

Conference Paper

Business Process Analysis: A case of primary shrimp processor

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Abstract

Shrimp industry is important for Thai economy due to high volume of export. However, there is an increasing trend in shrimp consumption in domestic market as well. Our objective is to study the current supply chain of a medium sized primary shrimp processor in Samut Sakhon province. First, we analyze its business process and identify the problems and propose the improvement. The business process is analyzed by using Integration Definition for Function Modeling (IDEFo) to illustrate major activities in the current situation of primary processing facility. Next, we propose guidelines to improve efficiency in each activity. We found that the temperature control material of shrimp during production is ice since it is convenient and need low investment. In summary, the appropriate material to control the temperature is important to minimize cost and maintain the quality of shrimp. In addition, the proper production processes can increase the productivity.

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INTRODUCTION

Shrimp is one of the major export products of Thailand with the fifth rank in market share in the world behind India, Ecuador, Indonesia and China. Thailand has high potential as a shrimp processor because there are fundamental aquaculture production and standard and traceability system to farm level. In addition, Farmer has high experience to cultivate shrimp [4]. However, in the last five years, Thailand faced problems that affected to low production and export volume such as Early Mortality Syndrome (EMS) disease in shrimp, slave labor and Illegal Unreported and Unregulated Fishing (IUU Fishing). Especially, EMS disease is the key factor that causes shrimp production dramatically decreases [1] At present, the Department of fisheries collaborate the private sectors to solve the problem by changing the culture method and improve the management system so that shrimp production becomes increasing. In 2015, shrimp

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production was 250,000 tons increasing from 217,438 tons in 2014 or 14.97 % [5] valued at 57,469 million baht. In Thailand, there are 311,589 rais (49,854 Hectors) or 21,668 shrimp farms [2] and there are two major species in shrimp cultivation i.e. 95% of white shrimp and 5 % of tiger shrimp. The domestic shrimp consumption is accounted for 10% and 90% of shrimp is exported. Hence, the reduction of shrimp production affects to unmet demand and high price for export but it slightly impacts the domestic consumption.

Shrimps are perishable and have short shelf life so the quality can change during storage such as color fading, lipid oxidation and denaturation of protein [3]. Thus, the proper management such as the temperature control during storage or process or cold chain management, short delivery time and proper packaging are required to maintain the quality from upstream to downstream supply chain. In addition, the production cost to produce shrimp and shrimp product are higher than the competitors in other countries such as Indonesia and Vietnam, so Thai shrimp production should be improved for increasing competitive advantage. The objective of this study was to identify primary shrimp manufacturer located at Samut Sakhon and its supply chain. Next, we analyzed business process of the supply chain by using IDEFo to study current situation and suggest guideline to improve production efficiency of the manufacturer.

METHODOLOGY

First, we interview the stakeholders in peeled shrimp supply chain for example farmer, a local and national collector, a primary manufacturer, a secondary manufacturer and a retailer. Next, we focus on a medium sized primary shrimp manufacturer in Samut Sakhon province. We use Integration Definition for Function Modeling (IDEFo) to analyze and pinpoint the business process at level 0 and 1. IDEFo is a tool to elaborate activities and their relationships of a particular system such as a supply chain or an organization. The model includes activities, input, output, control and mechanism. An activity presents in square box such as plan, source, make, delivery and return the product. Arrows has four types. First, an input arrow on the left side denotes factor that drives the activities. An output arrow on the right side denotes the product or result from activity. A control arrow on the top represents the standard or regulation that regulates an activity. Lastly, a mechanism on the bottom represents the resources to achieve an activity. Furthermore, the solid line represents a current activity (as-is) and dash line represents a guideline (to-be) [6, 7]. Finally, we proposed guidelines to improve productivity of primary manufacturer.

RESULT

A generic shrimp supply chain

From the interview, we present the relationship with other organizations in the peeled shrimp supply chain as shown in Figure 1 as follows.

- **Farmers:** The proportion of white shrimp farm in southern is around 56% and in Central and Eastern is about 44%. We interview the white shrimp farmers in the southern Thailand. Most farmers have knowledge and experience in shrimp cultivation for several years. In addition, they have to be certified by the Department of Fisheries. The cultivation crop takes 3-5 months depending on the sizes of shrimp when they are harvested. The cultivation needs intensive cares and high investment, especially for high quality feed, proper farm system and awareness of EMS disease. Before harvesting, farmers will contact a collector to send out the team to harvest and grade shrimp at a farm. Then, the skilled labor drains water out of a pond and harvest. Later, the staff will wash and grade shrimps according to their sizes. Next, graded shrimp will be put in a 200 liter tank with ice to preserve the freshness of shrimp. Then, the tanks will be loaded into a truck. The destination of trucks will be either to processing manufacturers located in Southern and Central Thailand or central markets. For large sized farmers, they will sell shrimp directly to national collectors or manufacturer by their own trucks.
- **Local Collectors:** The middlemen who gather shrimps in local region and sell to national collectors. They have a team to harvest and grade shrimp at farm and own trucks for transport shrimp. However, some local collectors outsource the harvest team to the local staff.
- **National Collectors:** They are collectors located in the national central markets. The central market will charge the fee for sales volumes occurred in the central market. Some manufacturers and retailers will bid for shrimp at about 12 p.m.-5 a.m. every day. National collector gathers shrimp from farmers or local collectors and sells them to customer in large quantities by bidding.
- **Central Markets:** The wholesale market gather high volume of shrimps in local or nation region. The largest national central market for shrimp and seafood is Talaad Talay Thai in Samut Sakhon province.

- **Primary manufacturers:** The manufacturers collect, wash, peel and devein shrimp, grade, storage and delivery to customer. Most of the primary manufacturers are small and medium sizes. They do not have capability and have not sufficient capital to invest in machines to become secondary manufacturers. At present, the association of shrimp exporter does not allow to export shrimp that buy from the primary manufacturer. This implies that the primary manufacturer can sell peeled shrimp to the domestic markets only.
- **Secondary manufacturers:** They add value to shrimps such as sushi, shrimp ring, fried shrimp and ready to eat product. Most of secondary manufacturers are located in Samut Sakhon. Since the major products are exported, hence, they have to certify Good Manufacturing Practices (GMP) and Hazard Analysis Critical Control Point (HACCP). They procure shrimp from several sources such as farmers, local and national collectors.
- **Exporters:** At present, the large sized secondary manufacturers become exporter.
- **Wholesalers:** They buy shrimp from the central market and sell.
- **Retailers:** They buy shrimp from the central market or manufacturer and sell raw shrimp and shrimp product directly to consumers.
- **Consumers:** The consumer can buy raw shrimp from retailers or wholesaler at the central market. For shrimp product, the consumer buys from retailers in local markets, modern trades and super markets.
- **The Department of Fisheries:** The department has an authority to control related activities from farm to manufacturer such as establishing the regulations, registration of stakeholders such as farmers, collectors and manufacturers, the traceability system, the research and development to improve the efficiency and solve the problems such as EMS disease, and providing the training and extension to farmers, etc. In addition, they control and monitor collectors and manufacturers to maintain good practices such as GMP and HACCP.

Background of Primary Shrimp Manufacture

The primary manufacturer is a medium sized shrimp manufacturer located in Samut Sakhon. At the beginning, the company with a family business style started the business as a collector. Later in 1967, the company developed business model to be a preliminary processor for selling peeled shrimp to both domestic and export market.

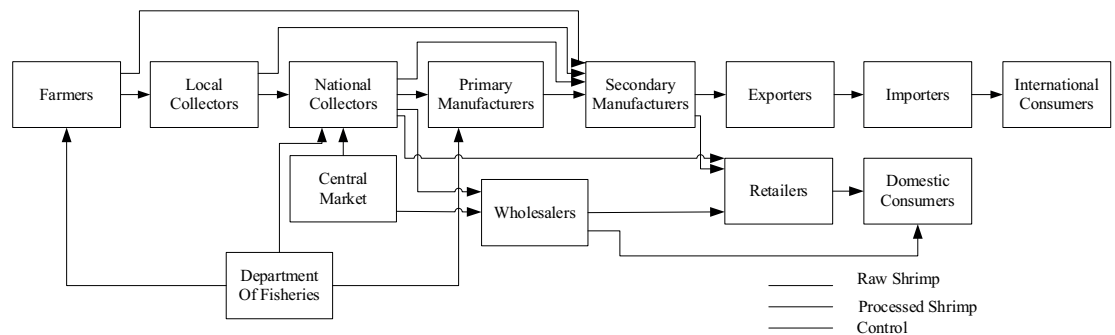


Figure 1: A generic white shrimp supply chain.

After that, the owner expanded and invested to produce frozen shrimp by leasing a place and contract plate freezer to produce. However, the direction of industry was changed after the Royal Thai government tried to upgrade shrimp product quality. Hence, the manufacturer who wants to export shrimp and shrimp product must present lab results for chemical, biological and traceability documents. These requirements results in the company either pay the lab charge or invest to establish laboratory itself, thus the company decided not to continue in shrimp processing business. In addition, shrimp price and volume are highly fluctuation and it is quite risk to enter to the business. Hence, the owner determined to switch to be a preliminary processor with the primary activities such as washing, peeling, deveining and grading. The business requires skilled labors who are skillful and tolerant to work in cold and wet place. At present, the shrimp industry faces several problems. For example, the legal labor issue is required the legal document of labors, especially the foreign worker with a minimum wage at 300 bath/day. This results in higher production cost due to labor intensive in shrimp manufacturer. Moreover, the Thai Frozen Foods Association established the rule that the secondary manufactures who are their member buy shrimp from traceable source. This implied that the secondary manufacturer could not buy shrimp from the primary manufacturers since their traceability system are not reliable. This results in many primary manufacturers with export market running out of business. Fortunately, the primary shrimp manufacturer adapted to target at domestic markets. At present, the company has a single customer who produces ready to eat meals for domestic markets. They use small sized shrimps rather than large sized shrimps for export. Currently, the company procures white shrimp from the national broker in Talaad Talay Thai which is the largest and closest central market. The number of current worker is 140 where most are legal foreign labors. The capacity is 6 tons/day.

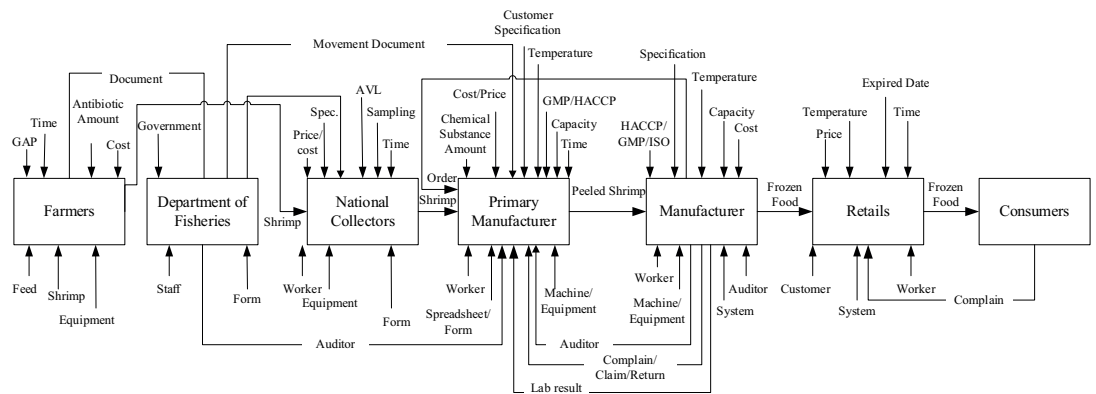


Figure 2: The business process of primary shrimp manufacturer at level 0.

Business process of peeled shrimp supply chain

A primary shrimp manufacturer at level 0 presents the relationship with other organization in its supply chain, as shown in Figure 2. Initially, farmers cultivate pacific white shrimp by following Good Aquaculture Practices (GAP). After harvest, raw shrimps are delivered to national collectors who have stored in a central market by 10-wheel trucks. Then, the primary manufacturer sends their truck to buy raw shrimps from national collectors at Talaad Talay Thai. Then, raw shrimp will be inspected every day such as sulfite while antibiotic will be tested every four months. The secondary manufacturer trusts the lab result since the primary manufacturer is certified as an approved vendor. The key decision for the owner is how many shrimps and how much to buy daily since the raw shrimp price is fluctuated. The primary manufacturer is certified GMP and HACCP. After peeling, grading and packing, shrimp will be delivered to a secondary manufacturer to produce a frozen food for domestic markets. At present, there is a single customer while the customer has two suppliers. The other supplier has lower capacity and quality, resulting in lower market share. Hence, the primary manufacturer has high risk from serving single customer. Therefore, we suggested the owner to expand to food service industry and add value to shrimp by further processing.

The major activities of primary shrimp manufacturer include plan, source, make, delivery and return as shown in Figure 3. At present, there is no forecast plan, but the production is based on customer orders by weekly basis (Make to Order). Fortunately, the size of shrimp required for domestic market is different than the export markets; hence, the competition of shrimp is lower. However, with high fluctuation in volume and price, sometimes the customer need is not met. Therefore, we suggested that the manufacturer should forecast volume and price of raw shrimp form historical data and consider keeping stock at some periods. The manufacture purchases raw shrimps

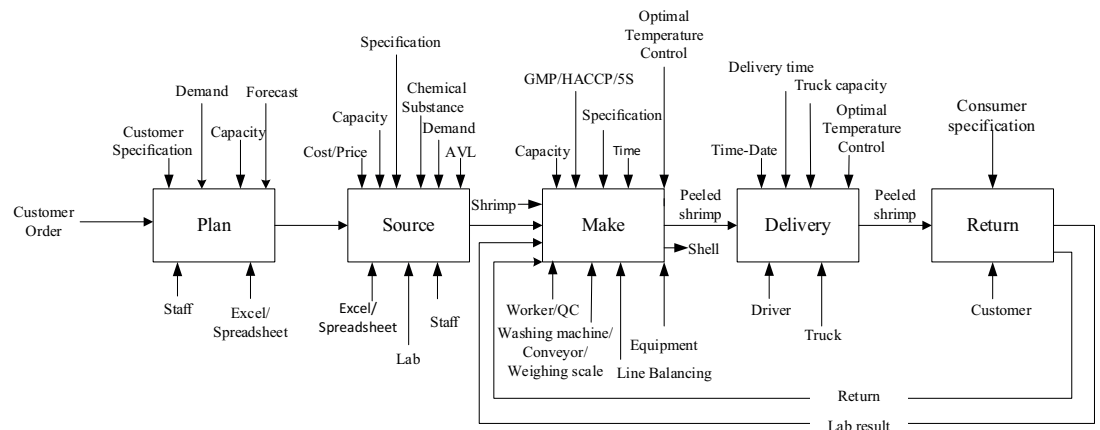


Figure 3: The business process of primary shrimp manufacturer at level 1.

every day from two suppliers that are in the Approved Vendor List (AVL). Then, the manufacture should establish the strategic alliance with other farmers or collectors as alternative suppliers. Since shrimps are perishable. Therefore, control temperature to under 5°C is required. At present, the manufacturer uses ice to control temperature because it is convenient and there is no need to invest. However, we found that using too much ice will result in high production cost. Hence, the proper type of materials and volume should be studied to optimally control temperature and still maintain high quality. In addition, the customer found adulterates such as hair, stones, plastic chip from products although there are twenty three workers in quality checking. Thus, the proper quality assurance system, process design, lean production and line balancing could increase productivity and reduce the defects. Finally, they deliver shrimp to customer by their own trucks.

CONCLUSIONS

This research studies chain by using IDEF0 to analyze the current situation of a peeled shrimp supply business at level 0 and 1. Then, the relationship among organizations in the supply chain and current activities of the primary shrimp manufacturer are elaborated. Next, we identify the problem and propose guideline to improve efficiency of the primary manufacturer. The manufacturer should plan to purchase raw material by forecasting from historical data, long-term relationship with partner or strategic alliance, use an appropriate material to control temperature in processing line and transportation to minimize cost and balance the line to increase productivity. In the future, we plan to implement the line balance and study the suitable method to control

the temperature in the production line. We wish that this case study can be a good example for similar manufacturers.

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