



The Supply Chain Management of Pomelo Production Processes and Tourism Sustainability in Nakhon Chaisri, Nakhon Pathom Province, Thailand

Sudarat Pimonratanakan* and Chitpong Ayasanond
College of Logistics and Supply Chain
Suansunandha Rajabhat University, Thailand
Email: sudarat.pi@ssru.ac.th chitpong.ay@ssru.ac.th

Corresponding author*

Abstract

This study aimed to identify the supply chain management (SCM) characteristics of Pomelo production process in Nakornchaisri and create a supply chain management (SCM) model of Pomelo production process in Nakornchaisri. In addition, it further sought to promote the use of a supply chain management (SCM) model in the practice of supply chain management (SCM) of Pomelo production process in Nakornchaisri and promote sustainable tourism in the process. The sample that was used comprised 609 farmers who cultivate Pomelo in Nakhon Chaisri. The study was conducted using a mixed methodology with the data analysis, calculation of percentage, mean, standard deviation, principal component analysis and also varimax rotation. The quantitative research ascertained that the SCM model of Pomelo production process was appropriate to the size of the farmers' land and in line with sustainable usage which could provide an agritourism tour experience for global visitors. This would thus promote the Pomelo SCM model by enhanced community participation, which would help contribute to the problem solving and resource mobilization in the area. The results of this research are an important way to make business grow in Nakhon Chaisri and promote tourism as well as success in self-reliance. It is also a way for farmers to develop in accordance with the circumstances of the external environment of business competition. The supply chain management (SCM) model of Pomelo with the use of information technology in the process, can also aid tourism ventures. This study resulted in the development of a Pomelo supply chain management (SCM) model.

Keywords: Supply chain management, production process, Pomelo, Nakhon Chaisri, Nakhon Pathom Province, tourism.

Introduction

Thailand has a total area of about 44,000 rai used for Pomelo production. The total area yields about 500,000 tons which is the usual yields throughout a single year. Between August and October, it is very productive to market Pomelo and the fruit has a long shelf life. It is a good export item and the exports of Pomelo to foreign countries from Thailand are estimated to be 1.2-1.3 thousand tons per year. (Office of Agricultural Economics, Ministry of Agriculture and Cooperatives, 2015). The pomelo, *Citrus maxima* or *Citrus grandis*, is the biggest citrus fruit from the *Rutaceae* family and it is a natural citrus fruit, resembling grapefruit. It is natural to South and Southeast Asia.

Thailand has been a major exporter of Pomelo for many decades, and its export value has continued to further growth of Pomelo for exporting to foreign countries. Major importers include China, Hong Kong, Singapore and Taiwan. After the further opening of the Pomelo market, Thailand will be able to compete with the counterparts in the product growth area and it will be more able to further impact the market. It is expected that the volume and value of Thai Pomelo exports to other countries will increase substantially. The export value is 200 million baht per year (Department of Agriculture, 2016). The Pomelo farms could also serve as important tourism visitation sites, much like New Zealand's kiwi-fruit industry has done.

From the Pomelo export consideration, using the 2012 database (export value of about 137.01 million baht), the export value of Pomelo in 2012-2014 has increased at an average annual rate.



95% market share and 5% export value. Exports to the Chinese market accounted for 60%. In 2012-2014, the value increased by 37%. The potential markets were Vietnam and United Arab Emirates. The non-tariff trade partners' (NTBs and NTMs), and aspects such as import certification, technical specifications, and quality assurance require additional consideration. The quality of Pomelo is enhanced by the transfer of appropriate technology to develop export patterns in fresh, chilled and ready-to-eat foods that can ultimately promote the Pomelo export market. In this regard, tourism could also support the growth of the Pomelo market.

Given the afore-said, the researchers were very interested in studying the SCM of Pomelo production processes in Nakornchaisri, the area where farmers grow Pomelo. It is grown in Nakhon Chaisri, Sampran and Phutthamonthon in Nakhon Pathom Province. Nakhon Chaisri Pomelo is the fruit which the Department of Intellectual Property has issued patents on such as "Geographical Indication" or GI, which is a popular and widely consumed Nakhon Chaisri Pomelo. There are 5 breeding lines; Thongdee, White honey, Khao Phuang, Khao Pan, and Khao Hom. (Department of Agriculture, 2016). The government and private sector stakeholders have encouraged farmers to develop standardization. This is an important demand of the international market, including the enhanced publicity of the Nakhon Chaisri Pomelo which should be known and consumed by the general public along with a range of other export products. The important thing is that farmers are still facing Pomelo SCM problems. The lack of good management is an issue and there has been no study to analyze problems in Pomelo SCM production processes such as moving goods, information flow and fund inflow and also the issue of production risk sharing. In case of moving goods, the market structure and competition processes and technology, and production channels are important (Office of Nakhon Pathom Province, 2013).

The promotion of the Pomelo farmer in Nakhon Chaisri, and the greater participation in the development of Pomelo to provide the Pomelo SCM are important considerations. The efficient planting of crops and quality in the production of Pomelo is important, as is the need to find new ways to reduce production costs from upstream to downstream. Farmers who farm Pomelo will have to develop and strengthen their capacity to produce it.

Research's objectives

- To identify the supply chain management (SCM) characteristics of Pomelo production process in Nakornchaisri.
- To form a supply chain management (SCM) model of Pomelo production process in Nakornchaisri.
- To bring the supply chain management (SCM) model to use in the practice of supply chain management (SCM) of Pomelo production process in Nakornchaisri.
- To promote sustainable tourism initiatives through Pomelo farm tours.

Literature Review

The National Tourism Development Plan No. 2 (2017-2021) has prepared a national tourism development plan to provide tourism management and development continuously. The balance of tourism, goods and services in the spatial and temporal, seasonal and tourism patterns needs to be bolstered by promoting spatial equilibrium in the distribution of revenues and the number of tourists by establishing a rural tourism development zone. The development of unique products and services of each local area is important, thus the Pomelo farms can be an added value for tourism promotion. Unique products such as Pomelo also promote niche marketing for special interest groups, such as sustainable agro-tourism. Ecological and ecological tourists (National Tourism Development Plan, 2017). The principle that drives tourism development is in the sector of small agricultural operators in Thailand.



Thailand is outstanding in agricultural products, local wisdom and agricultural knowledge, agricultural technology including the beauty of natural resources and climate that are all suitable for tourism. Although agricultural sites are established to develop and produce agricultural products to sell, and generate the main income of farmers, arranging tours in the agricultural garden or orchard helps to bring extra income to farmers and entrepreneurs. Also, there are some agricultural products in different seasons in each region of the country, so tourists can see diverse ranges of agricultural products throughout the year (Ranee Isichaikul et al., 2015: 300). Agro-tourism is the production of agriculture, lifestyle, local wisdom and, interesting culture and traditions of the Thai agricultural community. The Tourism Authority of Thailand and Department of Agricultural Extension organized the agricultural tourism activities. (Agro-Tourism) has released the policy to manage agricultural tourism in all provinces (Tourism Authority of Thailand, 2018). Agro-tourism is a part of tourism activities. It allows visitors to gain the knowledge of agriculture and appreciate the unique rural landscapes (Hall and Jenkins, 1998). Sometimes it can be enjoyed as rural tourism or farm tourism (Fleischer and Tchetchik, 2006). In view of agricultural occupation development, if a farm receives more guests, it then also needs more agricultural products that could be used as food (Sznajder, et al., 2009).

The pomelo farmers in Nakhon Chaisri District, Nakhon Pathom, are in an area where sustainable tourism can and should be further developed. The agricultural attractions are all embedded in mixed farming. The tourists can be taken to see the way of life of farmers and agricultural processes and thus use their pomelo farms as agro-tourist attractions (Travel News Division, Tourism Authority of Thailand, 2015). Farmers can sell the pomelo product and processing foods made from pomelo, such as pomelo jelly, pomelo spicy salad, pomelo cake, dried pomelo paste, pomelo peel in syrup, pomelo with sugar, pomelo candy, pomelo ice-cream, etc., to tourists who visit their properties. In addition, how to make pomelo and pomelo peel in syrup, how to peel the pomelo artistically, pomelo peel processed can all add to a farms revenue. In the form of products pomelo peel stirred in herbal seasoning is also a sought after item. Processing of pomelo by locally produced farms and good pomelo quality and yields throughout the year are all feasible. Pomelo is also suitable as a raw material to create new products as an alternative for consumers. At the same time, it also increases the income generation of farmers (Nakhon Pathom Provincial Agricultural Extension Office, 2018).

Agricultural tourism can also be developed as an ecotourism destination, focusing on the cultivation of organic pomelo, without the use of noxious chemicals so as to improve the quality of the fruit. Such tourism then is like advertising in the community. More tourists will come to the community, resulting in possible homestay tourism and the creation of other tourist accommodation. Because the community is in an agricultural tourism space, there are also various agencies that can bring people to visit them on field trips, so the homestay approach can be used to accommodate the tourists including community tourism accommodation. This will allow the tourists to learn the way of life of the community of pomelo farmers (Agricultural Technology Transfer Center, Samut Songkhram Province, 2018).

In many cultures, both western and non-western, homestays are noted for their historical significance as an early type of lodging for international travelers (Borchgrevink, 1999). Despite their long history, studies about homestays are marginal. Some research fields, including the anthropology of tourism, have touched upon homestays but it is nevertheless one of the aspects of tourism that is not explored in depth (Smith, 1977) but which could serve Nakhon Chaisri District well.

Supply Chain Management (SCM)

Jones and Riley (1985) provide a supply chain definition asserting it is planning and controlling the flow of all raw materials from the supplier to the manufacturer and the distributor to the consumer.



Stevens (1989) defines supply chains as a series of activities that are connected which involves planning, collaboration controlling raw materials and goods from the supplier of raw materials to consumers.

Scott and Westrook (1991) have defined the supply chain as the chain of connection of the components of the production process and supply flow from raw materials to consumers.

Lee and Billington (1995) have defined the supply chain as the network of facilities that enable the production of raw materials to be processed into the final product and the delivery of the product to the customer in the range of supply production and distribution.

Voge et al., (2005) argue that the supply chain is a process of integrating various organizations involved, transforming raw materials into the finished goods, and delivering them to the final consumer. Supply chains also include cost, time, transportation, packing, storage and about the steps in the production process to be able to deliver the goods to the customers properly. At the present time, supply chains also include items returned after use. These include renewable materials, re-useable packaging, including waste recycling.

Changcharoen Ubonrat (2011:20) states that the SCM is a combination of planning and management in every activity, starting with the procurement process, information technology, storage, distribution, transportation, suppliers, manufacturers, including customers, are involved in all relevant business processes, both inside and outside the organization. Each unit can work effectively. At the other end of the spectrum, researchers provide the definition of SCM, which refers to the use of systems of organizations, individuals, technologies, resources, information and activities to integrate them, moving goods or services from the supplier to the end customer.

Elements of Supply Chain Management (SCM)

John Langley (2002) has said that the future of supply chain needs have elements or characteristics that need to be addressed, namely customer and demand management. Supply chain performance measurement information technology outsourcing cooperative relationship key strengths and strategies for effective supply chain work.

Chen and Paulraj (2004) said that the purpose of SCM is to develop a research area that will likely improve understanding of SCM and help researchers understand the critical structure of SCM and its impact on capacity. Supply chain is critical both from theory and observation. Part 1 presents a consistent and structured sequence of knowledge in SCM, which includes key components in SCM that are vital for tourism and other businesses. Part 2 is the development of a research framework for SCM. Part 3 addresses the need for theoretical management that shows that a business that does not cooperate with others does not compete in the long-run.

Business can be competitive if it is conducted in the form of an effective and ethical supply chain. This can add value to the customer through the collaboration between the supply chain members in the planning, raw material control service and data link. There are four main components of SCM: strategic procurement, supply management, logistics integration, and collaborative network management. Supply network coordination, including the concept of performance or supply chain performance, including financial performance, and operational performance are also vital.

Supply Chain Management (SCM) with logistics

The Thailand Development Research Institute (2010) says SCM has a broader meaning than the mere definition of logistics. Indeed, logistics is one of the five key components of SCM. This includes links between people involved using information, manufacturing and transportation management in combination with the most efficient business process integration. SCM is therefore an activity throughout the supply chain (both activities flowing up and it flows down the chain). Organizing and coordinating activities (as if the central agency is responsible) to ensure that the

supply of goods is consistent with demand is essential. The chain of steps, and sharing of information and technology among all stakeholders contributes to innovation, to reduce the duration of the product development cycle, reduce cycle time, the flow movement of goods and inputs inventory to meet the needs of customers, reduce costs and increase customer satisfaction effectively.

Supply Chain Management (SCM) of agricultural products

The Thailand Development Research Institute (2010) states that agricultural SCM focuses on product flow, information and capital flow with risk, factors affecting the flow of goods, the market structure and competition, sales channels, manufacturing processes, product characteristics and logistics. The flow of information will invariably tend cover the manufacturing process and technology use. For capital flow, it will include risk management and risk sharing, review of relevant literature. The researcher took the example of Pomelo SCM in Nakhon Chaisri, Nakhon Pathom province, Thailand.

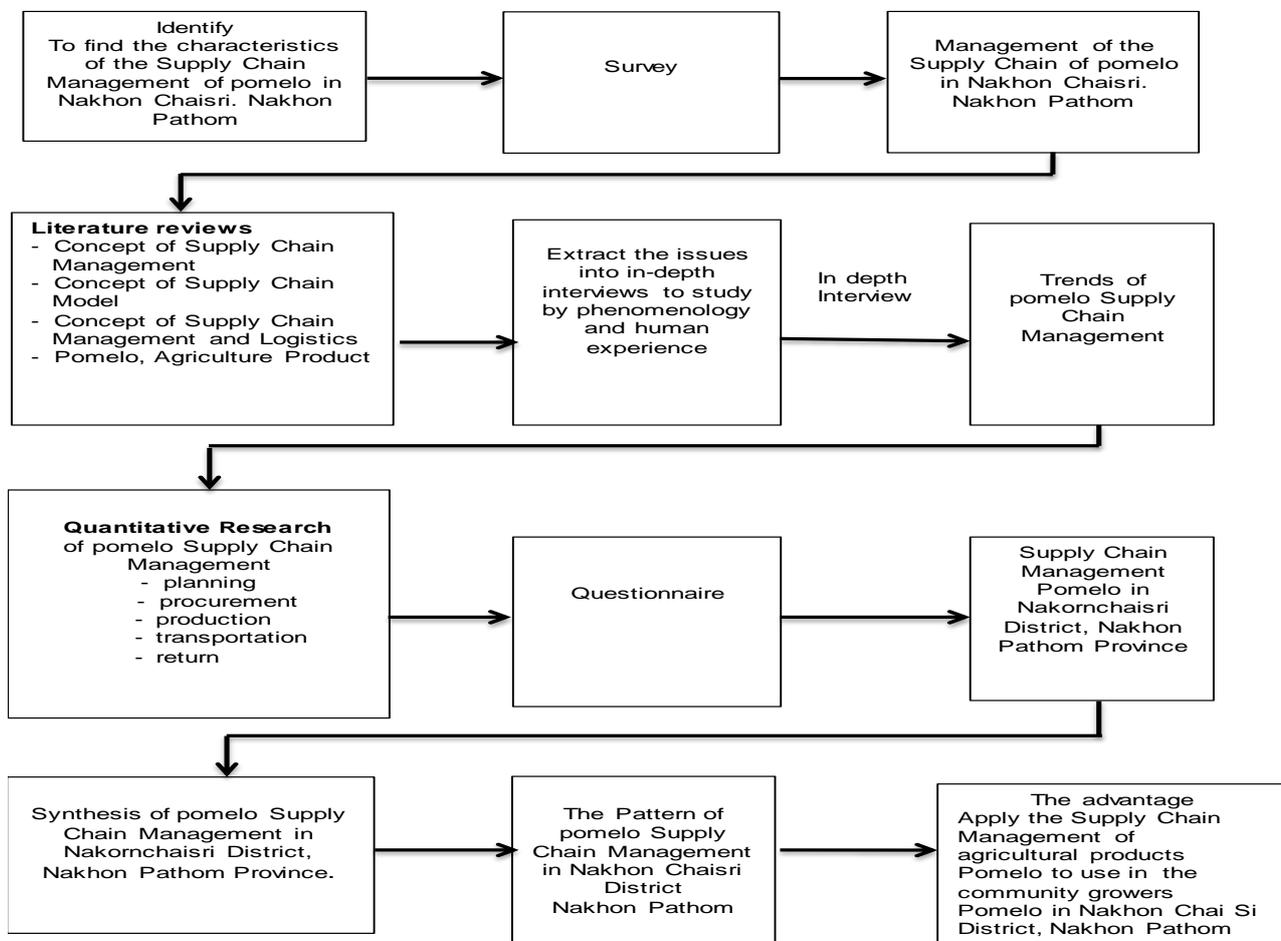


Figure 1. Conceptual Framework



Methodology

Population and sample

The population used in this study included: farmers planting Pomelo with farms with potential for tourism and residing in Nakhon Chaisri, Nakhon Pathom province. For the sample, the researcher considered the characteristics of the research data that required the use of advanced analytical statistics, factor analysis, to determine the samples size. The sample size was 10-20 people per sample parameter (Hair, 2010). The sample comprised Pomelo growers in Nakornchaisri, Nakhon Pathom province. There were 40 variables used in the study. The sample size was 15 respondents per observation variable. The sample size was 600 respondents in total.

Research instruments

This research uses a data collection questionnaire which was divided into 4 parts including Pomelo supply chain production processes and also included open-ended questions. The questionnaire was designed on a 5-point Likert rating scale, including the ratings highest, high, the average, low and the lowest as aspects of consideration.

The researchers examined the quality of tools including the three aspects as stated below:

1. Content validity: by bringing the questionnaire to the experts for consistency, coverage of questionnaire with objectives of research, terminology and language suitability of the questionnaire. By definition, the index of consistency of each question with the objective (Index of Item-Objective Congruence: IOC) from 0.50 to (Pasunon Prasopchai, 2012: 224). The researcher then considered the question, the recommendations of the experts and developed a model of tools to suit the next usage need. From the test, the IOC value was 0.85 or higher.

2. Analyzing the reliability of the tool: The reliability of the questionnaire was used to collect data from 50 respondents. The data were tested by Cronbach's Alpha (Srisaard Boonchom, 2011). It was found that the reliability coefficient of alpha was 0.90, which means that the reliability of the questionnaire is greater than 0.7, indicating that the test population has a consistent score of close to 1, indicating that the test has a high confidence level.

3. Data Analysis in this research: Descriptive statistics consisted of frequency, percentage, S.D. mean. The score was 4.21-5.00. Score of 3.41-4.20 indicates that the level is very high, 2.61-3.40 score is moderate, 1.81-2.60 score is low and 1.00-1.80 score is the lowest level (Srisaard Boonchom, 2011: 99- 102) and factor analysis was used to then test the relationship between variables.

This research was also qualitative research by means of a phenomenological study, with the need to study Pomelo SCM production processes in Nakhon Chaisri, Nakhon Pathom province of the grapefruit farmers living in Nakornchaisri, Nakhon Pathom province. The study was conducted in the following manner:

Primary informers

The main informants were farmers who grow Pomelo in Nakhon Chaisri, Nakhon Pathom province with 9 key informants as participants in Pomelo SCM production processes.

Research Instruments

The instrument used to collect the data was an interview form. The researcher chose the most important tools to help complete the data collection. These tools consisted of questions, interviews, notebooks, cell phone pens, researchers and of course, the interviewees.



Data collection

From articles, papers, and research related to the concept of SCM efforts were made to understand rich meanings and principles by means of in-depth interviews. The interviewer interviewed the key informants with questions about Pomelo SCM production processes. The researchers also prepared the questionnaire for the primary informants to provide an opportunity for them to share their experiences and independent work findings. The researchers had the chance to add to the need to expand or verify the confidential information obtained. Data collected by other means, such as non-participant observation, note taking and the reflections of respondents reflect the ideas presented.

Verification of data reliability

To verify the reliability of the data, the researchers used data triangulation to prevent lack of credibility and if the information was not deemed to be enough the researcher collected additional information by checking the data and time difference, different locations and statements of different people. Each person provided the same type of information but where there was discrepancy, additional interviews were held at different times and places to confirm findings and find more information for greater clarity.

Data analysis

The researchers used data analysis to generate conclusions based on the interview data. They then constructed the concept using theoretical principles. When completed they synthesized the data to ascertain the next step.

Results

Quantitative research

In the study of Pomelo SCM production processes in Nakhon Chaisri, the researchers summarized the results as follows.

1. Most of the farmers are female, aged from 31-40 years old. They have 11-20 years of experience in grape farming. They have more than 1-5 rai of land and earn income more than 50,001-90,000 baht per year.
2. The popularity of Pomelo was based on 'white gold' and most accounted for by 43.3% of responses obtained, using the grafting method in the propagation processes was accounted for 51.2% of responses. For harvesting, the most used the bamboo clearing method and this was stated by 52.30%. The key disease of Pomelo was a disease of rust and accounted for 28.7%. The key insect enemies of Pomelo were the orange worm as attested by 46.7%. The preventing and eliminating of pests used the largest numbers of workers (80.7%). Water used for cultivation was water from canals (58.0%). The method for sending water to the Pomelo cultivator was pumping for cultivation purposes (61.5%). For hiring staff, they mostly use the employing of two types of workers –fixed term and temporary (74.5%). For storage capacity aspects the period of inactivation is 4 years (52.5%). The harvest cut off time is between in August to September (52.3%) and the frequency was 4-5 times as the highest number (59.30%).

The practices after cutting is wiping and this accounted for 35.5% with the average yield per year at more than 30, the largest number accounted for 54.0%. Pomelo is sold to export companies (40.30%). The quality of the results is the highest grade, 93.5%, when it comes to the value of the sales. The high amount sold in kilograms was most accounted for by 84.6% of respondents. Pricing and Pricing Criteria are based on quality and considered important by 51.4% of respondents, while the post-sale payments accounted for 84.7%. The transportation method which is based outsourcing was mentioned by 72.4% of respondents. The marketing knowledge of professional farmers was discussed by 55.3% of respondents, while production control was considered to be a growing area accounted for by 40.8%. The reduction in production costs was accounted for by



61.5%. Pomelo pricing was based on the negotiation between buyers and sellers and was accounted for by 76.2%.

3. Formulation of Pomelo SCM in Nakhon Chaisri, found that the opinions of the farmers were divided into five area: planning, procurement, production, transportation and returns on investment. The overall level was very high with the mean score of 4.03. When considering each issue it was found to be at a very high level. The average was 4.12 in return, 4.06 in transportation, 4.03 in production, 3.99 in planning and 3.98 in procurement.

4. Results of component analysis

Elementary Requirements Testing in Analysis

1) The respondents completed 150 questionnaires (Pallant, 2001).

2) Correlation between the variables above was at 0.3 and above (Wiersma, 1991). Based on this test, it was found that the correlation between the data variables above 0.3 was 340 pairs. Considering a KMO that is greater than 0.6, Bartlett's test of Sphericity is statistically significant. (Burns, 1990), as shown in Table 1.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.649
Bartlett 's test Sphericity	Approx. Chi-Square	7806.124
	Df	478
	Sig.	0.00

Table 1. KMO and Bartlett's test Sphericity

Table 1 shows that the KMO value of 0.649 indicates that the available data is based on the factorial analysis technique and Bartlett's test of Sphericity is Chi-square = 7806.124. P = 0.00, rejecting the hypothesis (H0). Therefore, based on the results of the tests, the three basic terms are suitable for the use of component analysis.

The next step was to extract the elements (Factor Analysis) to consider the Pomelo SCM in Nakhon Chaisri. How many elements could be classified without correlation? Varying the Orthogonal axis by the Varimax method, the number of cycles in the extraction of 25 cycles shows the Eigen values were greater than 1, and does not show the lower coefficient of loading. 0.3. The Eigen values greater than 1 have 5 components and the last one can describe the maximum variance by 65.764 and the analysis eliminates factor with less than 0.3, only 37 variables were included in the analysis. The Scree plot was found to be consistent. Looking at the analysis components in the SCM of Pomelo in Nakornchaisri, in each of the components, the values had to be at least .40 (Pimpa, 2003). In addition, the analysis of communality values showed that Final Communality Estimated was 4.688. The supply of Pomelo comprised of five components.

Component 1: The planning consists of 8 parts, which include: 1). prior to planting, the plantation area is planned to have an average annual temperature of 25-35 °C. 2). Prior to planting, the planting area must be planned to have space with enough water to use throughout the year. 3). Prior to planting, there is a plan to provide an area for planting which is flat and there should be no flooding problem. 4). It is planned to monitor the temperature and moisture, with light to suit the species and cultivars. 5). Planning to keep weeds away so that ground is easy to navigate and operate on. 6). Using the statistics of the sale and return of Pomelo from the previous year to inform the future production plan. 7). Planning on the cost of transportation. 8). Using good quality water with the amount of minerals not too high. This variable had an Eigenvalue of 7.494.

Component 2: The production consists of 6 parts, consisting of: 1). A fertilizer schedule spray pesticides and preventive medicine. 2). A suitable number of laborers. 3). the exact flowering date is determined. 4). Using good technology in the production process. 5). Having more knowledge in decision making. 6). Having information on funding sources supporting the planting process. This variable had an Eigenvalue of 6.609.



Component 3: Procurement consists of 5 aspects, including: 1). In-depth relationship with the raw material supplier and long-term agreements. 2). Maintaining a win-win relationship. 3). Checking quality and limitations of the product from the raw material suppliers. 4). Making a purchase decision based on quality and price. 5). Using the technology in transportation process. This variable had an Eigenvalue of 6.336.

Component 4: Transport and Return consists of 8 parts consisting of 1). Two-way communication ti participate in problem solving and develop new technologies together. 2). The raw material suppliers have been verified and confirmed the quality of the products. 3). There is a common agreement to improve the quality continuously by cooperating and using raw materials for process improvement. 4). Having future contracts. 5). Quality of Pomelo remains the same during transportation 6). The transportation is convenient and fast. 7). Transportation costs are reasonable 8). Having small amount of error in ordering aspects. This variable had an Eigenvalue of 5.445.

Component 5: The development and construction of the network consists of 5 aspects: 1). There is a plan to find out the future direction of Pomelo development. 2). Having the plan in seeking more knowledge on Pomelo and tourism aspects. 3). Having the plan to find good channels of distribution. 4). Having the right criteria in choosing suppliers. 5). Having efforts to create a network of manufacturing flexibility. This variable had an Eigenvalue of 5.181.

Qualitative Research

Based on interviews with key informants, the findings are as follows.

1. The SCM model of Pomelo according to the size of the farmer is based on the participation of the community to contribute to the idea in problem solving and resource mobilization. It is an important way to make business successful and sustainable.

2. The pattern of Pomelo SCM is a system that will affect the success of self-managed management divided into various aspects: production planning, purchasing, shipping, return and shipping. There is a systematic relationship based on the importance of each task. This Pomelo SCM model can be developed according to the circumstances of the external environment business competition. Implementing the SCM model of Pomelo with the use of information technology in the process details as follows:

2.1 Production planning: farmers must know what the amount of debt and equity is? This is one of the factors that must be taken into account in investment decisions and management. Of importance for quality grape production is the need to speed up and maintain the freshness of the Pomelo transportation to markets. There are risks to the quality and price of Pomelo to keep up with the current competitive environment. For farmers or exporters, the SCM tools should be managed to be more effective in terms of reducing operational procedures and promoting efficiency.

2.2 Procurement in assessing the performance of exporters, the quality of Pomelo ordering costs and speed of delivery is important. The relationship between the organization and the gardeners, their levels of experience and teamwork are vital aspects.

2.3 Transportation in the field - rights assessment. The key consideration of the exporter is the quality of the Pomelo during transportation, transportation speed and transportation costs. This was found to be prominent in the transport sector issue, in terms of performance and the number of vehicles and route expertise of drivers. For transportation problems, it was found that the transport of Pomelo to the airport was a problem due to the uncertainty of traffic conditions and thus delays in transportation. There are problems with the flights file, cargo arriving late at the airport and the excessive bookings which cause problems.

2.4 The customer sends the Pomelo to the shipping agent. The shipping company then deals with the customer. When negotiating space for customers, the space will be provided to customers, and then preparation of documents for the goods is made to be sent to a destination and documents for

exportation are required. Then there is a pre-shipment by checking the accuracy of the goods and documents.

2.5 On the issue of returns, it was found that both small and large exporters experience inadequate space and in time delivery leading to quality problems of Pomelo sales. Only a small amount of exporters however, suffer from poor harvests and in such cases the Pomelo is not harvested according to required export standards.

3. From the research it was found that the barriers to Pomelo SCM are as follows:

3.1 Pomelo storage factors while awaiting transportation to the airport. When packing, there will be a waiting period for the carriage to the airport. At this time, there are problems with traffic conditions and planning problems at the airport. However, there are also problems for exporters in terms of waiting time for trucks moving to airports and when there are traffic problems this is worse. Based on this problem, the researchers propose that each phase of the project should be planned with minimal time delays. The transportation must be planned to be more effective. Negotiation is important when sending Pomelo to the exporter or shipping agent. Geographic Information System (GIS) must be used to help determine the optimal route for transportation.

3.2 Factors of export operation: Once the agent arrives at the airport, the Pomelo arrives at the warehouse and then proceeds to be processed for exportation. This requires waiting for the submission of documents for Pomelo exportation, which will take time more or less depending on the number of service staff available, as well as the order of export documents and the number of freight forwarders on duty.

The results of the quantitative data qualitative data should be used as the needed information to formulate policies to benefit the farmers. This should be according to the SCM issues of Pomelo sales and defined by the Pomelo SCM model of agricultural products as shown in below.

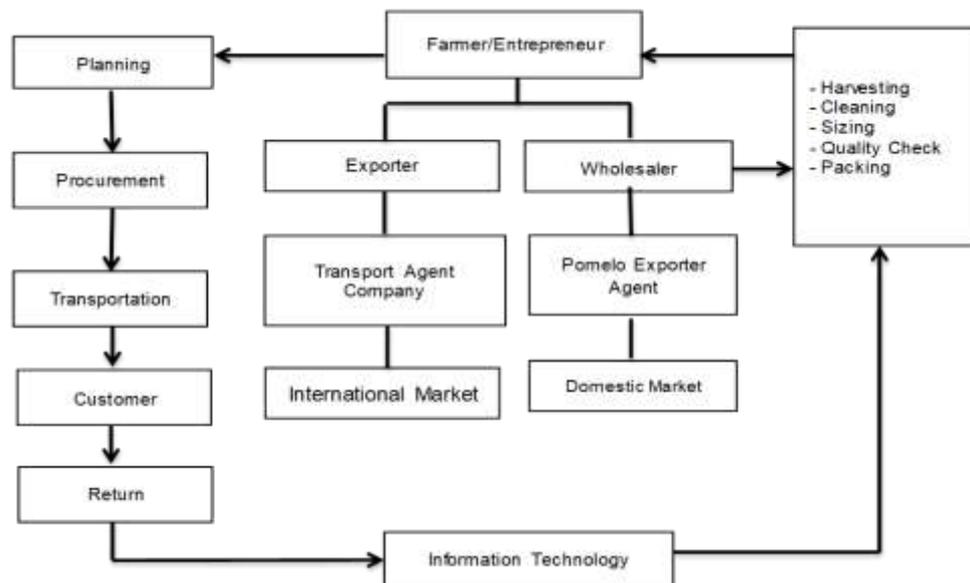


Figure 2. SCM of Pomelo Agricultural Products in Nakhon Chaisri, Nakhon Pathom Province, Thailand

Discussion

The results of the research showed that the creation of an SCM model is vital. It can be seen that most farmers have the idea that the SCM model of Pomelo should be developed for the further promotion of pomelo for export. This is consistent with the research by Jitimanee Ubonanee (2014). The research found that there are problems in the farmers sector. The middle-men and exporters



have the problem of volatility in quantity, resulting in inadequate demand. This is because especially the small farmers have independent chains that they work with. All sectors are government linked. Clubs should be adapted and networked to increase capacity and competitiveness to support new markets in the future. Meeting the needs of farmers, can satisfy them. Farmers have an influence on the development of the supply chain model for farmer products according to Limmakorn Thipawan and Mek Horum Thumrong (2011), based on the study of the development of logistics system and SCM of pomelo in Samut Songkhram province. The results showed that pomelo growers had a good level of SCM. The development of logistics and SCM was carried out by the development of the website of the Pomelo Quality Improvement Group to propagate and reduce the trading process, and to create trade opportunities for farmers in both domestic and foreign markets.

The farmers have an additional aspect worthy of consideration which is agritourism. Agriculture is an important and active part of Thailand's economy and way of life, and contributes meaningfully to the country's exclusive character. The Tourism Authority of Thailand (TAT), as part of its promotion of sustainable tourism, has produced 'Agro-tourism: Green Travel in Thailand' to provide opportunities general tourists, to get first-hand experience of farming and the Pomelo farms can benefit from this as tourist learn about Pomelo production and add value to local communities.

Ethics between Pomelo farmers and possible tourists to an agritourism farm would be an important consideration in SCM. The farmers will need to balance the rights and duties of the stakeholders such as their employees and tourists (Boone and Kurtz, 2010) in nay venture that is undertaken. They will therefore need to create a set of clear principles as they make decisions relating to tourists (Boone and Kurtz, 2010). Supply chain practice cannot accept unethical decisions that maximize a farmer's value while giving tourists a false picture of a farming operation. Making ethical decisions is a core competence required of any supply manager, including Pomelo farmers. The farmers need to align their expected business success with their social responsibility to be honest in business. Thus when tourists arrive at a farm, they should be treated with total honesty and not given false impressions of how a farm operates or what it produces. A key to responsible supply chain policy is to have better collaboration between suppliers so as to improve the working conditions and reduce carbon emissions as goods are transported to for example the airport in non-peak hour traffic. Reducing the carbon footprint by travelling in off peak times and also using more energy-efficient shipping methods can lower transportation costs and is socially responsible behavior.

Conclusion

The study and analysis of the SCM model of Pomelo in Nakhon Chaisri, Nakhon Pathom province was found to be in the very high level of need as stated by respondents. The research found that the SCM model of Pomelo agricultural products, will suit Pomelo farmers. This means there is a need to promote the SCM model and get the participation of community farmers, which will contribute to the idea. This is an important way for farmers in Nakhon Chaisri to be successful and self-sustaining. From the study of the farmers' context, Pomelo orchard management of Pomelo SCM is important. The system model that will affect the success of SCM that can be managed manually, is divided into various areas including production, planning, purchasing, shipping and returns from sales. In each of these areas, there is a systematic relationship based on the importance of each task that is undertaken. Once the SCM Pomelo model performs, it can be further developed in accordance with the circumstances of the external environment of the competition. The SCM model must be introduced by the use of IT and this action should be on a continuous basis. The theoretical approach followed was to create an SCM model of Pomelo. To publish the SCM model of Pomelo products for the use of Nakhon Chaisri farmers is an important step. All contributors of the supply chain should display a high standard of professionalism. Tourists can also be taken to see the way of life of farmers and agricultural processes and thus the use of Pomelo farms as agro-tourist attractions cannot be understated. With this knowledge, the SCM will be used by the farmers as a guideline for operations. Farmers were interested in changing their operations by introducing a suitable SCM model that would enable farmers in Nakhon Chaisri to



operate more efficiently and effectively. Also important to consider is that an ethical supply chain enhances profitability.

Pomelo agritourism can also be a huge opportunity for tourists to learn about Thailand's rural culture, agriculture and the locals, while experiencing a homestay and at the same time sustaining rural communities looking for new avenues of income generation to help safeguard their survival. This is an area requiring greater investigation in future studies.

Contributions

1. Farmers should attend training courses or technical seminars for SME entrepreneurs on management by applying information technology to their operations in order to develop the knowledge needed to increase the value of products.
2. Purchasing Pomelo exporters must focus on the quality of Pomelo in making a purchase decision based on quality and price, to develop the Pomelo production process, cost of purchase and the speed of delivery. That is the relationship between the organization and the gardeners, experience and teamwork.
3. In the research that is undertaken there must be greater emphasis on Pomelo research as a suitable economic crop for the climate in Thailand and more importantly, there should be a research plan that has a continuous research budget for this.
4. Human resource development has been studied in the field of skill development for the production of a Pomelo supply chain using the study tools of foreign labour management in the terms of production and labour migration to the industry and these aspects must be imparted to farmers and other stakeholders.

Future Research Direction

Future study should consider a long-term longitudinal study. So that in different environments, the operation of the operator will change as well. Therefore, in the next study there should be a consideration of changes and new developments in the operation of the operator.

This study is directed to agencies that represent the public and private sectors that implement the policies for agriculture and tourism. The idea is to promote and assist farmers and related operators in enhancing competitiveness in the agricultural industry in each area mentioned in this article, while simultaneously bolstering tourism and farm sustainability.

References

- Agricultural Technology Transfer Center, Samut Songkhram Province. (2018). Available online at https://unfccc.int/files/national_reports/non-annex_i_parties/biennial_update_reports/submitted_burs/application/pdf/347251_thailand-bur2-1-sbur_thailand.pdf
- Boone, L.E. & Kurtz, D.L. (2010). *Contemporary Business*, 14th ed., John Wiley & Sons, Hoboken, NJ.
- Borchgrevink, C. P. (1999). The historical perspective. In C. P. Borchgrevink (Ed.), *Perspectives on the hospitality industry: An introduction to hospitality management* Iowa: Kendall/Hunt, pp. 39-49.
- Changcharoen Ubonrat (2011). Factors of success of logistics process that affect value the economy in the electronic equipment business, Master Thesis Business, *Silpakorn University*.
- Chen, I.J. & Paulraj, A. (2004). *Towards a Theory of Supply Chain Management: The Constructs*



and Measurements, *Journal of Operations Management*, 22, 119.

Chitmanee Ubonanee (2014). Supply Chain Management for Pomelo, Khao Tang Kwa, Chai Nat. *United Journal Research*, 3rd Edition, January 1 - June 2014.

Department of Agriculture. (2016). *Agricultural Information*. Available online at <http://www.doa.go.th/en/>

Fleischer, A. & Tchetchik, A. (2006). Does rural tourism benefit from agriculture.(online), available from www.sciencedirect.com. Accessed May 25, 2010.

Hair, J., Black W.C., Babin, B. J. & Anderson, R. E. (2010). *Multivariate data analysis*. (7th ed.). Upper Saddle River, New Jersey : Pearson Education International.

Hall, C.M. & Jenkins, J. 1998. The policy dimensions of rural tourism and recreation in Butler., C.M., Hall and J. Jenkins (eds.), *Tourism and Recreation in Rural Areas*. Chichester: John Wiley and Sons. 19-42.

Coyle, J.C., Bardi, E.J. & Langley, J.C.Jr. (2002). *The Management of Business Logistics: A Supply Chain Perspective*, 7th edition, Thomson Learning , Canada, pp.424 – 443.

Korpeia. J. & Lehmesvaara, A, (1999). A customer oriented approach to warehouse network evaluation and design, *International Journal Production Economics*, 12(5), 112-115.

Jones, T. C. & Riley, D. W. (1985). Using inventory for competitive advantage through supply chain management. *International Journal of Physical Distribution & Materials Management*, 15(5), 16-26.

Lee, H. & C. Billington. (1995). The Evolution of Supply chain Management Models and Practice at Hewlett-Packard, *Interfaces*, 25(5), 42-63.

Limmanakorn Thipawan & Mekhara Thumrong. (2011). Logistics and supply chain management of pomelo in Samut Songkhram province. Bangkok: King Mongkut's Institute of Technology Ladkrabang.

Nakhon Pathom Provincial Agricultural Extension Office. (2018) Available online <https://www.naetcenter.com/>

National Tourism Development Plan. (2017-2021). Thailand.

Office of Nakhon Pathom Province. (2013). The briefing of Nakhon Pathom Province, 2013. Information Technology Group to Communicate Office of Nakhon Pathom Province.

Office of Agricultural Economics, Ministry of Agriculture and Cooperatives. (2015). *Agricultural Information*.

Pallant, J. (2001). *SPSS Survival Manual: A Step-by step Guide to Data Analysis*, Buckingham: Open University Press.

Pasunon Prasopchai (2012). *Marketing research*. Bangkok: Silpakorn University Press.

Pimpa, N. (2003). *Development of and Instrument for Measuring Familial Influence on Thai Students, Choices of International Education, International Education Journal*, 4(1), 24-29.

Ranee Isichaikul and Rachaporn Chansawang.ASEAN's agenda on agro-tourism development policy to support ASEAN's tourism. Bangkok: TRF.



Scott, C. & Westbrook, R. (1991). *New strategic tools for supply chain management*, *International Journal of Physical Distribution & Logistics Management*, 21(1), 23-33.

Smith, V. (1977). *Hosts and guests: The anthropology of tourism*. Philadelphia: University of Pennsylvania Press.

Srisaard Boonchom. (2011). *Introduction to Research*. Bangkok: Suviwara Sarasin.

Stevens, G. C. (1989). *Integrating the supply chain*. *International Journal of Physical Distribution & Logistics Management*, 19(8), 3-8.

Thailand Development Research Institute. (2010). *Logistics Information*.

Tourism Authority of Thailand. (2018). Available online at <https://www.tourismthailand.org/>

Travel News Division, Tourism Authority of Thailand. (2015). Available at <https://thai.tourismthailand.org/about-tat>

Vogel, D. J. (2005). *Is There a Market for Virtue? The Business Case for Corporate Social Responsibility*, *California Management Review*, 47(4), 19–45.

Wiersma, W. (1991). *Research Methods in Education*, (5th edition). Sydney: Allyn and Bacon.