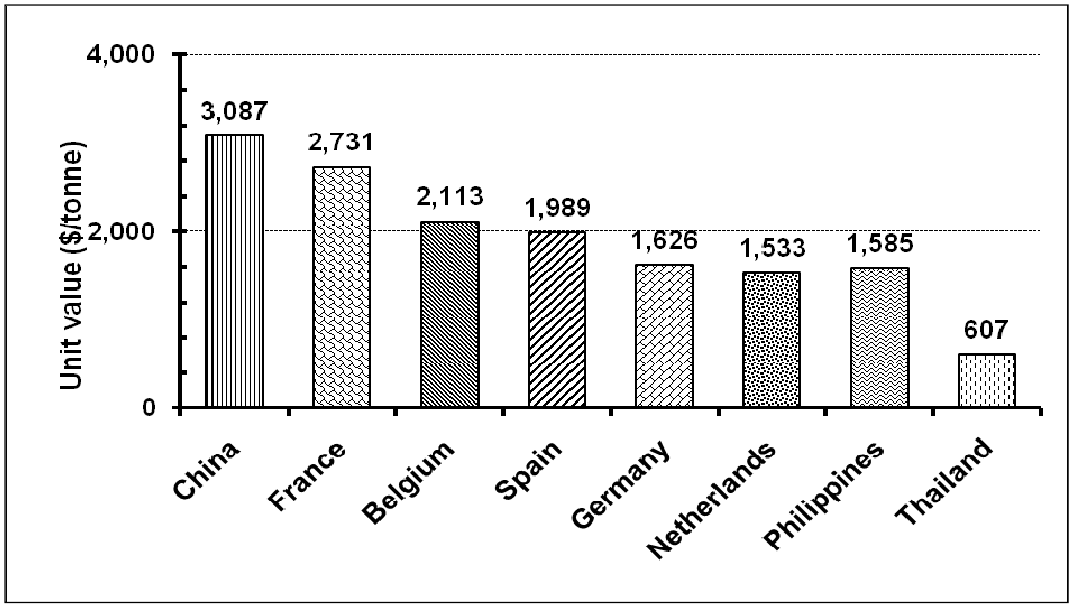

Figure 4. 6: Unit value of export mangoes from different countries

Source: FAOSTAT (2010)

With regard to global mango import performance in 2008, the world's major markets for mango imports were mostly in Europe. Out of the top-ten mango-importing countries worldwide in the year 2008, there were as many as six European countries. They were ranked by import value as follows: The Netherlands, the United Kingdom, Germany, France, Belgium and Portugal. The United States was the world's number-one importer of mango with 210.93 million USD in import value and 297,499 tons in import volume. Japan was the world's seventh largest importer of mango in terms of import value, which amounted to 50.00 million USD. Despite its high import value, Japan's mango import volume were only 11,669 tons in 2008 since its price per ton of mango imports, then at 4,285 USD, was the world's highest (Figure 4.7).

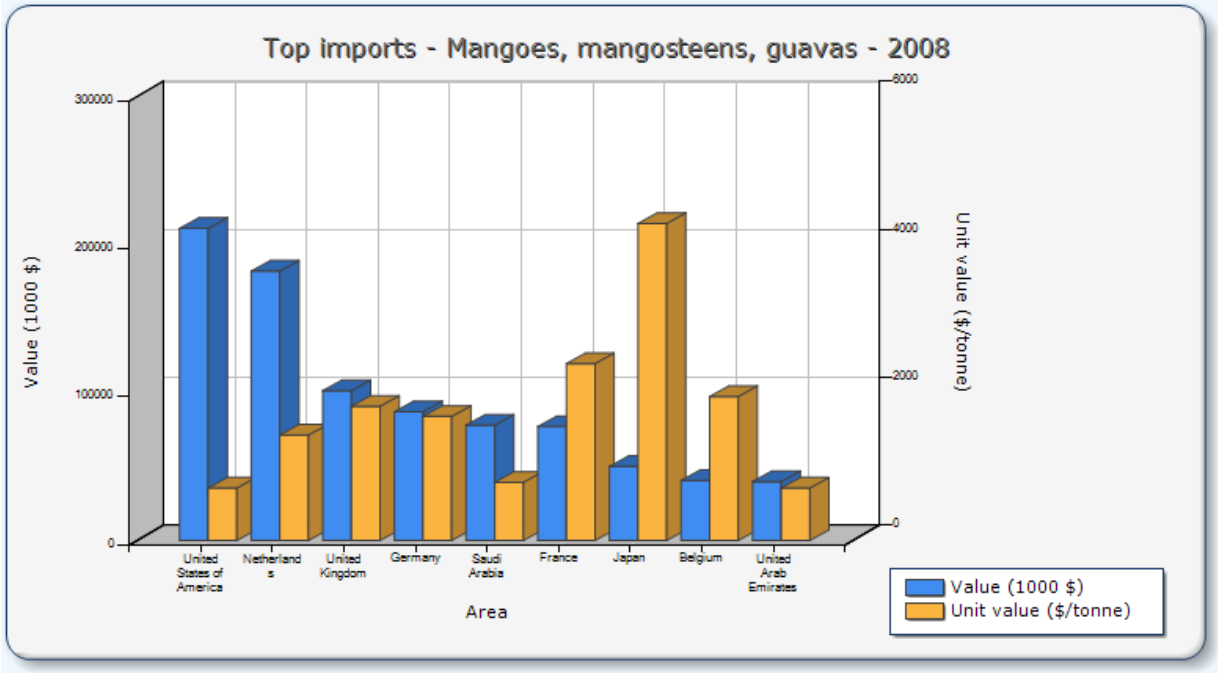

Figure 4. 7: Top countries' imports for mangoes, mangosteens, and guavas in 2008

Source: FAOSTAT (2010)

A thorough analysis of current Thai fruit production structure (excluding pineapple) reveals that the total market value of all Thai fruit amounts approximately to 90,361 million THB. Six major economic fruits, consisting of longan, durian, mango, mangosteen, rambutan and longkong, are collectively worth approximately 63,741 million THB in market value, accounting for 71% of the total value of the nation's overall fruit crop yields. There are approximately 1.16 million households engaged directly in farming activities of the six major economic fruits as their main source of income-generation, representing 60% of the nation's overall orchard growers (Table 4.15). The crop yields grown and harvested by these orchard growers serve both domestic and overseas consumer demand. Therefore, if the government's long-term strategy for dealing with these major economic fruit products are employed, major Thai fruit will present not only as an additional kitchen for Thai and world consumers but also as another factor contributing to the overall national economy (Fruit Development and Management Committee, 2009).

Table 4. 15: Structure of fruit production in Thailand

	Major fruit *		Minor fruit **		45 varieties of miscellaneous fruit		Total (without pineapple)	
Farmers (million households)	1.16	(60%)	0.16	(9%)	0.6	(31%)	1.92	(100%)
Areas (million rai)	5.44	(66%)	1.09	(13%)	1.65	(20%)	8.18	(100%)
Yield (million tons)	4.45	(59%)	1.74	(23%)	1.3	(17%)	7.49	(100%)
Value (million THB)	63,741	(71%)	13,620	(15%)	13,000	(14%)	90,361	(100%)

Note: * Major fruit: longan, durian, mango, mangosteen, rambutan, and longkong

** Minor fruit: pomelo, lychee, tangerine, big banana, kluay khai banana and papaya

6.25 rai = 1 hectare

Source: Fruit Development and Management Committee (2009)

4.3 The Government's Strategic Development for the Thai Fruit Industry

In 2009, the Thai government established a strategic 2010-2014 development plan for developing industrial Thai fruit (Fruit Development and Management Committee, 2009). There were six promising fruit varieties selected for the plan: durian, longan, mango, mangosteen, rambutan, and longkong. The strategic principles aimed to: 1) produce world standard products for trading partners; 2) support domestic fruit market mechanisms for efficient operation; and 3) implement rules, regulations and measures according to the Free Trade Agreement (FTA) for the benefit of Thai fruit. The government's vision was to maintain leadership in the world market as well as being the forerunner in increasing the world market share of tropical fruits. The mission was executed by: 1) increasing production efficiency by minimizing costs, improving product quality, and expanding the production period for off-season crops; 2) adding product's value by developing and promoting processed products; 3) expanding the domestic

market by developing central markets, promoting the establishment of product distribution centres and connected to marketing in order to encourage Thai fruit consumption and a Thai fruit network; 4) expanding export markets by maintaining existing markets as well as penetrating new ones, and accelerating negotiations on the rules and regulations which impede exports; 5) allocating fruit management funds to support the development of the Thai fruit system as a whole; 6) setting database systems for Thai fruit for greater accuracy, up-to-date, and unity. In order to accomplish the aims set, objectives were also formulated: 1) to provide a systematic framework in production development, product marketing, and good management in order to sustainably solve problems of fruit issues; 2) to generate a steady income, secure career, and better well-being for growers; 3) to increase Thai fruit values as well as to expand export volumes. In accordance with the plan, targets were aimed: 1) to create stability in fruit prices with the average farm price not lower than production costs, resulting in expected higher fruit values from 90,000 million THB in 2007 to 100,000 million THB in 2014; 2) to maximise profits to growers from an estimated 4,605 THB/rai in 2007 to 8,000 THB/rai in 2014; and 3) to increase export values of both fresh and processed fruit from an estimated 29,685 million THB in 2007 to 40,000 million THB in 2014.

In order to holistically develop the fruit industry, the Thai government launched four strategic plans with a budget of 3,630 million THB for industrial Thai fruit development: 1) production development; 2) domestic development; 3) export development; and 4) fruit funding development. Details of the plan are discussed below.

4.3.1 Production Development

In order to improve production effectiveness, production volume and consistency for all year round distribution, together with better information networks, this strategy was implemented with a budget of 880.25 million THB for the following issues: 1) increasing production efficacy; 2) increasing off-season production; 3) improving post-harvest management; 4) strengthening the grower's network from both the production and marketing perspectives; and 5) developing database and information systems for industrial Thai fruit.

The expected output focused on three target areas: 1) an increase in production volume; 2) a decrease in production cost; and 3) an increase in off-season product. Outputs 1 and 2 were set in zoning areas of 669,000 rai (107,040 hectares) with 160,000 growers. An increase in production volume at 10%, with a 600 million THB value together with a 10% decrease of production cost and a value of 500 million THB was expected. According to target 3 (production of off-season products) at 175,000 tons in 200,000 rai (32,000 hectares) would increase the income of 42,500 growers with a value of no less than 1,750 million THB. In conclusion, with a 880.25 million THB input, the 2,850 million THB output was set.

4.3.2 Domestic Development

In order to improve domestic volume sales and the promotion of Thai fruit consumption in the domestic market, a budget of approximately 274.75 million THB was allocated for the following issues: 1) increasing efficacy of central markets in production areas; 2) increasing volumes of product collection and sale through growers' institution/network; 3) supporting and promoting product distribution to outer provinces of origins; 4) campaigning for Thai fruit consumption; and 5) improving efficacy of controlling imported fruit.

An output with a 1,620 million THB value was set through two missions. Mission one was to distribute the product at the peak yielding period to outer provinces of origin at 10%. This would reduce loss of marketing problem 1 THB/kg/year, which was equivalent to 1,500 million THB. Mission two was to increase sales through a grower's network no less than 12,000 tons/year. This would generate more growers' income 2 THB/kg, which was equivalent to 120 million THB.

4.3.3 Export Development

In order to support exporters to establish new markets, and to solve existing trade barriers, the budget of 475 million THB was channeled into the following issues: 1) promoting and supporting offshore fruit distribution centres established by private sectors in other countries; 2) enhancing new market penetration; 3) maintaining existing markets

and expanding new ones; 4) promoting Thai fruit in foreign countries; 5) resolving trade restrictions by rules/regulations for exports and imports; and 6) developing exporting networks and logistics systems.

The expected output was to increase export volume for the six promising fruits from 9% of total production volume in 2007 to 12% in 2014, which was equivalent to a 3,500 million THB increase.

4.3.4 Fruit Funding Development

The Fruit Fund was allocated in order to set a holistic approach for the development and system management of Thai fruits. Approximately 2,000 million THB in funding was channeled into the following issues: 1) improving fruit production systems for growers, the growers' institution, and private sectors; 2) supporting the fruit development plan in accordance with individual provincial strategic plans; 3) preventing any difficulties that might occur for growers, the growers' institution, and private sectors; and 4) supporting the research and development associated with production, product processing, fruit exports, and fruit management.

The expected output was set at 20,000 million THB from two main activities. These were development, and problem solving for growers and exporters in the whole system of production, product processing, marketing and product export. This resulted in an increase in gross value (calculated from sale volume and price) for growers at 2% per annum, which was equivalent to 10,000 million THB, and an increase in export value at 5% per annum, which was equivalent to 10,000 million THB. In addition, an indirect output at 7,967.81 million THB was expected from a reduction in budget costs for solving current problems related to fruit production.

4.4 Government Sector and the Thai Mango Growers Association

The agricultural sector in Thailand is driven by the government sector through the Ministry of Agriculture and Cooperatives (MOAC) whose mission statement declares (MOAC, 2011): 1) conduct research and development and transfer knowledge to farmers; 2) maximise agricultural products with infrastructure development; 3) promote standards of food and agricultural commodities; and 4) promote and support farmers and their

organisations for their self-sufficiency, good quality of life, and stable occupations. To accomplish the mission, the MOAC formulated three strategic themes for grower development, agricultural development, and infrastructure development. The theme for grower development is defined to minimise the risks of agricultural production and market price by maximizing a farmer's efficiency for producing high quality product. The theme for agricultural development focuses on increasing the gross value of agricultural product, while the theme for infrastructure development focuses on developing the fundamental infrastructure in production and also supporting activities that develop agricultural resources.

Since the agricultural sector has long been an important production sector for Thailand, the principal aim of agricultural development in each period has focused on enhancing the quality of life for growers who are the majority of the Thai population. The MOAC has agencies that are responsible for undertaking its missions. For example, The Department of Agriculture (DOA) undertakes mission statement one, whereas The Department of Agriculture (DOAE) is one of the core agencies working closely with growers and undertakes mission statements number three and four (MOAC, 2011). In mango production, the DOAE is an agency closely working with growers in order to support growers to be self-reliant, and to develop grower's efficiency in terms of well-qualified production and sustainable farm management. The DOAE has been assigned to perform duties to: 1) improve growers' capabilities in terms of agricultural production, processing, and adding value; 2) to define measures and guidance for agricultural extension; to control the quality of agricultural product; and 3) to transfer agricultural technology to growers to maximise income and security for their farm occupation. Missions of the DOAE are to: 1) transfer agricultural production technology to growers; 2) promote and develop growers and growers' organisations; and 3) provide agricultural occupational training and services to growers (DOAE, 2011). The DOAE organised a project regarding fruit quality development in 1997. The project objective was to improve the quality of important Thai fruit, which considerably influences the economics of the country. Mango was selected as a potential fruit for greater product quality development. The objectives were then set to support mango production and to improve its quality by registering a group of mango growers from each district/province in Thailand in order to allocate fiscal budgets for supporting the activities of mango

growers. The budget was essential for many main activities such as a group conference, production purchases, long distance learning in production technology, educational field trips, production road shows, pest forecast demonstrations, mango grower network development, and in particular a conversation hub between networks of growers and traders and exporters at both the provincial and national level. As a result of these activities, groups of mango growers were united in order to enhance competitiveness in terms of production, marketing, and trade networking. In 2008, these mango growers were strongly united by more than 29 groups of mango growers across Thailand, and this united group was then formally established in 2010 as a nonprofit organisation namely, the "Thai Mango Growers Association" (FTA watch.org, 2011a). The organisation aimed to: 1) foster a career of mango producers; 2) support members to effectively produce high quality products; 3) propagandise news and knowledge of mango production, processing, and marketing; and 4) act as a mediator dealing with government sectors, public sectors, and state enterprises to solve problems and develop the mango industry of Thailand.

4.5 The Thai Government Mission for Mango Export Development

As one of the industrial Thai fruits listed in the strategic development plan, mango is promoted for quality development and control. Each qualified mango has a certified sticker attached as a sign of quality assurance. A certified sticker is one of the promoting methods to assure quality control for products on the shelf. Growers have to follow Good Agricultural Practice (GAP) and are required to have GAP certification by the DOAE as quality insurance for export production. The DOAE therefore provides technology transfers of good mango production to growers in order to meet GAP qualification. The DOAE designs schemes for both growers and DOAE's personnel in order to clarify goals, actions, and the duty of each stakeholder as shown in Figure 4.8 and Figure 4.9.

4.5.1 The Drive of Mango Production Development for Growers

In 2010, the DOAE set a plan for mango production development for growers. There were three main goals in the plan: 1) growers had knowledge and skill for

production techniques and production management; 2) growers had enough information to define customer and product demand; and 3) growers had the ability to penetrate the market. In order to reach the goals, the DOAE established a Process of System Development in production management and product distribution for the growers. There were five duties to accomplish as part of the system, as indicated below:

- Establish a database of production management and marketing
- Develop a production process for growers
- Develop trading groups/networks
- Develop post-harvest management, product collection and distribution
- Promote sales distribution and marketing networks with traders

This action is the real growers' need and these duties are certainly big tasks for the government. For instance, establishing a database of production management and marketing needs a large budget, and lots of technology and labour. Geographic Information Systems (GIS) technology might be used for this information system. When the system completed, such a database will be of great benefit for mango growers in the project zones. In addition, if the management of post-harvest, product collection and distribution are improved, the production cost will be satisfactorily reduced. In order to successfully perform these duties, there should be qualified mentors for growers to accomplish the goal (Figure 4.8).

Drive of Mango Production Development for Growers

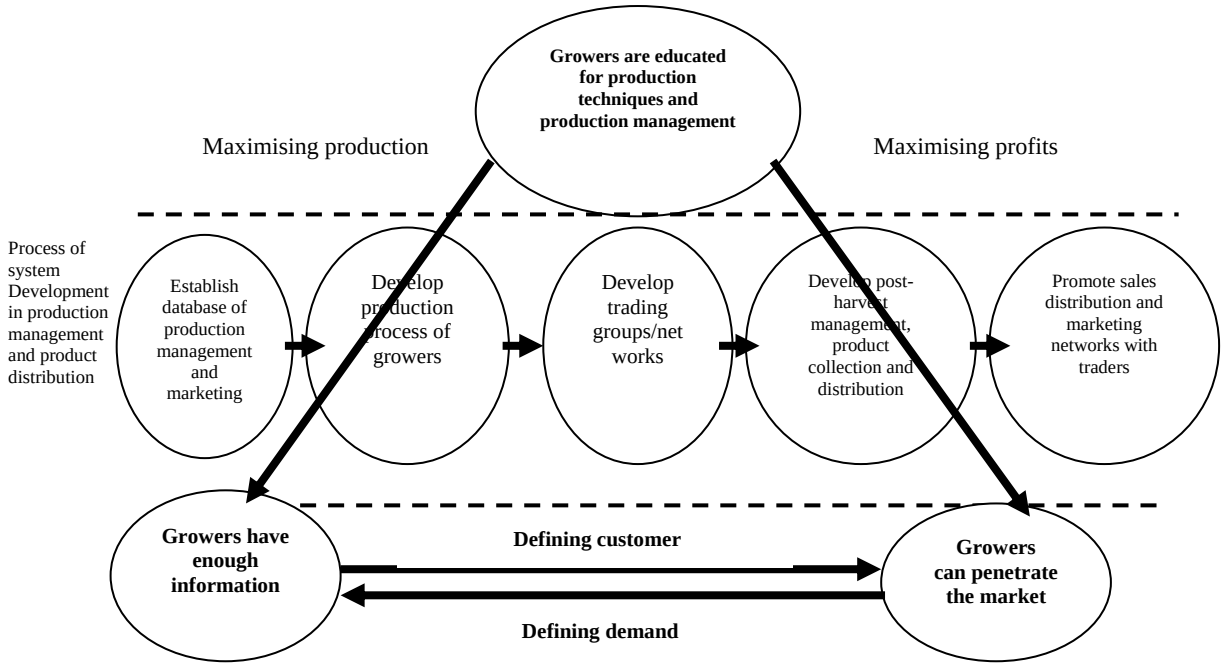

Figure 4. 8: Mango production development plan for growers

Source: DOAE (2010)

4.5.2 The Drive of Mango Production Development for DOAE's Personnel

In order to stimulate mango production development for growers successful, personnel of the DOAE should skillfully utilises the technology and have the know-how practiced by the growers. To enhance the grower's skill, personnel should closely work with the growers until the growers qualify for the DOAE goal. Therefore, the drive for mango production for DOAE's personnel was established in 2010. The goals of this drive were to increase personnel's capacity to work effectively and efficiently with the growers, and to train the personnel to become effective mentors for growers. The personnel should be educated for mentoring in information management, production processes, and production management. They should have adequate information and knowledge in solving growers' problems and can access or analyse problems and needs of the grower correctly. Personnel should expertly perform the assigned duties as indicated below:

- Establish a database of mango production by using GIS for grower registration
- Mentor growers in improving production processes

- Mentor/advisor growers in the development of business management in groups or networks

- Mentor growers in the development of product collecting and distributing processes

- Mentor growers in the promotion of marketing and in linking with traders

The DOAE launched the proactive mission for mango production development by improving the personnel capacity up to the manager level in the mango business. Moreover, they were assigned to have capabilities sufficient enough to manage GIS for regional production planning (Figure 4.9).

The Drive for Mango Production Development for the Department of Agricultural Extension (DOAE)'s personnel

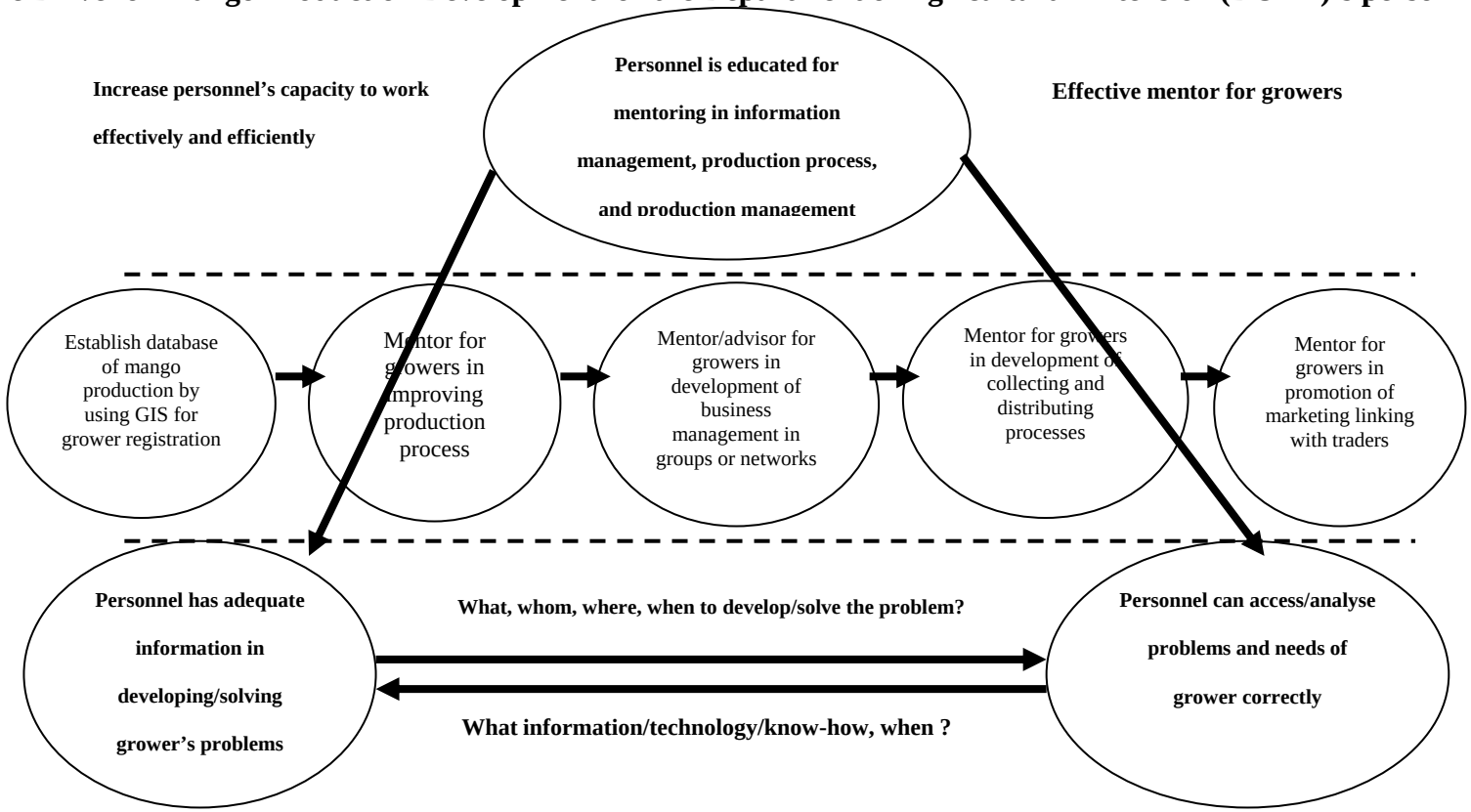

Figure 4. 9: Mango production development plan for the DOAE (2010)

4.6 The Function and Policy of the Department of Agricultural Extension (DOAE) for the Thai Mango Growers Development

According to the strategic development plan of industrial Thai fruit, the DOAE is directly responsible for project operations under the main plans policy in order to support technology transfer, manufacturing, and production management to enter into both domestic and global markets, and also to facilitate networking development of the Thai Mango Growers Association. The DOAE's function is to develop production efficiency by minimising the costs of production, production lead-time, and waste in production processes, as well as maximising off-season production by distance learning, demonstrating farm management, and educational field trips.

The DOAE was tasked with developing post-harvest management, strengthening the grower's network, and establishing a production database through GIS. The Thai Mango Growers Association therefore considerably benefits from these supporting activities in terms of production and organisation management. Not only growers gain benefits from networking development supported by the DOAE, but the DOAE also derives benefits from the Thai Mango Growers Association as listed in Table 4.16.

Table 4. 16: Benefits from promoting and developing the Thai Mango Growers Association

Benefits of DOAE from Thai Mango Growers Association	Benefits of growers from Thai Mango Growers Association
1. Greater efficiency in technology transfer: The DOAE could save time and budget in disseminating knowledge, spatial information, and news about production and marketing by broadcasting conferences of the Thai Mango Growers Association to group leaders so that they could transfer the knowledge to their group members 2. Convenience in updating database of mango production 3. Rapid access to information of mango production, markets, and fact finding about current marketing problems 4. Convenience for cooperation with growers and field operation 5. Enhancement of Thai mango in the global market since growers could improve more production volumes with high quality	1. Information sharing about production and marketing between groups. Production e.g. harvesting time, production technique to produce high quality product, and off-season production technique Marketing e.g. demand and conditions of traders/ customers, and contacts of traders/customers 2. Joint production plan in order to reduce in-season product and distribute products to market all year round 3. Gain negotiation power in selling products and buying input items Selling products e.g. pricing for group's product, and sharing price information of exporters Buying input items e.g. fruit wrapping bag 4. Group discussion to set production planning by grower's demand 5. Establishment of a representative of the Thai growers in driving development policy with government and private organisations

4.7 Conclusion

According to the third research objective which is to provide recommendations to the government and related agents on sufficient supply chain management for fresh mango exports, this chapter has explained the role and policy of the Thai government on Thai fruit development strategy with an emphasis on Thai mango exports to Japan and

how the Thai Kitchen to the World policy was related to the Thai fruit development strategy for 2010-2014. The latter part of the chapter explained the relationship and mutual benefits between the Thai government and the Thai Mango Growers Association.

With the government policy of the Kitchen of the World project starting in 2003, Thai cuisines, as well as agricultural products from Thailand have become globally recognised with annual increases in export volumes. During late 2006, food price increased rapidly caused by droughts in grain-producing nations and rising oil prices, which resulted in general escalations in the costs of fertilisers, food transportation, and industrial agriculture. Thailand learned a lot from the crisis period, recognizing that survival of the country depended much on its food security. As a result of these experiences, the Kitchen of the World project has been shifted towards a self-sufficient food economy with the production bases diversified to many areas rather than being monopolised by large food industries. In 2010, the government wanted to give priority of the budget to the entire system of industrial food development. Thai fruit development strategy was then established during that year.

State statistics for the year 2008 indicate that Thai mango gained a strong foothold in global production following exceptional annual crop yields of 2.374 million tons, then the world's third largest. Thailand's annual income generated from mango exports in 2008 was ranked sixth in the world (37.37 million USD). However, Thai mango exports were sold at only 607 USD per ton while mango exports from the Philippines gained exceptional market price of 1,585 USD per ton whereas the market price of mango from China was at 3,087 USD per ton. This information indicates that Thai mango has significant potential to develop qualitatively and quantitatively in the global market.

When the Thai fruit industry development strategy was launched in 2010, there were six promising fruits selected for the plan, namely, durian, longan, mango, mangosteen, rambutan, and longkong. Before the strategy, the DOAE organised a project regarding fruit quality development in 1997. This project objective was to improve the quality of important Thai fruit, which considerably influences the economics of the country. Mango was selected as one of the potential fruit for greater product quality development. The objectives were then set to support mango production and to improve its quality by registering groups of mango growers in each district/province of Thailand in order to allocate a fiscal budget for supporting the activities of mango growers. In

2008, these mango growers were strongly united by more than 29 groups of mango growers across Thailand, and this united group was then formally established in 2010 as a nonprofit organisation, namely, the “Thai Mango Growers Association”. The association aimed to: ascertain a career for mango producers; support members to effectively produce high quality products; propagandise news and knowledge of mango production, processing, and marketing; act as a mediator dealing with government sectors, public sectors, and state enterprises to solve problems and develop the mango industry of Thailand (FTA watch.org, 2011b)

Within the strategic development for Thai fruit industry, the Thai government then set the mission for mango export development. The DOAE was assigned as the core responsible agency. The DOAE then set two main strategies for the mission: The Drive for Mango Production Development for Growers and the Drive for Mango Production Development for DOAE’s Personnel. The main objective of this mission was to increase the capability of mango growers to do their business with information, knowledge and the know-how on a global scale by working side by side with personnel of the DOAE acting as their mentors.

Currently, only Thai mango growers have strong collaboration among themselves and are able to establish an official organization. However, this collaboration is still infancy and requires further development and support. To thoroughly study the supply chain collaboration, it is important to comprehend the background of the government policy, mission and strategy, together with the establishment of Thai Mango Growers Association.

As of the government policy for mango growers, the Thai Mango Growers Association took is a mediator dealing with government sectors, public sectors, and state enterprises. This not only benefits Thai mango growers but also benefits the DOAE to cooperate with growers under the government plan and policy.

The following chapter discusses the methodology used to assist the researcher in discovering the research findings of the mango supply chain in Thailand. Fieldwork with mango growers and interviews of exporters and government officials are carried out in order to fulfill the second research objective, which is to provide the supply chain collaboration between growers and exporters of mango export industry.

Chapter 5

Research Methodology

5.0 Introduction

The research framework has been presented in Chapter 1 and the background of supply management and supply chain collaboration in Chapter 2. The mango export process and the important role of government in supporting mango exports are reported in Chapters 3 and 4. This Chapter describes the research design and methodology used to fulfill the research objectives. To clarify the research process, this Chapter begins with an analysis of the research framework. The selection of research methodologies is also discussed. In order to achieve the research objectives, in-depth and semi-structured interviews have been selected as data collection techniques. These data are used for evaluating the mango supply chain and identifying problematic issues between grower and exporter.

The second part of the research examines collaboration in the mango supply chain. A review of the literature discussed in Chapter 2 found that there was a gap in empirical researches on the agricultural supply chain collaboration, particularly on the collaboration between growers and exporters. The research objectives are designed to address these questions within the mango collaborative supply chain since most supply chain collaboration analysis focuses on the relationship between exporters (as suppliers) and importers (as buyers) rather than growers (as producers/suppliers) and exporters (as buyers). The main reason for the chosen focus is due to the importance of collaborative supply chain implications, which are theoretically derived from the practice related to a specific agricultural product. The question is how the collaborative supply chain works well with agricultural products. In order to answer this question, a case study approach and cross-case analysis has been selected for this research in order to examine the supply chain collaboration in fresh mango exports.

5.1 Research Framework

The aim of the study is to establish the conditions for a more integrated supply chain management of Thai fresh mangoes exported to the Japanese market through an analysis of supply chain collaboration. In order to accomplish this aim, the research framework was conducted in four stages; stage 1 focusses on the development of the concept, stages 2 and 3 are concerned with data collection, and the findings and conclusions are presented in stage 4. The development of this research framework is illustrated in figure 5.1. In stage 1, the relevant literature is reviewed and then research questions defined and research objectives identified.

The development of data collection at stage 2 started with a field survey in order to observe overall activity along the supply chain and to investigate the key activities which either add value or increase costs of logistics to the supply chain. The field survey was conducted across the Central, Eastern, Northern, and Northeast regions in Thailand, as these regions produce the most mangoes according to Thai Mango Growers Association (2010). Then interviews with experts in different organisations such as the Thai Mango Grower Association, the Faculty of Agriculture of Kasetsart University, and the Graduate School of Agriculture of Kyoto University, as well as interviews with related authorities of government agencies such as the Department of Agriculture (DOA), the Department of Agricultural Extension (DOAE), and the Strategy Division in the National Economic and Social Development Board (NESDB) were conducted in order to identify the problems of mango production for exports and the difficulties in export procedures. The findings from these field observations and interviews were primarily summarised to describe the existing supply chain management of Thai mango for exports, and then were utilised to identify the supply chain structure of the Nam Dok Mai mango export industry, as well as focus on the main supply chain parties namely the mango growers and exporters. Since the first objective of the research is not only to review the existing supply chain management but also to identify strengths and weaknesses in the supply chain, so the in-depth interviews with growers and exporters are conducted accordingly in order to identify the problematic issues in the supply chain.

The information gathered from the field surveys and the in-depth interviews was used for developing lists of questions used in the semi-structured interviews for the case studies. In stage 3, the case studies were used to describe the supply chain collaboration

between growers and exporters in the mango production. In this research, six case studies were made using semi-structured interviews. The results of these interviews were collected for analysis in the next stage.

In stage 4, cross-case analysis was applied in order to compare similarities and to contrast differences between each of the cases in terms of supply chain collaboration mechanisms. The research findings were discussed and finally conclusions and recommendations made.

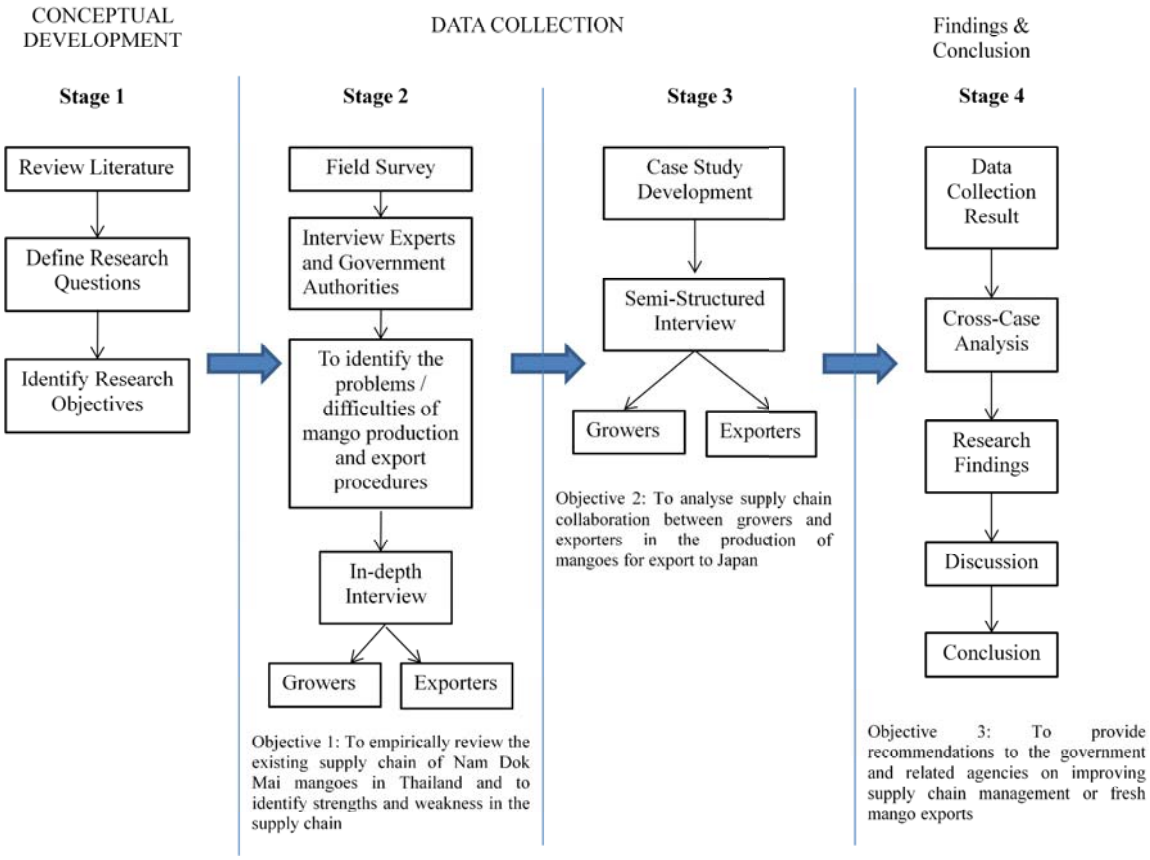

Figure 5. 1: Research Framework

5.2 Research Design

To design a study, it is important to decide if the information needed is qualitative or quantitative. According to Kumar (1996), the research classification is grounded on three criteria; 1) what the purpose of the study is; 2) how the variables are measured; and

3) how the information is analysed. The two different types of research also have different data collection methods, recoding, and analysing processes. Qualitative research is fundamentally interpretative in order to explain data that is created in the natural world, and a number of interactive and humanistic methods are used for it (Marshall and Rossman, 2006). Qualitative research is therefore prominent rather than solidly predicted. It is considered as "soft" because the research deals with texts, in contrast to quantitative research which is considered as "hard" because it deals with numerical data, statistic models and methods (Bauer and Gaskell, 2000). The differences between these two types of research are shown in Table 5.1 (Holloway and Wheeler, 2010)

Table 5. 1: Differences between qualitative and quantitative research

	Qualitative Research	Quantitative research
Aim	Exploration of participants' meaning. Understanding generation of theory from data	Search for causal explanations. Testing hypothesis, prediction, control
Approach	Base focus, Process-oriented, Context-bound, mostly natural setting, Getting close to the data	Narrow focus, Product-oriented, Context-free, often in artificial setting
Sample	Participants, informants, Sampling units such as place, time and concepts, Flexible sampling which develops during research	Respondents, subjects, Sample frame fixed before research starts
Data collection	In-depth non-standardise interviews, Participant observation/ fieldwork, Documents, photographs, videos	Questionnaire, standardised interviews, Tightly structured observation, Documents, Randomised controlled trials
Analysis	Thematic, latent content analysis, Grounded theory, ethnographic analysis, etc.	Statistical analysis
Outcome	A story, an ethnography, a theory	Measurable results
Relationships	Direct involvement of researcher, Research relationship close	Limited involvement of researcher, Research relationship distant
Validity	Trustworthiness, authenticity	Internal/ external validity, reliability

From Table 5.1, the differences between qualitative and quantitative research is based on the number of required data, and the method of data collection. The qualitative research is utilised when the profoundly in-depth explanations are required, whereas the

quantitative research is suitable for utilising more numbers of data collection for statistical analysis (Martin, 1981). However, the significant issue to consider type of research and methodology for research subject depends on the nature of either the research questions or objectives. After considering the research aim and objectives, the methods suited for this research become clearer and the research methodology is finally selected. The following section discusses methodologies in more detail.

5.2.1 Advantages and Disadvantages of Quantitative Research

The advantages of a quantitative research method are the ability to state the research problem(s) and to include both dependent and independent variables for the analysis. It is necessary to state concrete research objectives, to test the hypotheses and findings in order to developing conclusions. The data collected is reliable because it is obtained from laboratory experiments. As a result, we are able to measure the consecutive performances of the research subjects.

The disadvantage of the quantitative research method is the inability to provide profoundly in-depth information regarding to the occurrences of research phenomenon. Nor is it possible to control the environment in which the respondents complete the survey. It cannot stimulate the evolution and continual investigation of research phenomena since it is solely determined from the closed questions, and the structured format (Matveev, 2002).

5.2.2 Advantages and Disadvantages of Qualitative Research

The advantage of the qualitative research method is the ability to develop a more sensible perception of the real world, which cannot be obtained from the numerical data or statistical analysis obtained from quantitative research. The qualitative method has flexibility of data collection, analysis, and interpretation. It also has the ability to provide a holistic view of the research phenomena under investigation, and also to communicate with the research subjects in their own language.

The disadvantage of the qualitative research method is the difficulty in interpreting information collected from different respondents. The interpretation of

qualitative research is subjective; different researchers may draw different conclusions from the same information. Experience in data interpretation is therefore important. Qualitative research can use reliability in order to verify the research in terms of the subject development. In order to ensure information reliability, the respondent has to provide only particular details in disregard of other unrelated stories (Matveev, 2002). Furthermore, it is important to qualitative research to select particular respondents, sites, and documents, while quantitative research needs to select samples of a large number of respondents and sites (Creswell, 2003).

5.2.3 Comparison of Quantitative and Qualitative research

When comparing quantitative and qualitative research, Chang (2000) considers there are three different perspectives, namely ontological, epistemological, and methodological. From an ontological perspective, quantitative research believes that the world exists objectively while qualitative research believes that the world belongs to human subjectivity and thus can be interpreted by the research. From the epistemological perspective, quantitative research refers to objectively discovering the world while qualitative research believes that it is the duty of the researcher to explore the data and come to a real understanding of it. Finally from a mythological perspective, quantitative research analyses the results from various sources of data and uses them to draw conclusions, while qualitative research uses profound exploration of idiographic factors and focuses on the similar conditions to analyse the differences.

Quantitative research requires the testing of hypotheses for answering research questions. Because quantitative research deals with a large number of respondents, it also requires statistical methods to analyse the large number of questionnaires. Consequently, it is able to get most of the results from the respondents. However, it can only solve simple questions rather than obtain in-depth information. On the other hand, qualitative research does not require hypotheses to be made. It explores social phenomena in-depth by asking ‘why’ and ‘how’ questions. Qualitative research may be limited by the small sample size (Chang, 2000).

5.3 Qualitative Research

Many scholars illustrate the basis of qualitative research regarding the research emphasis, categories, and purposes. Creswell (2003) stated that qualitative research is considered as interpretive since the respondents are genuinely concerned with their continued interaction with the researcher. Hesse-Biber and Leavy (2004) claimed that the qualitative research is a part of an investigation which is composed of microanalyses regarding historical, comparative, structural, observational, and interrelation approaches of perception. Chang (2000) categorised qualitative research into action research, ethnology, discourse, interpretive, hermeneutics, and case study. Locke et al. (2000) mentioned that qualitative research includes not only a range of strategic issues but also ethical and personal issues.

Denzin and Lincoln (2005) indicated that the purpose of qualitative research was to describe, explain, and predict the phenomena of a real world. This includes the use of the qualitative data to understand social phenomena. Qualitative research builds on the basis of both science and philosophy in order to investigate social phenomena because human behaviour cannot be specific, fixed, or impersonal but relies on people, places and situations. Social phenomena are depicted but sentimental relation as well as language, thus, the aim of qualitative research is to interpret as wall as to explain.

However, Mason (2004) claimed that qualitative research becomes more challenging and debatable to the researcher, since the researcher has to explore the truths and represent the realities of others. This qualitative debate contains arguments that the more details obtaining from the characteristics of qualitative research, the more effortless it is to formulate answers from them.

5.3.1 The Characteristics of Qualitative Research

According to Creswell (2003, pp. 181-182) the characteristics of qualitative research are as follows;

- Qualitative research occurs in a natural setting.
- Qualitative research utilises various interactive methods.
- Qualitative research is prominent rather than tightly predicted.
- Qualitative research is essentially interpretive.

- Qualitative research views social phenomena entirely.

According to the above explanation, a qualitative researcher has to conduct the survey in various places in order to collect the required data from the respondents. After the data has been collected, the researcher can learn about the social phenomena from the point of view of the respondents' interests. Then, aspects of the qualitative research can be developed and become more tightly predicted rather than prominent at first. As mentioned earlier, qualitative research is essentially interpretive since the researcher has to clearly interpret the data in order to develop the precise description of research findings. The researcher must carefully ensure that s/he does not dominate the data analysis by making personal interpretations. Additionally, the qualitative research is conducted from a broad investigation incorporating a panoramic view rather than a microanalysis.

To analyse qualitative research, the researcher has to simultaneously utitilise a multifaceted rationale, and continuously reconsider the process, back and forth, from the data collection and analysis. The researcher also needs to apply one or more investigative strategies as a guide for the research process. The qualitative researcher has to take responsibility for the research quality and its claims, as the judgmental position is held by the reader rather than by the researcher. The researcher therefore should be critically self-scrutinising when it comes to conducting the research. Furthermore, qualitative research should deliver either explanations or arguments rather than generating more descriptions (Mason, 2004).

5.3.2 Qualitative Data Collection Techniques

Kent (1999) characterised qualitative research into two main features; 1) it is grounded in open-ended interviews or survey methods, and 2) mainly qualitative types of data are gathered in the narrative form rather than as separate statements. This thesis firstly gathered qualitative information and then utilised qualitative analysis. This section provides details of three techniques of data collection, namely interview, group discussion and case study (Abble-Fattah, 1997, Creswell, 2003, Yin, 2009).

5.3.3 Interviews

Since the interview does not need much technical information, only the basic technical skills are essential for those qualitative researchers who have the ability to initiate a conversation (Denscombe, 1998). However, conversational skills are necessary between researchers and interviewee. The researchers need to provide clear explanations of the research questions to the interviewees. With a clear understanding of the research questions, the interviewees are then able to answer accurately. It is important for the researcher to understand that a conversation is not a common interview, but it is a part of research process aimed at collecting the knowledge of the interviewees. This process generates not only research findings but also explores social phenomena due to the fact that the research contributes to theoretical and practical aspects of the topic under consideration. Thus, the interview process must be carefully and seriously conducted. A tape recorder is typically used during the interview in order to record the conversation for transcription. The utilisation of interview surveys is highly significant when the research objective is to obtain profound data and in-depth answers from the interviewees which can then be analysed and results obtained.

The benefits of interview surveys in qualitative research include the face-to-face communication between the researcher and the interviewees. The researcher is able to encourage the interviewees to answer open-ended questions. It also allows the researcher to have a chance to develop a greater understanding of the research context of the interviewees (Gorman and Clayton, 2005). The researchers can also produce in-depth and straightforwardly sympathetic research questions. Three different types of interviews are classified as structured interviews, semi-structured interviews and unstructured interviews or in-depth interviews (Denscombe, 1998, Bryman, 2011, Saunders et al., 2003), each of which is described below:

5.3.3.1 Structured Interviews

Since structured interviews are utilised for a large number of respondents in terms of data collection, the interviews are considered as the collection of quantitative data (Denscombe, 1998, p.112). A limited group of respondents is selected to be asked the same questions throughout. Fontana and Frey (2005) pointed out that this type of

interview has very limited flexibility in terms of asking and answering questions. To conduct a structured interview, the researcher must prearrange both questions and answers as part of the interview. This process provides more control over the wording, and precisely the same questions are asked to every respondent. Consequently, the data can be easily analysed using quantitative research methods.

5.3.3.2 Semi-structured Interviews

Similar to structured interviews, the researcher has to prepare a clear list of questions for the respondents to answer. However, the semi-structured interviews are conducted using open-ended questions which provide for flexibility for the interviewees which allows them to openly express their answers and develop their ideas widely.

5.3.3.3 Unstructured Interviews

Unstructured interviews and semi-structured interviews have a similar aim which is to explore the ideas of the interviewees rather than check them. With regard to the difference between unstructured interviews and semi-structured interviews, the unstructured interview does not require a prearranged list of questions so as to be able to profoundly explore the ideas, feelings and experiences of the interviewees. The in-depth interviews are performed when the researcher intends to collect profound opinions and judgments on the part of the interviewees, and allow in-depth questioning (Abdel-Fattah, 1997). This method of interview allows in-depth investigation and flexibility on the part of both the researcher and the interviewees in terms of developing their thoughts (Denscombe, 1998).

Kinnear and Taylor (1996) defined unstructured interviews as personal interviews which allow a single respondent to talk freely and openly in order to explore detailed feelings and beliefs regarding the research topic. Due to the open-ended interview method, the researcher is not restrained in terms of the prearrangement of pre-coded, highly structured questions, and a fixed sequence of questions. Hester (1996) mentioned that the researcher is required to use a large number of both structured and unstructured questions in a face-to-face interview in order to create an informative and comprehensive

database for analysis. Kent (1999 p.83) concluded that the in-depth interview is a series of conversations on an agreed topic, and the collected data are in the narrative form rather than separated statements.

5.3.4 Group Discussion

Sometimes a group discussion is known as a focus group (McDonald et al., 1996). The group discussion is not a common question-and-answer interview, as the main purpose of a group discussion is to discover what the respondents have to say and why they want to say it. The difference between a group discussion and an in-depth interview is the occurrence of interactions, in that interactions occur among group members during the group discussion, while the interactions are only between an interviewer and an interviewee during the in-depth interview. Hester (1996) referred to a group discussion as being one which is arranged with respondents from various backgrounds and attitudes in order to conduct a discussion leading to different insights and conceptions, even though Kinnear and Taylor (1996) argued that some researchers prefer to conduct a group discussion involving homogenous respondents rather than heterogeneous ones. A focus group is generally composed of eight to twelve respondents who are led and controlled by a moderator in an in-depth discussion on a particular issue or topic (McDaniel and Gates, 1998, Hester, 1996).

To conduct a group discussion, the group members are required to meet at one location in order to perform task(s) altogether. The interaction between group members during a prolonged period of discussion is essential for illustrating and arriving at a consensus on a specific issue(s). McDaniel and Gates (1998) suggested that the keys to a successful group discussion are qualified representative panellists, and a good moderator who must be skilful and unbiased. A capable moderator is able to lead the discussion in the right direction and also to create a proper harmony among the respondents. In addition, the close vicinity of group members is essential for the required degree of interaction during the group discussion (Delbecq et al., 1975).

5.4. Case Study

The case study technique is the preferred qualitative research method for augmenting the authenticity of the assessment, and for analysing the qualitative research findings. Case studies are utilised as an extensive qualitative research method by scholars of various disciplines (Yin, 2009). However, the case study is sometimes considered as a method to supplement other experimental techniques, or it is sometimes used for developing a self-sufficient approach to studying the social world, since the term *case study* has different meanings for different people (Gomm et al., 2000).

A case study is an essential method to attribute research investigation, in order to apply particular contemporary phenomena to a real-life context. In other words, the case study method is an important approach, particularly in a research scenario in which the empirical investigation of the phenomena lies within a real-life context (Robson, 2002, Gill and Johnson, 1997). Conversely, Yin (2009) claimed that the case study confronts a problem of negative judgment as the downgraded academic disciplines in utilising a social research approach. Nevertheless, this negativity can be refuted by the use of reasonable, non-biased and accurate evidential demonstration as a means of diminishing the problem of scientific generalisation that might be raised (Yin, 2009).

Gomma et al. (2000) suggested that the case study should be strengthened through the use of informative data which can be collected from various sources such as interviews, direct observation, physical artifacts and documentation. Table 5.2 outlines a comparison of the case study with the experimental and survey approaches. Both experimental research and survey research are considered as qualitative research methods since neither require in-depth information for the analysis of each case, while case study research needs to collect a large number of feature with regard to each case in order to allow a profound analysis of the findings. The case study focuses on rich quality informative data in each case, rather than the quantity of cases. This explains why a case study investigation typically consists of very small number of cases.

According to Cassell and Symon (1995), case study research comprises of a detailed investigation involving the data of one or more groups within an organisation(s) that is gathered over a period of time in order to develop an analysis of the research context and processes concerned with the phenomenon under consideration. The phenomenon has to be relevant to the research subject in order to examine the research

objectives. The number of case study selected is typically more than one case, since a number of cases are considered to be multiple experiments, and conclude that the minimum number of cases is approximately two or four cases (Carson et al., 2001).

Furthermore, Denscombe (1998) claimed that the interview case study does not require the researcher to gather a great deal of technical information. Only basic technical skills are necessary for researchers who are capable of conducting a conversation. Consequently, the data collected from the individual interviews of each case can be connected with the research and the subjects in general. Thus it can be concluded that the interview case study, if conducted properly, is able to provide a significant understanding of case studies, as human interaction can be one of its constituents (Gorman and Clayton, 2005).

Table 5. 2: Comparison of case study with experimental and survey approaches

Schematic comparison of case study with experimental and survey approaches		
Experiment	Case study	Survey
Investigation of relatively small number of cases.	Investigation of relatively small number of cases (sometimes just one).	Investigation of relatively large number of cases.
Information gathered and analysed in terms of a small number of features of each case.	Information gathered and analysed in terms of a large number of features of each case.	Information gathered and analysed in terms of a small number of features of each case.
Study of cases created in such a way as to control the important variables.	Study of naturally occurring cases: or in the action 'research' form, study of cases created by action of the researcher, but where the primary concern is not controlling variables to measure their effects.	Study of naturally occurring cases: selected in such a way as to maximise the sample's representativeness in relation to some larger population.
Quantification of data is a priority.	Quantification of data is not a priority. Indeed, qualitative data may be treated as a superior.	Quantification of data is a priority.
The aim is either theoretical inference and the development or testing of theory, or the practical evaluation of an intervention.	The main concern may be with understanding the case studied in itself, with no interest in theoretical inference or empirical generalisation. However, there may also be attempts at one, or other, or both of these. Alternatively, the wider relevance of the finding may be conceptualised in term of provision of vicarious experience, as a basic for naturalistic generalisation' or transferability'	The aim is empirical generalisation from a sample to a finite population, although this is sometimes seen as a platform for theoretical inference.

Source: Gomma et al. (2000)

5.5 Selection of Research Methods

As mentioned above, this study utilises the qualitative research method due to the research focus on “what” and “how” the supply chain collaboration is affected by the mango supply chain management. Multiple research methods are applied in order to achieve the research objectives. It starts from the field survey aimed at observing the overall activities along the supply chain, and to discover the current situation by in-depth interviews with mango growers, exporters, and representatives of government agencies. The case study method is then conducted through the use of semi-structured interviews involving six major mango exporters. The selected research method development of this thesis is also illustrated in Figure 5.1.

To achieve the first objective of the thesis, in-depth interviews were conducted to explore in depth the problematic activities which exist in the supply chain, the difficulties associated with mango export procedures, and barriers between growers and exporters. Since it is sensitive for the growers (as respondents) to express the problematic issues to an outsider, the face-to-face communications between the researcher and the interviewees and the flexibility in asking and answering questions were necessary in order to acquire profound and sensitive information. With the in-depth interviews, the researcher was able to encourage the interviewees to express their stories/opinions freely and straightforwardly. Besides, most growers do not understand the technical words used in this research topic such as “supply chain” and “logistics”. The researcher needed to conduct the in-depth investigation in a flexible manner so that both the researcher and the interviewees could openly develop their thoughts in order to accurately check their mutual understanding regarding the contents of the research topic. According to the reasons given above, the in-depth interviews, together with the field survey observation, were used to gather the data profoundly and thoroughly.

To achieve the second objective of the thesis, the collected information gathered from in-depth interviews and field survey observation were then utilised to develop semi-structured interviews in order to systematically obtain the information focusing on the research content of supply chain collaboration between the export companies and the growers. It was necessary to create lists of questions before interviewing the respondents in the companies, since this produced an expression of each case study which varied, depending on the contributors and the source of the data. With these lists of questions, the

researcher was able to focus on the same theme within the conversations, but was still able to adjust the varied flows of conversations obtained from the different respondents. The information gathered from the semi-structured interviews was therefore systematic and sufficiently thorough for analytical purposes.

The next step was to examine mango supply chain collaboration as proposed in the second objective. The case study approach was applied in order to investigate mango supply chain collaboration through the use of semi-structured interviews with each of six mango exporters who own VHT plants. The case study method was selected as it suited theoretical development since such development is important for this research. The semi-structured interviews used with regard to the case studies will be discussed in the next section.

In regard to the thesis associated with this study, qualitative research is used which focuses on supply chain collaboration. To achieve the research aim and objectives, detailed data are required in order to analyse the collaborative relationships which exist in each of the case studies. The theory discusses the supply chain collaboration mechanisms, necessities, and benefits. Therefore, the qualitative research approach is selected as the research emphasises “what” and “how” the collaboration has affected to the supply chain management.

There are two reasons for selecting interview case studies; firstly, the case study allows a combination of data collection and the historical background of the organisations; and secondly, the small number of cases is too few to conduct a research survey. This small number of research sites can gain advantage in terms of the researcher’s ability to collect profound information with regard to each case. Besides, the beneficial characteristics of a case study is its flexibility, which means the researcher is able to liberally investigate social phenomena as things naturally happen in the organisation involved. The number and selection of case studies is based on six mango exporters who own VHT plants and regularly process the VHT for fresh mango exports to the Japanese market (DOAE, 2010).

To conduct the case study interviews, the researcher had to prepare lists of questions before interviewing the respondents, in order to ensure that each of six exporters and 19 groups of growers were asked questions about the same subjects. This produced a constant expression of each case study. However, the sequence of questions

varied during the interviews based on the different situations of the conversation in each case. Since most of interview questions were open-ended, the respondents were able to freely express their thoughts, feelings, and experiences during the interviews.

5.6 Data collection process

Thailand is one of the main producers of high quality tropical fruits in the world (Chomchalow et al., 2008). Even though Thailand grows a wide range of fruit varieties, only some of these are of economic importance. Since most fruit growers in Thailand are small growers, they form cooperative groups in order to gain stronger bargaining power in the market due to greater production capacity. Traders and exporters prefer to collaborate with a group of growers rather than an individual. In each district or province, growers who cultivate the plantation area nearby collaborate to form a group. This group formation is not only beneficial for growers and traders/exporters to strengthen production capacity for greater competitiveness in the market, but also is beneficial for the government in allocating the regional budget, and to disseminating information on agricultural production practice. Thus, this research focuses on the group of growers instead of the individual grower.

According to Phomsupa (2008), there are 792 groups of fruit growers; the largest number is pineapple growers (159 groups), followed by mango growers (92 groups). Of the mango growers, 78 groups are officially registered as community enterprises but only 29 groups are considered as regular exporting producers (Thai Mango Growers Association, 2010). The research focused on the main mango production regions which are Central, Eastern, Northern, and Northern regions of Thailand. Then, 19 groups of mango growers were selected as the subject of this study since they have been active producers who regularly produce exporting mango particularly to Japanese market, and their production area were identified in the targeted regions.

Mango exporters are also considered as an important stakeholder in the supply chain. According to the Department of Agriculture Commodity and Food Standard Policy (2010b), there are 47 registered mango exporters to the Japanese market. All fresh mango exports must complete a process of Vapour Heat Treatment (VHT) which is regulated by Ministry of Health, Labour and Welfare (MHLW), in order to

eliminate fruit flies, prevent fruit withering and chemical residue (see Chapter 3). However few exporters own VHT plants due to the high cost of investment since The VHT machine can be used for processing fresh mangosteens as well as mangoes for export. This research focused only on the exporters who owned VHT plant. In doing so, it was found that only eight mango exporters own the VHT plants. Of these eight, one was temporarily suspended for producing mango exports to Japan in which chemical residue was detected, and another had a data protection policy. Thus this research focused on the remaining six regular mango exporters who own VHT plant. The production manager, director, and CEOs of the companies were interviewed.

To achieve the first research objective (see Figure 5.1), a filed survey and in-depth interviews were conducted during December 2009-March 2010 which was the mango season in Thailand. All production activities along the supply chain were observed in order to explore a current overview of the supply chain. The in-depth interviews with experts from the universities, and related authorities of government agencies were conducted in order to identify the mango supply chain structure, problems and difficulties of mango production and exports procedures. From the interviews with authorities of DOA and DOAE, the researcher was able to access the most current information of active groups of growers and exporters who were the key players in the mango supply chain.

Then, the in-depth interviews with 19 groups of growers from the targeted regions across the Central, Eastern, Northeast, and North regions respectively, and six exporters who own VHT plants were conducted in order to identify the problematic issues in the supply chain. The findings from these interviews and field observations demonstrated that the most raised problematic issue was a grading activity which caused conflict to the supply chain. Since the grading activity was the joint activity between growers and exporters, this indicated that the issue of supply chain collaboration needed to be examined. Therefore, lists of questions for semi-structured interviews were developed to identify what the supply chain collaboration mechanisms could be implemented.

The semi-structured interviews were conducted during January 2011-March 2011. Similarly to the in-depth interviews, the respondents were the same group of those six exporters and 19 groups of growers. However, the theme of semi-structured interviews were changed to focus on the concept of supply chain collaboration in order to investigate the supply chain collaboration between growers and exporters, and to identify the key

factors of supply chain collaboration for implementation. The findings from the interviews were classified into six case studies, and then were analysed by the cross-case analysis.

5.7 The Development of Semi-structured interviews

To examine supply chain collaboration in terms of perishable products, six case studies of mango exporters were conducted. This research explores the collaboration in the mango supply chain. The list of questions were developed from combining the empirical supply chain collaboration research as mentioned in Chapter 2 and the results of in-depth interviews with growers and exporters. Table 5.3 presents the lists of questions developed for the semi-structured interviews.

In order to create the lists of questions for these interviews, it is important to consider how the interview questions related to the research objectives which are 1) to provide an overview of the existing supply chain of Nam Dok Mai mangoes in Thailand, and to identify strengths and weaknesses in the supply chain; 2) to analyse supply chain collaboration between growers and exporters in the production of mangoes for export to Japan; and 3) to provide recommendations to the government and related agencies on the appropriate supply chain management for fresh mango exports.

Table 5. 3: The main categories of the semi-structured interviews

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
1	**To provide an overview of the existing supply chain of Nam Dok Mai mangoes in Thailand, and to identify strengths and weakness in the supply chain**			
	Production capability: From the field trip observation and in-depth interviews, it was found that the weakness in the supply chain is over-supply in the in-season for mango production. Therefore, it is necessary to have full detail of the mango cultivated plantation in order to estimate the current production capacity for further analysis regarding production development.	-How big is your plantation?	-What type of company business are you engaged in e.g. exporter/ trader/ VHT service provider/ joint venture with Japanese partner(s)?; In the event that the company has a Japanese partner, what kind of partner is it? e.g. wholesaler/ retailer/ distributor?; What is your destination(s) in the Japanese market e.g. supermarket, department store, Thai restaurant?;	Rushton, 2006, Knight, 2002, Aramyan, 2006, Van der Vorst, 2000, Van der Spiegel, 2004, SITPRO,2009, Christopher, 2005, Ketzenberg and Ferguson, 2003, Deniz etal., 2004, Onderstejin, 2006
		-How much do you yield/year?	- What is your production capacity per year?; Does the company cultivate mango plantation(s)?; If yes, for what purpose? How big is the plantation?, and how much does the company yield/year?	
	Pre-harvest management:	-How do you manage your plantation? e.g. use appropriate bags to wrap mangos, marking the wrapped mango to know when of which is ready to harvest; anthracnose-free atmosphere?	-In case of the company which cultivates the mango plantation, how does the company manage the plantation e.g. using appropriate bags to wrap mangos, marking the wrapped mango to know when of which is ready to harvest, creating an anthracnose-free atmosphere?	

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
	From in-depth interviews with growers and exporters, it was found that the problem of mango disease—anthracnose, and chemical residue highly affecting product quality. These problems can be prevented from the early stage of planting. Besides, some pre-harvest activities can add value to the products. Therefore, the study of pre-harvest management is important to the research.			
		-How do you manage the fertilisation/ pesticide?	- How does the company manage the fertilisation/ pesticide process?	
	Harvest management: From interviews with experts in post-harvest management, it was found that the method and equipment used in harvesting directly affects the product quality, particularly the fruit skin. Proper harvest management is needed to be studied and implemented.	-How do you harvest your product?; What equipment do you use?; Why do you decide to use such equipment?	- How does the company harvest the product?; What equipment do they use?; Why do they decide to use such equipment?	
		-How do you manage your labour?; Do you use home intensive labour or outsource? Why?; Do you have any problem in treating/ paying labour?; Do the costs of labour affect your production costs?	- How does the company manage its labour?; Do they outsource? Why?; Do the costs of labour affect production costs?	
	Post-harvest management: - Product handling in the orchards (from individual orchards to collecting area)	-What vehicles do you use for transportation?	- What vehicles do the company use for transportation?	

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
	It is necessary to determine the best practice for post-harvest management in terms of product handling and transportation in order to add value to the product.	-How do you prepare the container/basket?; Do you use anything (e.g. newspaper) to support the harvested mangoes?	- How does the company prepare the container/basket?; Do they use anything (e.g. newspaper) to support the harvested mangoes?	
		-Do you have any difficulties in product handling/ transportation in orchards?	- Does the company have any difficulties in product handling/ transportation in orchards?	
		-Do you have any product losses in this activity?; What are the causes of the problem?; How do you solve them?	- Does the company have any product losses in this activity?; What are the causes of the problem?; How do they solve the problem?	
	- Product delivery from the grower's orchard to the exporter's VHT plant	-Who is responsible for transportation in terms of vehicle management and costs?		
		-Does the vehicle have a temperature controlled container?		
		-How long does the transportation take? When is the transport - day or night? Why?		
		-Do you have any difficulties in terms of transportation?; If yes, what are they and why do they happen?; Does any product loss occur during the transportation? Who takes responsibility?; How do you solve the problem?		

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
	- Product delivery from the exporter's VHT plant to air/sea freight depot	N/A	What kind of freight does the company use for export e.g. air freight/ sea freight/ both?; What is the percentage of each type of freight?; Do you plan to export (Carson et al.) by sea freight to reduce the cost of transportation?; What are the different product conditions and practices for different types of freight e.g. product maturity, packaging, product handling?	
2.	**To analyse supply chain collaboration between growers and exporters in the production of mangoes for export to Japan**			
	2.1. Information sharing:	-How often are you in contact with group members/ exporters?; And for what purpose? e.g. information sharing, technology transfer?.	-How often are you in contact with your producers (growers)?; And for what purpose? e.g. information sharing, technology transfer.	Whipple et al., 1999, Simatupang and Sridharam, 2008, Liu and Kumar, 2003, Lee et al. 1997, Bowersox 2000, Handfield et al. 2000, Handfield 2002, La Londe 2002, Kwon and Suh, 2004, Drucker, 1992, Li and Lin,

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
		-How do you contact the traders (exporters)?; Do you initially approach exporters or do exporters initially approach you to offer to trade?; How do you contact each other?; Do the exporters share information/ news/ technology with you?; How do exporters support you? e.g. with knowledge, fruit wrapping bags.	-How do you contact the growers?; Do you initially approach the growers or do growers initially approach you to offer to trade?; How do you contact each other?; Do you share information/ news/ technology with the growers?	2006, Li et al., 2006, Shin et al., 2007, Cheng, 2011, Chow et al, 2007, Xu et al., 2000, Li and Lin, 2006, Lee and Whang 2001, Yu et al. 2001, Filala, 2004, Cooper et al., 1997, Sivabrovornvatan, 2006
		-Do you have any difficulties? e.g. collecting delays due to group members, delay on the part of exporters (the company)?; How do you solve the problem? Who is responsible for the loss?		
	- Collaborative performance system (CPS)	-Do you plan/discuss mutual goals, mission, and benefits with exporters? How do you create your goal and plan to achieve them?	-Do you plan/discuss mutual goals, mission, and benefits with growers? How do you create your goal and plan to achieve them?	Simatupang and Sridharam, 2008, Kapland and Norton, 2002
		-Do you set the clear objectives, product specificity, and realistic time frames with the exporters? How do you carry out your business plan with your partners?	-Do you set the clear objectives, product specificity, and realistic time frames with the growers? How do you carry out your business plan with your partners?	
	- Performance status	-Do you regularly inform exporters of your performance?; How often and why do you do so?; Do you know the procedures and current performance status of the exporters?	-Do you regularly inform growers of your performance?; How often and why do you do so?; Do you know the procedures and current performance status of the growers?	Simatupang and Sridharam, 2008, Kapland and Norton, 2002

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
		-How do you monitor the performances of yourself and the exporters?; Do you have difficulties due to a lack of information regarding performance status sharing?	-How do you monitor the performances of yourself and the growers?; Do you have difficulties due to a lack of information regarding performance status sharing?	
	- Production/demand planning	-Do you develop/discuss production/demand planning with exporters?; Do you have joint-planning meetings with exporters regarding production and demand planning?; How do you plan your production?; How long have you planned for production in advance?	-Do you develop/discuss the production/demand planning with growers?; Do you have joint-planning meetings with growers regarding production and demand planning?; How do you plan your production?; How long have you planned for production in advance?	Simatupang and Sridharam, 2008, Christopher, 2005
	- Knowledge sharing	-Do you share any knowledge which might be useful to the exporters in order to either maximise product quality, or minimise costs?; What kind of knowledge do you share or gain from the exporters?; How do you and your partners share new knowledge with each other?; Why do you do so?	-Do you share any knowledge which might be useful to the growers in order to either maximise product quality, or minimise costs?; What kind of knowledge do you share or gain from the growers?; How do you and your partners share new knowledge with each other?; Why do you do so?	Whipple et al., 1999, Simatupang and Sridharam, 2008, Lee et al. 1997, Bowersox 2000, Handfield et al. 2000, Handfield 2002, La Londe 2002, Kwon and Suh, 2004, Drucker, 1992, Li and Lin, 2006, Li et al., 2006, Shin et al., 2007, Cheng, 2011, Chow et al, 2007, Xu et al., 2000, Li and Lin, 2006, Lee and Whang 2001, Yu et al. 2001, Filala,

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
				2004, Cooper et al., 1997, Sivabrovornvatan, 2006
	2.2. Decision synchronisation	-Do you make joint-decisions with your business partners?; What kind of decisions did you make together?; Why do you do so?; Does this affect the relationship with your partners?; If yes, what is the effect and how does it change the situation?		Simatupang and Sridharam, 2008
		-Do you take joint-responsibility for joint-decision making?; How do you manage the responsibility together with your partners? How does this affect the relationship with your partners?		
	2.3. Intensive alignment	-Do you share risks and benefits with your business partners? How and why do you do so? Does this affect the relationship with your partners? What and how is the outcome(s)?		Simatupang and Sridharam, 2002, Kaplan and Narayanan, 2001, Corbett et al., 1999, Fisher, 1997,
	2.4. Supply chain contract (contract farming agreement)	-Do you sign a farming agreement contract?; Why did you decide to do so?	-Do you have a farming agreement contract with all your partners (growers)?	Lariviere,1999, Tsay and Lovejoy, 1999, Wang, 2002, Arshinder et al., 2008, Padmanabhan and Png, 1995, Giannoccaro and Pontrandolfo, 2004, Cachon and Lariviere,
		-Who created the conditions of the farming agreement contract, especially the price of the product?		
		-Do you think contract farming is useful/		
		helpful?; Who gains or loses from the signed contract?; How do the such (dis)advantages affect you?		

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
		-In practice, do you follow the conditions of contract farming?; Is there any negotiation in certain cases? Please explain how and why.		2005, Lee et al., 1997, Mighell and Jones, 1963b, Johnson et al., 1992, Kirsten and Sartorius, 2002, Da Silva, 2005, Eaton and Shepherd, 2001, Singh, 2006, Jueth et al., 1999, Bijman et al., 2009, Poole and Frece, 2010, Minot, 1986, Hill and Ingersent, 1987, Key and Runsten, 1999, Scott, 1984, Bogetoft and Olese, 2002, Wolf and Ligon, 2001, Glover, 1992b, Ornberg, 2003b, Williams and Karen, 1985, Leisinger, 1987, Benziger, 1996, Asano-Tamanoi, 1996, Burch, 1994
		-If the exporters break the contract, do you punish them? Have you ever done so, and how were you punished?	-If the growers break the contract, do you punish them? Have you ever done so?; In cases of uncertainty e.g. drought, fruit disease outbreak, etc., how do you inflict punishment on growers?; How do you manage with the difficulties?	
	2.5. Traceability	-How do you manage traceability?; What is your technique/practice?		Folinas et al., 2006, Opara, 2002, Jansen-Vullers et al., 2003, Regattieri et al., 2007
		-How do you manage the fruit containers/baskets?		
		-Do you experience any error(s)/difficulties regarding the products' traceability?		
	2.6. Transaction cost management:	-Do you undertake any grading process by yourself before taking	-Is the grading process duplicated in the sorting process? Is it	Hobbs, 1996, Wilson, 1995, Hobbs and

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
	From the survey, it was found that the grading activity causes problems for both growers and exporters. Grading is counted as a duplicated activity found in most cases. This affects the transaction cost in the supply chain.	products to be graded at the collecting area?; How do you manage for an initial grading process?	possible to reduce these activities to have only one process instead of two?	Young, 2000
		-What are the grading criteria? e.g. product size, weight, skin colour.		
		-Who actually grades the products - you or the exporters?	-Does the company solely control the grading process?; Why/why not?	
		-Do you have any difficulties in contacting/ communicating with group members regarding production/grading standards i.e. cross-communication?	-Do you have any difficulties in contacting/ communicating with growers regarding the production/ grading standards i.e. cross-communication?	
		-Do such problem(s) cause any losses?; How do you solve the problem(s)?		
	(In the event that the product is graded as “unqualified” and is rejected)	-How do you manage unqualified products?; Who/ where do you sell the products?; Do you manage the sale by yourself or do intermediaries contact you?; What is the difference in price of qualified mangoes for export and unqualified mangoes for the domestic/ local market?	-How do you manage unqualified products?; Do you still purchase them?; If not, which customer/ where do you sell the products?; Do you manage the sale by yourself or do intermediaries contact you?; What is the difference in price of qualified mangos for exports and unqualified mangoes for the domestic/ local market?	

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
		-For the transport of unqualified products, who is responsible for the costs?; Do you have to deliver the products to intermediaries or does your group leader manage it for you?	-For the transport of unqualified products, who is responsible for the costs?; Do you have to return the products to the growers or do you have intermediaries manage it for you?	
		-Do the exporters (the company) support unqualified products such as by introducing them to the market?		
		-Do you have any difficulties in contacting/ communicating with exporters e.g. cross-communication, information sharing?; Do the problem(s) cause any losses? How do you solve the problem(s)?	-Do you have any difficulties in contacting/ communicating with growers e.g. cross-communication, information sharing?; Do the problem(s) cause any losses? How do you solve the problem(s)?	
	2.7. Relationships	-How do you choose your traders (exporters)?; Do you have any criteria e.g. being reasonable/ negotiable grading standards, price deals, payment methods (cash or short credit term), reputation, relationship?	-How do you choose your producers (growers)?; Do you have any criteria e.g. being reasonable/ negotiable grading standards, price deals, reputation, relationship?	Vickery et al., 2003, Ellram, 1990, Heide and John, 1999, Johnston et al., 2004, Sahay, 2003, Arino et al., 2001, McCutcheon et al., 2004, Hingley, 2005,

Research Objective	Rationale of interview question development (derived from the field trip observations and in-depth interviews)	Interview questions/statements (These were translated into Thai.)		Related literatures
		Growers	Exporters	
		-What kind of relationship exists between you and your traders e.g. trustworthiness focusing on a sustainable relationship, business partner focusing on high profits with short term commitment?; Do you experience any difficulties? How do you solve any problems?		Meehan and Wright, 2012, Maloni, 2005, Maloni and Benton, 2000, Gummesson, 1996, Kumar, 1996, Christopher and Jüttner, 2000, Grunert et al. 1997, Larson and Kulchitsky, 1998, Howe, 1998, Hingley and Lindgreen, 2002, White, 2000, Hingley, 2001
3.	**To provide recommendations to the government and related agencies on sufficient supply chain management for fresh mango exports**			
		-What support from the government do you need the most? e.g. GAP application, production techniques, technology know-how.	-What support from the government do you need the most? e.g. lab testing of chemical contamination, documentary processing, phytosanitary certification.	
		-Do you have any suggestions in terms of government policy for agricultural development?	-Do you have any suggestions in terms of government policy for agricultural development and exports?	

5.8 Analysis Methods

The analytical processes for this research can be separated into two parts 1) analysis of interviews and 2) analysis of case studies. In the following sections, we will discuss the selected analytical method used in this research.

5.8.1 Analysis of Interviews

The data analysis must relate to the data and to the theory. It can also describe the dependent relationship consequent in the research (Carson et al., 2001). There are ten processes involved in interview analysis according to Gillham (2005);

- Ascertaining that the way the paperwork is organised is suited for the transcription process. For instance, the interview questions and interjection forms must be divided into different types by using double spacing to allow the insertion of coding references. Each transcript and quotation has to be distinguished clearly.
- Noticing the highlighting, then selecting what is necessary for the transcripts, and writing it.
- Reading the transcripts one after another. The first step in reading is important when dealing with transcripts, and then the next step will allow the analyst to progress.
- Double reading the transcripts and erasing some redundant reports in order to highlight significant information.
- Checking reliability by asking someone to comment. This is done to verify the content of the research.
- Defining categories for the answers and then selecting the categories right from the beginning. From these categories, the analyst will be able to examine which are redundant or deficient, in order to discover the practical data for the analysis.
- Writing the significant statements in a separate section. These statements are developed from the categories which are identified from the previous statements.
- Creating an analytical spreadsheet so as to ensure clearer data analysis.

- Creating two forms of the spreadsheet; one is to enter the actual words of the statements, and the other one is to enter a tick in each cell in which a statement has been inserted.
- Making a reference against the statement on the original transcript.

Kvale (1996) stated that the interview analysis is able to expand the meaning during the interview, with short periods of the categorisation of meaning, structuring of meaning through narratives, interpretation of meaning, and ad hoc methods for generating the meaning. The categorisation contains a few short words, which can be rapidly written down during the interview. Since the categorisation is a code symbol used for structuring and minimising a large transcript into the forms of figures or tables, this assists the researcher to analyse the answers obtained from the respondents. The interview process and findings are profoundly described by the interpretation of the meaning. The narrative structuring focuses on the investigative analysis of the story.

The analysis in the first phase of this research was implemented in order to summarise the key activities of the mango export process from the growers to the end-customers. To pursue the research aim, a prior view of general constructs and the interrelationship along the mango supply chain is important in theory building (Voss et al., 2002). This phase addressed the first and second research objectives in order to explore an overview of the mango supply chain and to examine the strengths and weaknesses respectively. The outcomes from the first phase were a detailed overview of the supply chain in Thailand, including the strengths and weaknesses of the existing supply chain management. It is very important to enumerate the evidence presented and the real statements when the interview actions are developed.

5.8.2 Case Study Analysis

With regard to the analysis of the case study, Yin (2003) defines five analytical strategies, namely pattern matching, explanation building, time-series analysis, logic models, and cross-case synthesis. Carson et al. (2001) suggested that the researcher should take significant quotations from the transcripts and also utilise codes to develop the category for research questions in order to compare the collected data of each case and to state the different findings and responses in the cross-case analysis. Carson et al.

(2001, p.106) also stated that the cross-case analysis report is required to emphasise the reasons why the differences occurred, and explain why a difference was found.

This thesis delivers the historical background and the important details of the six cases involving mango export companies. The analysis of each case is conducted in order to study the mechanisms of supply chain collaboration between the company and its supplier(s). The cross-case analysis is developed at the end in order to compare the significant similarities and differences in terms of the research findings and analysis.

5.9 Conclusion

This Chapter aims to introduce the research methodology and to discuss suitable research methods which were applied in this study in order to develop the research findings. The qualitative research method was selected for use in the research since this approach is based on the in-depth interpretation of the investigation and on the experiences of the respondents. This research method is applicable to the research aim which was to develop the integrated supply chain management of fresh Nam Dok Mai mangoes for export to Japan through supply chain collaboration. The qualitative research method was then selected for examining the results. To achieve the first research objective, the in-depth interview approach was selected in order to profoundly explore the problematic issues in the mango supply chain, and then the case studies were conducted to achieve the second research objective. The findings from the in-depth interviews are discussed and analysed in order to develop lists of questions for the semi-structured interviews which were used for case study analysis. The results of the case studies were analysed in order to answer the second and the third research objectives.

The above discussion of the methodology indicates how data was collected, how it was analysed in order to address the research's contribution to agricultural supply chain collaboration in terms of both theory and application. The next Chapter will discuss the research outcomes from the observation of the mango supply chain, and the findings from in-depth interviews.

Chapter 6

Mango Supply Chain in Thailand: Research Findings

6.0 Introduction

The previous chapter dealt with research methodology. It begins with the research objectives and framework. To obtain information about the mango supply chain, the essential data were designed to be collected from in-depth and semi-structured interviews. A case study approach and cross-case analysis has been selected for this research in order to examine supply chain collaboration with regard to the exporting of mangoes.

This chapter aims to achieve the first research objective (see Chapter 1) which is to provide an overview of existing supply chain of Nam Dok Mai mangoes in Thailand and to identify strengths and weakness in the supply chain. The chapter consists of the findings of an overview of the existing supply chain within the Thai mango industry related to Nam Dok Mai cultivation for export to the Japanese market, the results with regard to mango growers in Thailand, including the findings of a field survey and the costs of problematic logisticsl activities, the results with regard to mango exporters in Thailand, the role of the Thai government in the supply chain, and the findings of the interviews with government sector representatives.

6.1 An Overview of the Existing Supply Chain with regard to the Thai Mango Industry related to Nam Dok Mai Cultivation for Export to the Japanese Market

There are many stakeholders in the supply chain from upstream to downstream who are involved in the export of fresh Thai mangoes to Japan. According to Figure 6.1, the stakeholders are 1) manufacturers/suppliers of agricultural inputs, 2) growers, 3) intermediaries, 4) exporters, 5) the Department of Agriculture, 6) forwarders and freight carriers, 7) Japanese customs authorities and 8) importers.

The manufacturers or suppliers of agricultural inputs can be identified as the first stakeholders in the supply chain, since mango production requires agricultural inputs such as fertilisers, pesticides, and agricultural equipment to ensure high production quality. Growers have to use the inputs correctly, especially chemical inputs as part of Good Agricultural Practices (GAP) in order to prevent chemical residue which directly impacts on product quality and customer food safety.

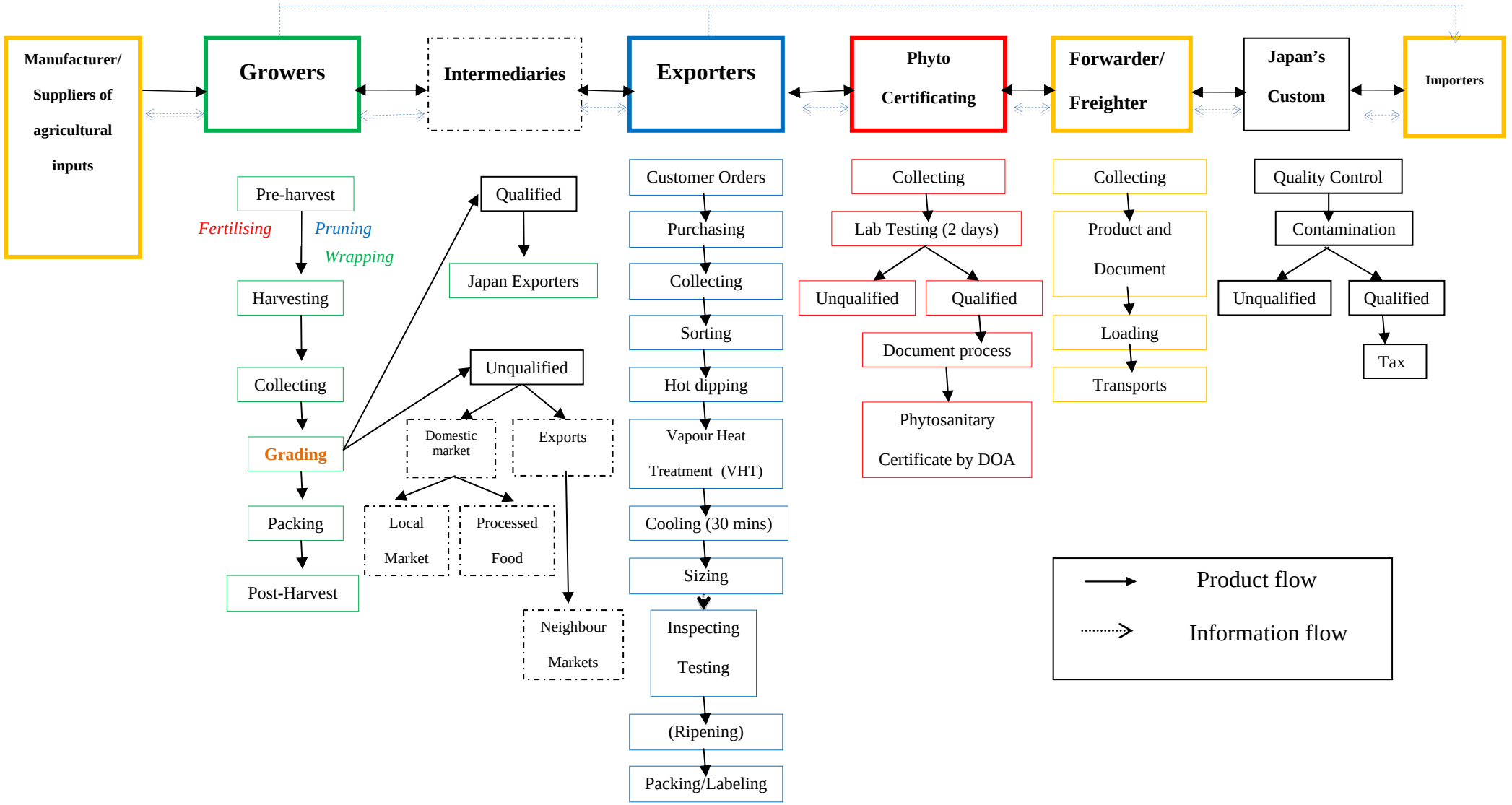

Figure 6. 1: Supply chain associated with exporting

6.1.1 The Growers' Activities

Growers are small groups of mango producers from the four main mango producing regions of Thailand; Northern, North-Eastern, Eastern and Central parts. In the upstream section of the supply chain, the logistics activities of growers start from the pre-harvest and progress to the post-harvest. Pre-harvest is generally related to farm management in terms of complying with GAP in order to control excessive chemical use and residue. Good farm management could add value to the product through logistics activities such as fertilising, pruning, and wrapping. Proper fertilising engenders a product's wellness, and prevents damage to the product from Vapour Heat Treatment (VHT), since weak products could potentially be harmed by the resulting heat. Heat injuries to the products are due to the presence of white spot and spongy tissue (DOAE, undate). These are recognised as defects in mangoes which mean that they cannot be exported nor returned to the growers. Another value adding logistics activity is pruning; growers should keep mango trees in good condition by pruning in order to conveniently nurture and harvest the fruit. Well-pruned mango trees can produce bigger and healthier fruit than non-pruned mango trees due to the fact that pruning can enhance a tree by developing its structure and stimulating fruit production. An unhealthy fruit might either fall from a tree before the fruit reaches maturity, or be undersized. This unacceptable fruit might be destroyed or sold in local cut-price markets. The market price of fallen/unripe mango is approximately 5-10 THB/kg. in-season and 20 THB/kg. off-season, whilst the price of acceptable mangoes for export to Japan is approximately 40-50 THB/kg. in-season and 60-70 THB/kg. off-season[1]. Wrapping is one of the key value adding activities for exporting Nam Dok Mai mango. The characteristics of Nam Dok Mai (see Chapter 3) require that it needs to be carefully nurtured in order to protect the delicate skin from insects and rain. If this is not done, the fruit may not grow fully or have imperfect skin, which means that it might be graded as an unacceptable product to be sold in local market instead of the Japanese market. Unwrapped mango might be so damaged by the harsh environment that it cannot to be sold, even in the local market. The market

[1] Interview with the leader of the Thai Mango Growers Association, February 2011

price of unwrapped mango is normally less than 10 THB/kg. in-season and approximately 20 THB/kg. off-season. From the reasons above, these logistics activities do not only add value to the product, but also to the supply chain by minimising product waste and finally maximising profits.

With regard to harvesting, growers use either hands or long-handled fruit-pickers in order to prevent bruises which might cause disease infection. Growers harvest and collect products from their farms and bring the products to their group leaders. The mango growers group leaders play an important role in collecting products from group members, since the collecting centre is at the group leader's premises, where the exporter's staff come to grade and collect acceptable products for export. The group representatives initially grade the products in order to estimate the quantity of acceptable products to be sold. The representatives have to cooperate with their own group members and exporters concerning time and product yield. To create efficiency in terms of collaboration, communication and information should be precisely managed. The representatives have to estimate the optimum time for collecting the products and communicate with the exporters when to come to grade the product, and how much of product yield is acceptable. Exporters have to estimate the time needed for the grading process and the time of delivery from the grower's collecting area to VHT plant. It was found that among 19 groups of growers, only three groups were allowed to grade the products by themselves. Most of them (16 groups) had the grading process managed by the staff of the exporters[2].

The purpose of the grading process is to screen for qualified mangoes for export to the Japanese market, taking into consideration the skin's condition, size and weight, and fruit maturity. According to the survey and interviews with experts from the Department of Agriculture, acceptable mangoes (classified as grade A) should be at approximately 80-85% of maturity, and could have at most two natural mark(s) which make up less than 5% of the total fruit skin. However, the criteria for grading varies in different seasons due to the market mechanism. Figure 6.2 demonstrates the mango production season in Thailand. In-season is from April to May or to late July for extended production in some regions of Thailand, while early off-season is from January

[2] From the field survey, January 2010

to March and late off-season is from August to December. Due to the demand and supply mechanism, the market price for in-season mango (higher supply than demand) is lower than the price of off-season mango (higher demand than supply). This mechanism could also explain the differences of grading standards between in-season and off-season. The grading is likely to be more stringent during in-season due to high supply, whilst the grading is more negotiable during off-season due to high demand.

In Thailand, mango growers have more negotiating power than other growers who are price-takers in the market, since the Japanese market still has a high level of demand for Thai mangoes. In addition, mango growers have greater collaboration in terms of organising groups of exporting mango producers and have also established the Thai Mango Growers Association, whereas other growers work as individuals rather than teams. The negotiation power of the Nam Dok Mai mango supply chain is therefore based on the market mechanism. The price of the product alters in the different mango seasons based on different demand and supply conditions, rather than based on price agreements in contract farming.

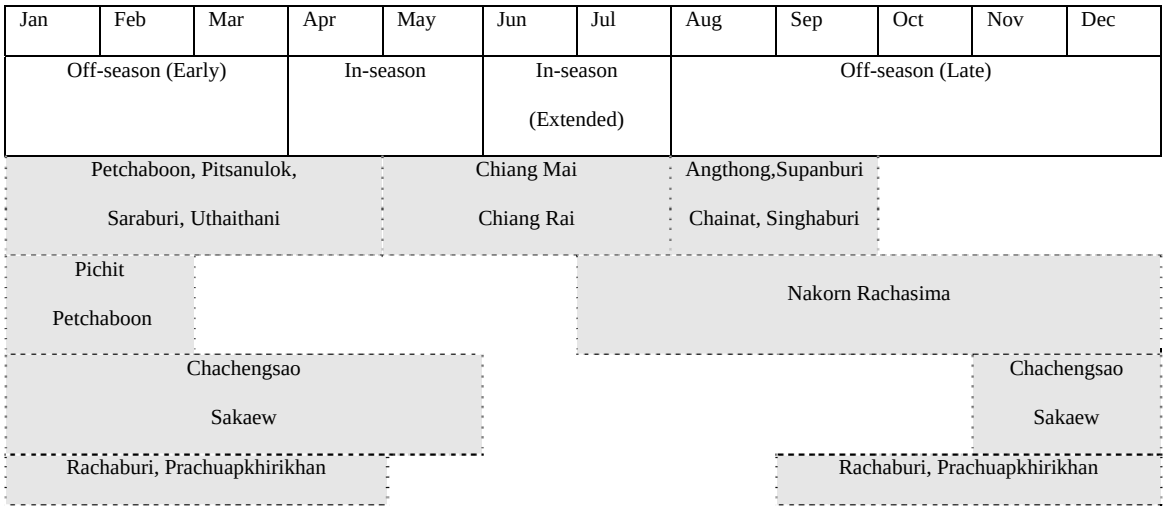

Figure 6. 2: Mango season in Thailand

Source: DOA; Rathcharate et al. (2009); modified by author

Based on grading, any unacceptable products are rejected. They will be sold either to local markets or neighbours where customers are not concerned with product conditions, especially imperfections of the mango skin. Traders (as intermediaries in

Figure 6.1) associated with these markets are contacted by the growers, as the growers know when the products are to be graded. The traders visit the growers, buy the product, and manage the transportation. The acceptable products are prepared for the packing process. This process is carefully handled by the growers and the exporters in order to avoid bruising the mangoes and to protect them during the transportation from the farm to the VHT plant. The packaging of mangoes is mostly managed by the exporters using their containers which are covered with newspapers, and with foam netting covering each fruit. After packing, the mango is transported to VHT plants. This process of transportation is managed by the exporters who take responsibility for product delivery to their VHT plants.

In the case of growers who manage the grading process themselves, they also have to manage the packing process and transportation. In our survey, only three groups of growers were allowed to grade the product, since the grading process has to involve trust between growers and exporters. The trust issue is very complicated, yet is very essential in the supply chain. These growers are well-known as experienced mango producers for export, and they have established a reputation for the high quality of their production. They therefore gain trust from the exporters with regard to grading and delivering the product. Transportation costs will be included in the price of the mango. The rejected products are normally very few in number, so the exporters might buy these products at the local market price. If too many products are considered to be unacceptable and are rejected by the exporters, the products are returned to the growers who, as a result, might lose credit and trust when it comes to the next harvest.

6.1.2 The Exporters' Activities

From Figure 6.1, the third tier in the supply chain consists of exporters whose logistical activities involve receiving customer's orders, purchasing, collecting, sorting, hot dipping, managing VHT, cooling, sizing, testing/inspecting, ripening, and packaging/labeling. When exporters receive orders from customers, they contact mango growers in order to purchase the product. Exporters and growers normally have an annual contract farming which guarantees production yield and price, so that both could estimate their production in each period of the year, since Nam Dok Mai mango can be

produced all year round in Thailand. Figure 6.2 demonstrates the mango season and the mango production of the various provinces in Thailand. Even though the in-season mango period is shorter than the off-season period, good production planning could resolve product deficiency during the off-season, and control production yield throughout the year. Exporters initially visit grower's orchards before creating a contract farming agreement in order to ensure that the growers reach production standards, particularly with regard to chemical residue and contamination.

In terms of collecting the product, the exporters mostly visit the orchard to grade and collect the acceptable products. When the products are delivered to the VHT plant, exporters sort them by size and weight, and then trim the fruit stems of the product, rinse the ruit with sterilised water to eradicate fruit fungus, and to prepare them for the hot dip process. Hot water treatment or hot prochloraz solution entails dipping products in 50-55°C heated water for approximately 10 minutes, then preparing the products for VHT. According to the regulations of the MHLW (see Chapter 3), mango exported to Japan has to be VHT processed at a temperature of 47°C of mango seed for 20 minutes in order to kill fruit flies. After VHT, the heated products are cooled down (cooling process) by blowing or spraying. In order to ascertain that fruit flies are completely eradicated by VHT, Japanese inspectors are send to test the product by randomly cutting mangoes to check their flesh and seeds. The VHT processed mango is sent for sizing based on the customer's orders and finally packed and labeled.

The packaging has to be in the form of a corrugated box (40x52x10 cm.). For air freight, the box should have two open air holes (2.5x7 cm.) on each side and be covered with netting. For sea freight, the package should have six air holes on the top and the bottom of the box (2.5x7 cm.) and be covered with netting, whose diagonal mesh should be less than 1.6 mm. The box has to be printed "FOR JAPAN" (3x15 cm) on at least three sides of the box. The box has to have a logo (5x15 cm) demonstrating "TREATED" on the top and "PQ-DOAE-THAILAND" on the bottom. The texts are red on a white background as shown in Figure 6.3. To label a mango, a sticker must be attached on every mango in order to indicate that the mango has completed VHT. The sticker is round (1.5x2.5 cm) with the blue text "PQ. THAILAND" on a white background as shown in Figure 6.4.

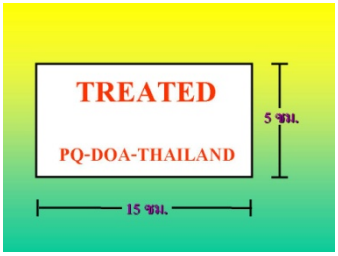

Figure 6. 3: A logo on the exporting packaging of mango to Japan

Source: DOAE (undate)

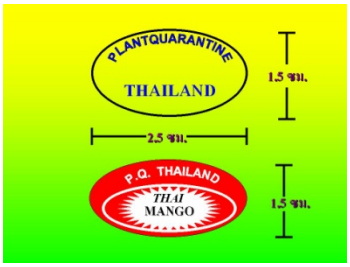

Figure 6. 4: A sticker on an exported mango to Japan

Source: DOAE (undate)

6.1.3 DOA's Activities

Another important stakeholder in the supply chain is the DOA which plays an important role in supporting growers due to its responsibility for conducting strategic development plans for Thai fruit production, particularly mango for export (see Chapter 4). To export mango, documents by the DOA are needed, including GAP for growers, GMP for VHT plant, and phytosanitary certificates. These documents have to be audited by Thai customs. The certificated products are finally freighted to Japan. Freighters/forwarders play a role in terms of document tracking and product handling. When the product is delivered to Japan, it has to be inspected by Japanese customs under MHLW at the import station (see Chapter 3). The importers take responsibility for distributing the imported products to their customers in Japan.

All stakeholders in the mango supply chain are connected in terms of product flow and information flow along the chain. Without any one of the stakeholders, the

chain cannot perform effectively. However, this research focuses on two stakeholders - mango growers and exporters - who are the key players in the chain. The research findings associated with the survey and the interviews are discussed hereafter.

6.2 Results with Regard to the Mango Growers in Thailand

6.2.1 Overview of the Mango Growers in Thailand

There are 792 groups of fruit growers in the whole country; 92 of them consist of mango growers with 78 groups of mango growers being registered as community enterprises (Phomsupa, 2008). However, not all of them produce mangoes for export. According to the Thai Mango Growers Association, only 29 groups of mango growers regularly export their products. From across Thailand, those who produce Nam Dok Mai mangoes for export are located in the North, Northeast, East, and Central regions. In terms of the most productive regions, there are 19 groups of mango growers producing mangoes for export to Japan. Nine of these groups are located in the North, one group is located in the Northeast, three groups are located in the East, and six groups are located in the Central region (Thai Mango Growers Association, 2010). Figure 6.5 demonstrates the location of the 19 groups in each region of Thailand.

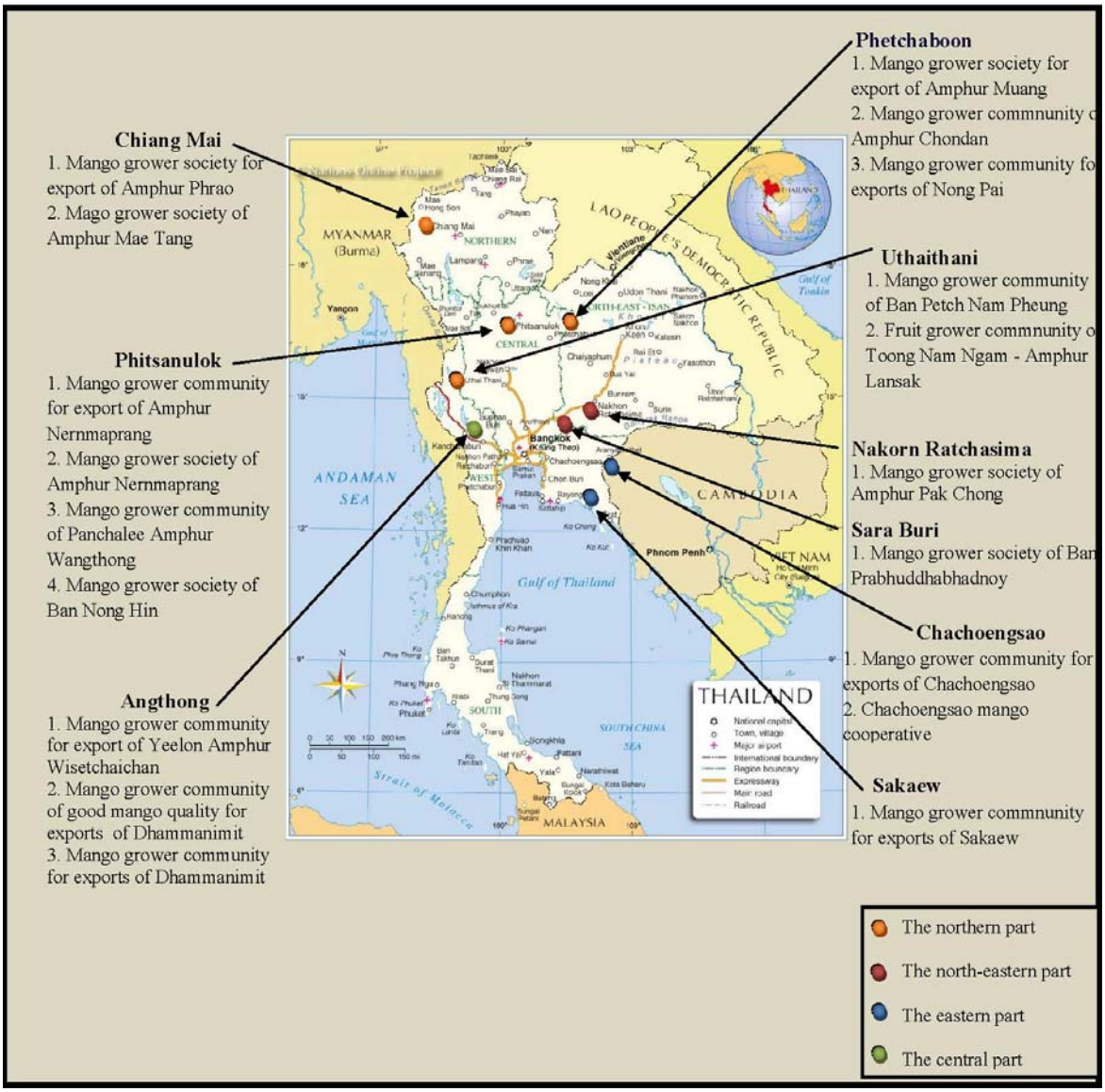

Figure 6. 5: Mango growers of the major mango producing regions in Thailand

According to Figure 6.5, the Northern region consists of Chiang Mai, Phitsanulok, and Petchaboon. There are two groups of mango growers in Chiang Mai, namely the mango growers society for the export of Amhur Phrao, and the mango growers society of Amphur Mae Tang. In Phitsanulok, there are four groups of mango growers, namely the mango growers community for the export of Amphur Nernmaprang, the mango growers society of Amphur Nernmaprang, the mango growers community of Panchalee-Amphur Wangthong, and the mango growers society of Ban Nong Hin. In Petchaboon, there are three groups, namely the mango growers society for the export of Amphur Muang, the mango growers community of Amphur Chondan, and the mango grower community for the export of Nong Pai. The Northeastern regions consists of Nakorn Ratchasima which has one group of mango growers, namely the mango growers society of Amphur Pak Chong. The Eastern region consists of Chachoengsao and Sakaew. There are two groups in Chachoengsao, namely the mango growers community for export of Chachoengsao, and the Chachoengsao mango cooperative. One group in Sakaew is the mango growers community for the export of Sakaew. The Central region consists of Uthaithani, Angthong and Sara Buri. There are two groups in Uthaithani, namely the mango growers community of Ban Petch Nam Pheung, and the fruit growers community of Toong Nam Ngam-Amphur Lansak. There are three groups in Angthong, namely the mango growers community for export of Yeelon-Amphur Wisetchaichan, the mango growers community of good mango quality for the export of Dhammanimit, and the mango growers community for the export of Dhammanimit. There is one group in Sara Buri, namely the mango growers society of Ban Prabhuddhabhadnoy.

To capture the overall picture of supply chain management, the researcher conducted a field survey investigating the production process of growers in their orchards. As the research objective needs to identify the weakness in the supply chain management through problematic logistics activity, the survey was performed involving semi-structured interviews with growers in order to gather rich information. The overall findings from the field survey will henceforth be discussed.

6.2.2 The Markets of the Thai Mango Growers

Since 19 groups of growers are located in different regions of Thailand (Figure 6.5), the field survey involved travelling across the country. The field survey was conducted in the period between December 2009 and March 2010 due to the different seasons of mango production in the different provinces (Figure 6.2). The field survey started in the Northeast, East, Central, and North respectively, due to the mango production season in each region. During such a season, the researcher could observe the key activities of mango production; harvesting, collecting, grading, and packing. From such observation, it was found that the activities involved in the production processes by each group of growers were similar in terms of the fundamental processes of producing products for export such as fertilizing, pruning, and wrapping. Nonetheless, producing products for export to Japan is more complicated than for domestic use due to the scrupulous restriction on chemical use (see Chapter 3).

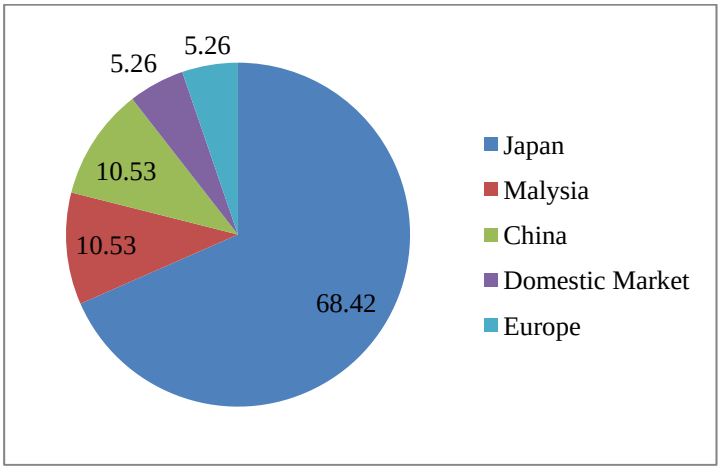

Figure 6. 6: Main export countries/regions and the domestic market

The growers produce mangoes for export to many countries as shown in Figure 6.6. It was found that most growers tend to produce mangoes for export to Japan. The reasons will be discussed in the following section.

6.2.3 Price of Mango

There are two main reasons why Japan is a large market for mango exports. Firstly, the distance from Japan to Thailand is suitable for exporting such a perishable product. In addition, there is a large price gap between mangoes sold for export and mangoes sold in the local market as shown in Figure 6.7.

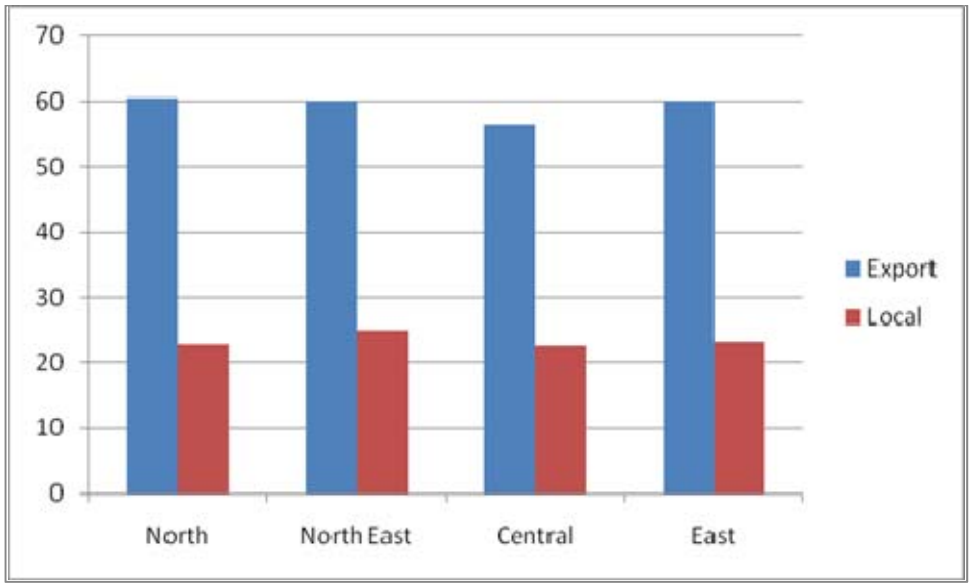

Figure 6. 7: Mango prices in terms of the export market and the domestic market (THB)

Though most growers prefer to produce mango for export to Japan, it is difficult to produce such products as of the customer's demands and the requirements of the exporters in terms of mango selection are relatively high, especially when it comes to grading. Grading techniques involve considerations of maturity, weight, skin perfection, and pest and chemical contamination. Generally, the maturity of exported mango should be approximately 85%-90%, based on the methods of transport. Mango exported by air would be harvested at a later stage of maturity than mango exported by sea. The weight of an exported mango varies from 280-500 grams depending on the customer's requirements. The acceptable proportion of skin damage of exported mangoes is approximately 5%. However, the most important factor is pest and chemical contamination, which must meet with the standard values of the Japanese market.

6.2.4 Mango grading

From the survey, it was found that the key factors for mango selection were maturity and weight, rated 100%, whilst skin perfection and contamination rated 92.30% as shown in Table 6.1. Mango skin perfection might vary due to different climatic conditions in different areas. It might be acceptable if the damage occurred naturally due to climatic or environmental uncertainty. However, it was found that 2 groups of growers were presently not able to export due to contamination. This indicates that the issue of pest and chemical contamination is a great concern, and it needs strong support from the government in order to help the growers to achieve GAP.

Table 6. 1: Key factors of mango grading

Key factors of mango selection	Response
Maturity	100%
Weight	100%
Skin perfection	92.30%
Pest and chemical contamination	92.30%

6.2.5 Mango Transportation

In terms of transportation of fresh mango from a farm's collecting point to a VHT plant, small trucks with a loading capacity of less than 2 tons are used. Most of these vehicles belong to the exporters. The exporters send their own trucks to collect the mangoes at the farm's loading points which are mostly located on nearby group leader's farms. There were two common conditions with regard to transporting mango (Figure 6.8). It was found that in terms of long distance delivery (such as from the northern region) only 33.33% of the trucks used a temperature control system in delivering fresh products, whereas the remainder (66.66%) were non-temperature control. The reason of using non-temperature control was that transportation mostly occurred at night when the temperature was not as high as during the daytime.

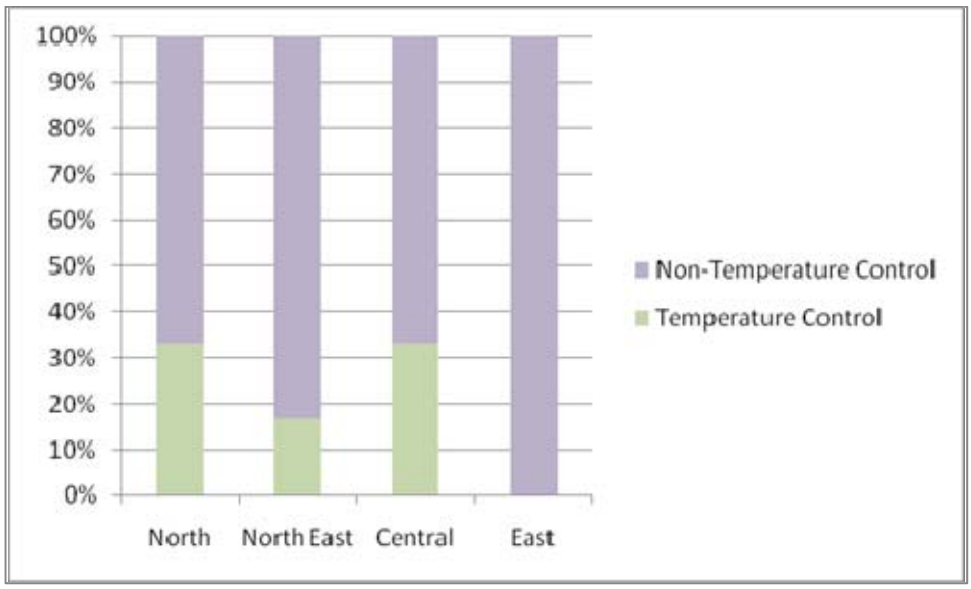

Figure 6. 8: Transport conditions from farm collecting points to factories

6.2.6 Mango Production Period

One of the advantages of Thai mango is the capability with regard to all year round production due to different geographic locations and different weather conditions. Figure 6.9 showed the mango harvesting time and production. Although the exact mango season is from late February to May, mangoes naturally ripen early in the central region, and late in the northern region. Although experienced growers could manage off-season production, they have to spent time and money on the necessary techniques. If all the year production is planned, Thailand is able to export fresh mangoes all the year round.

No.	Group Name	Province	Region	Period of Production Yield											
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Mango grower society for export of Amphur Phrao	Chiang Mai	North												
2	Mango grower society of Amphur Mae Tang	Chiang Mai													
3	Mango grower community for export of Amphur Nernmaprang	Phitsanulok													
4	Mango grower society of Amphur Nernmaprang	Phitsanulok													
5	Mango grower community of Panchalee Amphur Wangthong	Phitsanulok													
6	Mango grower society of Ban Nong Hin	Phitsanulok													
7	Mango grower society for export of Amphur Muang	Phetchaboon													
8	Mango grower commnunity of Amphur Chondan	Phetchaboon													
9	Mango grower community for exports of Nong Pai	Phetchaboon													
10	Mango grower community of Ban Petch Nam Pheung	Uthaithani	Central												
11	Fruit grower commnunity of Toong Nam Ngam - Amphur Lansak	Uthaithani													
12	Mango grower community for export of Yeelon Amphur Wisetchaichan	Angthong													
13	Mango grower community of good mango quality for exports of Dhammanimit Angthong	Angthong													
14	Mango grower community for exports of Dhammanimit	Angthong													
15	Mango grower society of Ban Prabhuddhabhadnoy	Sara Buri													
16	Mango grower community for exports of Chachoengsao	Chachoengsao	East												
17	Grower co operative of Chachoengsao limited	Chachoengsao													
18	Mango grower commnunity for exports of Sakaew	Sakaew													
19	Mango grower society of Amphur Pak Chong	Nakorn Ratchasima	N/A												

Figure 6. 9: Production period of mango in Thailand

6.2.7 Contract Farming

Theoretically, it is essential for growers and exporters to engage in contract farming. Contract farming is useful for both growers and exporters in terms of traceability and a guarantee of production forecasting. From the interviews, all exporters have a contract with their growers. However, according to the survey it was found that only 30.77% of growers had signed a contract with exporters. Most growers (46.15%) did not sign such a contract, while 23.08% made partial contracts which meant that the exporters actively made deals with growers, but did not enter into an official contract as shown in Figure 6.10. Although the government encouraged growers to officially engage in contract farming, there were a number of growers who were worried about contract penalties if they could not meet the production requirements as detailed in the contract. Those growers who officially signed contracts agreed that contract farming could encourage them to meet the requirements and gave them an opportunity to have a long-term relationship with the exporters. Nonetheless, most exporters agreed that contract farming was just a document signed between exporters and growers, but it was not completely implemented at present. Contract penalties had not been applied to any growers, since exporters understood the conditions of agricultural produce that depended on an uncertain climate. If the penalty was strictly applied, growers might not agree to sign a contract.

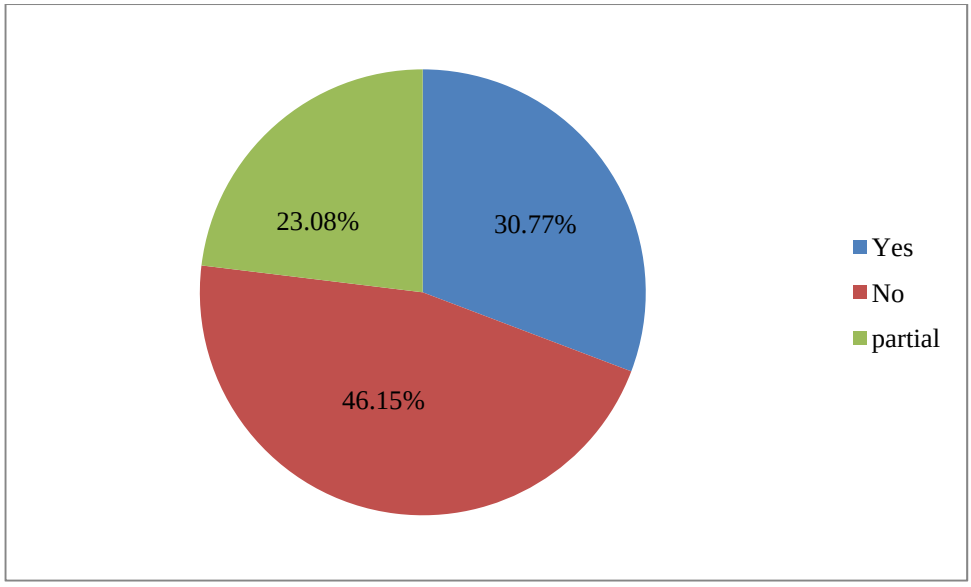

Figure 6. 10: Proportion of contract farming

6.2.8 Business Partner Selection

In terms of key factors for selecting business partners, all growers ranked money as the most important factor. Growers preferred their business partners to pay by short credit terms or cash, so that they could manage their cash flow. The second important key factor was the grading process with regard to mango selection (76.92%) in that the measureable grading processes were weight and maturity, whilst skin perfection was obviously classified based on the opinion of the exporter's staff. Growers claimed that in the high mango season, when supply was greater than demand, the grading was remarkably strict, whereas during the off season, when demand was greater than supply, the grading was compromised. This subjective grading should clearly be standardised. In addition, the more unqualified products there were from mango grading, the greater was the growers' burden, since they have to find another market such as the Chinese market or the domestic market in order to sell their remaining products which might not as premium as the Japanese market, leading to a far lower price. The least important factor was long term business partner relationship and information sharing (7.69%) in that most growers did not put much weight on long-term relationships with their business partners. Growers seemed to take tangible values such as money and grading as being important, rather than intangible values such as relationships, even though the long term relationship might cause a subsequent sustainable supply chain. Table 6.2 demonstrates the key factors from the point of view of growers in terms of selecting their business partners.

Table 6. 2: Key factors for selecting business partners

Key factors for selecting business partners	Response
Money	100%
Grading process	76.92%
Long-term business partnership and information sharing	7.69%

6.2.9 Problems and Barriers affecting Growers

The problems and barriers affecting mango growers were ranked in decreasing order: anthracnose disease (23.08%), commitment between growers and exporters

(23.08%), pest and chemical contamination (15.38%) and production volume not meeting market demand (15.38%). The most frequent problem was anthracnose, a disease affecting the pre-harvest stage, with the symptom appearing later in the fully ripened stage. To prevent the disease, growers have to seriously manage their farms as anthracnose free areas during the early stage of growing mango. Mango with the early stages of anthracnose infection might be acceptable in the domestic markets, but would be definitely rejected in the Japanese market. As a result, mango exporters were greatly concerned about the disease, although it was difficult to identify the incidence of the disease since the symptoms might not occur until the product was fully ripe. When the symptoms occur, most of the products had already been transported to the Japanese market. When the infected products are recognised, it is too late to replace them. Growers might not realise that although anthracnose might be acceptable in the domestic market, this was not the case in the export market. Better farm management should be implemented for export production. The other most frequent problem was the commitment between growers and exporters, in that growers usually experienced a problem with regard to price commitment on the part of exporters. In the case of mango over-supply, which normally occurs during the mango harvesting season, most exporters tend to have more powerful price negotiation positions, even though a commitment to the price was included in the contract. This problem disadvantages growers in terms of deriving benefit. The other problem is pest and chemical contamination in that some growers still lack knowledge of contamination control, although the government and exporters have attempted to provide knowledge and a how-to checklist. The last most mentioned problem was the production volume which did not meet market demand although growers attempted to produce more yield to match the demand of their exporters. Besides, growers normally overlook the fact that the greater the product quantity, the lower the product quality. As a result of increasing yields, the growers have difficulty maintaining product quality. This problem appears in the form of unacceptable products for the export market. The other problems and barriers were problems of sharing the cost of transport, the lack of new markets for unacceptable mangoes, the awareness with regard to harvesting immature mangoes, the lack of government support, a lack of labour, product packaging, and barrier to sharing information between growers (Table 6.3).

Table 6. 3: Summary of problems and barriers affecting growers

No.	Problems and barriers	%
1	Anthracnose disease	23.08
2	Pest and chemical contamination	15.38
3	Sharing cost of transport	7.69
4	Lack of new markets for unacceptable mangoes	7.69
5	Awareness of harvesting immature mangoes	7.69
6	Commitment between growers and exporters	23.08
7	Production volume not meeting market demand	15.38
8	Lack of government support	7.69
9	Lack of labour	7.69
10	Packaging	7.69
11	Barriers to sharing information between growers	7.69

6.3 Results of Mango Exporters in Thailand

6.3.1 Overview of Mango Exporters in Thailand

The mango exporting business is very competitive in Thailand as the Thai government has launched a strategic policy for enhancing mango production and exports (see Chapter 4). Each export country has its particular restrictions regarding food safety. According to the MHLW, every mango exported to the Japanese market has to be processed using VHT. From the records of the DOA (2010), there are 47 mango export companies in Thailand. However, only eight exporters have their own VHT plants. Out of these eight exporters, one of them has temporarily discontinued export to Japan due to the problem of chemical contamination, and another exporter has a data protection policy. Due to these limitations, the researcher could only collect data from six exporters who own VHT plants. The field survey and semi-structured interviews were used in order to investigate the activities involved in processing mangoes for export to Japan. The interview respondents were plant managers, directors, and CEOs of the companies concerned. The case study of these six companies will be discussed henceforward.

In terms of the semi-structured interviews, lists of questions were used to obtain information from the mango experts. The exporting companies mainly produced high

quality products for exporting to Japan (100% of the export companies mainly export mangoes to Japan). Also the first activity of all exporters was product recheck (100%) as a result of the long distance transportation that might damage the products. In addition, all exporters could accept a 5% loss of products while in transport, from the farm collecting points to the factory. Most exporters applied the same standard procedure for product delivery. The procedure began with company staff being sent from headquarters to monitor the selection process at the farm collecting points. Mangoes were then transferred by small trucks with or without a temperature control system, depending upon each company, and these delivered the mangoes to the factory.

6.3.2 Vehicles for Mango Transportation

In terms of transportation from the growers' collecting points to the factory, half of the exporters used small trucks with a capacity of less than two tons for product delivery without any temperature control. Only one-third of the exporters used cool trucks with temperature control. The rest (one exporter) used hired trucks outsourced by the growers and the cost of transportation in this case was added to the price of mangoes sold to the exporter (Figure 6.11).

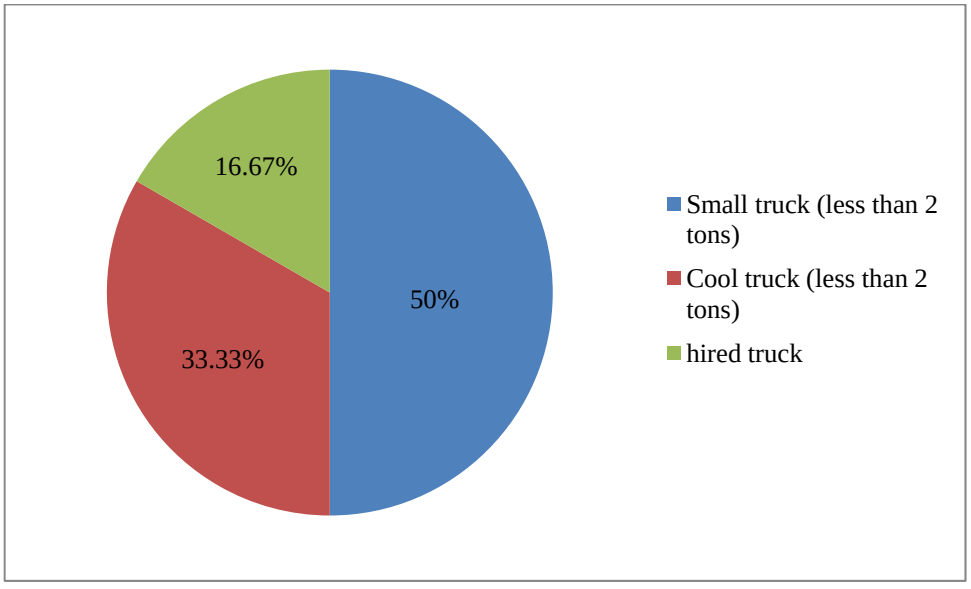

Figure 6. 11: Type of vehicle for domestic transport

In terms of overseas transport, although the cost of air freight was much higher than sea freight as mentioned in Chapter 3, half of the exporters transported their products by air due to convenience and the short lead time. In fact, these exporters were interested in sea freight transport, but the problem of anthracnose, which exhibited its symptom at a later period, was a greater risk associated with sea freight. Only one exporter seemed to make use of sea transportation, although this company still kept air freight as an alternative (Figure 6.12).

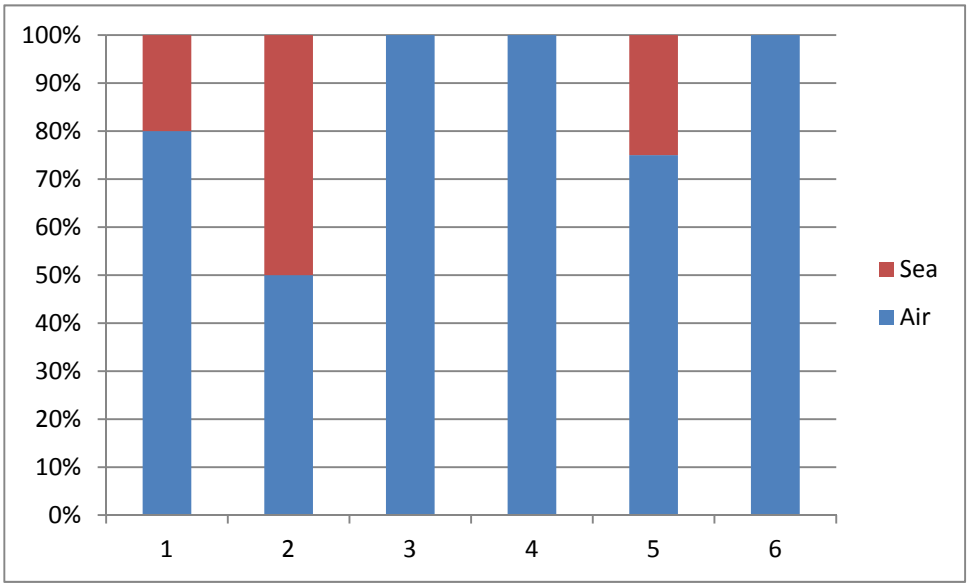

Figure 6. 12: Proportion of overseas transportation of each exporter

6.3.3 Business Type on the part of Thai Mango Exporters

Two-third of exporters were in a joint venture with Japanese companies in Japan so that their Japanese business partners could send product orders to them. These Japanese business partners were responsible for finding markets and for product distribution. In fact, most Thai exporters tended to seek Japanese business partners since Thai exporters did not have much negotiating power in this kind of relationship. There was one multinational company which ran this business. In this case, their headquarters were mostly located in Japan in order to manage the Japanese market. The rest (one company) was a Thai exporter which was quite a newcomer to the market without any Japanese business partner. However, seeking a Japanese business partner is essential

when it comes to running a business in Japan. Figure 6.13 demonstrates the type of business of exporters in Thailand.

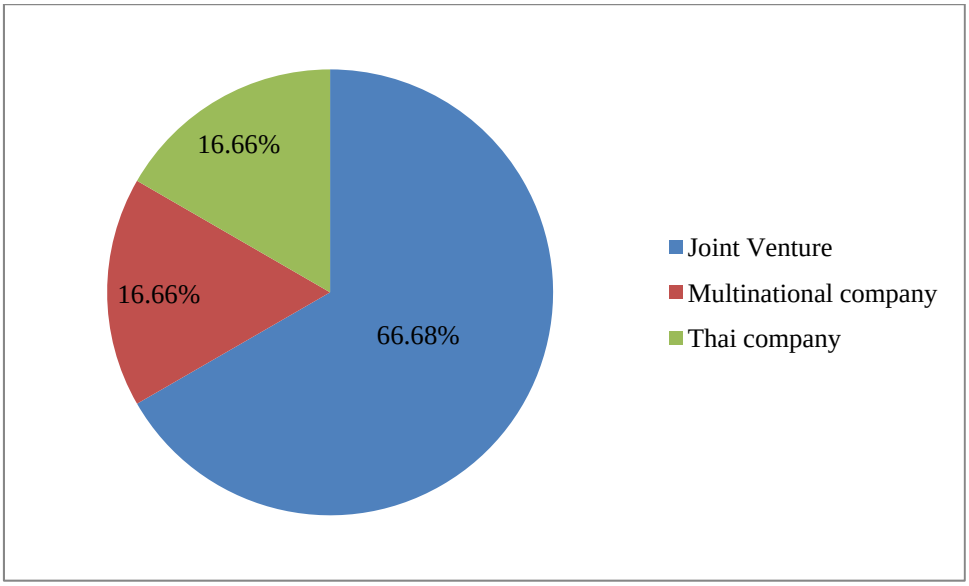

Figure 6. 13: Types of business on the part of Thai mango exporters

6.3.4 Problem and Barriers facing Thai Mango Exporters

A number of problems and barriers facing mango exports were mentioned by mango exporters (Table 6.4). All exporters agreed that they did need long-term relationships with their partners from both upstream and downstream in the supply chain. Exporters needed a long-term relationship with growers to ensure that the investment of know-how and technology would be productive, especially in terms of the farm management of mango exports since they need intensive care, particularly in the early pre-harvest stage. Besides, exporters needed long-term relationship with their business partner since they understand the requirements, limitations and preferences of the partner. Although finding new business partners was important, keeping the existing one(s) was also essential.

The second problem usually found by five out of the six exporters under consideration was demand and supply variations due to the nature of agricultural products which depended on climate. Growers sometimes overestimated their production which led to insufficient products for the exporters.

The third important problem was grading (mentioned by two-third of the exporters). During the grading process, exporters had to accept products of a smaller size when selected by the company's staff, although the products might not match the size ordered by the customers. To meet customer demand and to maintain the relationship with growers, exporters had to find other markets in order to distribute the products.

The fourth problem frequently found by half of the exporters surveyed was that growers focused on product quantity rather than quality. It cannot be denied that the more volume of the product that is sold, the more growers earned. But for a long-term relationship, this could cause a lot of problems. There were two examples of this problematic issue; the first related to anthracnose infection of the product, while the other one was immature products. Anthracnose is a mango disease which infects the products during the pre-harvest process, but symptom of the disease only appear at the full ripe stage. For exporters, this issue is extremely serious. Products from farms are sold to exporters when the products were not fully ripe and the symptom were not visible. The symptom would then appear at the end of the mangoes being transported, particularly following a lengthy journey by sea. Once the products were rotten, they could not be sold on the market. Exporters could not practically claim or return the damaged product to the growers. To solve the problem, growers had to introduce good farm management during pre-harvest and this should be considered as part of a long term relationship. The other case was immature products. Mangoes for export need to be harvested at 85%-90% maturity. It is crucial to harvest the product at this stage of ripening, because the strength of the Nam Dok Mai variety was its sweet flavour when it was fully ripe, whereas its weakness is its sour taste if it does not reach its full ripened stage. Experienced mango growers are easily able to classify the mango's maturity. Even though exporters randomly check the product's maturity at the farm's collecting point, some immature products may be intentionally sold to exporters. When the imperfect products are sold on the market, customers have a bad perception of the product, and this discredits the image of Thai mangoes as a whole. Thus, the growers should be concerned with the quality of the product as an image of the country.

The other problems were difficulty in controlling the supply for all year round production (one-third of exporters), administration delays on the part of the government with regard to signing the Sanitary and Phytosanitary Measures (SPS) certificate (one-

third of exporters), pest and chemical contamination (one-third of exporters), inadequate information sharing between exporters and their joint venture partners (one-third of exporters), difficulties in doing their own marketing (one-third of exporters), lack of information sharing (one-third of exporters), production delays (one-third of exporters), and growers' lack of knowledge in product selection in terms of its maturity stage (one exporter). In addition, the trust issue should be considered in supply chain relationships in order to create long term and sustainable relationship between stakeholders.

Table 6. 4: Summary of problems and barriers facing exporters

No.	Problems and barriers	%
1	Demand and supply variation	83.33
2	Sizing	66.66
3	Control supply of all year production	33.33
4	Need long term supply relationship	100.00
5	Administration delay from government in terms of sign "Sanitary and Phytosanitary Measures (SPS)" certificate	33.33
6	Contamination	33.33
7	Sharing of information between exporters and joint venture partners	33.33
8	Have to do own marketing	33.33
9	Lack of information sharing	33.33
10	Growers focus on quantity rather than quality	50.00
11	Lack of knowledge of growers (immature mango has sour taste leading to dissatisfied customers)	16.66
12	Production delay	33.33

6.4 Role of Government Sector in Supply Chain

6.4.1 Budget Allocation

The Thai government formulated a strategic policy in 2009 for developing Thai fruits for exports from 2010 to 2014. The Thai mango was one of the selected fruits in the strategic plan as mentioned in Chapter 1. In the past, the government did not greatly support mango production as much as other crops which faced more problematic issues such as the problem of a drop in price in the case of corn, longan, rice, and cassava, and drought problems. Among other crops, mango was considered as a potential export fruit

that did not need primary support from the government, since mango growers or exporters seldom directly issued any urgent appeals to the government. The fiscal budget for supporting economic crops was therefore allocated to the above-mentioned crops other than to mango. Recently, the Thai government has changed its agricultural fiscal budget from centralisation to localisation. The fiscal budget, which was directly controlled by the Ministry of Agriculture and Cooperatives (MOAC), was directly in the consideration of each district. District-chief officers would allocate a budget based on district strategic plans which varied for each district. There might be an opportunity for supporting mango growers if a district's strategic plan focused on mangoes and fruits for exports. On the contrary, if the strategic plan focused on other aspects such as tourism, manufacturing industry and the textile industry, the mango issue would not be prioritised for budget allocation. To consolidate permanent support from the government, the mango growers agreed to establish the Thai Mango Growers Association in order to support the growers in terms of information and knowledge sharing, and also to be a hub of coordination with government sectors, especially the DOA and the Department of Agricultural Extension (DOAE).

6.4.2 Knowledge Dissemination

The DOAE is responsible for disseminate knowledge to mango growers by conducting seminars and workshops with regard to how to achieve GAP which is essential in order to standardise farm practices. GAP in Thailand involves eight principles that growers have to adhere to in order to receive GAP certification approved by the DOA in order to export their products as mentioned in Chapter 3. In addition to a budget provided by the government, the Thai Mango Growers Association cooperate in partnership within a supply chain with other organisations such as a global enterprise producing fertilisers, and a company producing agricultural machinery and equipment, in order to conduct GAP seminars and other useful forums and to create a network. The network of the Thai Mango Growers Association mostly consists of active mango growers who are eager to develop their production and enhance their competitiveness.

Still, there are a number of inactive growers who do not follow GAP practices, or only expected support from the government.

The mango export business in Thailand is very dynamic since demand exceeds supply, especially in Japanese market. In this supply chain, it cannot be denied that the government focuses on growers rather than on exporters. Also, it is crucial to educate exporters about perishable product management, product restrictions and related news. Mango is a perishable product which has limitations in terms of time and storage. There are some cases of Thai exporters who failed to export fresh mango due to anthracnose. Exporters therefore need to be educated in order to manage their products perfectly from farm to customers; otherwise the failure of product management might affect the reputation of Thai mango exports as a whole.

6.4.3 Exporter Qualifications

Entering commercial business is not complicated in Thailand; many market seekers take this opportunity in terms of mango exports. The Thai government has experienced problems associated with unqualified products for export to China. Since mango exports to China did not require VHT nor Sanitary and Phytosanitary Measures (SPS), some exporters are careless about chemical residue that discredits mango exports from Thailand as a whole. Besides the problem of unsatisfactory products, Thai growers also experience credit fraud on the part of these exporters. In the case of Australia, exporters have to be qualified in terms of financial credit and skillful or knowledgeable with regard to post-harvest management and logistics for perishable products. They have to be educated by the government so that they could officially be registered for operations in the market. Another example of great exporter management is the case of Singapore. The government of Singapore supports exporters by creating national branding for exports. The government issues a sticker provided by the Exporters Association for labeling exported products as a guarantee of a product's quality. There is still more room for the development of the mango supply chain in Thailand. One of the most important aspects besides this is that producers and exporters should be ethically concerned about a long-term relationship along the supply chain to ensure a sustainable business

partnership, rather than being content with a short-term relationship aimed at only maximising their profit.

6.5 In-Depth Interview Summary with Government Sector Representatives

In a series of in-depth interviews with a number of authorities in concerned government agencies, an interviewee in charge of fruit, and attached to the Department of Agricultural Extension (DOAE), expressed an opinion that off-season mango production has become increasingly popular among growers owing to its higher commercial viability and its superior pricing position when compared to seasonal cultivation. In addition, agricultural technology available at present, makes off-season mango cultivation increasingly possible.

6.5.1 Grading System

With regard to the grading standard, it is found that grading standard strictness varies depending on the market mechanism. More stringent grading standards are imposed during the season for mangoes, when supply usually excess demand. On the contrary, the imposition of less stringent grading standards is common and even negotiable as a direct consequence of inadequate supply amidst ongoing strong unmet demand during the off-season period. A lack of understanding of this basic law of supply and demand on the part of growers inevitably leads to conflict between growers and exporters. However, another interviewee, a plant science and production expert, is in favour of regular stringency without regard to seasonality in terms of mango crop yields. CODEX, an internationally recognised standard relating to food, is currently applied to Thai mango farming. According to the CODEX requirements, mangoes qualified for export are allowed to have a certain percentage level in terms of acceptable defects. In part, the CODEX can safeguard growers against unfair treatment by the exporter acting as a middleman. In addition, the Chief of the Certification Coordination Group attached to the Department of Agriculture (DOA), reiterates the importance of growing off-season mangoes to ward off oversupply pressures and to cushion the potential impact of irregular grading practices.

6.5.2 Fiscal Budget

With regard to government budgetary support for the Thai mango export industry, the interviews reveal that the government sector places considerable importance on problematic agricultural products such as longan, rice, cassava and corn. The frequent price falls with regard to these crops and the subsequent protests among growers, force the government to prop them up with substantial portions of its available national agricultural budget. This heavily funnelled budget is also applicable to ad-hoc rescue packages launched by the government when natural disasters cause devastation on these crops. Despite being included in a list of high-potential crops qualified for national export fruit development programme, mango production still fails to have the full support of the government in terms of both financial support and technical know-how. Therefore, it is necessary for growers to be more self-reliance by means of the formation of their own associations. Aside from this challenge, budget spending at a regional level depends largely on the direction of provincial development strategies that naturally vary from province to province. Some provinces may decide to promote agricultural strategies; others may adhere to the promotion of tourism or industrial strategies. Each province focuses its available resources and budget on projects and efforts consistent with its decided development strategies. Although there is an intense focus on agriculture in the development strategies of most regional provinces, mango could encounter budget cuts in that it is not viewed as a main economic crop, due to the smaller size of its dedicated cultivation area when compared to other crops. The evolution of regional government from centralisation to decentralisation within the provinces has shifted local decisions on provincial development strategies from heavy reliance on centrally tailored policies in the past, to today's leaner, locally-decided and more independent procedures, resulting in a shortage of financial aid for the agricultural sector on the part of some provinces. This circumstances differ from the past when government entities such as the Department of Agricultural Extension, was authorised to allocate its annual budget for development projects aimed at virtually all economic crops.

6.5.3 Knowledge Management

On the export know-how management front, an opinion expressed by a representative from a government agency reveals that Thai exporters have not been adequately equipped with sound knowledge of the mango export business. Some exporters lack both knowledge and expertise in product handling, right from their grading stations and all the way through the entire management procedures until the final export destination. They are also not provided with practical know-how with regard to how to deal with product storage challenges that include temperature control, among others. Furthermore, not enough PR campaigns have been run to promote an understanding of the nature of Thai mango among target consumers. With these factors in combination, the Thai mango image and reputation have been damaged. In addition, as the lucrative nature of the mango export business has been arousing considerable interest among local and foreign investors, concerned government agencies should impose selection measures to screen out unqualified exporters.

Due to the fact that agricultural produce exports, particularly in the case of delicate mangoes, is a business activity involving a high degree of delicacy and expertise, both growers and exporters should be well-informed about, and gain insight into, their mango products, to best prevent potential problems from arising at their export destinations. Problems over mango exports occurring with regard to importers/consumers at the export destinations will persist into the future, and will have subsequent adverse impacts on other agricultural exporters. In some developed countries where fruit is the chief export, exporters are well equipped with technical know-how pertaining to product handling and post-harvest logistics through assistance provided by their government sectors. Such technical assistance from the government sector can help decrease their input costs, while simultaneously enhancing their competitiveness.

6.5.4 Problem of Low Barriers to Entry with regard to Mango Exporting

National branding is among the measures taken by those developed countries mentioned in the previous section. Comparatively, there is a marked difference in the management of mango exporters in Thailand. Without effective registration procedures, unqualified Thai mango exporters can enter the business without having to meet exacting

standards/requirements, for the sole purpose of reaping short-term trading benefits rather than aiming to achieve sustainable long-term commercial growth. Furthermore, these unqualified exporters are not readily equipped with standard industry guidelines on chemical uses, thereby undermining the Thai mango image and reputation among international consumers. In addition, problems over the unfair treatment faced by Thai growers partially stems from the immoral business practices of these unqualified players. Due to the factors noted above, Thailand should have in place rigorous management standards in terms of both export know-how and exporter registration, with a strong emphasis on decent business players with a solid financial background and proven expertise, instead of those seeking short-term commercial gain.

6.5.5 Good Agricultural Practice (GAP)

Concerning the adoption of GAP, the Chief of the Certification Coordination Group attached to the Department of Agriculture, a GAP expert, was of the opinion that concerted efforts from all concerned parties are in great need with regard to Thai mango exports bound for Japan; from growers to exporters and to the Department of Agriculture. The responsibility of the Department of Agriculture concerning GAP centres around certification of on-farm production and chemical uses based on the following eight requirements: 1) water; 2) soil; 3) pesticide issues; 4) on-farm stocking and transporting of produce; 5) record keeping; 6) pest management; 7) on-farm processing for quality produce; and 8) harvest and post-harvest handling, as set out in Table 6.5. Only farms in full compliance with the above requirements should be eligible for contract farming arrangements with exporters. In addition, growers are required to regularly maintain true and complete records of their pesticide use. The responsibilities of exporters regarding GAP compliance include compiling a list of growers from whom they purchase agricultural produce, and the submission of the list to concerned government agencies for supervision check against its GAP-certified farm database. Exporters also have to ensure that forbidden pesticides are not used on their contracted farms. Exporters need to make strenuous efforts to prevent violation of pesticide requirements on their contracted farms. Punitive actions must be taken without delay against violating growers, along with product purchase suspension.

Table 6. 5: GAP Certification Requirements and Criteria

Requirements	Criteria	Audit Methods
1. Water	- Water used in farming must be supplied from sources free of environmental contamination in the form of hazardous materials and microbes.	- Visually inspect surrounding environment. In case of potential risk exposure, collect water samples for lab test and analysis.
2. Field and Land	- Farming field must contain no hazardous materials and microbes potentially leading to chemical residues and contamination in agricultural produce.	- Visually inspect surrounding environment. In case of potential risk exposure, collect soil samples for lab test and analysis.
3. Pesticide Issues	- Use of chemicals must comply with, or refer to, recommendations given by the Department of Agriculture or product label registered with the Department of Agriculture, Ministry of Agriculture and Cooperatives. - Use of chemicals must be consistent with agricultural needs. - Use of hazardous materials listed in the agricultural hazardous material register is forbidden.	- Inspect the physical conditions of storage facilities for agricultural hazardous materials. - For use of certain chemicals permitted by importing country, inspect use records of agricultural hazardous materials. If in doubt, collect produce samples for lab test and chemical residue analysis.
4. On-farm Stocking and Transportation of Produce	- Storage facilities must be clean and well-ventilated and offer protection against contamination in the form of alien materials, hazardous materials and animal disease carriers. - Transport equipment and vehicles must be clean and without contamination in the form of hazardous materials with potential adverse impacts on consumer safety. - Harvested produce must be transported and handled with care.	- Visually inspect storage facilities, equipment, containers and transport means and procedures.
5. Record Keeping	- Track records of use of agriculturally hazardous materials must be maintained. - Track records of pest assessment and control must be maintained. - Track records of on-farm management for quality produce must be maintained.	- Inspect records as per checklist.
6. Pest Management	- Harvested produce must be free of pest contamination. In case of contamination, sort contaminated portions out from good portions and store them separately.	- Inspect records of pest assessment and control. - Visually inspect the separation of contaminated portions from good ones.
7. On-farm Processing for Quality Produce	- On-farm practice and management must be in line with production control plan. - Sub-standard produce must be sorted out from good produce and store it separately.	- Inspect records of on-farm practice and management. - Visually inspect the separation of sub-standard produce from good one.
8. Harvest and Post-harvest Handling	- Produce must be harvested at appropriate timeline as per criteria set out in production control plan. - Harvest equipment, containers and methods must be clean and not harmful, in order to produce quality produce without contamination from hazardous materials with potentially adverse impacts on consumer safety.	- Inspect records of harvest and post-harvest handling. - Visually inspect harvest equipment, containers and procedures/methods.

Source: Department of Agriculture (DOA, undate)

Modified: by Author

6.5.6 Chemical Residues Inspection

With respect to chemical residues and pesticide use, the imposition of strict rules and regulations governing chemical residue by Japanese authorities is beyond the understanding of some growers owing to obviously less rigid measures on the part of many other mango-importing countries. With the lack of understanding of Japan's exceptionally high standards, chemical residue requirements have been neglected by growers, eventually leading to exporters' suspension of product purchase from those non-compliant farms. Some growers are not readily equipped with chemical use know-how. In addition, low-funded growers find safe chemicals unaffordable, and therefore select more financially-friendly low-quality substitutes. The Department of Agricultural Extension is responsible for the provision of GAP training targeted at growers. However, effective implementation of its training plans has been encumbered by budget constraints. Moreover, the training sessions provided fail to reach the intended level of effectiveness, particularly in term of the practical application of the acquired knowledge in an actual farming environment.

Additionally, the same expert is of the opinion that the critical activity of mango export processing is the chemical residue inspection that lasts approximately three days. Concerned parties have confirmed that this time-consuming process is a prerequisite and necessary standard practice which is indispensable to agricultural product export. Despite the known significance of chemical detection procedures, exporters view it differently, and even blame it for long delays in the import/export process, and suggest that urgent government action is required to correct this inconvenient practice.

6.5.7 Japan's Positive List

Japan places considerable importance on the inspection of chemical residues in imported agricultural products. Japan's Positive List imposes restrictions on the amount of pesticides and dangerous material residues in imported food. Based on the Positive List, each shipment of imported agricultural products is subject to a series of inspections. The first inspection is carried out on a random basis on 30% of the whole shipment and, if it fails to pass, a second random inspection will follow. In the event that chemical contamination is detected again in the second sample, the whole shipment is then subject

to 100% inspection. This practice not only places heavy financial burdens on exporters, but also delays their product delivery to the target consumers, with their perishable fresh produce running greater risks of damage as time passes, and its shelf life becoming shorter. Furthermore, another interviewee - a senior expert in plant quarantine attached to the Department of Agriculture - states that the GAP is only a general preliminary standard for agricultural product exports, and is regarded as insufficient to guarantee the quality of the exports. In some importing countries, exporters are required to comply with additional local rules and regulations imposed by authorities in those countries, in addition to the fundamental GAP compliance. This is especially true in the case of Japan, where chemical residues exceeding restrictions will result in the quarantine of the whole shipment. Japanese procedures for detecting chemical residues in each shipment take approximately three days. However, exporters with a clean chemical history are eligible for the Japanese fast track system, which requires random inspection of some shipments only. Being qualified for the fast track system can shorten the transportation period, and the imported perishable produce can reach the target consumers more quickly, with their natural freshness and quality maintained.

6.5.8 Vapour Heat Treatment (VHT)

With respect to contract farming and vapour heat treatment, the senior expert in plant quarantine expressed additional opinions about the issues. From his point of view, it is advisable to require all exporters to enter into contract farming arrangements with growers. The reason behind this notion is that exporters need to carry out on-farm inspections to assure supply quality and compliance with chemical rules in order to meet the traceability requirements, one of the prerequisites with regard to agricultural product export. Aside from this, vapour heat treatment is another principal requirement applicable to Japan-bound mango exports. At present, out of the entire 41 mango exporters in Thailand, only eight have their own vapour heat treatment facilities. Most of the exporters without in-house VHT plant opt for outsourcing of crop procurement and VHT functions to those VHT-enabled ones, while still dealing with marketing on their own. While it is important to establish a network of growers to facilitate an effective mango export business, only major exporters are capable of fulfilling this on the back of

their larger fruit product range that in turn allows more extensive coordination with growers. According to the senior expert, most damage to mango exports occur during handling activities before the VHT process.

6.5.9 Mango Transportation

In terms of transportation, the extremely high cost of transport is the main obstacle to Thai mango exports to Japan, due to the fact that Thai mangoes are mainly shipped by air. The opinion given by Kasetsart University academics is in harmony with that of the plant quarantine senior expert in that the Philippines will remain the foremost supplier of mango to Japan. Due to the shorter distance of transport to Japan, the Philippines is capable of exporting mango by sea, a means of transport with much lower costs. Furthermore, Filipino mango is naturally more hard-peeled than its Nam Dok Mai counterpart from Thailand, and therefore can better resist a tough export/storage/packaging environment. Comparatively, Thailand is able to export mango via sea freight only when crops are gathered in sufficient quantities to pack into containers. This is commercially practicable only during the season for mangoes. Otherwise, Thai mangoes need to rely on air freight due to their limited shelf life of approximately two weeks maximum. In order to extend its shelf life, Thai growers need to harvest their crops earlier at the sacrifice of quality and natural sweetness.

However, although the crops may be in sufficient quantities to fill up a container, another serious obstacle to overcome is temperature control inside the container. Being packed in the same container, effective temperature control with regard to crops with different harvest times is difficult. In addition, the same senior expert in plant quarantine and the Chief of the Certification Coordination Group, both attached to the Department of Agriculture, were of the opinion that long periods of sea transport, probably lasting 6–7 days, can lead to the development of the plant disease anthracnose, which shortens the mango's shelf life. According to the senior expert in plant quarantine, the naturally thin peel of the Nam Dok Mai mango and its yellow ripe fruit make the disease even more noticeable. By contrast, the visual signs of disease infection are not as evident among some other mango cultivars such as ripe green or red fruits. Proposed solutions for the Anthracnose problem are effective on-farm management, which is to be implemented in

conjunction with quality control measures to be carried out right from the pre-harvest process, throughout the entire farming process.

According to the plant quarantine senior expert's perspective on the issue of Thai mango export using air freight, commercial airlines are at present usually unwilling to transport agricultural produce thanks to its space-consuming nature. Instead, less space-consuming industrial goods are more welcome. In addition, agricultural product exports in some countries benefit from government freight subsidies, designed to enhance international competitiveness in the global marketplace. However, such a freight grant is unavailable in Thailand despite its strong national policy in relation to agricultural product exports.

6.6 Strengths and Weaknesses of the Mango Supply Chain

6.6.1 Strengths of the Mango Supply Chain

From this study, there is clear evidence that growers can build up their bargaining power through strong relationships. Thai mango growers are hard-working and pro-active by nature. They organised the groups of mango growers from different parts of the country to establish the Thai Mango Growers Association in 2008. In fact, the association was gradually developed as a result of the original support from the DOAE in 1997 in order to encourage grower network development for close collaboration with the government sector (Chapter 4). This association is quite useful, not only for bargaining power, but also for supporting members in terms of information, technical know-how, and acting as a mediator dealing with the government and private sectors with regard to issues of concern.

The other strength is government policy, especially related to the campaign "Thai Kitchen to the World" in 2003 which greatly enhanced global sales of Thai food products. With that momentum, the Thai fruit development strategy for 2010-2014 was then established in 2009. Under this strategy, Fruit Funding Development was established. The DOAE was appointed as the government agency responsible for controlling the quality of agricultural products and for transferring agricultural technology to growers to maximise income and security for their agricultural occupation

(Chapter 4). Interestingly, the success of the government policy, in this case, is entirely based on the strength of Thai food products per se, which dominate the food global market.

One of the strengths of Nam Dok Mai cultivation is its premium quality. Thailand produces first class mangoes in terms of the qualities of colour, flavour, texture and taste. Its weak points are only its susceptibility to disease and its short shelf life. It is required further research and development to overcome these advantages in the near future. With regard to technological issues, there is another strength in the mango supply chain. Nam Dok Mai can bear fruit nearly all the year round. Production during the off-season creates more opportunities for business for mango growers.

6.6.2 Weaknesses and Difficulties of Mango Supply Chain Management

With regard to key factors of mango selection (Table 5.3), most growers are mainly concerned with the tangible value rather than with the intangible value of the product. The tangible values are mango maturity, weight, and skin perfection which can be visually measured by exporters. These tangible values directly impact on the grading process. According to the interviews with representatives of the DOA, a professor from Kyoto University, and exporters, the most important issue in terms of mango quality is concern over chemical residue and contamination. Excessive use of chemical to eliminate fruit flies and diseases considerably impact on the product quality in terms of food safety and hygiene according to the regulations of the MHLW. Contamination could be checked by the DOA and by the Japanese customs authorities. If the DOA detects any contamination, the product is returned to the exporter who might return the product to the grower for compensation. In the event that contamination is detected by the Japanese customs authorities, the product is rejected, and the exporter might be black listed. Growers who have a long-term relationship with exporters are acutely aware of this issue, so that they have good farm management right from the pre-harvest stage, whilst some growers who have a short-term relationship might ignore the contamination issue. One of the reasons for excessive chemical use is anthracnose. In some regions which have a high potential for disease infection, growers have to use more pesticides than is the case in other regions. As mentioned in previous chapters, anthracnose is found at the fully

ripened stage of the fruit, so that the primary risk takers in this case are exporters or Japanese importers. For these reasons, exporters prefer to visit the orchard and grade the products by themselves.

Grading is one of the main problematic issues. It is essential to clarify the standards associated with the grading process, since the standards usually shift in different seasons. Even though the contract entered into states the criteria for acceptable products, the criteria may change due to the market mechanism. Almost all respondents agreed that the contract farming agreement is not actually applied. The agreements on grading and pricing are mostly based on negotiation and satisfaction. As mentioned earlier, the market mechanism is the dominator of mango grading and pricing. Grading standards should base on the contractual agreement which is signed by both parties. Growers claim that exporters change the grading standard, making them more stringent during the in-season period, whilst the exporters claim that the purchasing volume is limited during the season. In order to solve this problem, growers and exporters should engage in joint production planning. Exporters should provide useful information to growers, especially marketing information, and should support production, particularly by providing technological support such as wrappings, fertilisers, containers, and agricultural equipment. On the other hand, growers should engage in the business process with greater trust. This is because this high grade product is under intensive care in terms of cultivation, mostly fruit by fruit. The unsatisfactory product, such as in terms of wrong size, unripe fruit, fruit with scars and defects might be preliminarily sorted out to become second grade products. The use of pesticides should be strictly controlled based on GAP guidance. Therefore, the most important issues for either strengths or weaknesses are trust and close collaboration, since they are the key essentials for this high value perishable product.

6.7 Conclusion

In the mango supply chain there are eight stakeholders; 1) manufacturers/suppliers of agricultural inputs, 2) growers, 3) intermediaries, 4) exporters, 5) the Department of Agriculture, 6) forwarders and freighters, 7) Japan's custom authorities and 8) importers. However, this research focuses on key stakeholders in the

chain who directly create value in the supply chain, in the form of mango growers and exporters. There are 19 groups of growers from Northern, North-eastern, Eastern, and Central regions of Thailand, and case studies of six exporters were studied in this research.

The growers studied are small groups of mango producers from four main mango production regions in Thailand. Growers play a role in the pre-harvest and post-harvest stages of production. Pre-harvest production places emphasis on GAP and value adding in terms of logistical activities in the form of fertilising, pruning, and wrapping; well-fertilised mango is strong enough not to be damaged by heat from VHT; a well-pruned mango tree is stimulated to produce healthy and high quality mango fruit; and well-wrapped mango fruit potentially has a flawless skin condition. Harvest activities involve product collection which is managed by mango group leaders. The grading process is mostly done by exporters who take into consideration the mango skin's condition, its size and weight, and fruit maturity. The grading standards and price agreement are mostly based on market mechanisms rather than on any contract farming agreement.

Exporters in this study are the owners of VHT plant. The logistics activities of exporters involve receiving customer's orders, purchasing, collecting, sorting, hot dipping, managing VHT, cooling, sizing, testing/inspecting, ripening, and packaging/labeling. Most of these activities are followed the restrictions of the MHLW in terms of food safety and hygiene.

In the mango supply chain, stakeholders are linked altogether by the product flow and information flow throughout the chain. To enhance competitiveness, they have to work collaboratively to ensure an effective and efficient supply chain. Such collaboration only works when the players have established good relationship and trust. Trust could be gained from consistency in production. Growers could have consistent production which means that they can deliver products which meet the exporter's requirements in terms of quality and quantity. However, mango is an agricultural product the quality of which is difficult to control. With a long-term relationship, growers could have time to adjust the product to match the demand. One year contract farming is quite short with regard to mango production. Growers should have a chance to be involved in the process of production planning, since they know have the best knowledge of mango production within the supply chain. Information sharing is of great concern when it comes to

improving the supply chain. Exporters should share more information with growers, especially with regard to market information, so that the growers can forecast and actively manage their production.

The Thai Mango Growers Association, Thai government policy especially “Thai Kitchen to the World”, Thai fruit development strategy for 2010-2014 and the mission of the DoAE, the strength of Thai food produce in the global market, the quality of Nam Dok Mai cultivar and off-season production technology, are the strengths of the mango supply chain, whilst chemical residue and contamination, grading, lack of trust and collaboration are among the identified weaknesses.

The next chapter deals with the research results from the semi-structured interviews. The study takes the form of case studies, and cross-case analysis is then conducted, in order to further discuss agricultural supply chain collaboration in Thailand.

Chapter 7

Agricultural Supply Chain Collaboration: The Export of Nam Dok Mai Mangoes to Japan

7.0 Introduction

The previous chapter has presented research findings from in-depth interviews with growers, exporters, and government representatives to explain and discuss the existing supply chain of Nam Dok Mai mangoes to Japan, and to analyse the costs of problematic logistics activities. The previous chapter meets the first objective of the thesis, which is to provide an overview of the supply chain of Nam Dok Mai mangoes in Thailand and to identify strengths and weakness in the supply chain.

This chapter aims to address the objective regarding supply chain collaboration; that is, to examine the supply chain collaboration between the exporter and growers of fresh mangoes. Six mango exporters have been selected as case studies to explore collaboration patterns within the supply chain. These six exporters, who own VHT plants, are referred to in these case studies as Company A, Company B, Company C, Company D, Company E, and Company F respectively, thus providing the anonymity they requested. Data obtained from fieldwork and semi-structured interviews are analysed and discussed. The Company's background will be described, using data collected from the company's website together with information provided by the respondents. The analysis links to the literature review in Chapter 2 regarding patterns of supply chain collaboration, applying the researcher's investigations to identify similarities and differences between practice and academic theory. The discussion focuses upon two aspects; the company and its suppliers. Subsequently, a cross-case analysis will be utilised to discuss the six cases in relation to each other.

7.1. Case Study of Mango Exporters

7.1.1 Case study of Company A: a Large Conglomerate Agricultural Company

7.1.1.1 The Background and Data

Company A is a big mango exporter and also one of the largest conglomerate agricultural businesses in Thailand. The company has its own mango orchard of approximately 10000 rai (1600 hectares) located at the VHT plant so that the company occasionally can produce all its mangoes itself. Most mango production is directly from the company; mangoes are purchased from other growers only when its own production is inadequate. The business comprises a joint venture with a Japanese company; Company A manages exclusively the export of mangoes for its Japanese partner. Representatives from the company visit the partner in Japan annually in order to develop a production plan so that the company may manage the production process effectively, and to the satisfaction of its Japanese business partner. The production agreement includes the product's size, volume, and type of transport required by the customer. As the business is a joint venture, the two companies have trust in each other and share financial information.

With regard to the production process, mangoes are grown in Company A's orchards. Any excess production is sold to other exporters. In case of production deficiency, the company purchases from other growers. Similarly to other exporters, Company A has an annual contract with growers. Regarding the grading process, the company has two processes; self-grading by the company or grading by the growers. In the latter case, company representatives visit the grower's collecting point, using either the company's own transport or logistics service providers (LSPs). For trusted growers can grade their own products and directly send them to Company A for export. Concerning waste products arising from the mango production, the company rarely has problems with chemical residue since most of the produce are grown in its orchard, so the company is assured of purchasing produce from experienced growers. A problem frequently encountered, however, is product size which does not match with that ordered by the customer due to difficulties in controlling the size of mangoes, a naturally grown agricultural product. The company has to sell rejected produce to other markets.

Other problems involve the high costs of logistics; airfreight is much more expensive than sea freight. To date, the company delivers its products by both air (50%) and sea (50%). From the survey and interviews, Company A has the highest percentage of sea freight compared to other exporters which implies that Company A is the most successful in terms of production and logistics management. To use sea freight, the exporter has to achieve two main product conditions, namely, adequate quantity and quality. The quantity of the product should be enough to fill a large shipping container. In addition, the product quality has to be well-managed in that the produce should be at a similar level of fruit maturity. It appears that, compared to other exporters, Company A is the most efficient in terms of production and logistics management; nevertheless it is attempting to further develop its production and logistics strategy to achieve still greater exports by sea freight.

7.1.1.2 Information Sharing

i) Collaborative Performance System (CPS)

CPS is defined as the process of designing and implementing performance guidance for supply chain members to achieve overall and individual performance. The chain members need to jointly designate written collaborative objectives which are measurable, quantifiable, and achievable (Simatupang and Sridharan, 2008).

Although Company A mainly relies on its own orchard for mango production, the company also purchases products from growers when its customer demand is higher than its production capacity. It could therefore be said that Company A has two sources of mango producers; the company's orchardist as an internal producer and mango growers as external producers.

Company A, as a mango buyer, operates CPS together with its orchardist (internal producer). They set mutual goals and share mutual benefits since they are in the same company; their collaborative objectives and processes result from joint agreements. Company A exchanges only information regarding customer demand to the growers (external producer), however, informing them of the required production volume and

product details. Growers share with the company information regarding their estimated production yield together with some product details. The company and growers individually manage their production activities and processes.

With regard to Company's A suppliers, that is, the internal supplier (company's orchardist) and the external supplier (other growers), the orchardist shares mutual goals and benefits with its company as a true CPS, whereas external growers only share with the company information regarding production yield and quality. The CPS between the growers and the company exists only for the purpose of producing and trading.

ii) Performance Status

Company A and its internal supplier consistently inform each other of their performance status in order to prevent excess demand or supply arising in different mango seasons. During the in-season, the mango supply is higher than market demand, whereas in the off-season the mango supply is lower than market demand (see Chapter 6). The routine tasks of sharing each other's performance status benefit both the supplier and the company in terms of production and marketing plans respectively. Since the mango exporting business is very competitive, the flow of information is dynamic, requiring quick responses from both supplier and buyer. Company A and its internal supplier therefore frequently share their performance status.

Company A normally shares its performance status with external suppliers only when there is a change in a customer's order. Conversely, the external suppliers share their performance status only when there is a change or a difficulty in their production process. Both the company and the external suppliers only give short notice when the change occurs.

From Company A's aspect, the internal supplier has priority over external suppliers since the company relies on the production from its internal supplier rather than external suppliers. Also, the company and the orchardist (internal supplier) are employed by the same company, thus facilitating communication and collaborative performance throughout the chain. In contrast, from the aspect of growers (external suppliers), they cite Company A as one of the export companies they would most like to do business with because of the reputation of Company A, which is affiliated to the largest conglomerate

agrifood business in Thailand. Company A is therefore regarded by growers as a trustworthy partner.

iii) Production and Demand Planning

Production and demand planning are jointly managed by Company A and its internal supplier so that both of them can develop the production process to prevent the uncertainty of demand and supply. The external suppliers are informed of the demand planning periodically, depending on the changes in seasons of mango production. As discussed above, unlike the external exporters, Company A and the internal supplier are employed by the same company so that they are able to achieve benefits and information sharing, and engage in joint planning and decision making.

iv) Knowledge Sharing

Company A has its own orchards, not only for mango production but also for research and development (R&D). The company cooperates with its orchardist and invests in R&D in order to develop its production techniques and product varieties. This co-operation results in the transfer of new knowledge and technology between Company A and its internal supplier. Company A prefers to share new knowledge and technology with its internal supplier rather than with its external suppliers since most of its produce comes from the internal supplier. In addition, the external suppliers also supply mangoes to other companies, recognised as Company A's competitors. Company A therefore shares only essential knowledge with external suppliers, such as lists of chemicals permitted for use in mango production. As mentioned in Chapters 3 and 6, exports to the Japanese market are governed by MHLW regarding chemical usage. Similarly, external suppliers share with the company only information regarding the chemicals they have used in production. The external suppliers are self-reliant in acquiring further knowledge and technological skills. Company A is located in the East region of Thailand, where most mangoes for export are produced. Company A selects experienced growers to be its external suppliers, and any knowledge sharing regarding mango production is likely to be

insignificant for these skillful mango producers. However, in order to enhance production yield, sharing knowledge and technology should be considered.

7.1.1.3 Decision Synchronisation

In similar ways to those seen in production and demand planning, Company A and its internal supplier make joint decisions related to their planning and operational processes. During the interview, a marketing manager and an orchardist manager remarked that they held regular meetings to monitor performance. The joint decisions made are necessary for problem solving, risk sharing, and effective responsiveness to customers. No decision synchronisation between Company A and its external suppliers was found, however. The company and its external suppliers work individually and share information only when assistance is required.

7.1.1.4 Incentive Alignment

As mentioned earlier, Company A and the internal supplier set mutual goals and share mutual benefits via CPS; the incentive alignment between these two parties is well-organised. Both parties agree to share costs, benefits, and risks at the stage of decision synchronisation. Such incentive alignment does not occur between Company A and the external suppliers, however; because they do not have such a close relationship at the stage of decision synchronisation and are consequently not likely to realise the necessity of incentive alignment.

7.1.1.5 Supply Chain Contracts

With regard to supply chain contracts, it was interesting to find that there is no formal documentation of supply chain contracts between Company A and its internal supplier, whilst the company signs an actual contract farming with its external suppliers. Within the same company, mutual trust is simply established between Company A and the internal supplier, developing naturally as a result of the close working relationship between the two parties. A formal document is not essential. Conversely, Company A

decided to draw up a contract farming with its external suppliers in order to minimise price uncertainty and to specify the production yield to be supplied. This is a one year contract and agrees the price, product yield, and production time plan. External suppliers are encouraged to sign the agreement as evidence of their commitment.

7.1.1.6 Traceability

Traceability is one of the most important issues in the food supply chain. The labeling technique is used to achieve traceability in Thai mango production. Both internal and external suppliers use the same technique to identify the source of each mango. Every mango basket has attached to it a label identifying the name of its supplier and delivery date. The company may thereby ascertain the supplier of any particular mango, and which orchard it came from.

7.1.1.7 Transaction cost management

According to the result from the field survey (see Chapter 6), grading activity is a problematic joint activity between growers and exporters. The process of grading activity is duplicated since growers have to sorting their products and initially grade the products in order to estimate their qualified products and income, whilst exporters have to send their staffs to grade the products at the orchard's collecting point. The grading activity is therefore concerned as a duplicate activity in the supply chain and the transaction costs of this activity should be greater managed.

Generally, grading activity is a problematic joint activity between growers and exporters as mentioned earlier in Chapter 6. Growers have to sort and initially grade their products before the grading process which is generally done by exporter's staff. Considering the transaction cost along the supply chain, the grading activity is needed to be improved due to its duplication which consumes time, labour, and costs.

In the case of Company A, Company A and its internal supplier agree to have mutual goals and benefits as they are the same company. As a result, all transaction costs are informed and discussed in order to find the best solution for minimising unnecessary costs. Grading activity of the company and the internal supplier is conducted and

controlled by the company's orchardist so both parties can effectively manage transaction costs. In contrast to the external suppliers, they have to initially grade their products before Company A sends its staffs to grade and deliver the products to the company.

The transaction cost management only found in the close relationship of Company A and its internal supplier but it was not found in the relationship between Company A and its external suppliers. Even though the relationship with external suppliers is classified as long-term, the company rather supports its major supplier (internal supplier) rather than the support suppliers (external suppliers).

7.1.1.8 Relationship

In terms of relationship management, Company A selects the growers according to the location of the grower's orchard, and the experience of growers, who are well-known as experienced mango producers with no record of chemical residue being found on their produce. Company A is advantageously located near the provinces where mangoes are mainly produced so that there are many potential growers to deal with. As mentioned earlier, most growers dealing with Company A are well-experienced in producing mangoes for export and so do not need much support from the exporter. Growers and exporters in this case work individually and information is shared only when essential and relevant to the exporter, such as, for example, lists of permitted chemicals, and changes in a customer's order. This is in contrast to the relationship with the company's orchardist where institutional trust has been developed. At this stage of trust, the company and the orchardist have established patterns of working collaboration that permeate the supply chain.

7.1.1.9 Summary of Company A

Company A is an integrated mango exporting company whose own orchards produce mangoes, and whose VHP plant processes them for export. The production capacity of Company A is very large. Their main production yield is from the company's orchards, but the company also uses external mango suppliers to support the volume of supply. The company therefore has two kinds of suppliers, the internal supplier (the

company's orchardist) and external suppliers (other mango growers). Company A thus collaborates with two groups; the internal supplier and the external suppliers.

Within the same company, Company A and the internal supplier establish a collaborative relationship throughout the supply process concerning information sharing, decision synchronisation, incentive alignment, traceability, financial sharing and institutional trust. Mutual goals and benefits should be clearly stated in CPS so that each party realises its tasks and responsibilities. Information should be regularly shared in order to encourage maximum performance and enable prompt responses to change. It must be emphasised that decision synchronisation is vital in creating a sense of belonging, that will lead towards reaching common goals.

On the contrary, the supply chain management of the external suppliers needs to improve since Company A mainly focuses on its internal supplier, rather than external suppliers. Though these external suppliers are experienced and skillful, information should be shared regarding CPS establishment, performance status monitoring, joint production and demand planning, and knowledge sharing. Decision synchronisation should be considered as this is an important process of building a sense of belonging. If Company A and its external suppliers consider that they are the same team, collaboration in the supply chain will be greatly developed.

Table 7. 1: Company A: an analysis summary

The factors of analysis		Company A		Company A's suppliers	
		Internal Supplier	External Suppliers	Internal	External
1. Information sharing	1.1 Collaborative performance system (CPS)	Mutual goals/benefits	Customer demand	Mutual goals/benefits	Product yield and quality
	1.2 Performance status	Routine	Short notice	Routine	Short notice
	1.3 Production/Demand planning	joint planning	Seasonal	joint planning	Seasonal
	1.4 Knowledge sharing	R&D	List of chemical uses	R&D	Chemical uses
2. Decision synchronisation		Joint decision	No	Joint decision	No
3. Incentive alignment		Mutual benefits/risks	No	Mutual benefits/risks	No
4. Supply chain contracts		Institutional trust	Contract Farming	Institutional trust	Contract Farming
5. Traceability		Basket labeling	Basket labeling	Basket labeling	Basket labeling
6. Transaction cost management		Complete	No	Complete	No
7. Relationship		Institutional trust	Long-term	Institutional trust	Long-term

7.1.2 Case study of Company B: a Japanese company, a pioneer in exporting Thai mangoes to the Japanese market

7.1.2.1 The Background and Data

Company B is a Japanese company who exports fresh Thai fruits and vegetables to Japan. The company is a pioneer in exporting Thai mangoes to the Japanese market and has put a great effort into calling for regulations to control the exportation of Thai mangoes to Japan. Company B has developed Thai mango processing with VHT, a considerable achievement supported by DOA and DOAE. Due to this great effort and commitment, Company B has gained experience in technological production processes.

The company has added the process of ripening (see Figure 6.1 in Chapter 6) to the mango treatment process by VHT, thus adding value to the product, ripening of the fruit being controlled by the ripening machine. Another activity which makes Company B unique is sweetness testing (brix); the senior manager claimed that products from Company B are guaranteed to be sweet. The company also labels the product, stating the date by which it should be consumed, in order to educate its customers, with whom it is greatly concerned and responsive towards. The company and its customers share the same cultural and behavioral background and the company therefore realises how to suitably promote its products.

The headquarters of Company B are in Japan and take responsibility for importing and marketing; Company B has thus to deal only with production and exports. Unlike Company A, which is a major mango producer, Company B has only small mango orchards exclusively for R&D so that most of their mangoes are supplied by growers. Data obtained from interviews revealed that many growers prefer to do business with Company B as it is supportive, honest, and a punctual payer. In their turn, Company B prefers reliable growers who can be trusted, and with whom the company can develop a long-term relationship.

The trustworthiness of growers depends upon their consistency of production. A senior manager of Company B stated that the company preferred to deal with a reliable grower who had less experience in mango production than an experienced grower who could not be trusted. The company's senior manager further commented that the skills and techniques of producing mangoes could be learned, but trustworthiness and honesty

could not. For this reason the company prefers to use a few reliable growers rather than many of more questionable trustworthiness.

The company experienced the problem of production inconsistency, caused by growers who focused on product quantity rather than quality. Growers increased the production area, expecting a higher product yield, without realising their capability and readiness; they consequently failed to produce, harvest, and deliver products. Another problem is grading, though the company's senior manager insisted that the grading standard never changed between different mango seasons; only the price. If the mango was up to standard it was not rejected, but the price would vary in different seasons. The standard was not changed but the price was negotiable due to market mechanisms. Growers might not understand these mechanisms and tended to blame the exporter even though the grading was managed by both parties. The company sent a temperature-controlled van to collect the accepted products at the grower's collecting point where the grading process was conducted.

Anthracnose is a major cause of mango wastage. Apart from when mango disease has caused rejection, rejected products are either returned to growers or sold in a local market. Anthracnose poses an obstacle for sea freight. The company used to deliver products by sea but this method failed because of anthracnose infection. As a result, all products are now delivered by air freight instead.

Because of the problems mentioned above, the company decided to deal with limited numbers of growers with high levels of experience and skill in producing mangoes for export. The company believes that these growers can provide production consistency in terms of product yield and quality. The company allows these growers to manage the grading process by themselves. This can help the company minimise some logistical costs such as those involving grading activities, and transport. The volume of rejected mangoes in the grading process is very low due to the highly developed skills of growers in producing high quality fruit.

7.1.2.2 Information Sharing

i) Collaborative Performance System (CPS)

From its experience in exporting fruits and vegetables, Company B has learned to set clear mutual goals and duties with its suppliers. Objectives, product specificity, and time periods are specified in CPS. The company also gives feedback to the suppliers with suggestions for improvement and increased motivation.

ii) Performance Status

Company B and its suppliers regularly communicate with each other regarding problems and difficulties relevant to their performance in the supply chain. The benefit of this performance sharing is that both parties can respond effectively to change. In a competitive market a rapid response to customers is important to achieve customer satisfaction. This responsiveness is facilitated by supply chain members sharing information. Sharing performance status can support the planning of operational activities. For example, at the first indications of inadequate production yield, if growers quickly inform Company B the company may solve the problem promptly by seeking products from other sources.

iii) Production and Demand Planning

Production and demand planning is conducted by Company B and its Japanese headquarters. The Company informs the supplier of the customer order so that the supplier can estimate the capability of production yield in each season. This process of planning is carried out jointly between company B and its headquarters in Japan and is seasonally managed. The suppliers receive the information and adjust their production capacity to meet the order.

iv) Knowledge Sharing

Company B owns mango orchards for R&D. The company attempts to develop techniques for producing high quality fruit and shares useful findings with its suppliers. A

list of approved chemicals is given to suppliers as fundamental knowledge in order to prevent chemical residue.

7.1.2.3 Decision Synchronisation

Some logistical activities, such as grading processes and transportation, are the result of joint decision making between the company and the supplier. Company B decides with the suppliers who is going to take responsibility for grading and product delivery in each mango season. Although these experienced suppliers normally handle these processes, in some off-mango seasons product quality may vary due to natural factors such as draught, flood or pest outbreak. In these circumstances, the company may take sole responsibility for grading, or may share decision-making with the suppliers.

7.1.2.4 Incentive Alignment

The interviews reveal that there is no incentive alignment between Company B and its suppliers. Though common goals are shared at the CPS, the risks and benefits are not shared at this point.

7.1.2.5 Supply Chain Contracts

Company B and the suppliers have a contract farming which guarantees product yield, price, and the delivery period agreed by both the company and suppliers. The establishment of such contracts is supported by DOAE and Thai Mango Growers Association.

7.1.2.6 Traceability

Traceability is a great concern of Company B and its Japanese headquarters since they have to follow MHLW Japanese regulations regarding food safety and hygiene. Using labels to identify mango origins is an effective and economical technique for

traceability. A label is attached to each mango basket at the time the mango is harvested until it is exported.

7.1.2.7 Transaction cost management

As mentioned earlier, Company B has long term relationship with the supplier(s) since the company chooses very few numbers of suppliers to deal business with. The company entrusts its supplier(s) to manage the grading activity, as a result, this can deduct the transaction costs. However, in case of inadequate production from the supplier(s), the company has to purchase the products from other suppliers. In this case, the company sends the staffs to grade the products at the orchards in order to ascertain the grading process and standard.

7.1.2.8 Relationships

Company B emphasises the importance of managing relationships with growers as it is the pioneer in exporting to Japan. Company B is the first exporter of Thai mangoes to Japan and also the first exporter who owns and operates a VHT plant. To achieve a large volume of exports, the company has a good relationship and mutual trust with its growers. The company attempts to support any activities that may enhance productivity; for instance, visiting the farm to educate growers, and sharing useful information and techniques relating to mango production. Since the aims of company are to attempt to support its suppliers and to develop production capabilities in conjunction with them, the company aspires to invest in suppliers who are reliable and can be trusted to ensure that the investment is a good one. The growers (suppliers) also prefer to have a long-term relationship with Company B, rather than with other companies.

7.1.2.9 Summary

Company B is a pioneer in the mango business, not only in exporting Thai mangoes to the Japanese market but also in developing the VHT machine. Its strength is that it is a Japanese company and therefore knows the cultural and behavioral preferences

of Japanese customers. In addition to this, their punctuality in paying (a Japanese characteristic), is greatly appreciated by its growers. Company B focuses on maintaining long-term relationships with its suppliers, aiming to support them and to develop increased production capabilities with them. The company therefore prefers to invest in reliable and trustworthy suppliers and the suppliers in turn prefer to work with a reputable company.

Table 7. 2: Case B: An analysis summary

The factors of analysis		Company B	Company B's suppliers
1. Information sharing	1.1 Collaborative performance system (CPS)	Mutual goals	Mutual goals
	1.2 Performance status	Routine	Routine
	1.3 Production/Demand planning	Seasonal	No
	1.4 Knowledge sharing	List of chemical uses, production techniques	Chemical uses
2. Decision synchronisation		Grading activity/Transport	Grading activity/Transport
3. Incentive alignment		No	No
4. Supply chain contracts		Contract Farming	Contract Farming
5. Traceability		Basket labeling	Basket labeling
6. Transaction cost management		Complete	Complete
7. Relationship		Long-term/ Mutual Trust	Long-term/Trust

7.1.3 Case study of Company C: a VHT Service Provider

7.1.3.1 The Background and Data

Company C is a mango exporter in joint venture with a Japanese company. Company C is responsible for producing and exporting products to its Japanese business partner, whilst the Japanese partner is responsible for importing, product distributing, sales and marketing. To date, the mango business of Company C has many more marketing channels than other exporters, including an on-line market, direct TV sales, supermarket, Thai restaurant, and department store sales. In addition, Company C is

under the control of DOAE as the company leases its VHT plant from them. Since DOAE's duty is to support growers and exporters to enhance mango productivity and competitiveness, DOAE and Company C have an agreement to follow this mission. The company thus is obliged to provide VHT services to other exporters, and also to support the production of growers.

With reference to the VHT plant management, Company C now uses VHT primarily for the company's production (78%) but also provides VHT service to other exporters (22%). According to their agreement with DOAE, Company C is required to assign priority for other exporters who mostly do not have their own VHT plant. As a VHT service provider, Company C has connections with many official agencies and so rarely has difficulties in processing official documents.

Most problems in Company C's supply chain management lie in the area of production management, all products being delivered by growers or transporters. The company experiences difficulties in grading due to misunderstandings arising from cross communication between company personnel and growers. A managing director of Company C claimed that some growers were not honest and made exaggerated claims relating to their productivity. This caused problems for the company in terms of time and personnel management, and transport. For this reason, the company decided to return any produce they rejected to the grower but, in the event, this accounted for such a very small percentage of the total that the company continued to buy from the growers.

The disease anthracnose also poses problems for Company C when transporting its mangoes by sea. The company now delivers only 5% of product by sea freight; 95% is delivered by air. Sea freight is possible only during the mango in-season because of product scarcity in off-season. Though the anthracnose- infected products are traceable, growers refuse to accept returned produce and do not take responsibility for the loss.

Since Company C has an agreement to support Thai mango production and exports, the company attempts to conduct activities to enhance the production capabilities of growers by means of, for example, meetings, seminars, and mango field trips to Japan. The main purposes of these activities are to educate growers in good pre-harvest and post-harvest management techniques, and to develop relationships between growers and the company.

7.1.3.2 Information Sharing

i) Collaborative Performance System (CPS)

Company C is required by its agreement with the DOAE to develop and support growers' production capabilities. To this end, the company sets mutual goals and informs growers of the CPS objectives. Growers (suppliers) are provided with a list of collaborative objectives in order to help them realise their responsibilities and achieve good performances.

ii) Performance Status

As a VHT service provider, Company C has more responsibility than other companies. The company is required to manage the VHT services for other companies as a priority, according to their agreement with DOAE. Consequently, the company is likely to focus on clients who are VHT service customers, and Company C's Japanese business partners, since the company has diversified markets in Japan. Communication between Company C and growers tend to be sporadic, mostly informing them of changes in customer demand rather than appraising them regularly of performance status.

iii) Production and Demand Planning

Company C implements production and demand planning with its supplier when there is a change in customer demand. The growers normally conduct their production plan based on the estimation of the previous year's production yield.

iv) Knowledge Sharing

Unlike the first two companies, Company C does not have its own orchards for R&D. Even though the company cannot therefore provide its own R&D findings to the suppliers, the company educates them instead by conducting academic seminars on developments in agricultural production. This knowledge sharing is supported by DOA and DOAE.

7.1.3.3 Decision Synchronisation

Company C and growers make joint decisions concerning grading processes and produce transport. Initially, the company discusses with growers whether they are able to manage grading and product delivery. Issues are discussed concerning grading standards, product specification, and delivery times.

7.1.3.4 Incentive Alignment

In order to support and develop the production capabilities of growers, incentive alignment is essential. Incentives may greatly motivate performance. At the stage of CPS, Company C provides opportunities for field study in Japan to growers who outstandingly achieve their goals. This incentive benefits not only growers but also the company. The selected growers are stimulated to maintain performance, whilst the others attempt to achieve the goal. This results in greater production capacity and volume for export to Japan.

7.1.3.5 Supply Chain Contracts

DOAE encourages growers to form contract farming with exporters, and Company C actively responds to this. Every supplier is required to sign the contract farming agreement with the company. The contents of contract farming are similar to other companies', specifying price, production yield and delivery issues. The growers and the company decide the topics to be addressed in the contract, excluding the price issue which is always included. DOAE aims to protect mango growers from exploitation and prices are therefore considered and agreed by DOAE and the Thai Mango Growers Association.

7.1.3.6 Traceability

Since Company C is a VHT service provider under DOAE, the company's plant forms the centre of mango collection from various sources. Traceability is crucial for the

company to identify mangoes from different sources. Labels are used to achieve traceability.

7.1.3.7 Transaction cost management

As Company C is a main VHT service provider, all of the company's suppliers take responsibility for grading and delivery products to the company. Unlike Company B which selected the very small numbers of company's suppliers, Company C experiences the difficulty in controlling quality of products since the company's suppliers are various. Although Company C can deduct transaction costs from grading activity, the company has to carefully inspect the graded products before VHT process. When the product is inspected as unqualified, it will be sent back to the suppliers along with their baskets which are used as product containers carrying from supplier's orchards to the company. If the products are found unqualified after VHT, those products are not able to be returned to the suppliers. The more suppliers the company has, the more problems of various grading standard arise, accordingly the more inspection for product quality is needed. The company therefore can partially manage the transact cost of the grading activity since it has to invest more for product inspection.

7.1.3.8 Relationship

In accordance with its agreement with DOAE, Company C regularly conducts meetings and seminars to share knowledge and information with growers. As a result, close relationships are established that lead to longer-term relationships.

7.1.3.9 Summary

Company C is a mango exporter and a VHT service provider under the governance of DOAE, with whom it has an agreement regarding developing the production capability of growers. The company focuses on knowledge and information sharing with its suppliers. Seminars, meetings, and field trips are organised to educate growers and develop relationships between growers and the company.

The company sets mutual goals at CPS with an incentive alignment. Growers who outstandingly achieve their goals are selected for reward. This incentive strategy is intended to enhance the production capability of growers and the competitiveness of the company.

Table 7. 3: Case C: An analysis Summary

The factors of analysis		Company C	Company C's suppliers
1. Information sharing	1.1 Collaborative performance system (CPS)	Mutual goals	Mutual goals
	1.2 Performance status	Short notice	Short notice
	1.3 Production/Demand planning	Seasonal	No
	1.4 Knowledge sharing	List of chemical uses, production techniques	Chemical uses
2. Decision synchronisation		Grading activity/Transport	Grading activity/Transport
3. Incentive alignment		Yes	No
4. Supply chain contracts		Contract Farming	Contract Farming
5. Traceability		Basket labeling	Basket labeling
6. Transaction cost management		Partial	Partial
7. Relationship		Long-term	Long-term

7.1.4 Case study of Company D: a Family Business

7.1.4.1 The Background and Data

Company D started from a family business that has decades of experience in trading mangoes. The family business has developed into a company that exports fresh fruits and vegetables, with Japanese partners who are responsible for marketing in Japan. Company D is responsible for delivering products to this partner. From its long experience working in the mango business, the company's chiefs, who are mostly family members, have good connections with growers. The company has developed its own mango orchards which now provide 10% of its total export produce. The remaining 90% are purchased from growers.

Problems affecting growers' production include inconsistency of product quality and quantity, and anthracnose. Anthracnose impacts upon the sea freight of Company D. An interview with a general manager of Company D revealed that the company lacks a

partner (importer) to recheck and repack the products at sea ports in Japan. If a product is infected by anthracnose, it has to be rejected before the disease spreads and the rest of the produce has to be repacked in order to prevent the infection. Anthracnose has caused a loss of 50% of produce delivered by sea freight. The company now exports 25% of its produce by sea freight and 75% by air. A related problem is that of delay in document processing by DOA, in order to obtain a phytosanitary certificate.

From the survey, it was found that Company D frequently communicated and exchanged information with growers and their Japanese partners. Information regarding changes in product size is most frequently shared. The company also supports the use of wrapping bags by growers. This indicates that Company D seeks to maintain good relationships with its suppliers (growers). As the family business, Company D runs agricultural export business for more than two generations so long relation that the company has close connection with its suppliers. The company has a strategy to keep the connection and relationship with all its suppliers as long as the suppliers can provide qualified products. As a result, Company D has a larger number of suppliers than other companies. A general manager of Company D claimed that it is easier to thoroughly control the product quality from a small group of growers rather than that from a large group. Accordingly, the company prefers to have a large number of small suppliers rather than a small number of big suppliers. This strategy enhances the connection between the company and the suppliers to become a large network.

7.1.4.2 Information Sharing

i) Collaborative Performance System (CPS)

From the interviews, it appears that supply chain processes, and collaboration between Company D and its suppliers, are guided by operational activities. Since Company D and most of its suppliers have worked together for decades, growers have learned their duties from experience. The operational activities of producing mangoes are taught from generation to generation. These experienced growers are aware of what needs to be done and develop their production capability to meet requirements. Company D provides customer orders and specific requirements to growers. The company occasionally gives some feedback to the growers to help develop their performance.

ii) Performance Status

Company D frequently communicates and shares information with growers as they have close and long-term relationships. Informing each other of their performance status is routine in both parties. This facilitates a quick responsiveness to change, particularly customer demand.

iii) Production and Demand Planning

Growers, as the company's suppliers, initially develop their production plan based on the previous year's information. The production to meet demand is actually planned by the company and its Japanese partners. Then, the company informs its supplier of the customer order so that the company and suppliers can jointly manage the production plan.

iv) Knowledge Sharing

Company orchards are used for both mango production and R&D. The company shares new production techniques arising from R&D with its suppliers to enhance production. Suppliers also share some of their skills and techniques with the company. As a result of this two-way knowledge sharing, the company's R&D has steadily progressed.

7.1.4.3 Decision Synchronisation

The company and the suppliers make joint decisions about grading processes and transport. As mentioned earlier in Chapter 6, grading processes vary throughout different mango seasons; therefore, joint decisions on this process might be needed more during the in-season of mango production as the supply is then higher than the demand. Standards guiding mango selection are negotiated to find the best solutions for both parties.

7.1.4.4 Incentive Alignment

The interviews did not reveal the existence of any incentive alignment between Company D and its suppliers. Since mutual goals and benefits are not committed at CPS, the incentive alignment is not implemented in this case.

7.1.4.5 Supply Chain Contracts

Similarly to other companies, Company D and the supplier have a contract farming agreement set up by DOAE. The content of the contract is compulsorily related to product price, production yield, and product delivery.

7.1.4.6 Traceability

Labels are used to enable traceability in Company D. A label is attached on each basket of mango to identify its producer, orchard, and delivery time.

7.1.4.7 Transaction Cost Management

Company D takes responsibility for grading activity for all its suppliers. The company sends the staff to conduct and control the grading process and to deliver products to the company. As mentioned earlier that the company has many suppliers to deal with, the standard of grading process is various in different suppliers. Accordingly, to control the grading standard and product quality, the company decided to conduct the grading activity by itself. The costs of grading activity as transaction cost therefore cannot be deducted.

Contrast to Company B which has a very few number of supplier(s), Company B does not have difficulty in transaction cost management of grading activity since the company can conduct the cost of this duplicated activity. Company B has advantage in its small numbers of big suppliers who can be trusted so that the standard of grading process and product quality can be easily uniformed.

7.1.4.8 Relationship

As mentioned above, Company D and its suppliers have close and very long-term relationships since they have run the business for several generations. The company and the suppliers share useful information in order to jointly develop their production capability. The company also supports its suppliers in terms of R&D and some utility support. Hence, trust is strengthened over time.

7.1.4.9 Summary

Company D, a family business, has experience in trading mangoes for several decades and generations. Resulting from this, the company has developed long-term relationships and trust with its suppliers. The company and its suppliers provide two-way sharing of knowledge to help each other develop their production capability and stimulate R&D.

Although the company and the supplier do not officially set objectives of collaboration or mutual goals, the supply chain could be guided by the operational activities in the supply chain (see Figure 6.1, Chapter 6). For greater supply chain performance, the supply chain collaboration should be systematically developed by CPS.

Table 7. 4: Case D: An analysis Summary

The factors of analysis		Company D	Company D's suppliers
1. Information sharing	1.1 Collaborative performance system (CPS)	Customer demand	Product yield and quality
	1.2 Performance status	Routine	Routine
	1.3 Production/Demand planning	Seasonal	Seasonal
	1.4 Knowledge sharing	R&D	Chemical uses, production techniques
2. Decision synchronisation		Grading activity/Transport	Grading activity/Transport
3. Incentive alignment		No	No
4. Supply chain contracts		Contract Farming	Contract Farming
5. Traceability		Basket labeling	Basket labeling
6. Transaction cost management		Partial	Partial
7. Relationship		Long-term/Trust	Long-term/Trust

7.1.5 Case study of Company E: a Thai company, a pioneer in developing new Nam Dok Mai cultivar for exports

7.1.5.1 The Background and Data

Company E is a Thai company that has business partners in Japan. The Japanese partners of Company E are importers, wholesalers and retailers. The company processes mangoes via VHT and delivers to its partners. Company E is the first company who succeeded in exporting the new Nam Dok Mai cultivar namely Nam Dok Mai See Thong (meaning of golden Nam Dok Mai, due to its golden colour skin). The company does not have orchards for producing mangoes for export, only some demonstrating orchards for R&D. The new knowledge derived its R&D is shared with growers to develop their production management. The company also encourages growers to achieve GAP standard by providing interest- free financial support.

The company encourages growers to engage in contract farming in order to guarantee production volume and price. A CEO of Company E claimed that only growers benefitted from contract farming: in the off-season, when the market price is higher than the price set by the contract, the exporter is forced to pay a high price. During the in-season, however, when the market price is lower than the contract price, the exporter has to pay a high price in order to help the growers.

Anthracnose causes another problem related to sea freight. The company could now achieve equal sea and air freight rates and is making great attempts to deliver more by sea, due to the very high costs of air freight.

Since Company E has long experience in producing mangoes for exports, the company has long term relationship with its suppliers. Company E has a policy to develop farm communities by supporting its suppliers in terms of financial support and technology transfer in order to improving yields.

7.1.5.2 Information Sharing

i) Collaborative Performance System (CPS)

To achieve its “win-win” policy as mentioned above, Company E has to stabilise CPS by setting mutual goals, benefits, and performance metrics with its suppliers. Although the performance metrics are not in written form, the company informs the suppliers, emphasising the outcomes of successful collaboration.

ii) Performance Status

Though milestones of performance are specified at CPS, communication regarding performance status is likely to be urgent notice rather than regular. Changes in demand or supply are the key issues in most communication. In summary, it could be said that the sharing of performance status occurs mostly when one party has changes or difficulties.

iii) Production and Demand Planning

Similarly to most other cases, the production and demand planning is initially agreed by Company E and its customer and then the company informs its suppliers of the level of customer demand to enable joint planning of production capability.

iv) Knowledge Sharing

Company E has made a great contribution in the field of R&D as it was the first company able to export the new Nam Dok Mai cultivar. The company is still engaged in developing the cultivar and its production technique for greater production efficiency. Their R&D knowledge is shared with its suppliers to enhance their production.

7.1.5.3 Decision Synchronisation

As mentioned earlier, regarding joint planning, most decisions are made by Company E and its Japanese business partner, rather than by its suppliers. The suppliers

merely receive information, and have few chances to influence decision making within the company.

7.1.5.4 Incentive Alignment

Data obtained from interviews suggest that the company focuses more on the development of production efficiency than upon motivation. The incentive alignment arouses a supplier's motivation, which brings enthusiasm to production performance. Although the incentive alignment impacts only indirectly upon production development, it is nevertheless essential for long-term performance development.

7.1.5.5 Supply Chain Contracts

The DOAE requires that every company should sign contract farming with their growers. Contract specifications have to be agreed by the company, growers, and DOAE, in order to prevent inequity to growers. According to the CEO of company E, in practice the contract farming results in inequity to exporters instead of growers. As mentioned earlier, the company has to guarantee to growers the price of the product, but there is no price guarantee to exporters. Company E is forced to pay higher in both in- and off seasons of mango production. The CEO remarked that the concept of contract farming appears helpful to both parties but, in application, the opposite results. Only one party, the grower, is able to gain benefits from contract farming. If the contract farming is actually applied in reality, both parties in the supply chain could benefit.

7.1.5.6 Traceability

A label is attached to every basket, as soon as the mango has been graded and packed for delivery.

7.1.5.7 Transaction Cost Management

Similarly to Company D, Company E manages the grading activity by sending its staff to grade the products at the supplier's orchard and also deliver the products to the company. Therefore, the transaction cost is not deducted from the supply chain of Company E and its suppliers.

7.1.5.8 Relationship

Company E is one of the best known mango exporting companies, and plan to expand its business in the near future. Long-term relationships are therefore needed for performance development in the supply chain. The company maintains good long-term relationships with established suppliers by financially supporting their production processes. To strengthen these relationships, true collaboration should be considered.

7.1.5.9 Summary

Company E is a Thai company whose joint venture companies are Japanese. The company has a "win-win" policy involving co-ordination and collaboration of its supply chain members. The company has developed contracts to provide long-term support to its suppliers in order to enhance their growers' production capabilities and strengthen relationships.

The company contributes R&D for production development and shares new knowledge with its supplier. However, some aspects need to be developed for true collaboration, such as decision synchronisation, incentive alignment, and supply chain contracts. The supply chain contract should be properly applied in practice for real benefits to both parties.

Table 7. 5: Case E: An analysis Summary

The factors of analysis		Company E	Company E's suppliers
1. Information sharing	1.1 Collaborative performance system (CPS)	Mutual goals	Mutual goals
	1.2 Performance status	Short notice	Short notice
	1.3 Production/Demand planning	Seasonal	No
	1.4 Knowledge sharing	R&D	Chemical uses
2. Decision synchronisation		No	No
3. Incentive alignment		No	No
4. Supply chain contracts		Contract Farming	Contract Farming
5. Traceability		Basket labeling	Basket labeling
6. Transaction cost management		Partial	Partial
7. Relationship		Long-term	Long-term

7.1.6 Case study of Company F: a New Mango Exporter, a New Entrant

7.1.6.1 The Background and Data

Company F is a new mango exporter located in the far distance of the Eastern region of Thailand. The establishment of the company is supported by the cooperative of a province in order to support agricultural production of the province. The company does not own only the VHT plant, but also a food processing machine for producing processed fruits and vegetables.

Company F has its own orchards which it plans to use to produce mangoes for export. At present, however, as the orchards have only just started to be developed they are used solely for R&D.

Due to its limited experience in the mango business, the company does not have established networks on the same scale as other companies. Nor does it have a business partner in Japan, and so has to seek its own market. A CEO of company F stated that, because the company was at the beginning of setting up management systems, many aspects needed to be improved, such as production management, the business network, and relationships with the company's stakeholders. Company F experiences problems of product deficiency during the mango off-season, when it has to contact and purchase

produce from intermediaries. This could be risky in terms of, for instance, chemical residue, since although these intermediaries may be able to be traced, they may not be held responsible for any faults.

7.1.6.2 Information Sharing

i) Collaborative Performance System (CPS)

Interview data revealed no CPS the supply chain management of Company F. Though the company aims to develop the production capability of growers and create collaboration within the supply chain, plans are as yet indeterminate. An assistant manager of company F revealed that the company intended to directly purchase mangoes from growers who are GAP certified. Most experienced mango growers are able to reach full production capacity that meets the needs of other companies. This company has to contract with various mango growers, each of whom has limited production capacity. Another difficulty is product scarcity during the mango off-season meaning that the company has to purchase mangoes from intermediaries, which Company F uses as alternative suppliers. Because of this problem of uncertainty regarding who the company's supplier may be, the company cannot establish CPS in its supply chain.

ii) Performance Status

As mentioned above, Company F is still uncertain of who its suppliers will be, and so information regarding performance status is communicated only with regard to changes in customer demand and product specification.

iii) Production and Demand Planning

Company F cannot establish production and demand planning because of the uncertainty surrounding its suppliers and business partners. Unlike other companies, who are supported by their Japanese joint venture companies in terms of marketing and product distribution in Japan, Company F has to find new Japanese markets and contracts

by itself. The company needs to assess customer demand, plan production capacity, and then pass on the information to its suppliers.

iv) Knowledge Sharing

Company F shares only compulsory information with its suppliers, such as lists of approved chemicals and how they may be used. The company expects to carry out R&D from its orchards in the near future and intends to share any new knowledge with its suppliers.

7.1.6.3 Decision Synchronisation

Most decisions are made by the company, and decision synchronisation does not appear in this case.

7.1.6.4 Incentive Alignment

The incentive alignment cannot be created until the company knows who its suppliers will be.

7.1.6.5 Supply Chain Contracts

Although the commitment of Company F to its suppliers is still surrounded by uncertainty, the company nevertheless has to follow the requirements of DOAE in signing contract farming agreements with the suppliers. It should be noted, however, that the conditions in contract farming are not always properly applied in practice, as mentioned in the analysis of Case E.

7.1.6.6 Traceability

Similarly to other cases, Company F uses labeling for traceability as this technique is convenient and cheap. This technique also can be applied to direct purchases from growers. If the company purchases mangoes from intermediaries, it is difficult to trace the product's origins.

7.1.6.7 Transaction Cost Management

Company F has the biggest number of suppliers who mostly are the small growers and some of them are intermediaries. Therefore, the company has difficulties in product quality control. For the transaction cost activity with growers, the company manages the grading activity by itself to assure the product quality. In contrast to the intermediaries who individually manage all the grading processes by themselves, consequently the company has to investigate the products before processing VHT in order to assure the product quality. Thus, the company can only partially manage the transaction cost from this transaction activity.

7.1.6.8 Relationship

Consideration of relationship issues in this case is not relevant since the company has been established less than two years, and it is too early to judge the progress or nature of any relationship. The company realises the necessity of collaboration, however, and plans to develop such relationships with its partners.

7.1.6.9 Summary

Company F is a new mango exporter. The company's establishment is supported by a cooperative of a province where the company's VHT plant is located. The company aims to encourage agricultural production by its R&D. As an amateur in mango exports, Company F, unlike others, does not yet have any partnerships with Japanese joint venture companies and therefore has to construct its own production, demand and marketing plans. Furthermore, the company is as yet uncertain of who its suppliers may be, so that it has to purchase mangoes from intermediaries during the mango off-season. Because of this, information sharing, decision synchronisation, incentive alignment and financial sharing do not appear in this case.

With regard to relationships, the researcher found that it is too early to judge any particular relationship's interval as either short or long term, since Company F is very new to the business. The company realises the importance of collaboration and

relationship in the supply chain, however, and plans to work on these issues to improve performance.

Table 7. 6: Case F: An analysis Summary

The factors of analysis		Company F	Company F's suppliers
1. Information sharing	1.1 Collaborative performance system (CPS)	Customer demand	No
	1.2 Performance status	Short notice	Short notice
	1.3 Production/Demand planning	Seasonal	No
	1.4 Knowledge sharing	List of chemical uses	Chemical uses
2. Decision synchronisation		No	No
3. Incentive alignment		No	No
4. Supply chain contracts		Contract Farming	Contract Farming
5. Traceability		Basket labeling	Basket labeling
6. Transaction cost management		Partial	Partial
7. Relationship		N/A	N/A

7.2 Cross-Case Analysis

In this section, the cross-case method is selected for analysing six companies in order to compare similarities and to contrast differences in terms of the findings. This section integrates six tables (Tables 7.1, 7.2, 7.3, 7.4, 7.5, and 7.6) in order to summarise the cross-case findings in Table 7.7. The main principle is to discuss the supply chain collaboration of six companies, and also identify the factors that help to improve it. It is also necessary to evaluate the supply chain collaboration mechanism and its application. The next study provides a clear understanding of the mango supply chain collaboration in Thailand, and examines the outcomes of such collaboration. The following section contains details of the cross-case analysis of six exporting companies.

Table 7. 7: A Summary of Cross-Case Analysis

The factors of analysis		Company A		Company B	Company C	Company D	Company E	Company F
		Internal Supplier	External Supplier					
1. Information sharing	1.1 Collaborative performance system (CPS)	Mutual goals/benefits	Customer demand	Mutual goals	Mutual goals	Customer demand	Mutual goals	Customer demand
	1.2 Performance status	Routine	Short notice	Routine	Short notice	Routine	Short notice	Short notice
	1.3 Production/Demand planning	Joint planning	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal	Seasonal
	1.4 Knowledge sharing	R&D	List of chemical uses	List of chemical uses, production techniques	List of chemical uses, production techniques	R&D	R&D	List of chemical uses
2. Decision synchronisation		Joint decision	No	Grading activity/Transport	Grading activity/Transport	Grading activity/Transport	No	No
3. Incentive alignment		Mutual benefits/risks	No	No	Yes	No	No	No
4. Supply chain contracts		Institutional trust	Contract Farming	Contract Farming	Contract Farming	Contract Farming	Contract Farming	Contract Farming
5. Traceability		Basket labeling	Basket labeling	Basket labeling	Basket labeling	Basket labeling	Basket labeling	Basket labeling
6. Transaction cost management		Complete	No	Complete	Partial	Partial	Partial	Partial
7. Relationship		Institutional trust	Long-term	Long-term/ Mutual Trust	Long-term	Long-term/Trust	Long-term	N/A

7.2.1 Information Sharing

i) Collaborative Performance System (CPS)

It was found that most companies (four companies; Company A, Company B, Company C, and Company E) have mutual goals with their suppliers. Nonetheless, having mutual goals is a CPS concept since, according to Kaplan and Norton (2002), CPS consists of objectives, metrics, target specificity, an explicit time period, and performance feedback. The concept behind CPS is the design of performance metrics and targets as guidance for performance improvement on the part of the chain members. These performance metrics drive the members of the chain to achieve mutual goals and objectives. In order to achieve an effective CPS, the mutual goals and benefits of supply chain collaboration should be set out by the chain members as a milestone (Simatupang and Sridharan, 2008). It was found that only Company A has systematically implemented the concept of CPS as a general manager of the company stressed that "Our company necessitates collaboration as one of the key success factors since the company is the largest conglomerate agricultural businesses, so the collaboration from upstream to downstream of the whole supply chain is vital. We have joint-decision on setting mutual goals, production planning and time period in order to ascertain performances of ours and other's division, and we agree to provide routine information sharing. As such, we can keep proactive to change as well as control product quality and costs.[3]" According to the theoretical concept underpinning a CPS, only Company A could achieve a CPS with its internal supplier, whilst other companies could partially apply a CPS to their suppliers.

However, Company A provides mutual goals and benefits only with its internal supplier as they belong to the same company. Company A and its internal supplier mutually rely on each other. The main production of Company A is based on the internal supplier. Conversely, the supplier has Company A as its sole customer (buyer). As a result, the process of the management of Company A and that of its internal supplier is interdependent and highly responsive to each other. This interdependent relationship leads to collaboration in the supply chain. This is relevant to the perspective of

[3] Interview with the general manager of Company A, Chonburi, Thailand, December,19th 2010, 13.00-14.20

Simatupang and Sridharan (2008) which suggests that the business process management (BPM) is a remarkable element of supply chain collaboration. The BPM concept proposes that work processes become the key to organisational transformation (Hammer and Champy, 1993). The business process associated with logically related tasks are redesigned and performed in order to achieve mutually defined supply chain outcomes (Berry et al., 1999; Evans et al., 1995).

In contrast, the relationship that company A has with its external suppliers is likely to be more dependent on each other. The CPS is not established at this stage since neither party has jointly determined objectives, outcomes, and performance feedback. According to Simatupang and Sridharan (2008), the members of the supply chain are required to mutually determine specific collaborative objectives, characterised by written terms of outcomes, rather than measurable and quantifiable actions, a clear time frame, and clear communication with all necessary participating members. In this case, Company A therefore has not achieved a CPS. This is similar to the situation with regard to Company D and Company F in that they have decided to share details only of customer demand with their suppliers. It is remarkable that although Company A and Company D have a long-term relationship with their suppliers, both companies are still more likely to dominate the suppliers than engage in joint business planning and sharing in terms of marketing information and planning. Company A uses its external suppliers as alternatives with regard to mango suppliers. Rather, the company focuses on its internal supplier as the main mango supplier.

Company D, a family business, has been in the mango export business for decades, so the company has a long-term relationship with many mango suppliers. Due to the large number of suppliers compared to other companies, Company D does not have a strong relationship with any one supplier, as the company attempts to preserve a good relationship with as many suppliers as possible. Regarding the number of suppliers and the supply chain relationship, Skjøtt-Larsen et al. (2003) stated that the supply chain management also refers mainly to a procurement strategy for reducing the number of suppliers in order to effectively establish strong relationships with strategic allies and partners. Company D therefore should reduce the number of its suppliers by selecting key potential suppliers, and developing the CPS to ensure greater supply chain collaboration.

Company B, Company C and Company E decided to establish mutual goals with their suppliers. However, these three companies could only partially achieve the CPS. As mentioned earlier, the CPS consists of many elements which have to be accomplished aside from mutual goals.

ii) Performance Status

With regard to performance status sharing, it was found that most companies (Company A with its external suppliers, Company C, Company E and Company F) do not share performance status with its suppliers. These companies normally mainly inform their suppliers about changes in customer demand at short notice. However, Company A (with its internal supplier), Company B and Company D frequently communicate and share performance status with their suppliers, in order to monitor the suppliers' performance, and to be able to evaluate and give feedback in terms of performance improvement.

iii) Production and Demand Planning

It was found that only Company A conducts joint planning in terms of production and demand with its internal supplier, whilst Company B, Company C, Company D, Company E, Company F and Company A (with its external suppliers) periodically share demand planning only when customer demand changes, particularly in different mango seasons. However, unlike factory goods which are precisely produced to order by factory machines, agricultural products are more complicated in terms of product quantity and quality. Agricultural products involve more uncertainty than factory products, since the production yield and product quality of agricultural products is mainly based on nature. As a consequence, agricultural products are typically impacted on by natural uncertainty such as changes in climate, drought, inundation, pests and diseases. To prevent product scarcity, a company and a supplier should both regularly share demand and production plans. Even though a company and a supplier may agree to sign a one year contract in order to arrange demand and the production plan, the information sharing regarding demand and production planning should be monitored at least quarterly for greater

responsiveness to change. Timely demand information could increase the performance level under certain conditions. Besides, sharing information in advance (i.e. early) has been proposed as a means of improving supply chain performance (Bourland et al., 1996).

iv) Knowledge Sharing

It was found that all companies share a list of chemical uses with their suppliers in order to educate suppliers concerning chemical usage. Suppliers also report the use of chemicals to their buyers (the companies) to ascertain the food safety of the production process. As mentioned in Chapter 3 regarding the food safety of fresh fruit exports to Japan, the exporters have to follow the restrictions of the Ministry of Health, Labor and Welfare (MHLW), as the problem of chemical residue is the main concern of fresh fruit and vegetable exporters. According to Jankor et al. (2004) the biggest problem found in importing fresh fruit and vegetables from developing countries is pesticide residues exceeding the maximum residue levels. Other problems are harmful insects and foreign objects in the packages of products, while another issue is the poor quality of imported products which are found to be perished. Thus, a knowledge of chemical uses is a fundamental knowledge for producers and exporters who have to meet the food sanitary standards of the MHLW.

In order to enhance production capability, other knowledge beyond chemical uses is needed, especially with regard to production techniques. Company B, Company C, Company D and Company E are found to educate their suppliers in production techniques involving such activities as trimming, pruning, and wrapping. Company A has its own orchardist (internal supplier) who takes responsibility for mango production and for R&D.

7.2.2 Decision Synchronisation

Decision synchronisation could link knowledge and decision rights for the mutual benefit of chain members, since independent chain members have limited capability in terms of individual decision making, possibly due to a lack of information or knowledge

(Simatupang and Sridharan, 2004, Simatupang and Sridharan, 2008) Company A has applied the concept of decision synchronisation with its internal suppliers at the stage of creating the CPS. The mutual goals, targets and performance feedback are discussed as joint decisions. On the other hand, Company A does not provide joint decisions to its external suppliers. Similar to Company E and Company F, the companies only provide information to the suppliers without decision synchronisation. Company B, Company C and Company D make joint decisions with regard to some activities with their suppliers, such as grading processes and product delivery from the mango collecting orchard to the VHT plants. According to Bagchi, Ha et al. (2005), joint decisions could be made with regard to the procurement, production, distribution, inventory management, facility location, and material flow processes. Successful joint decisions result in product quality improvement, cost reduction and precise delivery times; these are aspects of a good supply chain performance. In addition, issues relating to dominance, the balance of power, and resource sharing should be determined with regard to decision synchronisation in order for collaborative supply chain relationships to succeed (Eyaa and Ntayi, 2010).

7.2.3 Incentive Alignment

According to Simatupang and Sridharan (2002), one of the most important problems associated with supply chain collaboration is the motivation of participating chain members to create value for the benefit of all members. The incentive alignment scheme could motivate members to perform consistently in terms of their mutual goals. These should be optimal for the overall supply chain, and also should disclose accurate private information. An appropriate incentive alignment, such as rewarding responsiveness and sharing cost markdowns, could motivate the chain members to ensure the accomplishment of supply chain profitability. Not only should profit sharing be considered an incentive alignment, but risk sharing among the chain members in terms of demand/supply management and price uncertainties are also included (Fisher, 1997).

With regard to the concept of incentive alignment, it was found that only Company A achieved theoretically the concept by sharing both mutual benefits and risks with its internal suppliers. On the other hand, Company C provided only incentives with

its suppliers without risk sharing. The other companies, Company B, Company D, Company E, and Company F, did not extend the incentive alignments to the suppliers. It is interesting to note that even though Company C does not apparently achieve a concept of supply chain collaboration mechanism regarding incentive alignment, the company's strategy appears to be in a favour of DOAE. A managing director of Company C stressed that the company had an agreement with DOAE to support mango growers in order to increase their production efficiency "Growers need encouragement for the improvement of their production capability. So we provide the field survey to Japan as an incentive to growers who can achieve our targets. This incentive can motivate growers as well as disseminate the knowledge to them[4]." Such an incentive strategy is in accordance with the principle of DOAE whose mission is to provide knowledge to growers in order to enhance greater production performances and higher product quality standards. The incentives can apply in ways to promote the behavior the company desires, however, there is no one size-fits-all approach to incentives. The company should be thoughtful about when and where incentives are applied in order to avoid incentive misalignment which might lead to bias and dissatisfaction (Cohen et al., 2007). To resolve the problem, the incentive to improve supply chain performance should be clearly in a part of the supply chain contract. If policies and measures are properly aligned, then the optimal benefits can be gained successfully from aligned incentives and each supply chain partner can have a stake in success (Simatupang et al., 2000).

7.2.4 Supply Chain Contracts

Supply chain contracts aim to install rules for material accountability and pricing in order to guide independent entities towards a globally desirable outcome (Whang, 1995, Lariviere, 1999). According to Tayur and Lovejoy (1999), supply chain contracts include the specification of decision rights, pricing, minimum purchase commitments, quantity flexibility, buyback or return policies, allocation rules, lead time, and quality. Eppen and Iyer (1997) also reveals "backup agreements" to the supply chain contract in

[4] Interview with the managing of director of Company C, Bangkok, Thailand, January 4th ,2011, 12.30-15.00

which the buyer is allowed a certain backup quantity in excess of its initial forecast at no premium, but pays a penalty for any of these units not purchased.

Singh (2005) defined contract farming as a system for the production and supply of land based and allied products produced by primary producers under advance contracts in order to procure a certain pre-agreed quantity and quality of products at a specified time, price, and in a specified quantity. Contract farming varies depending on the nature and type of contracting agency, the technology involved, the nature of the products, and the local and the national context. Glover (1992a) stated that contract farming is a key element of the Thai government's development plan in the form of "private-led integrated agricultural development".

Due to the requirements of the DOAE that every exporter should sign a farming contract with growers, all companies of the cases under consideration have a contract farming agreement with their suppliers as part of the supply chain contracts. In the process of creating contract farming, the DOAE and the Thai Mango Growers Association play the role of assistant to the mango growers with regard to pricing negotiation. Since agricultural producers are normally price takers, the DOAE ascertains the impartiality of the contract. Contract farming not only benefits growers in terms of price guarantees, but also benefits the exporting company in terms of production volume and delivery.

In practice, it was found that contract farming is not actually implemented, as Singh (2005) claimed that most researchers found contracts inequitable, short-term, and ambiguous. All companies claimed that contract farming is created for the benefits of the growers rather than for mutual benefit. Company E, in particular, complained that the company has always purchased products at a higher market price in order to maintain a good relationship with the growers. "The contract farming is conducted for the sake of growers instead of exporters. The conditions in the contract are mostly controlled and managed by DOAE and Thai Mango Growers Association as they need to ensure that growers are not exploited by the exporters. DOAE focus on promoting the contract farming, but the implementation in practice must be taken into account. We found that the problems of grading and pricing still remain as long as people play out of the game. It

is not fair for exporters to accept such burden alone.[5]" insisted the CEO of Company E. In addition to the price issue, most growers refuse to accept the return or payback of the unqualified products except as a result of chemical contamination problems. This is due to the perishable nature of an agricultural product in that the product quality is changed by time. The more time consuming the process, the less the product quality, especially in terms of freshness. Perishability is a very important issue with regard to supply chain contracts as part of the agro-food supply chain.

Nonetheless, both growers and the companies surveyed agree that if contract farming is well designed and implemented, it can lead to the development of all the parties involved, although Singh (2000) noted that there could not be a sole blueprint or contract farming model for all circumstances. It is not the sole contract, but the relationship it represents which is important, as the divergence between the two parties can prove crucial in resolving the development of contract farming as an institution (White, 1997). Establishing relationships of trust with growers through company reputation rather than through marketing schemes is important. This requires mutual respect, a fair and transparent bilateral negotiation process, realistic assessment of benefits, long-term commitment, equitable risk sharing, and practical business planning (Mayers and Vermeulen, 2002). Through a successful contract, an innovative pricing mechanism will be created which can involve such aspects as a bonus at the end of the processing cycle, shares in company equity, dividends, grower's fixed price, and quality based pricing, all of which reward performance and can help contract performance (Singh, 2000).

Contract farming is eventually only an approach to agricultural and rural development, not an end in itself (Singh, 2007). As a vertical coordination mechanism, contract farming is only a response to a situation of market failure, and depends on crop/commodity dynamics which are likely to change at any time in the globalised world, although there are many indications that contract farming can continue even in the competitive markets as has been the case in developed countries, or in even in Thailand (Ornberg, 2003a). However, as market conditions for a crop/commodity change, contract farming can wither away if the market becomes efficient (Singh, 2007). "The essence of

[5] Interview with the CEO of Company E, Nakornphathom, Thailand, January 12th 2011, 13.00-15.30

contract farming is to ascertain that growers and the company act accordingly. If all parties are fair and honest, therefore contract farming is not needed" said a senior manager of Company B[6].

7.2.5 Traceability

Traceability in terms of product safety and quality become essential as a good product tracing system could minimise the production and distribution of unsafe or unqualified products. A traceability system helps companies to isolate the source and extent of safety or quality control problems. A company's traceability system not only diminishes potential damage for an individual firm, but it also diminishes damage to the whole industry, and to upstream and downstream industries (Golan et al., 2003). Wang and Li (2006) also added that traceability could create competitive advantages. The traceability could be value added by integrating the traceability system with the supply chain management process, and using data to develop performance.

According to (Golan et al., 2004, Wang and Li, 2006), the objectives of companies in terms of using traceability systems are to facilitate trace-back for food safety and quality, differentiate and market foods with undetectable quality attributes and improve supply chain management. Traceability systems vary from simple paper recording systems to computer-based information technology methods including biological technologies. The reliability and effectiveness of the food traceability system depends on the degree of accuracy and efficiency of the food identification and authentication techniques. Using information technology and associated innovations, traceability systems can deliver real-time information to consumers on the quality and safety status of products and can enable speedy recall when the product quality or safety is breached. From the interviews, it was found that all companies and their suppliers have applied logistics traceability to their production processes. The same technique, using basket labeling, complements this. A mango basket has an attached label which identifies the grower and the orchard. The information is paper-based due to the limitations/difficulty of information technology accessibility on the part of growers.

[6] Interview with the senior manager of Company B, Bangkok, Thailand Decemeber 14th 2010, 15.30-17.00

Growers and the companies communicate by phone for further inquiries with regard to product information, only when a problem regarding product quality is encountered. The traceability system should be improved by adding production and process information so that all parties are able to check the product's status along the supply chain. Wang and Li (2006) mentioned that the information concerning the products are generally generated by each node of the supply chain, and collected for business purposes, even though some data are important in terms of fulfilling ethical and legal responsibilities, while other data are less essential but still relevant for optimal processing. When the traceability information with regard to the process is available, greater quality and process control, and an optimal production plan can be established to reduce the risk of cross-contamination of products, and prolong the product life cycle. Hence, a traceability system has to be properly designed on order to ensure that the correct data is collected and effectively managed. The system requires collaboration between the supply chain partners, and information sharing along the chain.

7.2.6 Transaction Cost Management

According to Hobbs (1996), transaction cost analysis represents an approach to the comprehension and evaluation of supply chain management. The aims of supply chain management are to reduce the transaction costs incurred within the linkages in the chain, both upstream and downstream, and also to eliminate barriers between each of the stages in the supply chain in order to achieve greater service and cost savings (Wilson, 1995). Hobbs and Young (2000) noted that the transaction of agricultural products has become more complex since agricultural products have become more differentiated due to the increasing price uncertainty which is tied to various product qualities. Moreover, perishability has to be a concern, as another complex aspect of a transaction, because the quality of the product can diminish over time. This imposes sorting information costs on buyers and also increases negotiation costs as the parties (buyer or seller) are responsible for product quality at different stages of the transaction.

In the case of the supply chain associated with fresh Nam Dok Mai mango exports to Japan, grading activity is a problematic joint activity between growers (sellers/ suppliers) and exporters (buyers). As mentioned earlier, grading activity can be

considered as a duplicated activity which generates transaction costs for both growers and exporters. Company A (and its internal supplier) and Company B are found to have complete transaction cost management in terms of grading activity with their suppliers. Apparently, Company A and its internal supplier are in the same company, so it is easy to manage the transaction costs. Company B has a very small numbers of suppliers so it can entrust its supplier(s) to manage the grading process, whilst other companies which have many suppliers to deal with have to grade all products by themselves, to prevent various product quality standards in the grading process.

Company B was concerned greatly about the importance of supplier selection and, as a senior manager said, "Our company attentively selects suppliers to work with as we intend to have relationship in the long run. The good long-term relationship needs to be invested so we have to be very careful of supplier selection. We prefer to have few numbers of reliable suppliers so that we can intensively invest for them. With these few suppliers of ours, we can effectively confirm consistency in product quality and specification. As such, we can entrust our devoted suppliers to manage the grading process.[6]" This indicates that buyers are looking for fewer and larger suppliers who can work with them in partnership as they reduce the number of food suppliers. This is in agreement with the general business trend in developing an exclusive relationship with fewer, favoured single sources of devoted partnerships (Hingley, 2005).

Newman (1988) mentioned the benefit of reducing the number of suppliers in that a reduced supplier base can help eliminate mistrust between buyers and suppliers due to the lack of communication. The greater the number of suppliers, the more difficulty arises in terms of communication and mistrust. This is the reason why a company with a small numbers of suppliers can effectively manage its transaction costs. In addition, transaction costs decrease as partnerships and trust reduce the need for contracts and costly negotiations. The chain members can work together to invest in the development of relationships to meet the needs of customers, and the needs of large numbers of suppliers are diminished (Wilson, 1996). Developing relationships and trust is therefore important in order to reduce transaction costs in the supply chain.

---

[6] Interview with the senior manager of Company B, Bangkok, Thailand Decemeber 14th 2010, 15.30-17.00

7.2.7 Relationships

Partnership between a buyer and a supplier is a mutual ongoing relationship which indicates a high level of trust, commitment over time, long-term supply chain contracts, joint conflict resolution, and the sharing of information, risks and rewards (Vickery et al., 2003, Ellram, 1990, Heide and John, 1990). These arise with regard to the three critical elements of information flow, product flow and relationship management as part of a supply chain management strategy (Johnston et al., 2004). Handfield and Nichols (1999) stated that relationship management can be fragile and tenuous. This is due to the high significance placed on "trusting relationships", where each party in the supply chain has mutual confidence in the other members' capabilities and performances. Developing trust is therefore a key element for relationship management in the supply chain (Johnston et al., 2004)

Supply chain management is established on the basis of trust and commitment (Lee and Billington, 1992). Wilsons (1995) claimed that trust-building moves through stages as a relationship matures. From the surveys and interviews, it was found that every company with the exception of Company F has long-term relationship with its suppliers. Company F is a new exporter. As a result, the relationship with its suppliers is at an early stage, and currently it is considered as not being applicable in the analysis of relationship management. Company A and its internal supplier have the strongest relationship and trust. As they are the same company, Company A and the internal supplier share information cooperatively. The marketing manager from Company A and the orchard manager claimed that they could share confidential information if the information is vital. Sahay (2003) stated that the process of sharing vital information not only helps establish trust, but also grows with the presence of trust. Trust facilitates the relationship causes it to be stronger, and then leads to a longer relationship for greater benefits. In contrast, Company A does not share vital information with its external supplier as the company recognises that the external supplier is a second supplier. Though they have a long-term relationship, the sense of belonging does not exist in this case.

It was found that Company B and Company D have established a long-term relationship and trust with their suppliers. Though these two companies cannot share the confidential information with their suppliers as Company A does, they have the reliability of commitment with their suppliers. As a Japanese company, Company B insisted on a

culture of trustworthiness and honesty with its suppliers. The company underlined its importance of relationship and trust as its senior manager stressed that "Our company prioritise the trustworthiness, honest, and reliability of suppliers rather than production capability. We can teach and train growers how to produce good products from pre-harvest to post-harvest, but we cannot teach them to be trustworthy and honest. Honestly speaking, if the growers are truly honest in their clean production, then phytosanitary nor contamination test are not needed.[6]" This "goodwill" concept of Company B, made growers trust and associate willingly with the company. This demonstrates that mutual trust greatly develops within this buyer-supplier relationship. Consequently, due to the reduction of some duplicated activities, the transaction costs could be reduced since it was found that only Company B entrusted the supplier(s) to manage grading activities. It is certain that good relationships need mutual trust. However, in the case of Company B, mutual trust developed from satisfaction of honest commitment and consistency in performance. This demonstrated that satisfaction drove the buyer-supplier supply chain relationship rather than performance. If the power holder attempts to promote supplier satisfaction, the relationship-driven supply chain strategy should be concerned rather than a performance based strategy (Benton and Maloni, 2005).To establish trust, the activities designed to demonstrate trustworthiness are particularly important in the early stage of a relationship (Arino et al., 2001). Johnston, McCutcheon et al. (2004) described the acts or behaviours which represent trustworthiness, such as providing proprietary information or assistance without compensation. Not only is a high level of trust involved in a partnership of customers and suppliers, but also long-term contracts, joint conflict resolution, commitment over time, and the sharing of information, risks and rewards are involved in this collaborative relationship (Ellram, 1990, Heide and John, 1990). Trust facilitates the relationship and helps it to connect into a strong link between customers and suppliers, where the strength of the relationship then leads to a longer relationship and greater benefits (Sahay, 2003).

In the case of Company D, since it had a large number of suppliers, the company could not develop mutual trust with all its suppliers. A general manger of Company D claimed that, as the company was a family business which had been transferred from

[6] Interview with the senior manager of Company B, Bangkok, Thailand Decemeber 14th 2010, 15.30-17.00

generation to generation, the company preferred to maintain good relationships with suppliers since they have worked as partners for decades. “We necessitate the relationship with our suppliers because most of them have worked for us for such a long time. In the past, there were not many suppliers like today but when the business becomes more competitive so they demand their descendants run the business too. For this reason, most of our suppliers are currently like huge families which tie in together.[7]” The general manager explained. Due to the large number of suppliers, it was difficult for the company to manage relationships intensively with all its suppliers. Even though the company and suppliers can maintain trust, the company could not develop the exclusive relationship and mutual trust to all suppliers since the company decided to manage the grading activities by its self to control the product quality rather than entrusting the suppliers process the grading. Hingley (2005) mentioned that neither mutual trust nor gaining mutual benefits was the basis of all relationships. In order to develop an exclusive relationship with suppliers, buyers might select the fewer and larger suppliers with which they preferred to collaborate (Fearne and Hughes, 2000, Hingley, 2001, White, 2000, Cowe, 1996, Rademakers and McKnight, 1998, and Hingley, 2005). If the suppliers realised such unfairness and were able to accept the power-imbalance and benefits, the agricultural supply chain relationship could be improved (Hingley, 2005).

7.3 The Summary of Cross-Case Analysis

Considering all factors of supply chain collaboration mechanism discussed above, it is apparent that Company A (in collaboration with internal supplier) demonstrates the best performances in contrast to Company F. With its internal supplier, Company A was performing as a prototype of good practice in supply chain collaboration. This was in contrast to the performance with its external supplier since the Company tended to base all production processes on its own. Since Company A was the largest conglomerate agribusiness in Thailand, it had experience of the management of an integrated supply chain and buyer-supplier relationships, whereas Company F was a new entrant to the

[7] Interview with the general manager of Company D, Panakorn Si Ayutthaya, Thailand, Januray 25th, 2011, 10.00-12.30

business and had limited experience and tenuous connections. However, it had to consider that Company A's performance was only with its internal supplier since they operated within the same company. As such, the company could monitor conveniently and control all supply chain activities. In addition, Company A's case was very unique since Company A was the only company, in Thailand, which owned the entire production system. Accordingly, Company A appeared to be the best performer in terms of the implementation of supply chain collaboration mechanisms. However, in practice, this case could not be implemented fully in other developing economies.

With regard to the practical implementation in the circumstances of developing economies, Company B appeared to be the best performer and it also provided good lessons to be learnt particularly with regard to issues of transaction costs and relationship management. Company B prioritised the importance of mutual trust and long-term relationship as key factors in driving supply chain collaboration. The company implemented its relationship-based strategy to select suppliers who gained satisfaction from their preferred-supplier status. The company developed CPS as the first milestone to setting clear mutual goals and benefits with supplier(s). The information and knowledge was shared frequently and routinely in order to monitor the performance and prepare to react to change or uncertainty which might occur due to the dynamic nature of competitive business. The mutual trust and long-term relationship were developed accordingly. In comparison, it was found that other companies (except in the case of Company A regarding collaboration with the internal supplier) prioritised the performance of the suppliers rather than relationship and trust. Even though long-term relationships were developed in some cases, only Company B could gain mutual trust with the supplier(s). Consequently, the transaction cost could be shared and minimised. This indicated that relationship-driven strategy was important in developing mutual trust in supply chain collaboration as Benton and Maloni (2005) argued, the relationship-driven supply chain strategy was preferred to performance-based strategy for improving supplier satisfaction in buyer-supplier relationship.

7.3 Conclusion

Six case studies are selected with regard to export companies which own VHT plant. Seven supply chain collaboration factors are conducted for cross-case analysis. These are information sharing, decision synchronisation, incentive alignment, supply chain contracts, traceability, financial sharing, and relationships.

The cross case analysis illustrates similarities and differences between each company as shown in Figure 7.7. In Chapter 2 it was noted that information sharing consists of four elements - collaborative performance system (CPS), performance status, production demand planning, and knowledge sharing. In addition, the outcomes of each factor are discussed. Four companies shared mutual goals with their growers. Only company A can achieve the CPS concept, their supplier is owned by the same company and they share both mutual goals and benefits. Moreover, the outcome shows that it is fundamental for every company to share a list of chemicals used. Nonetheless, most of the companies attempt to develop supply chain collaboration by sharing knowledge such as production techniques.

In order to enable supply chain collaboration, the CPS should be constructed as the beginning process of setting mutual goals, common interests, clear expectations, benefit sharing, and performance monitoring. Information sharing is one of the keys to achieving collaboration. Apart from the flow of products, information flows should be consistently linked to monitoring the performance of the members of the supply chain in conducting related supply chain activities.

The mango exporting business is very competitive and the flow of information is very dynamic. A quick response is needed from each supply chain member. The information should be regularly shared for greater responsiveness. However, it was found that most companies and their suppliers share only fundamental information (lists of chemical uses and applications) and informed quick response regarding changes in customer demand. This causes the problem of product scarcity during the mango production off-season. To solve the problem, the company and the supplier should consistently share related information in terms of production/demand plans, current performance, and time lines. Decision synchronisation should be applied for effective decision making. The decision synchronisation can be described in the mango supply chain activity in terms of grading activity and transport. This benefits all parties in the

supply chain as they can share their interests, capabilities and limitations when asking for support from other participating chain members.

The outcome shows that most companies outsource the grading and transport activities to their growers. These represent the development of collaboration between grower and exporter. However, only one company provides incentive to their growers, which indicates a lack of incentive alignment. In addition, traceability is a fundamental requirement in terms of the export of agricultural goods. All companies apply a basket-labeling system in order to track and trace the source of a product. To achieve collaboration between grower and exporter, the relationship is an important factor. The outcome shows that most companies are agreeable with regard to having a long-term relationship with the growers.

The supply chain contract as part of contract farming should be considered in terms of practical implementation. Effective contracts should benefit all related parties. Although mango growers need the support of the DOAE and the Mango Growers Association in terms of price, the issue of product return and repurchase could be implemented regarding unacceptable product quality e.g. due to disease, insect, and chemical contamination. To motivate the performance of growers, incentive alignments should be applied. Company C is a good example of implementing incentive alignments with its suppliers, as the company provides a reward to those suppliers who have provided an outstanding performance.

With regard to relationships, it was found that all companies and suppliers prefer a long-term relationship. However, the number of suppliers should be a concern. Too many suppliers may lead to ineffective relationship management as it adds to costs, particularly with regard to facility support. Company D is an example of this issue. Although the company has a long-term relationship with its suppliers, the large number of suppliers obstruct the ability of the company to provide support.

In summary, this chapter presents six case studies and cross-case analysis. The analysis shows the collaboration between growers and exporters in the mango supply chain. Some factors already show evidence of collaboration. However, some factors require more collaboration between growers and exporters. In order to enhance the competitive advantage, supply chain collaboration should be developed. Mentzer, et al. (2001) stated that once collaboration begins with key supply chain members, it finally

becomes routine, and the focus could turn to new relationships. The next chapter will present the discussion and conclusion with regard to this thesis.

Chapter 8

Conclusion and Recommendation

8.0 Introduction

This chapter summarises the study by reviewing the previous chapters and discussing the results of the research. It concludes with the aim and objectives of the thesis, and then reviews supply chain management and supply chain collaboration from the literature. Then, the implications of the study are introduced. This chapter will present the contribution of the findings in terms of theory and practice. The limitations of this study are identified before recommendations are made.

8.1 Conclusion of the Thesis

8.1.1 Thesis Overview

Although the mango is Thailand's chief economic fruit with great production and export potential, domestic consumption accounts for approximately 90% of its total annual crop yield, while the remaining portion is shipped overseas to serve the export markets (Intraluk, 2009). In response to this factual information, the Thai government has placed considerable importance on the domestic mango industry, with an eye to satisfying unmet demand on the part of international consumers, with great emphasis placed on Japan, a prime export market for Thai mangoes.

Agricultural products in the fresh produce category incur high transportation costs due primarily to their limited shelf life, perishable nature and susceptibility to transport damage. This study centres around various contributing factors influential to the achievement of greater potential among growers and exporters, with the purpose of increasing their competitiveness, by means of case studies on the production of Nam Dok Mai mango which are exported to Japan.

Initial study findings indicate that the supply chain structure of the Thai mango export industry consists of the following major parties; growers, growers' community enterprises/cooperatives, exporters/domestic distributors and export trading companies.

Growers are responsible for producing mangoes of export quality standard, size grading and quality grading in line with the requirements pre-determined by buyers. The product yields are then sent to growers' community enterprises/cooperatives, which oversee the collection and storage of harvested product yields, as well as subsequent negotiations with exporters/domestic distributors. Export trading companies handle quality enhancement functions and process fresh products into other processed forms.

Costs are incurred in relation to the implementation of each of the above-mentioned activities in the supply chain. Those costs are mainly divided into two groups according to the parties responsible for such activities, namely growers and exporters. In brief, the cost base among growers can be broken down into harvesting and transportation. The cost base among exporters comprises transportation, vapour heat treatment (VHT), packaging materials and management. The empirical studies reveal that transportation is the most substantial portion of the cost base among growers. Unlike growers, transportation cost incurred by exporters is, however, comparatively higher. This is demonstrably evident from the fact that growers bear transportation costs only from the harvest site to the collection/storage area, whereas exporters are responsible for transportation cost from collection/storage areas to VHT plants and to airports/seaports (Kantabutra, 2010). Therefore, the study investigates the problematic transaction activities which affect product quality and operations costs, as the aim of the study is to develop the supply chain collaboration in the management of fresh Thai mango, namely Nam Dok Mai, for export in order to enhance its competitiveness in the global market.

The study involves the comprehensive primary data collection through field surveys and interviews, and secondary data from empirical research, covering the following topics: agro-food supply chain in terms of supply chain management and supply chain collaboration (see Chapter 2), limitations of Thai mango exports to the Japanese market (see Chapter 3), the Thai government's role and policy in relation to Thai mango production and export promotion (see Chapter 4). In addition, research findings are formed on the basis of data collection by means of field surveys, in-depth interviews and semi-structured interviews (see Chapter 6 and Chapter 7). Furthermore, the study also incorporates the analysis of six case studies with the aim of compiling case studies associated with the supply chain collaboration of growers and exporters (see Chapter 7). The data collection with regard to the study involves growers, exporters and

related representatives in the government sector, in order to provide profound information and recommendations for policy guidelines to achieve sustainable development in terms of a national agricultural supply chain.

8.1.2 Supply Chain Management

The literature review begins with a consideration of the background of the concept of supply chain management. Forrester (1958) identified the integrated nature of organisational relationships in distribution channels by illustrating a simulation of production flow and information flow in terms of each channel member's performance throughout the system, to improve each member's perception of the interrelationship. This concept became the key management issue that illustrates the dynamic factors associated with the recognition of supply chain management. Later, in 1992, Christopher (1992) claimed that the supply chain has now become the value chain, since he identified the supply chain as a network of organisations which are involved through upstream and downstream linkages associated with different activities that can add value to products and services. The value chain principle was developed by Porter (1985) as being strategically applied to supply chain management for enhancing competitive advantage. Mentzer et al. (2001) gave the definition of a supply chain as a set of companies which are connected through upstream and downstream flows of products, services, finances, and information. Although concepts of the supply chain are various, the similar common goal of supply chain management relate to relationship management as a means of accomplishing a more profitable outcome for all chain members (Christopher, 2005).

In the agricultural sector, supply chain management has been implemented as a means of developing long term relationships throughout the whole chain (Knight et al., 2002). The agri-food supply chain is classified into two categories according to Aramyan et al. (2006) - 1) supply chain for fresh products, and 2) supply chain for processed food products. However, the supply chain with regard to fresh products has many limitations which are different from other types of supply chain, such as the condition of product safety, production seasonality and perishability. The specifications of perishable product characteristics are a short product life cycle, proneness to damages, and specific condition of storage and transportation. These make the fresh product's supply chain more

complicated. Thus, the supply chain for perishable products has to be concerned with all activities regarding to right quality of market demand and supply which fit timing of distribution.

8.1.3 Supply Chain Collaboration

Collaborative supply chain management can assist the supply chain members in reducing costs and improving the quality of service. Supply chain collaboration can not only achieve the goal of supply chain management of meeting the customer's need by supplying the right product at the right place and in the right time, at a satisfactory price, but can also develop greater relationships between buyers and suppliers. With partnership collaboration, supply chain members can gain advantage in terms of better performance, greater competitiveness, cost reductions, competitive pricing, and increased operational flexibility when it comes to dealing with uncertainty in terms of customer demand and market diversity (Malhotra et al., 2005, Fisher, 1997, Hogarth-Scott, 1999)

Collaboration in the supply chain with regard to fresh food products is an arrangement between producers, processors, retailers, traders and purchasers about product quality, safety conditions, time of delivery and price. The collaborative supply chain mainly involves information exchange, and sometimes also deals with transactions finance and technology/ knowledge facilitation. This is necessary since, during the collaborative process, the partners need to engage in joint planning and need to share information in order to create a competitive advantage through appropriate mechanisms. Supply chain collaboration therefore needs communication, trust and respect, skills and knowledge.

Accordingly, the research gap relates to the collaboration of growers and exporters, since most research on supply chain collaboration focuses on industrial inter-firms/organisations. The key factors in the mechanism of supply chain collaboration are considered in the study: information sharing, decision synchronisation, incentive alignment, supply chain contracts, traceability, transaction cost management, and relationship management.

8.1.4 Data Collection

The methodology chapter discussed the methods which are best suited to the study. The case study method is selected as it can profoundly investigate and achieve the research objectives. In order to achieve the research aim and objectives, a field survey and in-depth interviews are initially conducted in order to observe overall activities along the supply chain, and to investigate the key activities which can either add value or reduce costs in the supply chain. Then the in-depth interviews with growers, exporters, and authorities of related government agencies are conducted in order to identify the key activities which are problematic. The information so gathered is utilised for developing semi-structured interviews for the creation of the case studies in order to analyse supply chain collaboration between growers and exporters. Finally, the semi-structured interviews with six case studies involving exporters who own vapour heat treatment (VHT) plants are conducted in order to thoroughly explain the relationship and collaboration between the exporter (as a buyer) and the growers (as suppliers).

The first field survey was conducted in 2009 across four regions in Thailand; Central, Eastern, Northern, and Northeast region, where most mango plantations and production facilities are located, according to the Thai Mango Growers Association (2010). Considering the scope of the area of study, 19 groups of mango growers who were considered to be regular exporting producers had targeted production areas which were located in the mentioned regions. Also, six exporters were investigated as part of the fieldwork. These six exporters were selected as being big exporters who own VHT plants and regularly process the VHT for fresh mango exports (DOAE, 2010). The findings from the field survey were from the field survey itself and from in-depth interviews with growers, exporters and related government agents. The interviews were analysed to answer the research objectives; the strengths and weaknesses of existing supply chain management were discussed, and the problematic logistics activities were examined (see Chapter 6).

The second fieldwork activity and interviews were conducted in 2010. The detailed data collected from the first fieldwork survey was analysed in order to develop the semi-structured interviews to investigate relationships as part of supply chain collaboration. The case study technique was selected in order to analyse the research findings. This was done in order to discuss the factors of supply chain collaboration

mechanism that could effectively apply to the supply chain collaboration involved in exporting fresh Nam Dok Mai mango to Japan on the part of each of the six companies concerned (see Chapter 7). The analysis was linked to the literature review chapter to compare academic theory and practice.

8.2 The Results of the Study

This section answers the three main research objectives: 1) to provide an overview of existing supply chain of Nam Dok Mai mangoes in Thailand and to identify strengths and weakness in the supply chain; 2) to analyse supply chain collaboration between growers and exporters in the production of mangoes for export to Japan; and 3) to provide recommendations to the government and related agencies on sufficient supply chain management for fresh mango exports.

8.2.1 An Overview of the Existing Supply Chain of the Thai Mango Industry relating to the Nam Dok Mai Variety, and the Strengths and Weaknesses of the Supply Chain

In the fresh Nam Dok Mai mango supply chain there are eight stakeholders; 1) manufacturers/suppliers of agricultural inputs, 2) growers, 3) intermediaries, 4) exporters, 5) Department of Agriculture, 6) forwarders and freighters, 7) Japanese importers, and 8) customers. Despite being considered to be the nation's prime economic export crop with a constant robust demand on the part of Japanese consumers, Thai mango remains in great need of further improvements in terms of production and export potential. This study finds that the supply chain associated with Thai mango exports currently consists of two key stakeholders - growers and exporters.

There are 19 groups of growers within the Northern, North-eastern, Eastern, and Central regions of Thailand. Most growers are small groups of mango producers from the four regions of Thailand's major mango production areas. Growers are involved in activities from pre-harvest through to post-harvest. Pre-harvest activities focus on good agricultural practices (GAP) and value adding to the product such as fertilising, pruning, and wrapping. Post-harvest activities are sorting, packing, and product handling.

Regarding the activities of the fresh mango exporters, this study focuses on the six main mango exporters who own VHT plant and who also regularly export fresh Nam Dok Mai mangoes to Japan. The exporters' activities range from grading processes to exporting to Japanese customers.

The gathered data shows that the apparent strength of the supply chain with regard to Thai mango exports at the present time is unity among growers, as is demonstrably evident from the existence of the Thai Mango Growers Association. The association provides growers with greater bargaining power which is sufficient to effectively deal with buyers and exporter representatives. This is a great strength of the mango supply chain compared to other fruit supply chains in Thailand. Another strength is government policy supporting the project "Thai kitchen of the World" which has made the DOAE responsible for product quality control and agricultural technology transfer.

From the research findings, it can be seen that the weaknesses of the supply chain are the gap in grower's production capabilities, uncoordinated goals, and different grading standards. Although there is an association of Thai mango growers, the association is still in its infancy, and there are both potential and production standard gaps between experienced growers in the mango export industry and newcomers. The perceived goals of growers and exporters are uncoordinated. Most growers are concerned with tangible product values such as mango maturity, weight, and skin perfection, rather than intangible product values such as chemical contamination and residue. These tangible values directly influence the grading process. On the other hand, exporters are seriously concerned with chemical contamination and residue since they are restricted by the Ministry of Health, Law and Welfare (MHLW) of Japan. Consequently, export companies can be banned from the Japanese market in the event of contaminated products being detected by Japan's custom authorities.

Another weakness is different grading standards which has proved to be the most problematic transactional activity between growers and exporters. Grading standards and pricing basically depend on demand and supply in the market. Although the DOAE has promoted the use of contract farming to solve the pricing problem, contract farming has not been practically implemented. The negotiation of grading and pricing is based on the market mechanism of demand and supply.

To minimise the weaknesses, growers and exporters should foster collaboration focusing on the transaction activities along the supply chain. Both growers and exporters should introduce a collaborative performance system (CPS) in order to ascertain that they have mutual goals and benefits. This can solve the problem of uncoordinated goals between the two parties since they can realise mutual goals by performing supportive operational activities to achieve such goals. Besides, sharing information is a necessary mechanism of supply chain collaboration as collaborative partnerships rely on information sharing, especially in order to minimise uncertainties. Beyond information sharing, knowledge sharing is also important for successful supply chain collaboration. Growers and exporters should share and update their knowledge for greater performance along the supply chain. Knowledge sharing can also reduce the gap in the grower's production capabilities. The new growers can gain knowledge and garner skills of production and production management from experienced growers. When supply chain collaboration is effectively applied, some transaction activities can be reduced. In the case of the fresh Nam Dok Mai mango supply chain, the grading process is the most problematic transaction activity (see Chapter 6 and Chapter 7). The supply chain collaboration is developed on the basis of mutual ongoing relationships and trust. According to the case study analysis of this thesis, the company which entrusts its supplier to manage the grading process can deduct the transaction costs of grading activities. Since partnership and trust reduce the need for costly negotiations, the transaction costs in the supply chain are decreased accordingly. Therefore, the concept of supply chain collaboration can practically minimise the weaknesses of the supply chain with regard to fresh Nam Dok Mai mangoes.

In the supply chain of fresh Nam Dok Mai mango exports to Japan, the main supply chain activities of growers range from pre-harvest activities such as fertilising, pruning and wrapping, to post-harvest activities such as collecting, grading and packing. Meanwhile, the main logistical activities of exporters are dealing with customers (demand) and growers (supply), and managing the VHT process (see Figure 6.1). However, there is a crucial transaction activity namely grading, which is a problematic joint activity with regard to both growers and exporters. In the supply chain, grading can be considered as a duplicate process since growers have to sort and initially grade their products at the orchard collecting points in order to estimate the qualified products and

income before the actual grading process which is conducted by the staff of the exporters. This grading activity generates transaction costs in the supply chain for both growers and exporters due to the duplication which takes time, labour, and costs. Another problem is grading standards which can vary in the different mango production seasons. Even though the criteria for qualified products and price are stated in the contract, grading and pricing alter in different mango seasons due to the mechanism of demand and supply (see Chapter 6).

In order to solve the problem of transaction costs, the two parties have to make a synchronised decision about which activities should be eliminated or converted. In this research, a company (Company B) which applies supply chain collaboration to solve the problem of duplicated joint activity, can successfully minimise transaction costs (see Chapter 7). The company has a strategic plan to have a very small number of suppliers who are trustworthy in terms of production capability and product quality so that the company can entrust its supplier(s) to manage the grading activity. Consequently, the grading processes and standards are managed only by the supplier(s). For this reason, the company rarely has the problem of transaction costs associated with this problematic transaction activity. On the other hand, other companies which have many suppliers, experience difficulties in terms of grading activity and grading standards, and also have to bear the duplication costs. This is because these companies have to send staff to conduct the grading activity at the growers' orchards to prevent variations in product quality standards even though their suppliers (growers) have already graded the products. This indicates that the transaction costs can be minimised since trust and partnerships can decrease the necessity for costly negotiation. With supply chain collaboration, the chain members are able to work together effectively in order to achieve greater performance in the supply chain.

8.2.2 Supply Chain Collaboration between Growers and Exporters in the Production of Mangoes for Export to Japan

In this research, it was found that most of the Thai fresh mango export companies under consideration did not apply the concept of supply chain collaboration with their suppliers (growers). Even though information flows occur along the supply chain from

upstream to downstream, growers and exporters share only essentially fundamental information/knowledge and occasionally inform one another at short notice, mostly regarding changes in customer demand. Joint decisions are considered only when assistance is needed. As a result, the responsiveness to customers and uncertainties is not efficiently managed. Fresh Nam Dok Mai mango exports are very competitive, and the information should be updated and shared with supply chain members. Changing information affects all members in the supply chain. Without accurate information, the members cannot effectively react to change.

From the study, we can conclude that information sharing is a key to improving the responsiveness to customers, changes and uncertainties. Information sharing is a linkage in terms of gaps of communication which might damage the performance of the supply chain. In the event of a demand change, both growers and exporters are able to synchronise their decisions at the right time, and can therefore react and deal with the changing circumstances effectively. Thus, frequent sharing of information is one of key success factors in terms of supply chain collaboration.

With regard to supply chain contracts, since the DOAE appreciates market competitiveness and the uncertainties of the mango business, it encourages both growers and exporters to sign a contract farming agreement to guarantee the grower's income by guaranteeing pricing. Contract farming can theoretically be an assurance of production yield, production schedule, and product price. However it was found that the concept of contract farming was not actually applied by both growers and exporters. The product order, product qualification/specification and price usually vary depending on customer demand and different times of the mango season. Consequently, the grading activity is found to be the most problematic transaction activity in most cases with the exception of Company B which entrust its supplier(s) to manage the grading process. This indicates that relationship and trust are important when it comes to resolving the development of contract farming. Relationship and trust are also the factors that strengthen supply chain collaboration. To achieve supply chain collaboration, both growers and exporters have to set mutual goals/benefits, share information/knowledge, and introduce decision synchronisation as Company B has done (see Chapter 7). In terms of supply chain collaboration, full trust occurs in a close/trustworthy relationship. Consequently, contract farming might not be necessary according to the case of company B as the senior

manager aforementioned "The essence of contract farming is to ascertain that growers and the company act accordingly. If all parties are fair and honest, therefore contract farming is not needed.[6]"

8.2.3 Recommendations to the Government and Related Agents on Sufficient Supply Chain Management for Fresh Mango Exports

The study aims to investigate the supply chain of Nam Dok Mai mango exports to Japan and makes the following recommendations:

8.2.3.1 Improvement of GAP efficiency

The DOAE has developed GAP for mango production in order to establish a standard of agricultural production. GAP is an initial step in the industrialized development of agricultural products. With the current GAP, the chemical residue issue remains unsolved. To achieve GAP efficiency, the DOAE should emphasise improvements in chemical practices by training DOAE personnel to gain a greater knowledge of chemical residues, and then disseminate this knowledge through improvements in public relations, especially with growers in order to create a sense of awareness regarding chemical practices. However, there are two issues of concern which growers have to realise; 1) compulsory information and knowledge of chemical practices, and 2) the penalty system related to chemical residue. All growers must be educated with regard to information on all forbidden chemicals. This is necessary because some growers have inadequate information/knowledge about compulsory practices in terms of chemical restrictions. Also, growers must be informed about the penalty system which has been introduced. Japan's custom authorities will ban the exporters in the event that they detect products contaminated with chemical residue. The exporter and the government are able to track the problematic product to its origins. Consequently, the growers will be punished by either the exporters or the government.

[6] Interview with the senior manager of Company B, Bangkok, Thailand Decemeber 14th 2010, 15.30-17.00

From the study, it was found that growers are mainly concerned with tangible values of their product such as flawless skin, weight, and fruit maturity rather than with the intangible values such as chemical contamination and fruit disease since it is only those tangible values which directly affect the grading process (see Chapter 6). The intangible product quality is visible after products are processed at the stage of either phytosanitary testing by the DOA or by Japan's customs authorities. To solve the problem, growers have to be made more aware of the penalty system.

8.2.3.2 Innovative production system

Although agricultural production is sensitive to external factors such as weather, plant disease, and insect pests, an innovative production system can be applied to enhance production efficiency. According to the case study analysis, there are two cases of exporters who have applied innovative production; Company A whose orchardist own the production process, and Company B whose supplier(s) have a tacit knowledge of production (see Chapter 7). Company A can conduct its own production process by using the company's orchardist. Although this production process is confidential, there are some fundamental production processes which can be shared, such as flowering stimulation for off-season production, pruning dates, and technology. It is certain that if the flowering date is observed, the date of harvesting and the best consumption date can easily be calculated. Every flowering mango branch should be recorded in order to arrive at a precise date for harvesting and consumption. In addition, the date of chemical application should be included in the investigation to prevent chemical contamination of the products. As Company A manages its own production process, the company is able to control and monitor all the production process, from pre-harvest to post-harvest.

In the case of Company B, the company's supplier(s) have long experience of producing Nam Dok Mai mango exports for the Japanese market. As a result, the supplier(s) have developed a tacit knowledge of the production process, particularly grading activity, so that the company can trust the supplier(s) to manage the grading process. Compared to other cases, it was found that most companies have to send their staff to the suppliers' orchards to conduct the grading activity. Based on these two lessons from the case studies, it is recommended that the production of Nam Dok Mai mango

should be upgraded to industrialized manner by using precision agriculture, together with the creation of a database of growers and the application of GIS. This innovative production approach should be initiated by the DOAE, and the training in this production approach should be funded by either the government or any interested company.

8.2.3.3 Intensive training for small growers

From the field survey, the small growers tend to neglect the processes of precise farming practices such as fertilisation dates, pruning dates, pesticide application dates, and flowering dates. These periods are very important for producing high quality mangoes. The flowering mango branches have to be recorded individually in order to ensure precise treatment. Hence, the government should have an increased budget for this training, particularly for small growers through the motivation of achieving a better selling price for mangoes due to better product quality.

8.2.3.4 Stronger Market Foothold

The uniqueness of the Nam Dok Mai mango includes its golden yellow fruit, instead of the reddish green fruit commonly found among other species, its rich aroma, its succulent flesh and its pure sweetness. From an interview with a Japanese professor, Nam Dok Mai mango has the favourable characteristics sought for by Japanese consumers due to the fruit's fragrance, sweet taste, and juicy meat (Ngamsak et al., 2000). These natural strengths of the Nam Dok Mai mango should be further promoted as its attractive selling points. However, consumers should be informed as to how to differentiate ripe mangoes from unripe ones to prevent confusion over ripeness due to its yellow colour. It is therefore advisable to have effective the consumption period printed on packaging and to provide consumers with detailed instructions for different practical consumption alternatives. In addition, as Japan is evolving into an aging society with the increasing proportion of elderly people, it is therefore an opportunity to penetrate the new market by appealing to elderly consumers and also to gain a greater market foothold.

8.2.3.5 Fostering Grower Unity

Although growers have formed the Thai Mango Growers Association to provide assistance for members without the need to seek government support, the association is nevertheless in its infancy. The Government sector should place more emphasis on the attainment of such unity and should re-focus its efforts on mango export development in line with the Thai fruit development strategy. The promotion of agricultural know-how improvement to achieve national fruit standards fulfills an indispensable development function, not only for mango but also for the entire agricultural produce industry. Mango development efforts will serve as a pilot scheme which could subsequently be extended to other agricultural products.

8.2.3.6 Fostering of Exporter Unity

Apart from growers, organised and concerted efforts on the part of exporters could play a vital role in networking and in the exchange of data pertaining to legislative updates, as well as the latest production know-how and techniques. Although the Thai Fruits and Vegetables Exporters Association has been established, the government sector should provide technical support through training sessions specific to individual agricultural products. Each product faces unique export limitations and therefore needs to be handled with different approaches. Exporters need to gain real insight into the natural qualities and limitations of their products so as to develop proper handling guidelines and minimise loss of quality with regard to each process.

8.3 Research Contribution and Implications

This research results in the identification of the importance of supply chain management with a strong emphasis on the development of supply chain collaboration for a better grower-exporter relationship, which is of the essence to drive the mango supply chain system. This development of a relationship will contribute in part to the reduction in unnecessary costs, while simultaneously enhancing competitiveness in a range of international markets in the long run.

8.3.1 Contribution to Theory

The contribution to theory is reflected in the support for supply chain collaboration. There are two points from this research that contribute to academia. These are as follows: the key factors provided for establishing collaboration in the perishable supply chain; the means by which supply chain collaboration can reduce costs and improve performance. The benefits from supply chain collaboration help both growers and exporters reduce duplicate activities which tend to increase time and cost. The duplicated activities are identified with regard to the decision synchronisation process. This process identifies duplicate activities by using information sharing and decision sharing between the parties concerned.

The key factors for establishing supply chain collaboration have been mentioned in many empirical studies. However, most studies have focused on the relationship of two agro-industry companies rather than on the relationship between growers and companies. This leads to a gap considered by this research which emphasises supply chain collaboration regarding the relationship between growers and export companies, since these two parties play important roles as the main producers (growers) and the processors/traders (export companies owning VHT plants) in the supply chain of fresh Nam Dok Mai mango exports to Japan. As a result, the key factors of supply chain collaboration are applied with regard to this study: 1) Information sharing (regarding CPS, performance status, production/demand planning, and knowledge sharing), 2) decision synchronisation, incentive alignments, supply chain contracts, traceability, transaction cost management, and relationships.

Since the characteristic nature of the product under consideration is that it is perishable, sharing information is very crucial, and such information has to be precise and rapidly exchanged. The mango business is very competitive so information has to be frequently updated due to changes and uncertainties such as changes in demand, fruit diseases, and climate uncertainty. Growers and exporters should regularly share and update relevant information and should aim to achieve mutual goal and benefits so that the two parties can perform the activities as targeted. Decision synchronisation is important in order to create a sense of belonging and to strengthen relationships. Successful joint decision making leads to improved performance, product quality improvement, and cost reduction.

Incentive alignment is also essential in order to motivate the members to constantly perform in such a way as to achieve mutual goals for overall profitability in the supply chain. Another critical factor is contract farming. Since the DOAE has encouraged growers and exporters to sign contract farming agreements, it is necessary to include this factor in the research regarding supply chain contracts. Due to the conditions of the agro-food supply chain, traceability is a significant factor to be considered in terms of food safety and hygiene. Besides, it is essential to have traceability from the origins to the final consumers when it comes to exporting fresh mango to Japan.

In order to evaluate supply chain management, cost reductions is one of the major factors, since the aims of successful supply chain management are to minimise costs and to improve performances in order to provide better product quality or service. It is therefore important to study transaction cost management in the supply chain. The last important factor which it is necessary to study is the relationship between growers and exporters. Relationship is a basis mechanism of supply chain collaboration. Also, mature relationship can develop to the establishment of trust. Thus, the issue of relationships and trust is significantly important which is why it is considered in the study.

With regard to those aspects of supply chain collaboration which help to reduce costs and improve the performances, from the study we found the factor of transaction cost management which can reduce costs through the development of transaction activity. In order to develop transaction activity, it needs trust on the part of both growers and exporters to develop mutual agreement and decisions as to how to implement problematic transaction activities. Trust can be established from mature relationships. However, good relationship and trust can only build up when the two parties share information, have decision synchronisation, and provide incentive alignment. However, traceability and supply chain contracts are also necessary for assurances with regard to product quality and production capability. Since every factor is related, the members of the supply chain should take all these factors into account in order to achieve supply chain collaboration.

8.3.2 Contribution to Practice

In terms of contribution to practice, this study demonstrates that mango supply chain management in Thailand places emphasis on the collaboration between mango

growers and main exporters who own VHP plants. This also includes the strengths and weaknesses of the existing mango supply chain (see Chapter 6), barriers to mango exports and regulations (see Chapter 3), and the analysis of factors of supply chain collaboration between the parties concerned (see Chapter 7). From investigating the weaknesses of the supply chain, it is found that the most problematic supply chain activity is grading. It is clear to both growers and exporters that the grading activity is their most complex transactional activity. The analysis of the factors in this study found that this problem can be solved by the implementation of supply chain collaboration. Not only can the problem of transaction activity be solved, but also the performances of supply chain members can be improved. Through collaboration, the members can efficiently perform to achieve the mutual ultimate goals of the supply chain.

It is necessary for growers to realise that their role in the supply chain is not only to maximise production volumes, but also to concentrate on product quality and specifications in order to meet the customers' requirements. The realistic production capability must be clearly stated to the exporters so that both parties can effectively manage production in order to satisfy demand. Since the uncertainties of disease and climate directly impact on production and product quality, growers should share information with exporters at the beginning of any difficulties so that the solution can be arrived at effectively. The factors that growers should be seriously considering are information sharing, traceability, and supply chain contracts; the sharing of information should be realistic, valid, and frequent; traceability should be focused on the pre-harvest period regarding food safety and hygiene; and supply chain contracts (contract farming) should be practical so that both parties can benefit.

To achieve the supply chain's goals, exporters should realise that growers are not only producers but are also business partners who can support the exporters' performance. To accomplish this, exporters should consider information sharing, decision synchronisation, incentive alignment, supply chain contracts, transaction cost management and relationships. Exporters should set a clear mutual goals and benefits to the growers at the first stage of conducting supply chain contract (contract farming). The clear understanding and target can improve the performances of both parties to gain the optimal benefits of the supply chain. Exporters should frequently share information with growers and should also arrive at joint decisions. Since exporters are the only one who

are in contact with the Japanese market and make the trading decisions, growers play a role as only a producer in the supply chain. Through information sharing and decision synchronisation, both exporters and growers can establish greater production planning to effectively meet demand. Incentive alignment is also important to motivate growers' performances. The relationship issue is one of the keys to success in terms of collaboration, as supply chain management is based on trust and commitment. Therefore, establishing a mature relationship is essential. However, in order to develop trust, the parties concerned should exhibit consistent performance, fairness, and honesty. The sense of belongings as a unity is also important. When the two parties are united and realise that they have to achieve mutual goals, they will be concerned with mutual benefits rather than individual advantages. Decision synchronisation can encourage the sense of belonging in such a relationship. When trust occurs, the transactional activities can be complemented in order to reduce transaction costs. Minimising costs is one of the main goals of doing business. However, exporters are concerned with only reducing costs associated with their activities rather than realising that a partnership can also reduce transaction costs from transactional activities. Thus, if collaboration is implemented, a win-win situation on the part of both exporters and growers might occur.

Regarding other stakeholders in the supply chain, the DOAE and the Mango Growers Association can support growers with regard to increasing production capability by educating them in terms of effective farm management and production techniques for different areas of production, as different geographic areas have different climate, soil, and disease which affect production and product quality. Besides, the DOAE and the Association can also support growers and exporters with regard to updating useful information, especially in terms of new Japanese markets and sources of demand. In addition, the DOAE should clarify the process of phytosanitary certification, and the necessary documentation so that growers are able to manage product handling and shipping in a timely manner.

8.4 Limitations of the Study

The majority of growers do not document their farm management data. The lack of availability of accurate data records, such as production times and product quantities,

makes the data obtained during the study only rough estimates. Problems over data collection from exporters is associated with a lack of access to some necessary data. In addition, due to the high-competition nature of the mango export business, exporters are not willing to disclose their data to outsiders. Therefore, the researcher was able to obtain only relatively limited amounts of data under such circumstances. As regards data collection from the government sector, certain data available to the public is not up-to-date. The obsolescence of some data available from government agencies is particularly evident in the area of the official exporter register, essentially a result of a high degree of entrepreneurial turnover among exporters due to high competition in the mango export business. In order to acquire the most up-to-date data, the researcher needs to make direct inquiries to agencies in charge of the issue with close follow-ups.

8.5. Recommendations for Further Research

Supply chain collaboration between growers and exporters, as identified in the study, is regarded as a new concept. Sustainable development of the mango industry still requires upgrades of production potential and knowledge capability on the part of growers in order to make them comparable to those of exporters. The study found that a comparable knowledge base and capability between growers and exporters could promote a fertile win-win situation in terms of their business transactions. Such a mutually beneficial environment would form the basis of an efficient mango supply chain management. However, to create sustainable supply chain collaboration, such collaboration cannot only run from growers (producer/supplier) to exporters (buyer) but should also run from exporters (supplier) to importers (buyer/supplier).

The Thai government's policy proposes to enhance the competitiveness of agricultural producers. The contribution of this research can be of benefit to other perishable products. The research outcome shows that collaboration between growers and exporters can improve both product quality and service quality. This also can reduce unnecessary costs and duplicate activity. For future research, supply chain collaboration can be implemented with regard to several perishable products. However, the key factor in terms of collaboration may change due to the characteristics of the product under consideration.

8.6. Conclusion

In conclusion, this research aims to develop supply chain collaboration for fresh Thai mangoes for export, in order to enhance the competitiveness of the product. The research begins with the theory of supply chain management and then introduces the concepts associated with supply chain collaboration. The research gap is the study of the collaboration regarding to the relationship between growers and exporters. There are two parts to the outcome of this thesis; the first part is the investigation of the existing supply chain management in order to examine its strength and weaknesses, and to clarify the problematic supply chain activities which cause inefficiency in the supply chain; while the second part is the analysis of factors implemented in supply chain collaboration, focusing on the relationship between growers and exporters, as they are the key players in the Nam Dok Mai mango supply chain for exports to Japan. In the supply chain, the members are linked by the flow of products and information throughout the chain. Therefore, the members have to collaboratively perform in order to achieve optimal benefits for all those involved in the supply chain.

The outcome of this research demonstrates the key mechanisms of supply chain collaboration which are information sharing, supply chain contract, relationship and trust. To achieve supply chain collaboration, the mutual goals should be set as a milestone and the information/knowledge should be shared regularly in order to gain/develop the consistency of performance. According to cross-case analysis (see Chapter 7), the research found that Company A was the only one company which could set mutual goals and benefits, and reached decision synchronisation with its internal suppliers as they were the same company. Nonetheless, it was found that Company B was the best performer in terms of implementing the concept of supply chain collaboration particularly in relationship and trust. Company B was able to maintain a long-term relationship and developed mutual trust with their growers. The company could entrust its supplier to manage the duplicated activity, and then the transaction costs could be reduced accordingly. The outcomes of Company B could represent the successful implementation of supply chain collaboration and buyer-supplier relationship of growers and exporters in mango supply chain. Hence, the outcomes of this analysis can contribute to the introduction of grower-exporter collaboration in agro-food supply chain.

Appendices

Appendix 1: List of Questions for Semi-Interview with Mango Growers

Name.....

Telephone.....

Group..... Province.....

Date ..... Venue.....

Semi-Structured Interview (Grower)

loss = product quality + time + money + human resource

The Research Study "Supply Chain Management of Thai Mango Exports to Japan: Nam Dok Mai Variety" aims to find solutions and support both growers and exporters as they are main stake holders in the supply chain in order to minimise loss in terms of product quality, lead time, investment, human resources in overlapping/duplicating activities, and to maximise efficiency in terms of production and export. The effectiveness in supply chain management based on the collaboration and sustainable relationship among stake holders especially growers and exporters. The research study focuses on main activities along the supply chain which are impact factors in collaborative supply chain such as information sharing, technology transfer, and trust issue.

This part is only for the leader of "Thai Mango Growers Association"

- What are the main purposes in establishing the association?
- Vision & Mission
- Objectives & Benefits
- Outcomes & Achievement
- Problem/Difficulties & Suggestions
- Do you know "Supply Chain Management"?
- How do you manage your mango supply chain?

For Growers

1. Supply Chain Management Approaches

1.1 Production capability:

-How big is your plantation?

-How much do you yield/year?

1.2 Pre-harvest management:

-How do you manage your plantation? e.g. use appropriate bags to wrap mangos, marking the wrapped mango to know when of which is ready to harvest; anthracnose-free atmosphere?

-How do you manage the fertilisation/ pesticide?

1.3 Harvest management:

-How do you harvest your product?

-What equipment do you use? Why do you decide to use such equipment?

-How do you manage your labour?

-Do you use home intensive labour or outsource? Why?

-Do you have any problem in treating/ paying labour?

-Do the costs of labour affect your production costs?

1.4 Post-harvest management:

From individual orchards to collecting area;

-What vehicles do you use for transportation?

-How do you prepare the container/basket?

-Do you use anything (e.g. newspaper) to support the harvested mangoes?

-Do you have any difficulties in product handling/ transportation in orchards?

-Do you have any product losses in this activity?

-What are the causes of the problem?; How do you solve them?

From the grower's orchard to the exporter's VHT plant;

-Who is responsible for transportation in terms of vehicle management and costs?

-Does the vehicle have a temperature controlled container?

-How long does the transportation take?

-When is the transport - day or night? Why?

-Do you have any difficulties in terms of transportation? If yes, what are they and why do they happen?

-Does any product loss occur during the transportation?

-Who takes responsibility for the loss? How do you solve the problem?

2. Supply Chain Collaboration Approaches

2.1 Information Sharing

-How often are you in contact with group members and exporters? And for what purpose? e.g. information sharing, technology transfer?

-How do you contact the traders (exporters)?

Do you initially approach exporters or do exporters initially approach you to offer to trade? How do you contact each other?

Do the exporters share information/ news/ technology with you?

How do exporters support you? e.g. with knowledge, fruit wrapping bags.

-Do you have any difficulties? e.g. collecting delays due to group members, delay on the part of exporters (the company)? How do you solve such problem? Who is responsible for the loss?

i) Collaborative Performance System (CPS)

-Do you plan/discuss mutual goals, mission, and benefits with exporters? How do you create your goal and plan to achieve them?

-Do you set the clear objectives, product specificity, and realistic time frames with the exporters? How do you carry out your business plan with your partners?

ii) Performance Status

-Do you regularly inform exporters of your performance? How often and why do you do so?

-Do you know the procedures and current performance status of the exporters?

-How do you monitor the performances of yourself and the exporters?

-Do you have difficulties due to a lack of information regarding performance status sharing?

iii) Production/demand planning

-Do you develop/discuss production/demand planning with exporters?

-Do you have joint-planning meetings with exporters regarding production and demand planning?

-How do you plan your production?

-How long have you planned for production in advance?

iv) Knowledge sharing

-Do you share any knowledge which might be useful to the exporters in order to either maximise product quality, or minimise costs?

-What kind of knowledge do you share or gain from the exporters?

-How do you and your partners share new knowledge with each other? Why do you do so?

2.2) Decision Synchronisation

-Do you make joint-decisions with your business partners?

-What kind of decisions did you make together? Why do you do so?

-Does this affect the relationship with your partners? If yes, what is the effect and how does it change the situation?

-Do you take joint-responsibility for joint-decision making?

-How do you manage the responsibility together with your partners?

-How does this affect the relationship with your partners?

2.3) Intensive Alignment

-Do you share risks and benefits with your business partners? How and why do you do so?

-Does this affect the relationship with your partners?

-What and how is the outcome(s)?

2.4) Supply Chain Contract (Contract Farming)

-Do you sign a farming agreement contract? Why did you decide to do so?

-Who created the conditions of the farming agreement contract, especially the price of the product?

-Do you think contract farming is useful/helpful? Who gains or loses from the signed contract?; How do the such (dis)advantages affect you?

-In practice, do you follow the conditions of contract farming?

-Is there any negotiation in certain cases? Please explain how and why.

-If the exporters break the contract, do you punish them? Have you ever done so, and how were you punished?

2.5) Traceability

-How do you manage traceability?

-What is your technique/practice?

-How do you manage the fruit containers/baskets?

-Do you experience any error(s)/difficulties regarding the products' traceability?

2.6) Transaction Cost Management

-Do you undertake any grading process by yourself before taking products to be graded at the collecting area?

-How do you manage for an initial grading process?

-What are the grading criteria? e.g. product size, weight, skin colour.

-Who actually grades the products either you or the exporters?

-Do you have any difficulties in contacting/ communicating with group members regarding production/grading standards i.e. cross-communication?

-Do such problem(s) cause any losses? How do you solve the problem(s)?

In the event that the product is graded as "unqualified" and is rejected;

-How do you manage unqualified products? Who/ where do you sell the products?; Do you manage the sale by yourself or do intermediaries contact you? What is the difference in price of qualified mangoes for export and unqualified mangoes for the domestic/ local market?

-For the transport of unqualified products, who is responsible for the costs? Do you have to deliver the products to intermediaries or does your group leader manage it for you?

-Do the exporters (the company) support unqualified products such as by introducing them to the market?

-Do you have any difficulties in contacting/ communicating with exporters e.g. cross-communication, information sharing? Do the problem(s) cause any losses? How do you solve the problem(s)?

2.7) Relationships

-How do you choose your traders (exporters)?

-Do you have any criteria e.g. being reasonable/ negotiable grading standards, price deals, payment methods (cash or short credit term), reputation, relationship?

-What kind of relationship exists between you and your traders e.g. trustworthiness focusing on a sustainable relationship, business partner focusing on high profits with short term commitment?

-Do you experience any difficulties? How do you solve any problems?

3. Recommendations and suggestions

-What support from the government do you need the most? e.g. GAP application, production techniques, technology know-how.

-Do you have any suggestions in terms of government policy for agricultural development?

Appendix 2: List of Questions for Semi-Interview with Mango Exporters

Name.....

Telephone.....E-mail.....

Company.....

Position.....

Date ..... Venue.....

Semi-Structured Interview

(Exporter: Large Enterprise)

loss = product quality + time + money + human resource

The Research Study "Supply Chain Management of Thai Mango Exports to Japan: Nam Dok Mai Variety" aims to find solutions and support both growers and exporters as they are main stake holders in the supply chain in order to minimise loss in terms of product quality, lead time, investment, human resources in overlapping/duplicating activities, and to maximise efficiency in terms of production and export. The effectiveness in supply chain management based on the collaboration and sustainable relationship among stake holders especially growers and exporters. The research study focuses on main activities along the supply chain which are impact factors in collaborative supply chain such as information sharing, technology transfer, and trust issue.

Question:

- ***Do you know the concept of "supply chain"?***
- ***How could you apply supply chain management to your business?***

1. Type of Business and Marketing

- Business Type: Exporter / Trader / Joint Venture with.....
- Vision & Mission:
    - Producer (self-growing).....
    - Supplier to.....
    - Retailer to.....
    - Export.....
    - VHT Service Provider to.....
    - Japan market seeker.....

- Japan Business Partner: Wholesaler/ Retailer/ Distributor
- Destination inSupermarket /end supermarket-Hi /Thai restaurant :Japan Market
- Product Positioning: Premium/ Middle to High class/ Middle class (The reason supporting your product positioning and Who choose/influence the market?)

2. Supply Chain Management Approaches

2.1 Production capability:

-What type of company business are you engaged in e.g. exporter/ trader/ VHT service provider/ joint venture with Japanese partner(s)?

-In the event that the company has a Japanese partner, what kind of partner is it? e.g. wholesaler/ retailer/ distributor?

-What is your destination(s) in the Japanese market e.g. supermarket, department store, Thai restaurant?;

- What is your production capacity per year?

-Does the company cultivate mango plantation(s)?; If yes, for what purpose?

-How big is the plantation?, and how much does the company yield/year?

2.2 Pre-harvest management:

-In case of the company which cultivates the mango plantation, how does the company manage the plantation e.g. using appropriate bags to wrap mangos, marking the wrapped mango to know when of which is ready to harvest, creating an anthracnose-free atmosphere?

- How does the company manage the fertilisation/ pesticide process?

2.3 Harvest management:

- How does the company harvest the product? What equipment do they use? Why do they decide to use such equipment?

- How does the company manage its labour? Do they outsource? Why?

-Do the costs of labour affect production costs?

2.4 Post-harvest management:

From individual orchards to collecting area;

- What vehicles does the company use for transportation?

- How does the company prepare the container/basket? Do they use anything (e.g. newspaper) to support the harvested mangoes?

- Does the company have any difficulties in product handling/ transportation in orchards?

- Does the company have any product losses in this activity? What are the causes of the problem?; How do they solve the problem?

From the grower's orchard to the exporter's VHT plant;

-Who is responsible for transportation in terms of vehicle management and costs?

-Does the vehicle have a temperature controlled container?

-How long does the transportation take?

-When is the transport - day or night? Why?

-Do you have any difficulties in terms of transportation? If yes, what are they and why do they happen?

-Does any product loss occur during the transportation?

-Who takes responsibility?

-How do you solve the problem?

From the exporter's VHT plant to air/sea freight depot;

-What kind of freight does the company use for export e.g. air freight/ sea freight/ both?

-What is the percentage of each type of freight?

-Do you plan to export by sea freight to reduce the cost of transportation?

-What are the different product conditions and practices for different types of freight e.g. product maturity, packaging, product handling?

3. Supply Chain Collaboration Approaches

3.1 Information Sharing

-How often are you in contact with your producers (growers)? And for what purpose? e.g. information sharing, technology transfer.

-How do you contact the growers?

-Do you initially approach the growers or do growers initially approach you to offer to trade?; How do you contact each other?

-Do you share information/ news/ technology with the growers?

-Do you have any difficulties? e.g. collecting delays due to group members, delay on the part of exporters (the company)?

-How do you solve the problem?

-Who is responsible for the loss?

i) Collaborative Performance System (CPS)

-Do you plan/discuss mutual goals, mission, and benefits with growers?

-How do you create your goal and plan to achieve them?

-Do you set the clear objectives, product specificity, and realistic time frames with the growers?

-How do you carry out your business plan with your partners?

ii) Performance Status

-Do you regularly inform growers of your performance? How often and why do you do so?

-Do you know the procedures and current performance status of the growers?

-How do you monitor the performances of yourself and the growers?

-Do you have difficulties due to a lack of information regarding performance status sharing?

iii) Production/demand planning

-Do you develop/discuss the production/demand planning with growers?

-Do you have joint-planning meetings with growers regarding production and demand planning?

-How do you plan your production?

-How long have you planned for production in advance?

v) Knowledge sharing

-Do you share any knowledge which might be useful to the growers in order to either maximise product quality, or minimise costs?

- What kind of knowledge do you share or gain from the growers?

- How do you and your partners share new knowledge with each other? Why do you do so?

3.2) Decision Synchronisation

-Do you make joint-decisions with your business partners?

- What kind of decisions did you make together? Why do you do so?

-Does this affect the relationship with your partners? If yes, what is the effect and how does it change the situation?

-Do you take joint-responsibility for joint-decision making?

-How do you manage the responsibility together with your partners? How does this affect the relationship with your partners?

3.3) Intensive Alignment

-Do you share risks and benefits with your business partners? How and why do you do so?

-Does this affect the relationship with your partners? What and how is the outcome(s)?

3.4) Supply Chain Contract (Contract Farming)

-Do you have a farming agreement contract with all your partners (growers)?

-Who created the conditions of the farming agreement contract, especially the price of the product?

-Do you think contract farming is useful/helpful? Who gains or loses from the signed contract?; How do the such (dis)advantages affect you?

-In practice, do you follow the conditions of contract farming? Is there any negotiation in certain cases? Please explain how and why.

-If the growers break the contract, do you punish them? Have you ever done so? In cases of uncertainty e.g. drought, fruit disease outbreak, etc., how do you inflict punishment on growers?

-How do you manage with the difficulties?

3.5) Traceability

-How do you manage traceability? What is your technique/practice?

-How do you manage the fruit containers/baskets?

-Do you experience any error(s)/difficulties regarding the products' traceability?

3.6) Transaction Cost Management

-Is the grading process duplicated in the sorting process? Is it possible to reduce these activities to have only one process instead of two?

-What are the grading criteria? e.g. product size, weight, skin colour.

-Does the company solely control the grading process?; Why/why not?

-Do you have any difficulties in contacting/ communicating with growers regarding the production/ grading standards i.e. cross-communication?

-Do such problem(s) cause any losses?; How do you solve the problem(s)?

In the event that the product is graded as "unqualified" and is rejected;

-How do you manage unqualified products?

-Do you still purchase them?; If not, which customer/ where do you sell the products?

-Do you manage the sale by yourself or do intermediaries contact you?

-What is the difference in price of qualified mangos for exports and unqualified mangoes for the domestic/ local market?

-For the transport of unqualified products, who is responsible for the costs?

-Do you have to return the products to the growers or do you have intermediaries manage it for you?

-Do the exporters (the company) support unqualified products such as by introducing them to the market?

-Do you have any difficulties in contacting/ communicating with growers e.g. cross-communication, information sharing?

-Do the problem(s) cause any losses? How do you solve the problem(s)?

3.7) Relationships

-How do you choose your producers (growers)? Do you have any criteria e.g. being reasonable/ negotiable grading standards, price deals, reputation, relationship?

-What kind of relationship exists between you and your traders e.g. trustworthiness focusing on a sustainable relationship, business partner focusing on high profits with short term commitment?

-Do you experience any difficulties? How do you solve any problems?

4. Recommendations and suggestions

-What support from the government do you need the most? e.g. lab testing of chemical contamination, documentary processing, phytosanitary certification.

-Do you have any suggestions in terms of government policy for agricultural development and exports?

References

(DEP), D. o. E. P. (2010) 'Export of Thai Fresh Vegetables and Fruits to Japan in 2010', [Online]. Available at: http://www.depthai.go.th/ (Accessed: 18 October 2011).

Abble-Fattah, N. M. (1997) *Road Freight Privatisationin Egypt.,A with Great Britain and Hungary*. thesis. Universityof Plymouth.

Great Britain. Parliament. Ministry of Commerce, G. o. I., (2008) *Residue Monitoring Plan for Mangoes for Export to Japan*

Agriculture and Agri-Food Canada. (2010a) *The Japanese Consumer Behaviour, Attitudes and Perceptions toward Food Products.* Ottawa: International Markets Bureau

Agriculture and Agri-Food Canada. (2010b) *The Japanese Consumer Behaviour, Attitudes and Perceptions toward Food Products.* International Markets Bureau

Anderson, R. (2011) 'Sprouts and Bacteria: It's the Growing Conditions', *Food Safety News*,

Aramyan, L. (2006) *Performance Indicators in Agri-Food Production Chains.* Springer: The Neatherland.

Arandilla, R. (2011) *Brilliant Japanese Product & Packaging Design*. Available at: http://www.1stwebdesigner.com/%20inspiration/japanese-product-packaging-design/ (Accessed: September).

Arikawa, T. (2010) 'Trend of food supply and demand', [Online]. Available at: http://www.jtbf.info/aots2010e.html#Anchor-4 (Accessed: 2 October 2011).

Arino, A., de la Torre, J. and Ring, P. S. (2001) 'Relational quality: managing trust in corporate alliances. ' *California Management Review*, 44, (1), pp. 109-131.

Arshinder, Kanda, A. and Deshmukh, S. G. (2008) 'Supply chain coordination: Perspectives, empirical studies and research directions', *International Journal Production Economics*, 115, pp. 316-335.

Asano-Tamanoi, M. (1988) "Farmers, Industries, and the State: The Culture of Contract Farming in Spain and Japan', *Comparative Studies in Society and History*, 30, (3), pp. 432-52.

Bagchi, P. K., Ha, B. C., Skjoett-Larsen, T. and Soerensen, L. B. (2005) 'Supply chain integration: a European survey', *The International Journal of Logistics Management*, 16, (2), pp. 275-94.

Bauer, M. W. and Gaskell, G. (2000) *Qualitative Researching With Text, Image and Sound: A Practical Handbook.* SAGE Publications Ltd: Great Britain.

BBCNews. (2006) 'Thai PM deposed in military coup', *BBC News*, 20 September 2006,

BBCNews. (2008) 'The Cost of Food: Facts and Figures', *BBC News*, 16 October 2008,

Benton, W. C. and Maloni, M. (2005) 'The influence of power driven buyer/seller relationships on supply chain satisfaction', *Journal of Operations Management*, 23, pp. 1-22.

Benziger, V. (1996) 'Small Fields, Big Money: Two Successful Programmes in Helping Small Farmers Make the Transition to High Value Added Crops', *World Development*, 24, (11), pp. 1681-93.

Bijman, J., Slingerland, M. and Baren, S. v. (2009) 'CONTRACTUAL ARRANGEMENTS FOR SMALLHOLDERS IN BIOFUEL CHAINS: A CASE STUDY OF JATROPHA IN MOZAMBIQUE', *VII International PENSA Conference*. Sao Paulo, Brazil, November, 26-28th, 2009 CONTRACTUAL

ARRANGEMENTS FOR SMALLHOLDERS IN BIOFUEL CHAINS: A CASE STUDY OF JATROPHA IN MOZAMBIQUE: pp.

Blackburn, J. and Scudder, G. (2009) 'Supply chain strategies for perishable products: the case of fresh produce', *Production and Operations Management,* 8, (2), pp. 129-137.

Blois, K. J. (1998) 'Don't all firms have relationships inherently unstable?' *Journal of Marketing,* 13, (3), pp. 256-270.

Bogetoft, P. and Olesen, H. B. (2002) 'Ten rules of thumb in contract design: lessons from Danish agriculture', *European Review of Agricultural Economics,* 29, (2), pp. 185-204.

Bourland, K. E., Powell, S. G. and Pyke, D. F. (1996) 'Exploiting timely demand information to reduce inventories', *European Journal of Operational Research,* 92, (2), pp. 239-253.

Bowersox, D. J., Closs, D. J. and Stank, T. P. (2000) 'Ten Mega-Trends that will revolutionize supply chain logistics', *Journal of Business Logistics,* 21, (2), pp. 1-16.

Brandenburger, A. M. and Nalebuff, B. J. (1996) *Co-opetition.* Doubleday: New York NY.

Brug, J., Debie, S., Assema, P. v. and Weijts, W. (1995) 'Psychosocial determinants of fruit and vegetable consumption among adults: results of focus group interviews', *Food Qual. Pref.,* 6, pp. 99-107.

Bryman, A. (2011) *Social Research Methods.* Oxford University Press.

Burch, D. (1994) 'Agribusiness, Peasant Agriculture and the State: The Case of ContractF armingi n Thailand', in Lloyd, T. and Morrissey, O.(eds) *Inequality and Rural Development: Case Studies in Economic Development.* Vol. 3 St Martin's Press: London, pp. 163-83.

Buurma, J. and Saranark, J. (2006) 'Supply-Chain development for fresh fruits and vegetables in Thailand', in Ruben, R., Slingerland, M. and Nijhoff, H.(eds) *Agro-Food Chains and Networks for Development.* Springer.

C. Van der Meer. (2006) 'Exclusion of small-scale farmers from coordinated supply chain: market failure, policy failure or just econo,ics of scale?' in Ruben, R., Slingerland, M. and Nijhoff, H.(eds) *Agro-Food Chains and Networks for Development.* Springer: Dordrech, pp. 209-217.

Cachon, G. P. and Lariviere, M. A. (2005) 'Supply chain coordination with revenue sharing contracts: Strengths and limitations', *Management Science,* 51, (1), pp. 30-44.

Campbell, A. J. (1997) 'Buyer-supplier partnerships: Flip sides of the same coin?' *Journal of Business & Industrial Marketing,* 12, (6), pp. 417-434.

Caputo, M. and Mininno, V. (1996) 'Internal, vertical and horizontal logistics integration in Italian grocery distribution', *International Journal of Physical Distribution and Logistics Management,* 26, (9), pp. 64-90.

Carson, D. G. A., C., P. and Gronhaug, K. (2001) *Qualitative Marketing Research.* Sage Publications Inc: British.

Cassell, C. and Symon, G. (1995) *Qualitative methods in organizational research: a practical guide* Sage publication Ltd.: British.

Chang, C. C. (2000) *Research methodology.* Tsanghai co., Ltd, : Taiwan.

Chaoprayanews. (2009) 'Sanan pushes Thailand to World Kitchen with 3 Food Policies', 21 August 2009,

Chareanwanich, P., Srijedsadarak, W. and Ngamsak, T. (2000) *Development of Mango Products and Their Competitive Advantage in Export Markets.* Khon Kaen, Thailand: Khon Kaen University

Cheng, J.-H. (2011) 'Inter-organizational relationships and information sharing in supply chains', *International Journal of Information Management,* 31, pp. 374-384.

Chomchalow, N., Somsri, S. and Songkhla, P. N. (2008) *The Economics and Marketing of Tropical and Subtropical Fruits.* Kula Lumpur, Malaysia, January 2008.

Chow, H. K. H., Choy, K. L. and Lee, W. B. (2007) 'A strategic knowledge-based planning system for freight forwarding industry', *Expert Systems with Application,* 33, pp. 936-954.

Christensen, S. R. (1992) 'Between the Farmer and the State: Toward a Policy Analysis of the Role of Agribusiness in Thai Agriculture', *Thailand's Economic Structure: Towards Balanced Development?* Chonburi, Thailand, December 12-13. Between the Farmer and the State: Toward a Policy Analysis of the Role of Agribusiness in Thai Agriculture: pp.

Christopher, M. (1992) *Logistics and Supply Chain Management.* Pitman: London.

Christopher, M. (2005) *Logistics and supply chain management.* Prentice Hall.

Christopher, M. and Juttner, U. (2000) 'Supply chain relationship: Making the transition to closer integration', *International Journal of Logistics: Research and Applications,* 3, (1), pp. 6-23.

Collins, T. and Doorley, T. (1991) *Teaming up for the 90s: A Guide to International Joint Ventures and Strategic Alliances.* Homewood: IL.

Cooper, M. C., Lambert, D. M. and al, e. (1997) 'Supply chain managment: More Than a New Name for Logistics', *The Interantional Journal of Logistics Management,* 8, (1), pp. 1-14.

Corbett, C. J., Blackburn, J. D. and Wassenhove, L. N. v. (1999) 'Partnerships to Improve Supply Chains. (cover story)', *Sloan Management Review,* 40, pp. 71-82.

Cousin, P. D. (2002) 'A conceptual model for managing long term inter-organisational relationships', *European Journal of Supply Chain and Management,* 8, (2), pp. 71-82.

Cox, A. (1997) *Business Success.* Earlsgate Press: Boston.

Cox, A. (1999) 'Power, value and supply chain management', *Supply chain management: An international Journal,* 4, (3), pp. 167-175.

Creswell, J. W. (2003) *Research design: Qualitative, Quantitative, and Mixed Methods Approaches.* Sage Publications Inc: USA.

CRFG, C. R. F. G. (1996) *Mango*. Available at: http://www.crfg.org/pubs/ff/mango.html (Accessed:

Da Silva, C. A. B. (2005) *The growing role of contract farming in agri-food systems development:drivers, theory and practice.* Rome:

Davies, G. (1996) 'Supply-chain relationships', in Buttle, F.(ed), *Relationship Marketing: Theory and Practice.* Paul Chapman Publishing Ltd: London, pp. 17-28.

Day, G. S. (1994) 'The capabilities of market-driven organization ', *Journal of Marketing,* 58, (October), pp. 37-52.

Delbecq, L., Van de Ven, A. and Gustafson, D. (1975) *Group Techniquesfor Program Planning., A guide to Nominal Group and Delphi Processes.* London, Routledge.

Deniz, B., Scheller-Wolf, A. and Karaesmen, I. (2004) *Managing Inventories of perishable good: the effect of substiution.* Pittsburgh, PA.: Carnegie-Mellon University

Denscombe, M. (1998) *The good research guide for small-scale social research projects.* Open University Press: UK.

Denzin, N. K. and Lincoln, Y. S. (2005) *The Sage handbook of qualitative research.* Sage publications Inc: USA.

Diop, N. and Jaffee, S. F. (2005) 'Fruits and vegetable: global trade and competition in fresh and processed product markets', in Aksoy, M. A. and Beghin, J. C.(eds) *Global agricultural trade and devloping countries.* Washington, pp. 237-257.

Great Britain. Parliament. National Bureau of Agricultural Commodity and Food Standards, M. o. A. a. C., (2010a) *Japanese Consumption Behavior* Agricultural Cooperative Assembly of Thailand Press.

Great Britain. Parliament. National Bureau of Agricultural Commodity and Food Standards, M. o. A. a. C., (2010b) *Exportation of Vegetables and Fruits to Japan* Agricultural Cooperative Assembly of Thailand Press.

DOA (undate) *Good Agriculture practice.* Available at: http://www.student.chula.ac.th/~51373154/GAP.htm (Accessed:

DOAE. (2010) *Mango production development plan* Bangkok: Deparment of Agricultural Extension

DOAE (2011) *Mission of DOAE.* Available at: http://www.doae.go.th/page/about (Accessed: September).

DOAE (2013) *Develoment of Thai producer's capability for exporting mangoes to Japan.* Available at: http://pr.agritech.doae.go.th/Policynews/2556/policynews31_rujiporn.pdf (Accessed:

DOAE (undate) *VHT process.* Available at: http://www.agriqua.doae.go.th/plantclinic/Clinic/other/mango_b/k.htm (Accessed:

DPIE. (1998) *Chain of Success. Case studies on international and Australian food businesses, co-operating to compete in the golbal market.* Australia: Agribusiness and Community Branch, Commonwealth Department of Primary Industries and Energy

Drucker, P. F. (1992) 'The new society of organization', *Harvard Business Review,* 70, pp. 95-105.

Dyer, J. H. and Ouchi, W. G. (1993) 'Japanese-style partnerships: giving companies a competitive edge. ' *Sloan Management Review* 35, (1), pp. 51-63.

Earp, S., Harrison, T. and Hunter, A. (1999) *Proceedings of the 15th Annual IMP Conference.* University College, Dublin,

Eastham, J. F., Sharples, L. and Ball, S. (2001) *Food supply chain management - for the hospitality and food retail sectors* Butterworth-Heinemann: Oxford, Great Britain.

Eaton, C. and Shepherd, A. W. (2001) *Contract Farming: Partnerships for Growth.* Rome: FAO

Econ News Newspaper. (2005) 'Open offensive strategy “Thai Kitchen to the World” by launching 20,000 Thai restaurants worldwide within 5 years. ' *Econ News Newspaper*,

Great Britain. Parliament. Affairs, D. o. I. E., (2005) *Strategies to expand Thai restaurant: Thai Kitchen to the World project.*

Ellram, L. (1990) 'The supplier selection decision in strategic partnerships', *Journal of Purchasing and Materials Management*, Fall, pp. 8-14.
Eppen, G. D. and Iyer., A. V. (1997) 'Backup agreements in fashion buying: The value of upstream flexibility.' *Management Science* 43, pp. 1469-1484.
Eyaa, S. and Ntayi, J. M. (2010) 'Procurement Practices and Supply Chain Performance of SMEs in Kampala. ' *Asian Journal of Business Management* 2, (4), pp. 82-88.
Fabro, R. (2006) *Tropical and Sub-Tropical Fruits: Globalization.* Trend, and Networking for Research and Development in Asia.
Food and Agriculture Organization of the United Nations *Current Situation and Medium-Term Outlook for Tropical Fruits* [Online]. Available at: http://www.fao.org/es/esc/common/ecg/218/en/Sit_web_e.pdf (Accessed: 23 November 2008).
FAO. (2003) *Development of framework for Good Agricultural Practices.* Committee on Agriculture
(2011) *Food price from crisis to stability* [Online]. Available at: http://www.fao.org/fileadmin/templates/getinvolved/pdf/WFD2011_IssuesPaper_EN_rev-web.pdf (Accessed: December 2011).
FAO (undate) *Good Agricultural Practices GAP*. Available at: http://www.fao.org/sard/en/sard/754/945/index.html (Accessed:
FAO Statistics Division (2008a) [Online]. Available at: http://faostat.fao.org/default.aspx (Accessed: 24 November 2008).
FAOSTAT (2008b) *Imported value of fruit and processed fruit product in 2000 and 2005*. Available at: http://faostat.fao.org/site/342/default.aspx (Accessed:
FAO Statisitics Division (2010) [Online]. Available at: (http://faostat.fao.org/site/342/default.aspx) (Accessed: 4 June 2010).
Ferguson, M. and Ketzenberg, M. (2005) *Sharing information to manage perishables.* Atlanta, GA.: Georgia Institute of Technology
Fiala, P. (2005) 'Information sharing in supply chains', *Omega, The International Journal of Management Science*, 33, pp. 419-423.
Fisher, M. L. (1997) 'What is the right supply chain for your product?' *Harvard Business Review*, 75, (2), pp. 105-16.
Folinas, D., Manikas, I. and Manos, B. (2006) 'Traceability data management for food chains', *British Food Journal*, 108, (8), pp. 622-633.
Fontana, A. and Frey, J. H. (2005) in Denzin, N. K. and Lincoln, Y. S.(eds) *The Sage handbook of qualitative research.* Sage publications Inc,: USA, pp. 695-727.
Forrester, J. W. (1958) 'Industrial dynamics: A major breakthrough for decision makers', *Harvard Business Review*, 38, (July/August), pp. 37-66.
Fruit Development and Management Committee. (2009) *Thai Fruit Development Strategy for 2010- 2014.* pp: 18.
(2011a) [Online]. Available at: http://www.ftawatch.org/all/news/23879;%20http://www.acfs.go.th/news_detail.php?%20ntype=09&%20id=9029 (Accessed: September 2011).
FTA watch.org (2011b) *Mango: A best practice of fruit network.* Available at: http://www.ftawatch.org/all/news/23879 (Accessed: September 2011).
Gardner, E. L. and Rasberry, S. D. (1993) 'What's new in traceability?' *J. Testing and Evaluation*, 21, (6), pp. 505-509.

Gattorna, J. L. and Walters, D. W. (1996) *Managing the Supply Chain: A Strategic Perspective.* MacMilan.

Giannoccaro, I. and Pontrandolfo, P. (2004) 'Supply chain coordination by revenue sharing contracts', *International Journal of Production Economics,* 89, (2), pp. 131-139.

Gill, J. and Johnson, P. (1997) *Methods for Managers.* Paul Chapman: London.

Gillham, B. (2005) *Research Interviewing --- the rang of techniques.* McGraw-Hill Education: England.

Glover, D. (1992a) *Contract Farming in South-East Asia: Three CountryStudies,.* KualaLumpur: Universityof Malaya

Glover, D. (1992b) 'Introduction', in Glover, D. and Ghee, L. T.(eds) *Contract Farming in South-East Asia: Three Country Studies.* University of Malaya: Kuala Lumpur, pp. 1-9.

Goffin, K., Lemke, F. and Szwejczewski, M. (2006) 'An exploratory study of 'lose'supplier manufacturer relationships', *Journal of Operations Management,* 24, (2), pp. 189-209.

Golan, E., Krissoff, B. and Kuchler, F. (2004) ' Food traceability', Amber Waves, 2, April,2004, p.14-22.

Golan, E., Krissoff, B., Kuchler, F., Nelson, K., Price, G. and Calvin, L. (2003) 'Traceablity in the US Food Supply: Dead End or Superhighway?' The magazine of food, farm and resource issues, p.17-20.

Gomm, R., Hammersley, M. and Foster, P. (2000) *Case Study Method.* Sage: London.

Gorman, G. E. and Clayton, P. (2005) *Qualitative research for the information professional: A practical handbook.* Facet Publishing: London.

Grunert, K. G., Larsen, H. H., Madsen, T. K. and Baadsgaard, A. (1997) *Market orientation in food and agriculture.* Mass Kluwer Academic Publishers: Boston.

Gummesson, E. (1996) 'Relationship marketing and the imaginary organisation: A synthesis', *European Journal of Marketing,* 30, (2), pp. 31-44.

Hallam, D., Liu, P. and Laver, G. (2004) *The market for non-traditional agricultural exports.* Rome: FAO

Hammer, M. and Champy, J. A. (1993) *Reengineering the Corporation: A Manifesto for Business Revolution.* Harper Business Books: New York.

Handfield, R. B. (2000) 'Avoid the pitfalls in supplier development. ' *Sloan Management Review* 41, (2), pp. 37-49.

Handfield, R. B. (2002) 'The New Supply Chain Model', *APICS*, pp. 24.

Handfield, R. B. and Nichols, E. L. (1999) *Introduction to Supply Chain Management*
Prentice Hall: NJ.

Harris-White, B. (1999) *Agricultural markets from theory to practice: field experiences in developing countries.* Macmillan Press: Basingstoke.

Headey, D. and Fan, S. (2008) 'Anatomy of a crisis: the causes and consequences of surging food prices', *Agricultural Economics,* 39, pp. 18.

Heide, J. and John, G. (1990) 'Consensus and collaboration: norm regulated behavior in industrial marketing relationships', *European Journal of Marketing*.

Heller, T. (2002) 'Sales Grow so does competition', *Progressive Grocer,* 81, (10), pp. 103-106.

Hesse-Biber, S. N. and Leavy, P. (2004) *Approaches to qualitative research: A reader on Theory and Practice* Oxford University Press Inc: USA.

Hester, E. L. (1996) *Successful Marketing Research: The Complete Guide to Getting and Using Essential Information About Your Customers and Competitors.* John Wiley and Sons, Inc.

Hill, B. E. and Ingersent, K. A. (1987) *An Economic Analysis of Agriculture.* Heinemann: London.

Hingley, M. K. (2001) 'Relationship management in the supply chain', *International Journal of Logistics Management,* 12, (2), pp. 57-71.

Hingley, M. K. (2005) 'Power Imbalance in UK Agri-Food Supply Channels: Learning to Live with the Supermarkets?' *Journal of Marketing Management,* 21, (1-2), pp. 63-88.

Hingley, M. K. and Lindgreen, A. (2002) 'Marketing of agricultural products: Case findings', *British Food Journal,* 104, (10), pp. 806-827.

Hobbs, J. E. (1996) 'Transaction cost approach to chain management. ' *Supply chain Management,* 1, (2), pp. 15-27.

Hobbs, J. E. and Young, L. M. (2000) 'Closer vertical co-ordination in agri-food supply chains: a conceptual framework and some preliminary evidence', *Supply Chain Management: An International Journal,* 5, (3), pp. 131-142.

Hogarth-Scott, S. (1999) 'Retailer-supplier partnerships: hostages to fortune or the way forward for the millennium? ' *British Food Journal,* 101, (9), pp. 668-682.

Holloway, I. and Wheeler, S. (2010) *Qualitative Research in Nursing and Healthcare.* Wiley-Blackwell.

Homasawin, N. (2002) *Thai's Mango Export.* Department of International Trade Promotion, Ministy of Commerce, Royal Thai Government, pp:

Howe, W. S. (1998) 'Vertical market relations in the UK grocery trade: analysis and Government Policy', *International Journal of Retail & Distribution Management,* 26, (6), pp. 212-224.

Huang, G. Q., Lau, S. K. and Mak, K. L. (2003) 'The impacts of sharing production information on supply chain dynamics: A review of the literature', *Journal of Production Research,* 41, pp. 1483-1517.

Hueth, B., Ligon, E., Wolf, S. and Wu, S. (1999) 'Incentive instruments in fruit and vegetable contracts: input control, monitoring, measuring, and price risk', *Review of agricultural economics,* 21, (2), pp. 374-389.

Infothaifood. (2010) 'Government policy on Thai Kitchen to the World'.

International Market Bureau. (2010) *The Japanese Consumer : Behaviour, Attitudes and Perceptions toward Food Products.* International Market Bureau, Agriculture and Agri-food Canada

Intraluk, A. (2009) *Mango Domestic consumption*. Available at: http://www.vegetweb.com/%E0%B9%80%E0%B8%84%E0%B8%A3%E0%B8%B7%E0%B8%AD%E0%B8%82%E0%B9%88%E0%B8%B2%E0%B8%A2%E0%B8%A1%E0%B8%B0%E0%B8%A1%E0%B9%88%E0%B8%A7%E0%B8%87/ (Accessed:

Jankor, T. H., Ito, H. and Fujishima, H. (2004) *Food Safety and Quality Satndards in Japan.* Washington DC: The International Bank for Reconstruction and Development

Jansen-Vullers, M. H., van Dorp, C. A. and Beulens, A. J. M. (2003) 'Managing traceability information in manufacture', *International Journal of Information Management,* 23, pp. 395-413.

Jiamsawad, N. (2005) 'Watch on the strategy for Thai Kitchen to the World', *Manager Weekly*, 5 December 2005,

Johnson, C. S., Schrader, L. F. and Foster, K. A. (1992) *Market, Contracts, and Integration as Methods to Link Farm Production with Food Processing.* Agricultural Economics Department, Purdue University

Johnston, D. A., McCutcheon, D. M., Stuart, F. I. and Kerwood, H. (2004) 'Effects of supplier trust on performance of cooperative supplier relationships', *Journal of Operations Management*, 22, pp. 23-38.

Jonker, T. H., Ito, H. and Fujishima, H. (2005) 'Food Safety and Quality Standards in Japan', *Compliance of Suppliers from Developing Countries*, pp. 29 – 34.

JOR, J. O. t. P. J. R. A. (2011) Available at: http://jronet.org/eng_index.html (Accessed: September).

Jullavech, T. (2008) *The Decoding of Thailand's Coup d'e tat from 1932-2006 "From Contents to Statistical Analysis"*. thesis. Krirk University.

Kalafatis, S. P. (2000) 'Buyer-seller relationships along channels of distribution', *Industrial Marketing Management*, 31, pp. 215-228.

Kamjaiphai, V. (1991) 'Opinions on Thai Vegetable and Fruit Export to Japan', [Online]. Available at: http:// lib2.dss.go.th/elib/cgi-bin/ (Accessed:

Kantabutra, S. (2010) *International Conference on Agriculture and Agro-Industry (ICAAI2010) in Food, Health and Trade.* Chiangrai, Thailand,

Kaplan, R. S. and Narayanan, V. G. (2001) 'Measuring and manging customer profitability', *Journal of Cost Managment*, Sep/Oct, pp. 5-15.

Kaplan, R. S. and Norton, D. P. (2002) *Use the balanced scorecard to partner with strategic constituents* in Segil, L., Goldsmith, M. and Belasco, J. (Eds), Partnering: New York, NY.

Kariuki, L. N. (2006) 'Participation of smallholders in international trade', in Ruben, R., Slingerland, M. and Nijhoff, H.(eds) *Argo-Food Chains and Networks for Development.* Springer: Dordrecht, The Netherlands.

Ketzenberg, M. and Ferguson, M. (2003) *Sharing information to Manage Perishables.*

Key, N. and Runsten, D. (1999) 'Contract Farming, Smallholders, and Rural Development in Latin America: The Organisation of Agroprocessing Firms and the Scale of Outgrower Production', *World Development*, 27, (2), pp. 381-401.

Kinnear, T. C. and Taylor, J. R. (1996) *Marketing research: an applied approach.* McGraw-Hill.

Kirsten, J. and Sartorius, K. (2002) 'Linking agribusiness and small-scale farmers in developing countries: is there a new role for contract farming?' *Develop. Southern Africa*, 19, (4), pp. 503-529.

KMITT (undate) *list of Mango and Coconut exporters.* Available at: http://www.kmutt.ac.th/titec/gtz/mango-detail-pusongaog.html (Accessed:

Knight, C., Stanley, R. and Jones, L. (2002) *Agriculture in the food supply chain: an overview.* CCFRA in collaboration with RASE: Campden.

Kumar, N. (1996) 'The power of trust in manufacturer–retailer relationships.' *Harvard Business Review* ((November–December)), pp. 92-106.

Kvale, S. (1996) *Interviews: An introduction to Qualitative Research interviewing.* Sage Publication Inc.: USA.

Kwon, I.-W. G. and Suh, T. (2004) 'Factors Affecting the Level of Trust and Commitment in Supply Chain Relationships', *The Journal of Supply Chain Management*, (Spring), pp. 4-23.

La Londe, B. (2002) 'Who can you trust these days', *Supply chain management review*, pp. 9-10.

La Londe, B. J. (1997) 'Supply chain management: Myth or reality?' *Supply Chain Management Review*, 1, (Spring), pp. 6-7.

New England Complex Systems Institute (2011) *The Food Crises and Political Instability in North Africa and the Middle East* [Online]. Available at: http://necsi.edu/research/social/food_crises.pdf (Accessed: June, 2012).

Lariviere, M. A. (1999) *Supply chain contracting and coordination with stochastic demand.* . Kluwer Academic Publishers: Norwell, MA.

Larson, P. D. and Kulchitsky, J. D. (1998) 'Single sourcing and supplier certification: Performance and relationship implications', *Industrial Market Management*, 27, (1), pp. 73-81.

Lee, H., Padmanabhan, V. and Whang, S. (1997a) 'Information distortion in a supply chain: the bullwhip effect', *Management Science*, pp. 546-58.

Lee, H. and Whang, S. (2001) *E-Business and Supply Chain Integration.* Stanford CA.: Stanford University Report

Lee, H. L. (2000) 'Creating Value though Supply Chain Integration ', *Supply chain management review*, 4, (4), pp. 30-36.

Lee, H. L. and Billington, C. (1992) 'Managing supply chain inventory: pitfalls and opportunities', *Sloan Management Review*, 33, (spring), pp. 65-73.

Lee, H. L., Padmanabhan, V. and Whang, S. (1997b) 'Manufacturer's returns policies and retailer's competition', *Marketing Science* 16, (1), pp. 81-94.

Leisinger, K. M. (1987) 'Multinational Companies and Agricultural Development:A Case Studyo f 'TaonaZ ina' in Madagascar', *Food Policy*, 12, (3), pp. 227-41.

Lewis, J. (2000) *Trusted Partners.* Simon & Schuster Inc.: Washington, DC.

Li, S. and Lin, B. (2006) 'Accessing information sharing and information quality in supply chain management', *Decision Support Systems*, 42, pp. 1641-1656.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T. S. and Rao, S. S. (2006) 'The impact of supply chain management practices on competitive advantage and organizational performance', *Omega*, 34, pp. 107-124.

Liu, E. and Kumar, A. (2003) 'Leveraging information sharing to increase', *Twenty-Fourth International Conference on Information Systems.* Leveraging information sharing to increase: pp.

Locke, L. F., Spirduso, W. W. and Silverman, S. J. (2000) *Proposals that work: A guide for planning dissertations and grant proposals* Sage: Thousand Oaks, CA.

Malhotra, A., Gosain, S. and Sawy, O. A. E. (2005) 'Absorptive Capacity Configurations in Supply Chains: Gearing for Partner-Enabled Market Knowledge Creation', *Special Issue on Information Technologies and Knowledge Management* 29, (1), pp. 145-187.

Maloni, M. J. and Benton, W. C. (2000) 'Power influences in the supply chain', *Journal of Business Logistics*, 21, (1), pp. 42-73.

Manager Online. (2004) 'Chaturon orders significant adjustment on the strategy for Thai Kitchen to the World', *Manager Online*, 23 Novemeber 2004,

Marshall, C. and Rossman, G. B. (2006) *Designing Qualitative Research.* Sage Publications.

Martin, J. (1981) 'A garbage can model of the psychological research process ', *American Behavioural Scientist*, 25, (2), pp. 131-151.

Mason, J. (2004) *Qualitative researching.* Sage Publications Inc: London.

Mason, R., Lalwani, C. and Boughton, R. (2007) 'Combining vertical and horizontal collaboration for transport optimization', *Supply chain management: An international Journal*, 12, (3), pp. 187-199.

Matveev, A. V. (2002) 'The Advantages of employing quantitative and qualitative methods in intercultural research: practical implications from the study of the perceptions of intercultural communication competence by American and Russian managers', *I.N. Rozina, Rostov-do-Don: Institute of Management, Business and Law Publishing*, 1, (168), pp. 59-67.

Mayers, J. and Vermeulen, S. (2002) *Company –community forestry partnerships: From raw deals to mutual gains?* London: International Institute for Environment and Development (IIED)

McDaniel, C. D. and Gates, R. H. (1998) *Marketing research essntials.* International Thomson Publishing.

McDonald, C., King, S. and Goodyear, J. (1996) *Sampling the universe: the growth, development and influence of market research in Britain since 1945.* NTC Publications.

Meehan, J. and Wright, G. H. (2012) 'The origins of power in buyer-seller relationships', *Industrial Market Management*, 41, pp. 669-679.

Mentzer, J. T., Dewitt, W., Keebler, J. S., Min, S., Nix, N. W., Smit, C. D. and Zacharia, Z. G. (2001) *What is supply chain management.* Sage publication USA.

Mentzer, J. T., Min, S. and Zacharia, Z. G. (2000) 'The nature of interfirm partnering in supply chain management', *Journal of Retailing*, 76, pp. 549-568.

Mighell, R. L. and Jones, L. A. (1963a) *Vertical Coordination in Agriculture.* Washington, DC: US Department of Agriculture, Economic Research Service Farm Economics Division.

Mighell, R. L. and Jones, L. A. (1963b) *Vertical Coordination in Agriculture.* Washington, DC:

Great Britain. Parliament. Minister of Agriculture, F. a. F., (2012) *Agriculture: Who should be the bearers of agriculture*

Minot, N. W. (1986) *Contract Farming and its effects on small farmers in less developed countries.* East Lansing, MI.: Michigan State University, Department of Agricultural Economics.

MOAC. (2002) *Approach paper for Workshop Linking Production and Marketing under Contracts.* Bangkok, Thailand: Ministry of Agriculture and Cooperatives

MOAC, M. o. A. a. C. (2011) *Mission of Minstry*. Available at: http://eng.moac.go.th/ewt_news.php?nid=101 (Accessed: September).

Monczka, R. M., Morgan J.', I. M. D. S., Vol. 101 No. 6, pp. 290-304., Trent, R. J. and Handfield, B. (1998a) *Purchasing and Supply Chain Management* South-Western, Cincinnati, OH.

Moore, J. F. (1996) *The Death of Competition.* Haper Collins: New York NY.

Moorman, C., Deshpande, R. and Zaltman, G. (1993) 'Factors Affecting Trust in Market Research Relationships', *Journal of Marketing*, pp. 81-101.

Mowat, A. and Collins, R. (2000) 'Consumer behaviour and fruit quality', *Supply chain management: An international Journal*, 5, (1), pp. 45-54.

National Food Institute (2006a) *Logo of "Thai Select"*. Available at: http://www.thaifoodtoworld.com/home/governmentproj-detail.php?cms_id=110 (Accessed: 16 April 2011).

National Food Institute. (2006b) 'The project plan of Thai Kitchen to the World 2006'.

NESDB. (undate-a) *The Seventh Economic and Social Development Plan, 1992-1996.* Bangkok, Thailand: National Economic and Social Development Board, Office of the Prime Minister

NESDB. (undate-b) *The Sixth National Economic and Social Development Plan, 1987-91*. Bangkok, Thailand: National Economic and Social Development Board, Office of the Prime Minister

Neves, M. F., Chaddad, F. R. and Lazzarini, S. G. (2000) *Alimentos: novas tempos e conceitos na gestao de negocios.* Pioncira: Sao Paolo.

(2006) *The project plan of Thai Kitchen to the World 2006* [Online]. Available at: http://www.thaifoodtoworld.com/home/governmentproj-detail.php?cms_id=110 (Accessed:

Ngamsak, T., Srijadsadarak, W., Worapudtaporn, W. and Chandanee, P. (2000) *Development of Mango Products and Their Competitive Advantage in Export Markets.* Khon Kaen, Thailand: Khon Kaen University

Nochai, R. (1988) *The economic analysis of Thai mango export.* thesis. Kasetsart University.

Office of Agricultural Affairs, J. (2010) *Variety of Thai mango cultivars*. Available at: http://www.thaiembassy.jp/rte3/index.php?option=com_content&view=article&id=888:-1-&catid=38:2010-06-07-04-55-11&Itemid=91 (Accessed:

Opara, L. U. (2002) 'Traceability in agriculture and food supply chain: a review of basic concepts', *Technological implications, and future prospects*.

Ornberg, L. (2003a) 'Farmers' Choice: Contract Farming, Agricultural Change and Modernisation in Northern Thailand', *at the 3rd International Convention of Asia Scholars (ICAS3).* Singapore, August 19-22. Farmers' Choice: Contract Farming, Agricultural Change and Modernisation in Northern Thailand: pp.

Ornberg, L. (2003b) 'Farmers' Choice: Contract Farming, Agricultural Change and Modernisation in Northern Thailand', *the 3rd International Convention of Asia Scholars (ICAS3),* . Singapore, August 19-22. Farmers' Choice: Contract Farming, Agricultural Change and Modernisation in Northern Thailand: pp.

Oyewole, O. B. and Philip, B. (2006) 'A case study of cassava marketing in Nigeria', in Ruben, R., Slingerland, M. and Nijhoff, H.(eds) *Argo-Food Chains and Network for Development.* Springer.

Padmanabhan, V. and Png, I. P. L. (1995) 'Return policies: make money by making good', *Sloan Management Review*, (Fall), pp. 65-72.

Phillips, N., Lawrence, T. B. and Hardy, C. (2000) 'Inter-Organizational collaboration and the dynamics of institutional fields', *Journal of Managment Studies*, 37, (1), pp. 23-43.

Phomsupa, S. (2008) *The development of Mango production and JIT develivery* Bangkok: Department of agriculture extension

Plant Protection Station (2013) *List of import prohabited plants*. Available at: http://www.pps.go.jp/english/law/list2.html (Accessed: 25 January).

Poole, N. and Frece, A. d. (2010) *A Review of Existing Organisational Forms of Smallholder Farmers.* Food and Agricultural Organisation

Porter, M. E. (1980) *Competitive Strategy.* Free Press: New York.

Porter, M. E. (1985) *Competitive advantage: Creating and sustaining superior performance.* Free Press.: New york.

(2010) *Thai shrimp ranked 1st in global export volume.* [Online]. Available at: http://www.fisheries.go.th/cf-pak_panang/webbord/ index.php?topic=384.0 (Accessed: 23 November 2011).

Prachachart News (2008) *Dam Dok Mai- Mahachanok the opportunity for Thai mango to penetrate Japanese market*. Available at: http://www.thaishipper.com/content/content.asp? Archives=true&ID=25604 (Accessed:

Promsupa, S. (2001) *The improvement of production and Mango JIT delivery* Bangkok: Department of Agriculture Extension

R. Limchupatipa. (2005) 'Thai Kichen to the World. '

Rathanachaleat, T., Limnirunkhun, B. and Yibmuntasiri, P. (2008) *The implementation of clustering for enhancing mango grower capability.* Thailand research fund

Rathcharate, T., Limnirankhun, B., Yipmantasiri, P. and Uthumphun, R. (2009) *The way of stategic cluster for improving Mango exporter cabablities.* Cheang Mai, Thailand: Cheang Mai University

Regattieri, A., Gamberi, M. and Manzini, R. (2007) 'Traceability of food products: General framework and experimental evidence', *Journal of Food Engineering*, 81, (2), pp. 347-356.

Ring, P. S. and Van de Ven, A. H. (1994) 'Developmental processes of cooperative interorganisational relationships', *Academy of Management Journal*, 19, pp. 90-118.

Robson, C. (2002) *Real World Research: A Resource for Social Scientists and Practitioner.* Blackwell Publishing.

Rosenzweig, M. R. and Binswanger, H. P. (1993) 'Wealth, Weather Risk and the Composition and Profitability of Agricultural Investments', *The Economic Journal* 103, (416), pp. 56-78.

Ross, D. F. (1998) *Competing through supply chain management.* Chapman&Hall: New york.

Ruben, R., Slingerland, M. and Nijhoff, H. (2006) *Argo-Food Chains and Networks for Development.* Springer: Dordrecht, The Netherlands.

Rushton, A., Croucher, P. and Baker, P. (2006) *Logistics and Distribution Management.* CILT (UK): London.

Sahay, B. S. (2003) 'Understanding trust in supply chain relatinships', *Industrial Management & Data Systems*, 103, (8), pp. 553-563.

Salsberg, B. (2010) *The new Japanese consumer.* McKinsey Quarterly

Saunders, M., Lewis, P. and Thornhill, A. (2003) *Research Methods for Business Students.* Prentice Hall: UK.

Schepers, H. and Kooten, O. v. (2006) 'Profitability of 'ready-to-eat' strategies: Towards a model-assisted negotiation in a fresh produce chain', in Onderstejin, Wijnands, C.

J. M., Huirne, J. H. M. and Kooten, R. B. M.(eds) *Quantifying the Agri-food Supply Chain.* Springer: NL, pp. 117-132.

Schmitz, T. G. and Seale, J. (2002) 'Import Demand for Disaggregated Fresh Fruits in Japan', *Technical Paper TPTC 02-01*. University of Florida, Import Demand for Disaggregated Fresh Fruits in Japan: pp. 42.

Schuurhuizen, R., Tilburg, A. V. and Kambewa, E. (2006) 'Fish in Kenya', in Ruben, R., Slingerland, M. and Nijhoff, H.(eds) *Argo-Food Chains and Networks for Development.* Springer: Dordrecht, The Netherlands.

Scott, C. D. (1984) 'Transnational Corporations and Asymmetries in the Latin American Food System', *Bulletin of Latin American Research,* 3, (1), pp. 63-80.

Shaw, S. A. (1994) 'Competitiveness, relationships and the Strathclyde University Food Project', *Journal of Marketing Management,* 10, (5), pp. 391-407.

Shin, S. K., Ishman, M. and Sanders, C. L. (2007) 'An empirical investigation of socio cultural factors of information sharing in China', *Information & Management,* 44, pp. 165-174.

Siamrath Newspapaer. (2010) 'Slices Thai Kitchen to the World budget, Aims to push entire food industry development.' *Siamrath Newspaper,* 9 September 2010,

Simatupang, T. M. and Sridharan, R. (2002) 'The collaborative supply chain', *International Journal of Logistics Management,* 13, (1), pp. 15-30.

Simatupang, T. M. and Sridharan, R. (2004) 'A benchmarking scheme for supply chain col- laboration', *Benchmarking: An International Journal,* 11, (1), pp. 9-30.

Simatupang, T. M. and Sridharan, R. (2008) 'Design for supply chain collaboration', *Business Process Management,* 14, (3), pp. 401-418.

Singh, S. (2000) 'Theory and practice of contract farming', *Journal of Social and Economic Development,* 2, (2), pp. 228-246.

Singh, S. (2005) 'Contract Farming System in Thailand', *Economic and Political Weekly,* 40, (53), pp. 5578-5586.

Singh, S. (2006) 'Contract Farming System in Thailand', *Economic and Political Weekly,* 40, (53), pp. 5578-5586

Singh, S. (undate) 'Leveraging Contract Farming for Improving Supply Chain Efficiency in India: Some Innovative and Successful Models'.

SITPRO. (2009) *The cost of paper in the supply chain: Project Hermes Perishable food sector.*

(2006) *The Value of Information Sharing in Supply Chain Management* [Online]. Available at: bai2006.atisr.org/CD/Papers/2006bai6458.doc (Accessed:

Skjott-Larson, Kotzab, H. and Grieger, M. (2003) 'Industrial Marketing Management', *Industrial Marketing Management,* 22, (3), pp. 199-210.

Heraldscotland (2008) *The year of global crisis* [Online]. Available at: http://www.heraldscotland.com/2008-the-year-of-global-food-crisis-1.828546 (Accessed: 12 July 2011).

Sorat, T. (2008) 'Enhancing Thai's logistics competitiveness', Logistics Digest, 2 June 2008,

Speckman, R. E. and Sawhney, K. (1990) *Toward a Conceptual Understanding of the Antecedents of Strategic Alliances.* Cambridge MA.: Marketing Science Institute

Spekman, R. E., Kamauff, J. W. and Myhr, N. (1988) 'An empirical investigation into supply chain management: a perspective on partnerships', *Supply Chain Management: An International Journal,* 3, (2), pp. 53-67.

Suttikhun, K. (2008) 'The progession of Thai mango in Japanese market', House Agricultural Magazine, 32, 11, November 2008, p.162-166.

Svensson, G. (2001) 'Extending trust and mutual trust in business relationships towards a synchronised trust chain in marketing channels', *Management Decision,* 39, (6), pp. 431-440.

Swan, J. and Combs, L. (1976) 'Product performance and consumer satisfaction: a new concept', *Journal of Marketing,* 40, (7), pp. 431-438.

(2011) *Thai Chicken Meat Export* [Online]. Available at: http://www.thaipoultry.org/STATISTIC/tabid/248/Default.aspx (Accessed: 23 November 2011).

Thai Food Processors' Association (2011) Available at: www.thaifood.org (Accessed:

(2011) *Thai rice export at14 million tons was expected by US traders, Thai traders foreseen only 11-12 million tons* [Online]. Available at: http://www.thairiceexporters.or.th/ Local%20news/News_2011/news_220611-3.html (Accessed: 23 November 2011).

Thron, T., Nagy, G. and Wassan, N. (2007) 'Evaluation alternative supply chain structures for perishable products', *The Interantional Journal of Logistics Management,* 18, (3), pp. 364-384.

Top ten list (2010) *Top 10 Cuisines of the World – Popularity Wise*. Available at: http://top-10-list.org/2010/11/22/top-ten-popularcuisines-of-the-world/ (Accessed: September).

Tsay, A. A. (1999) 'The quantity flexibility contract: an supplier-customer intensives', *Management Science,* 45, pp. 1299-358.

Tsay, A. A. and Lovejoy, W. S. (1999) 'Quantity Flexiblity Contracts and Supply Chain Performance', *Manufacturing and Service Operations Management,* 1, (2), pp. 89-111.

(2010) *Food Processing and Packaging opportunities in Thailand, Sector Briefing* [Online]. Available at: http://static.globaltrade.net/files/pdf/20101128154138.pdf (Accessed: 19 November 2011).

Van der Meer. (2006) 'Exclusion of small-scale farmers from coordinated supply chain: market failure, policy failure or just econo,ics of scale?' in Ruben, R., Slingerland, M. and Nijhoff, H.(eds) *Agro-Food Chains and Networks for Development.* Springer: Dordrech, pp. 209-217.

Van der Spiegel. (2004) *Measuring effectiveness of foof quality management.* Proefshrift Wageningen.

Van der Vorst. (2000) *Effective food supply chains: generating, modelling and evaluating supply chain scenarios.* Proefschrift Wageningen.

Vasileiou, K. and Morris, J. (2006) 'The sustainability of the supply chain for fresh potatoes in Britain', *Supply chain management: An international Journal,* 11, (4), pp. 317-327.

Vickery, S. K., Jayaram, J., Droge, C. and calantone, R. (2003) 'The effects of an integrative supply chain strategy on customer service and financial performance: an analysis of direct versus indirect relationships', *Journal of Operations Management,* 21, pp. 523-539.

Von Braun, J. (2008a) *Food and Financial Crises: Implications for Agriculture and the Poor.* Washington, D.C: International Food Policy Research Institute (IFPRI)

Von Braun, J. (2008b) *Addressing the Challenges of a Changing World Food Situation: Preventing Crisis and Leveraging Opportunity.* U.S. Agency for International Development (USAID), Washington, D.C

Wang, C. X. (2002) 'General framework of supply chain contract models', *Supply Chain Management: An International Journal,* 7, (5), pp. 302-310.

Wang, E. T. G. and Wei, H. L. (2007) 'Inter-organizations governance value creation: Coordinating for information visibility and flexibility in supply chain', *Decision Sciences,* 38, pp. 347-374.

Wang, X. and Li, D. (2006) *Service Operation and Logistics, and Informatics SOLI 06 IEE.* Shanghai, 21-23 June 2006.

Wangsinthaweekhun, N. (2007) *Nam Dok Mai supply chain export to Japan from Chacherngchao.* thesis. Kasetsart University.

Watanawan, C. (2007) *Mango production for export.* Bangkok: Department of Agriculture

Whang, S. (1995) 'Coordination in operations: A taxonomy.' *Journal of Operations Management,* 12 pp. 413-422.

Whipple, J. S., Frankel, R. and Anselmi, K. (1999) 'The effect of governance structure on performance: a case study of efficient consumer response. ' *Journal of Business Logistics,* 20, (2), pp. 43-62.

White, B. (1997) 'Agro-industry and Contract Farming in Upland Java', *The Journal of Peasant Studies*

24, (3), pp. 100-136.

White, H. M. F. (2000) 'Buyer-supplier relationships in the UK fresh produce industry', *British Food Journal,* 102, (1), pp. 6-17.

William, T. R. and Diana, C. R. (2007) 'Compound relationships between firms', *Journal of Marketing,* 71, pp. 108-123.

Williams, S. and Karen, R. (1985) *Agribusiness and the Small Scale Farmer: A Dynamic Partnership for Development.* Westview Press: London.

Wilson, D. T. (1995) 'An integrated model of buyer-seller relationships. ' *Journal of the Academy of Marketing Sciences,* 23, (4), pp. 335-345.

Wilson, N. (1996) 'The supply chain of perishable products in northern Europ', *British Food Journal,* 98, (6), pp. 9-15.

Wolf, S., B Hueth and Ligon, E. (2001) 'Policing Mechanisms in Agricultural Contracts', *Rural Sociology,* 66, (3), pp. 359-381.

WTO. (2006) *Annual Report 2006.* World Trade Organization

Xu, K., Dong, Y. and Evers, P. T. (2001) 'Towards better coordination of the supply chain', *Transportation Research Part E,* 37, pp. 35-54.

Xuewen, T. (2007) 'The Sustainability of Food Supply Chain in China: Review and Comment'.

Yabuki, N. (1998) 'Tariff ang Non-Tariff Barries on Tropical Fruit Trade: Regulation of the European Union, Japan and the United States. FAO: Fruits Session of the Sub-Group on Tropical Fruits*', CCP: SG TF 98/CRS. 10.* Pattaya, Thailand, 25-28 May 1998. Tariff ang Non-Tariff Barries on Tropical Fruit Trade: Regulation of the European Union, Japan and the United States. FAO: Fruits Session of the Sub-Group on Tropical Fruits: pp.

Yin, R. K. (2003) *Case study research: design and methods.* Sage Publications.

Yin, R. K. (2009) *Case Study Research: Design and Methods.* Sage Publications.

Yoshida, R. (2008) '10 sick after eating tainted 'gyoza' from China', *The Japan Times*, 31 January 2008,

Yu, Z., Yan, H. and Cheng, T. C. E. (2001) 'Benefits of Information Sharing with Supply Chain Partnerships', *Industrial Managment & Data Systems*, 101, (3), pp. 114-119.

Zylbersztajn, D. and Filho, C. A. P. M. (2003) 'Competitiveness of meat agri-food chain in Brazil', *Supply chain management*, 8, (2), pp. 155-165.