A Study and An Analysis of Supply Chain of Canned Pineapple in Prachuab Kirikhan

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Abstract

This research aims to study the structure and activities of a canned pineapple supply chain in Prachuab Kirikhan from upstream, midstream, to downstream and to give recommendations and guidelines for industrial supply chain development. The study used one of the biggest canned pineapple companies in Thailand as a case study. The data collection instrument was an in-depth interview of the administrators and some keymen in that company by giving topics of the canned pineapple supply chain. This research is qualitative, and the analysis instruments were content analysis, value chain analysis, and SWOT analysis.

The results revealed that the supply chain of the canned pineapple industry started from the upstream that concerned fresh pineapples as the major production factor. Most of them were from contract farmers, non-contract farmers, local suppliers, and offshore suppliers. The proportion of contract and non-contract farmers was about 60:40, and deals were made by the brokers. The midstream comprised two parts, which were canned pineapple factory and warehouses. Besides, they were subdivided into 2 tiers that consisted of rental warehouses and transportation agencies. The production process under the midstream was labeled and non-labeled cans. The results of the value chain of the factory, as the case study, could be explained by its activities, which were primary activities and support activities. After adjusting the activities of the value chain, it eventually showed a decrease in cost by 100 million baht in the stimulation of the factory after purchasing fresh pineapples from nearby sources. Furthermore, one positive result of the spread of COVID-19 was that the orders from overseas customers had increased because the needs for foods had increased and the major food factories in many countries had stopped their production lines. Besides, the new methods were founded to increase work efficiency and reduce the costs in the COVID-19 situation. They are collaboration internally and externally, Right Product-Right Time-Right Quantity-Right Quality, World Class Manufacturing, Reengineering, Traceability& Recall, Good Governance, and Project Horizon. These concepts were applied to the supply chain of this industry.

***Keywords*:** *Supply Chain, Value Chain, Canned Pineapple, SWOT, COVID-19*

1. Introduction

Pineapple is an important economic plant of Thailand. The export volume was about 580,000 tons a year (FAO STAT, 2020). The statistics of exporting pineapples are shown in Figure 1: Quantity of Exporting Pineapples of the World from 2015-2019. Pineapple processing products were canned pineapple and pineapple juice, which was about 45% of fruit-processed export values (Bureau of Agricultural Economic Research, 2018). Thailand is the first pineapple exporting country in the world. The Thai market share is about 50% while the major markets are the USA, EU, Japan, and middle-east countries.

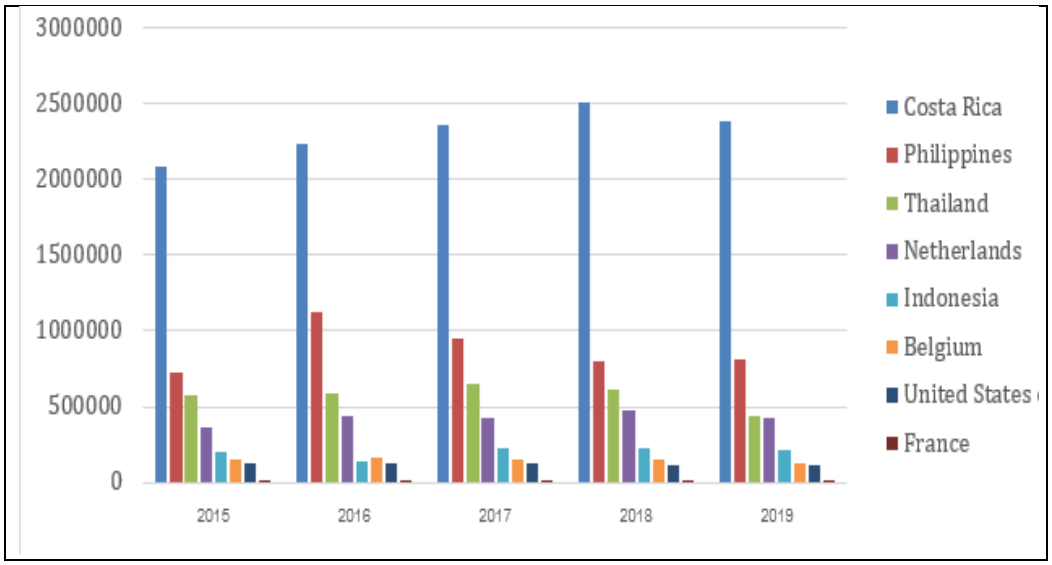

Figure 1 Quantity of exporting pineapples of the world
Source: Bureau of Agricultural Economic Research

The pineapple processing industry is important to Thai economics since it has made the nation's economy more valuable by using domestic materials, including the labor force in the pineapple processing industry as well. Also, this industry makes more income for the agricultural sector. The number of pineapple agriculturists has increased rapidly from 12,000 households in B.E. 2510 to 33,577 households in B.E. 2557. At present, there are 82 pineapple processing factories (Agricultural Economics, 2019).

However, data in the past showed that there were many problems with pineapple productions. Since pineapple cultivations need proper areas, weather, and surrounding, if some of these factors change, the quantity of pineapple will change as well. So, the quantity of pineapple has been inconsistent, which affects the pineapple processing factories. Other factors, such as the changes in the population, consumer behaviors, and numbers of agriculturists, also affected the quantity of pineapple produced and their prices. Normally, the price of pineapple was fluctuated due to many factors as mentioned before, and it was hard to plan for the production. The factories faced the problems of production cost in each production period of the supply chain (Kanyapak, 2018). The production plan was very discrepant. The procurement of raw materials had a lot of problems, and its quality directly affected the production costs, inventory management, and improper inventory size.

There are many problems in the pineapple supply chain and its business. The overview of its problems is the highest price in 10 years (Office of Agricultural Economics, 2020) that was affected by the drought, shortage of labor in the pineapple processing industry, and trade barriers from the markets. Moreover, the current COVID-19 situation makes a lot of changes in every dimension, the factory is affected by these factors as well.

According to the pineapple supply chain of the factory, this research was set up to study and analyze the overview of upstream, midstream, and downstream of the pineapple supply chain. It was more efficient and effective in its system and enables to be used as the guideline to develop the factory's supply chain management.

2. Objectives

The objectives of the study were

1) To study supply chain activities of pineapple canned factory in Prachuab Kirkhan
2) To analyze the supply chain of pineapple processing for canned pineapple and pineapple juice
3) To find a guideline to improve and develop the production process of canned pineapple

3. Materials and Methods

This research used materials and methods as follows:

3.1 Research Design

This study is qualitative research that is designed to explore the supply chain management of canned pineapple production in Prachuab Kririkhan and to find out ways to improve and develop the processes of the canned pineapple production. The researcher initially collected data from secondary data sources. The scope of this research was to study in one of the canned pineapple factories.

3.2 Research Instruments

The instruments used to study supply chain and supply chain management of a case study, one of the pineapple canned factories, was an in-depth interview with the administrators of the factory and ones who concern the supply chain of the canned pineapple.

3.3 Research Analysis

The analysis instruments of the secondary data and primary data were content analysis, value chain analysis, SWOT analysis, and supply chain management analysis of the canned pineapple products in Prachuab Kirikhan.

4. Results and Discussion

Part I: Value Chain

The results of a supply chain analysis method with a case study are identified by the streams of the canned pineapple; upstream, midstream, and downstream, as shown in Figure 2: Supply chain of canned pineapple.

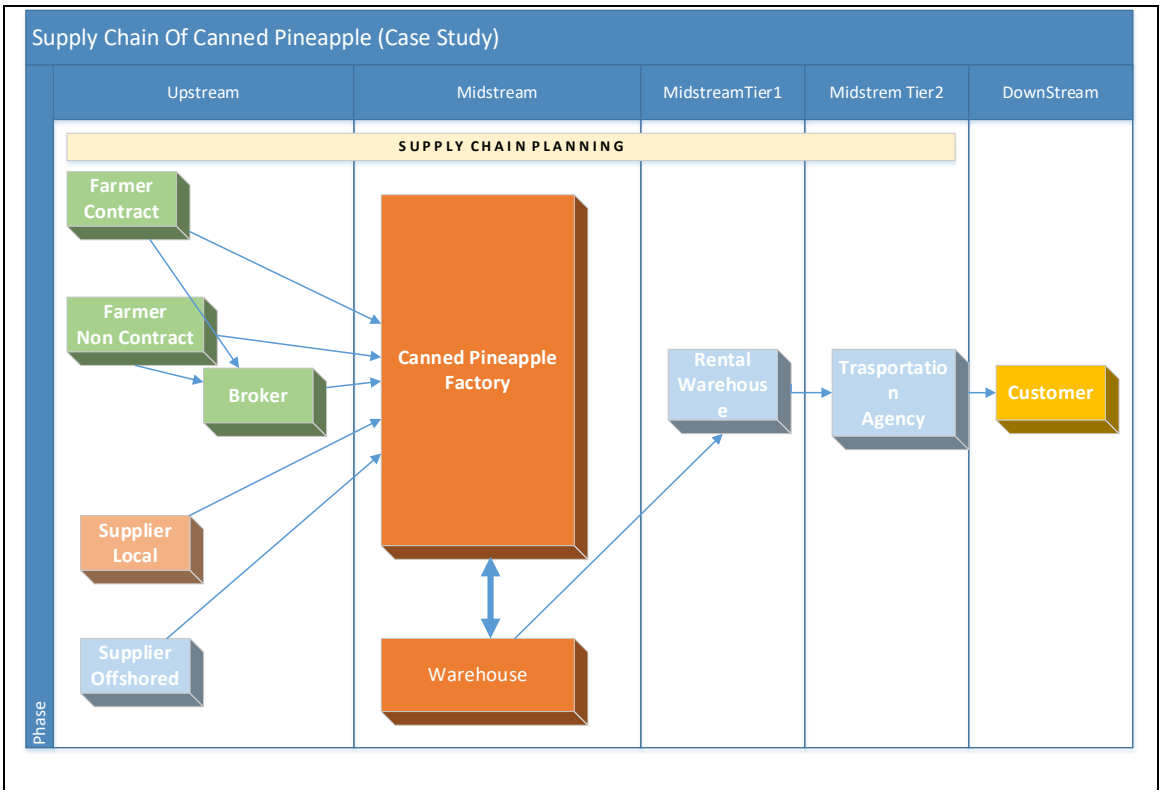

Figure 2 Supply Chain of The Canned Pineapple (the factory)

The overview of the canned pineapple production flow in Figure 2 started at the upstream that was concerned production factors; a major raw material. Fresh pineapples were sent to the factory from various sources: 1) contract farmers, 2) non-contract farmers, 3) local suppliers, and 4) offshore suppliers; however, some were contract and non-contract farmers through the middlemen. The proportion of the contract and non-contract farmers was 60:40. All fresh pineapples must be qualified and checked before entering the production line. Each of them will be checked for nitrate. The ripeness of the pineapple was randomly checked. After that, the raw material would be on the midstream, which started from the processes of cleaning, sizing, peeling, cutting, canning with syrup, and closing and pasteurizing. These cans would be sent to the warehouse and divided into two types; labeled and non-labeled cans. The inventory would be sent to the customers by purchasing orders that had been planned before the production line started. The factory's customers are in domestic and foreign markets.

Furthermore, the results of this research can apply as strategies to increase the efficiency of the canned pineapple supply chain. The results are shown in Figure 3: Value Chain of the factory that can be divided into three parts; the primary activities, and the support activities and values.

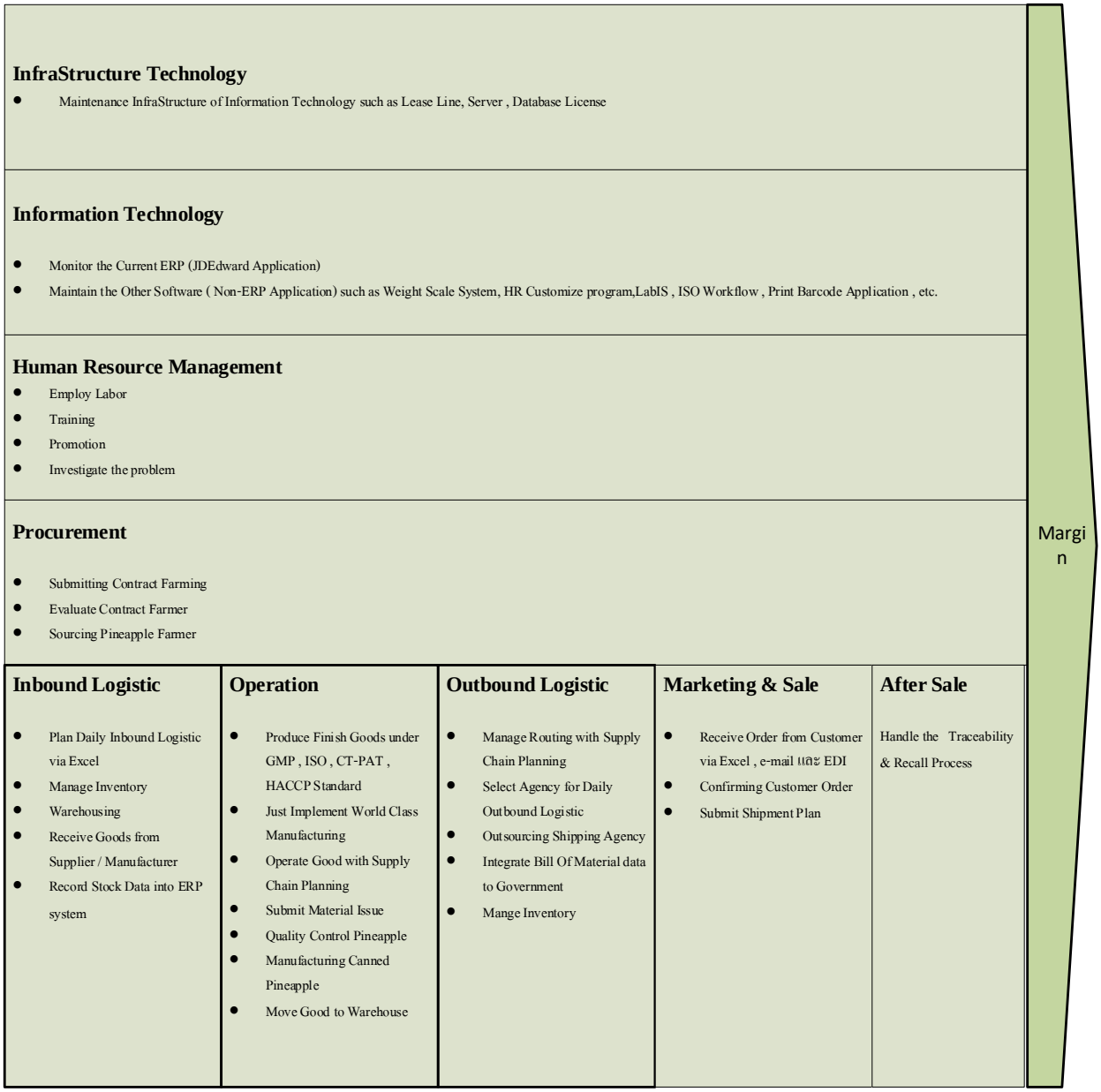

Figure 3 Value Chain of the factory

4.1 Primary activities

Primary activities consisted of five activities as the following:

4.1.1 Inbound logistics – The factory started to flow the raw material, pineapple, from all suppliers to the production line. Many problems were concerned in this activity such as the limited spaces for keeping the raw material, high transportation costs, labor shortage, inventory problems, and inefficient inventory management; handling all processes with manual function and not strictly and fully follow the FOFO criteria. Therefore, several problems later occurred in other activities due to these reasons.

4.1.2 Operation – Processes under the production line; operations, are under Thai and international FDA standards. It is essential to care for the quality of all products starting at the beginning of the production

line to the customers' hands. Besides, the factory had tried to develop more and more international standards and ensure that the customers perceive them. Nonetheless, the factory had some problems with the pineapples' quality, sizes, wastes, and quality control of the canned pineapples, hence, this activity had to improve point by point and integrated.

4.1.3 Outbound logistics – This activity is about the distribution from the factory to customers. It can be separated into two tiers, inventory in the warehouse and finished goods with the agency according to the customers' purchasing plans. The factory encountered some problems in this activity such as high transportation costs, obsolete data transmission in the production line, some errors caused by workers during shipment periods, and mostly labor-intensive works.

4.1.4 Marketing & Sales – The factory set the missions of marketing; to fulfill the customers' needs with high-quality products and to listen to customers' feedbacks for improving the products and the company's activities. These missions were set at that time; however, they are quite out-of-date now. Therefore, the missions of the factory should be changed as well.

4.1.5 Service – The administrators of the factory should concentrate much more on this activity. It can return more intangible profits to the company. Thus, the compare has provided services for the customers in every point of activities. Since it is a big data system, it takes quite a long time to analyze what the customers need and fulfill them in the appropriate time.

4.2 Support activities

Secondary activities consisted of four activities as the following:

4.2.1 Procurement – There are three methods of this activity that are contract farming, non-contract farming, and brokers. It is quite different in each method, especially the costs of the raw material and the quality of them. Therefore, the company had tried to use more technology to solve these problems.

4.2.2 Human resource management – Labors are the heart of the food processing industry. There are unskilled, semi-skilled, and skilled workers in the factory. Human resource management is one of the major keys for the improvement and development of the factory and is the most difficult as well. If the company efficiently sets the system for human resource management at the beginning of the process; job specification, job description, job training, and so on, it will be able to take their potentials for the highest benefits of the factory and themselves.

4.2.3 Technology development – The factory is one of the biggest pineapple processers in Thailand, so high technology for food processing is the major part of the factory, not only in the production line but in every single part of every department as well. It must integrate all together and use JIT online and Current ERP to control the whole system, effectively and efficiently. However, it is hard to change or update the technology system all at one time.

4.2.4 Infrastructure – Since the factory has been established for more than 20 years, it has set the whole system under international standards, resulting in fewer problems in the factory's infrastructure. However, only one thing that the factory has to develop is to use all infrastructures efficiently, with the least wastes.

Therefore, this research has shown the analysis of the value chain of the factory by developing Porter's Value Chain Model and offered the strategies of each activity as in Figure 4: Porter's Value Chain Model.

InfraStructure Technology
- Invest Solar Energy
- Outsourcing
- Cloud Computing

Information Technology
- Implement New ERP(SAP) for Integrate all Module
- Transform to Digitalization .

Human Resource Management
- Employ Labor
- Training Employment for World Class Manafacturing
- Set up Company KPI

Procurement
- Expand Contract Farming
- Evaluate Contract Farmer
- Sourcing Pineapple for Nearly Factory
- Consignment Contact

Inbound Logistic	Operation	Outbound Logistic	Marketing & Sale	After Sale
• Submit Daily Inbound Logistic Plan with Supply Chain Planning • Manage Inventory and Warehousing with Warehouse Management System • Implement Production Order Record Stock Data into ERP system	• Following Daily Production Order • Control and monitor Production Order • Invest Automate Machine • Invest Mobile Application in Factory • Submit Plant Maintain Plan • Move Good to Warehouse	• Use Program Optimization for Routing Process • Use Program Optimization for Select Agency • Integrate information with Third Party • Manage Inventory with Warehouse Management System	• Receive Order from Customer via Excel , e-mail และ EDI • Confirming Customer Order • Submit Shipment Plan with Program Optimization	• Handle Traceability & Recall with Document Management

Margin

Figure 4 Porter's Value Chain Model

The strategies for primary activities are of each part:

1. Inbound logistics mainly uses collaboration from both inside and outside the factory (Meathawiroon, 2017) to increase the proportion of contract farming and non-contract farming to be 70:30, to do more quality control of the raw material, to promote pineapple cultivation to agriculturists, and support them with information such as cultivation plan of each period, the farm projects to demonstrate how to plant efficiently and effectively, and the fertilizer-borrowing project.

Moreover, the strategy for 7 Rights; Right Product, Right Quantity, Right Condition, Right Customer, Right Place, Right Time, and Right Cost, is applied to improve the planning of the supply chain, production, and purchasing, and the Warehouse Management System is used to increase more capital-

intensive proportion and optimize the whole system. Big data management is used for Review ABC inventory and JIT purposes.

2. The operation is the main part of the factory; therefore, World Class Manufacturing is the strategy to upgrade the food processing factory. World-class manufacturing is a collection of concepts, which set the standard for production and manufacturing for other organizations to follow (Mey, 2011). Furthermore, the factory should apply some techniques to increase efficiency such as lean manufacturing, make-to-order, built mindset for continuous improvement to reduce costs and wastes and make plant maintenance plans to reduce process downtime.

3. Outbound logistics – The strategies for this part are to use the optimization program for selecting the most suitable agency of each shipment, to integrate data both inside and outside the factory, and to set the one-stop service program.

4. Sales – The strategies for this part are to use the logistics information to apply in the sales department and to reengineer the paths from the customers' purchasing order to the delivery part, including a program to improve the shipment.

5. Services – The strategy of this part is to emphasize the after-sales service by traceability and recall. This technique helps to find sources of problems

The strategies for support activities are of each part:

1. Procurement – The strategy of this part is related to the inbound logistics, but the factory should look for raw material sources in the nearby region to reduce the transportation costs.

2. Human resource development – Good governance is the major strategy integrated with training and downsizing the organization.

3. Information technology strategies are to implement new ERP (SAP) to integrate all modules into the system, such as master data, purchasing, inventory sale order management, warehousing, and maintenance plans. It is called the Horizon project.

4. Infrastructure strategy is to use more clean energy such as solar-cell energy.

4.3 Value (Margin)

The result of the value chain reveals that the value (margin) of the factory increases by approximately 100 million Baht as shown in Table 1 below.

Table 1 The stimulation of the factory after purchasing from sources nearby

Situations	Current	Strategy Implementation
The factory purchased a pineapple cot total of 1,000 million Baht in 2020. Transportation cost was about 25%, which was 250 million Baht.	250	-
To purchase 10% pineapples from sources in the regions nearby. Transportation cost will reduce almost 10%	-	150
Possible Consequences:	Saving Cost = 250 – 150 = 100 million Baht	

If the factory purchases the raw material from the sources in the nearby region, it will save costs by reducing the transportation cost by approximately 100 million Baht.

Part II: SWOT Analysis of the pineapple processing factory

Table 2 SWOT Analysis of canned pineapple products of the factory

Strengths	**Weaknesses**
1. One of the biggest canned pineapple factories in Thailand 2. High market share 3. High investment 4. Reliable brand 5. Domestic-and-international-standard Products 6. High-quality products	1. High raw material costs 2. High production costs 3. Shortages of labor 4. Unskilled labors
Opportunities	**Threats**
1.Positive effect from the spread of COVID-19 2.New channels from the online market 3.Worldwide networking	1. High labor rates in Thailand 2. Baht appreciation in five years (2015-2019) 3. Trade barriers in foreign markets, such as the USA and EU.

The SWOT analysis of the pineapple processing factory shows that the situation of COVID-19 spreads does not affect the sales volumes, but it makes the sale volumes increase continuously, especially from foreign markets. However, the uncontrollable factors; Baht appreciation and trade barriers, are still problems, and the factory needs some help from the Thai government.

5. Conclusion

The research of the supply chain of the canned pineapple factory as a case study provides some useful results to guide the factory to reduce the costs and increase the efficiency of every activity in the factory, especially the production line. However, the supply chain management should integrate the works not only inside the factory but also outside as well. Besides, other kinds of the factory can use this study as a guideline to improve their supply chain and add more values to increase their potentiality in the world market.

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