

IMPROVING EFFICIENCY OF TEA VALUE CHAIN: A CASE STUDY OF THAI TEA COMPANY

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Introduction

One of the main challenges in managing supply chains for most manufacturers is the uncertainty in contractual achievement to customers (Per, 2009). A value chain analysis is a method of studying and analyzing how value's product can be added in activities (Michael, 1985)

To ensure that value chain will improve, manufacturers required to work closely with their customers (Jan and Dennis, 2006). Moreover, the ASEAN Economic Community (AEC), which will become effective on 2015, focuses on three policies, i.e., people, peace and prosperity. In short, the AEC will transform ASEAN into a region with free movement of goods, services, investment, skilled labor, and free flow of capital. The formation of the AEC gives opportunities to business expansion of Thai food industry. It also presents challenges and brings more revenue to Thailand. This paper analyzes the activities within the value chain of tea product using a case study of a Tea Company in Northern Thailand.

Food industry is supported by the Thailand Economic and Social Development Plan. The food industry in Thailand has high contribution which gives the economic potential of the food industry in ASEAN. Over the next 15 years, the ASEAN population is expected to grow up to 350 million. Most of them will have greater purchasing power (FIA, 2014). The food industry also contributes to other supporting industries, including packaging, such as cans, which leads to employment and higher income. The food industry is an industry with the potential to produce for domestic consumption and for export to other countries. Thailand has a steady background in agricultural production including many qualified workers. Furthermore, the manufacturing that uses modern technology can develop a product to meets the needs of the market. Thailand aims to increase competitive advantage in this food industry to stay on top in providing sufficient and quality food.

Tea is a popular beverage for a long time. The agricultural output of the tea leaves derived through different processes lead to the appearance of different flavor teas. The culture of tea and drinking tea is unique in several countries. For Thailand, tea has been a popular drink tea from European country and china. Future trend of tea market will continue growing because consumption behavior of people emphasize in healthy. The nutrients in tea are useful as an antioxidant.

This paper presents a case study of a Tea Company in Northern Thailand. The Company became a pioneer of Thailand's tea industry in 1941 before transforming into an international tea organic plantation as it is known today.

Literature Review

Several issues relating to this study have been reviewed as follows; value chain management and tea industry in Thailand.

Value Chain Management (VCM)

Originally, the Value Chain concept, proposed by Michael E. Porter, shows how activities create value for the customer and how managed activities can create competitive advantage [8]. The core of Porter's work is the idea of linking the boundary between activities. Porter considers that as a part of a business strategy, active management and improvement of these linkages is important as costs can be eliminated (Kate and Mark, 2006). Value chain analyses are used to comprehend socioeconomic and power relationships in the production chain from the initial starting material to a final product. It takes a financial view of the sequential value creation process in a network of firms (Anthony *et al.*, 2012). The value chain can be used to understand how to plan and improve efficiency in industrial operations and practices as well as to strengthen the academic premise on the economics and optimality of the business value chains (Pekka *et al.*, 2010). Moreover, value chains can be applied in food industry to develop and improve the efficiency that brings benefits for wide range of producers and consumers (Jesse and Clare, 2010) and improve demand management (David and Andrew, 2009).

Nowadays, the organic product value creation grows through a well-coordinated supply chain. It was aware and responsive to consumers' personal values and agri-food value chain from a consumer or from a supply chain perspective (Luciana *et al.*, 2011). In this research, we can apply value chain management to use with a case study to improve efficiency in company that creates the opportunity for competitive advantage (Alison and Rajbir, 2010).

Tea Industry in Thailand

Food industry uses raw material from agricultural sector such as livestock, fisheries and crops. Technology of food processing and preservation is used to produce large quantities of food products.

The tea supply chain tends to be complex, with many actors, producers, collectors, traders/brokers and packers involved (IFAD, 2014). The value chain with a wide range of stakeholders and activities are involved in transforming tea leaves to the beverage for consumer. Likewise, transforming the tea industry into a sustainable economic sector presents an extraordinary challenge to all its stakeholders. Cooperation between producers, governments, traders, processors and retailers is necessary to improve the efficiency of people involved from the beginning of the tea supply chain.

In recent years, there has been a growing concern about fair trade and safe working conditions for producers and employees as well as sustainability and natural resource management. The principles of organic agriculture are wide ranging and include concerns for safe food production, for environment, animal welfare and for issues of social justice (Angela *et al.*, 2000).

Thailand has a large agricultural production area, being 45 percent of the entire country, Thailand ranks among the top of the world's food producing countries in several food categories. The fast-growing demand for food is increase by the world's population trend that the limitless expansion of the consumer market. Thailand exports approximately three million metric tons of food to various countries, valued at one billion US dollars (IFAD, 2014). Therefore, Tea Company is an organic manufacturing that was chosen as a case study to be a guideline for improving efficiency. It will be used as preliminary data for other industries.

Case Study's Diagnosis based on Value Chain Concept

The concept of value chain will help to understand the roles of each activity in the company's supply chain (Figure 1). Overall the management of the supply chain can identify elements of the activities that will be affected by internal and external factors along the value chain. There are the 5 primary activities and 4 supporting activities



Figure 1: Tea supply chain of case study

The analysis of the current state

These activities of the company was analyzed by using value chain analysis shown in table 1

Activities	Issues
Inbound Logistics	Most tea leaves were planted by company. Some of the tea leaves are imported from Vietnam and Chiang Rai that will affect the quality and taste of the tea.
Operations	<p>The production type of company is Mass Production / Mass Customization. The steps in production are complex and consist of many small steps in order to obtain products such as tea, dried tea leaves extraction. This process requires staff to sort leaves, find bud's tea leaves or other foreign matter.</p> <p>The flavor of the tea from different process is not constant. Therefore, sometimes it needs to adjust flavor that require further processes and long lead time.</p>
Outbound Logistics	Currently, the brand of the company has been exported to Europe, Japan and Indonesia accounted for 20 percent and domestic customers accounted for 80 percent.
Marketing and Sales	The company has market planning unit that has begun a project to expand the market to neighboring countries such as Burma. However, AEC market is small. Therefore, the company will begin the project to expand the market in this area.
Service	The company is an OEM manufacturer of goods to customers which individual customers will have different needs. Service after sales is not included because the products are a consumer product.
Procurement	The source of tea production from domestic and foreign countries has different quality.

Activities	Issues
Technological Development	The company has developed the products in their research and development unit. For example, technology in package is used to speed up the packaging.
Human Resource Management	The company began as a community, producing tea leaves, with almost six hundred villagers, mostly Lahu and hill tribe and sub-contractor with farmers to plant tea and coffee plantation.
Firm Infrastructure	The company production consists of 2 plants. The first plant pre-processes to obtain dry tea leaves with warehouse for the storage of fresh tea leaves. The plant is on the mountain. Often, there is a power outage that makes the production interruptions. The second plant is only for packaging process

Table 1: The analysis of the current state

The analysis of the current production has used FMEA (Failure Mode & Effect Analysis) to perform a risk assessment within the manufacturing process to identify weaknesses or deficiencies which may affect the product or products. The risk was calculated for each block using FMEA analysis. FMEA is a systematic process meant for reliability analysis [12]. It improves operational performance of the production cycles and reduces their risk level [10]. The risk was calculated as ratio of three coefficients: severity of failures (S), probability of occurrences (O) and detection (D). Each coefficient was assigned value in the range from 1 to 4 and the risk priority number (RPN) was calculated which is shown in simple equation ($RPN = S \times O \times D$). The results of FMEA have been rating priority by production supervisor and quality control supervisor which shown in table 2.

Process	Defects / problems	Outcome	Cause	Current State	Evaluation				
					S	O	D	RPN	
Sorting	The contamination of old tea leaves, rods and unknown materials exceed standard.	The output quality is not up to standard.	Inbound materials are not up to standard.	There are 8 employees.	3	4	2	24	
Sorting	The process of sorting is unevenly volume.	Unstable performance in manufacturing	Inbound materials are not up to standard.	No performance measurement in production.	1	2	3	6	
Sorting	Sorting volume does not meet the requirements of production.	Production capacity does not meet the requirements.	There are defect that need sorting again in the process.	Repeat sorting process and adjust the speed to slow down.	1	2	3	6	
Sampling Inspection	The volume old tea leaves, rods and unknown material excessive into other processes.	The output quality is not up to standard	----- Not a current problem -----						
Blending	The ingredients do not meet the formula.	The output quality is not up to standard	----- Not a current problem -----						
Drying	Raw materials have moisture more than	The output quality is not up to	----- Not a current problem -----						

Process	Defects / problems	Outcome	Cause	Current State	Evaluation				
					S	O	D	RPN	
Packing	standard. Machines have stumbled damage.	standard Production capacity does not meet the requirements.	The maintenance is not scheduled with no spare parts.	There are only replacing the spared parts when needed	2	3	3	18	
Packing	Many waste generated in the production process (package damage).	Production capacity and production costs increase.	Some parts cause machine malfunctions.	Modify / Repair parts by the maintenance department	1	2	1	2	
Packing	Package quality is low	The output quality is not up to standard	----- Not a current problem -----						

Table 2: FMEA result on company's operation process.

After a risk assessment by FMEA it was found that the process of sorting tea leaves and packing have defects or problems that occur on many issues. The results will be evaluated by Risk Priority Number (RPN) to prioritize the issue. The RPN will show how to select problems to improve. For other process in activities that are not a current problem, this is because the companies are in between improving process.

Results and discussion

The preparation of standard tea leaves sorting processes.

Tea sorting process is the first step in the production process of the tea drying at the headquarters. This process sort white tea (tea's buds), old leaves, tea's rods and unknown materials (hair rope, thread rock band, leaves, etc.) from the tea leaves for preparation prior to the next process, the blending.

Raw dried tea from all sources must be sorted by machine with a sorting conveyor. The machine vibrates to sort out white tea. Then a conveyor transports tea material and sorting staffs will sort old leaves, tea's rods and unknown materials. The characteristics of the material shown in Figure 2.





Figure 2: Sorted material

After sorting process the quality inspection department will conduct random quality control of 100 grams in every hours of operation. The standard sampling quality tea leaves after sorting is shown below.

Type of material removed	Standard sampling quality inspection (Samples per 100 grams)
Old tea leaves	< 3%
Rod of tea leaves	< 2%
Unknown materials	0%

Table 3: Standard sampling quality for tea leaves after the sorting.

If the sample quality is not up to standard, the process must repeat again to prevent non-standard tea leaves to the next process.

The diagnostics in sorting process with 8 working staffs found problems in the following two issues:


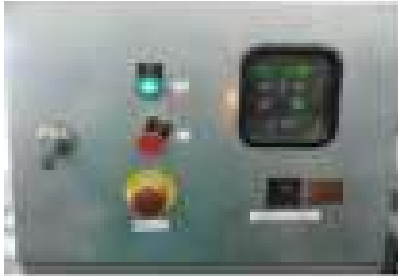
<p>Issues of sorting standard</p> <ul style="list-style-type: none"> - There is no standard procedure for sorting clearly. Staff will pick old tea leaves, rods and unknown materials in conveyer into a container (cup) which placed above the conveyer. Staffs usually use one hand to pick up while other hand was not working. - No specific functions of each position. Staffs will divide among themselves as who will pick up or sort what type of material. 											
<p>Issues of conveyer speed, uneven material</p> <ul style="list-style-type: none"> - The dried tea leaves come from different sources. Some had tea leaves and rods in large quantities. Staff will adjust conveyer speed to slow down sorting and random testing. - Conveyer speed was scheduled for raw materials from different sources as follows. <table border="1" data-bbox="204 1720 874 1908"> <thead> <tr> <th>Dried tea leaves</th> <th>Conveyer speed</th> </tr> </thead> <tbody> <tr> <td>Source GPP</td> <td>11</td> </tr> <tr> <td>Source GCR</td> <td>10</td> </tr> <tr> <td>Source GWP</td> <td>8</td> </tr> <tr> <td>Organic tea leaves</td> <td>13</td> </tr> </tbody> </table>	Dried tea leaves	Conveyer speed	Source GPP	11	Source GCR	10	Source GWP	8	Organic tea leaves	13	
Dried tea leaves	Conveyer speed										
Source GPP	11										
Source GCR	10										
Source GWP	8										
Organic tea leaves	13										

Figure 4: Comparison of sorting rods tea and old tea leaves (before – after)

Increase productivity by adjusting conveyer speed to suit the material.

The standard of sorting process also includes speed adjustment of the conveyor speed. The experiment tests the speed of conveyor from current speed, up by 1 in each experiment to see if the quality is acceptable. Moreover, the quality control is stricter by 10% to ensure the output of the process.

Type of material removed	Standard sampling quality inspection (Samples per 100 grams)	The criteria used in trials (Samples per 100 grams)
Old tea leaves	< 3%	< 2.7%
Rod of tea leaves	< 2%	< 1.8%
Unknown materials	0%	0%

Table 5: Standard samples and the criteria used to adjust the conveyor speed.

No.	Conveyor speed	Sample quality after sorting (100 grams)			Quality criteria
		%Old tea leaves	%Rods of tea	%Unknown materials	
1	11	2.2	0.8	0	<input type="checkbox"/>
2	12	2.7	1.1	0	<input type="checkbox"/>
3	13	3.6	1.5	0	<input type="checkbox"/>
4	12.5	2.7	1.2	0	<input type="checkbox"/>

Table 6: Experimental results from variable speed conveyor and random quality after sorting.

The experimental varies speed of conveyor from the original speed of 11 to the new speed of 12.5. This experiment can increase the yield of sorting 45 kg per day from 382.5 Kg/day to 427.5 kg/day (up 11.76%)

Conclusion

The risk assessment is used to identify weaknesses or deficiencies of manufacturing process by FMEA the process of sorting tea leaves is the most concern. The problem is the contamination of old tea leaves rods and unknown materials that exceed standard and makes output quality low. Therefore, this approach may increase accuracy of sorting process by introduce sorting process standard with conveyor speed adjustment. The result of improvement can increase efficiency of employee. It can increase the yield of sorting drying tea leaves 11.76% (from 382.5 kg/day to 427.5 kg/day).

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