Thai Mango Supply Chain Comparison and Analysis to Japanese Market

Mem. Muroran Inst. Tech., 62(2012) 15~19

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Thai Mango Supply Chain Comparison and Analysis to Japanese Market

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(Received 28 February 2012, Accepted 17 January 2013)

The purpose of this research is to study and analyze Thai mango supply chain exported to Japanese market. In order to understand the relationship and the connectivity of the members on Thai and Japanese partners in the supply chain, the study started from upstream to downstream (farm, middle-man, processing, factory and exporter). The Supply Chain Integration Model (SCI Model) and the Integration Definition for Function Modeling (IDEF0) were used. Where the SCI model is constructed by 4 major criteria, ie, infrastructure, institutional, businesses and people, IDEF0 shows the connection of activity in Supply Chain Management. The results indicate the problem and concerns in terms of food quality, food safety as the weakest links of the chain. These indications lead to the suggestion of improvement of supply chain of the products in the future.

Keywords : Supply Chain Integration Model, Integration Definition for Function Modeling, Thai Mango Supply Chain in Japanese Market

1 INTRODUCTION

Japanese market is a big food importer of the world[1]. Japanese government by the Ministry of Agriculture Forestry and Fisheries (MAFF) has strickly controlled the imported food in term of quality, especially, on food safety and traceability[1]. The reason of this control is due to the inspected pesticide residue food imported in September 2008, with China's Sanlu infant milk powder contamination. Then, the milk powder was mixed with melamine, leading to infants kidney stone diseases[2]. The major components of the safety management are Hazard Analysis at Critical Control Points (HACCP), Good Manufacturing Practice (GMP) and Good Hygiene Practice (GHP)[3].

Japan is the second largest market of Thailand agriculture, accumulating a total of 2.6 billion USD in 2009 and increasing 15.07% from 2008[4]. Moreover, Thai Government has been promoting Thai food, via the "Kitchen to the world" and "Thai Food Good Taste policies"[5][6], which was to ensure Thai food with good quality. This study focuses on mango supply chain in Japanese market. Where Thai Mango is becoming an important exporting fruit of Thailand, in 2011, mango has been exported to Japan more than 6.17 million USD. MAFF was strictly controlled these Thai mango as well as other imported fruits as the importers must declare and specify the list of chemicals both those are allowed and those are not allowed in imported mangoes[7]. However, there are still problems for this mango industry, i.e., disease, pesticides contamination and mango maturity. (Various problems occur because of smallholder and event that effect the traceability of Thai mangoes)

The purpose of this research is to apply the Supply Chain Integration Model (SCI Model) and the Integration Definition for Function modeling (IDEF0) in order to study and analyze overall relationship between Thai and Japanese partners within the mango supply chain. Then the relationship will indicate the way to improve and develop food safety and food quality to be meet Japanese requirement, expectation and standard.

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2 LITERATURE REVIEW

Business process mapping and SCI model have been used in a variety of research to find the defects of system and the way to improve and manage the supply chain. The details are as follows.

2.1 Business Process Mapping

The Business Process Mapping (BPM) is a tool to analyze and identify improvement process from current state (AS-IS) to future state (TO-BE). It is commonly used by many organization to show the interconnections between the activities and the decomposition of the process[8]. In this research, the integration definition for function modeling (IDEF0) is used. IDEF0's roots has been initiated to form when the air force in response to the identification of the need to improve manufacturing operations[9]. IDEF0 is a modeling tools used to produce a model or structured representation of the functions of a system and of the information flow and the physical flow between activities of an organization and across the supply chain[10][11]. IDEF0 helps the organizations to develop a basis for process improvement planning and have a foundation to define information requirement[12].

2.2 Supply Chain Integration Model

The Supply Chain Integration Model (SCI Model)[3] is used to study the association with supply chain management and to find the corporations that could be better adjusted. Bywhich, the design and development can be adapted from the model within this international supply chain[5][13]. SCI Model is constructed by 4 major criteria, i.e., infrastructure, institutional, businesses and people. In these 4 major criteria, there are sub-criteria as shown in Figure 1.

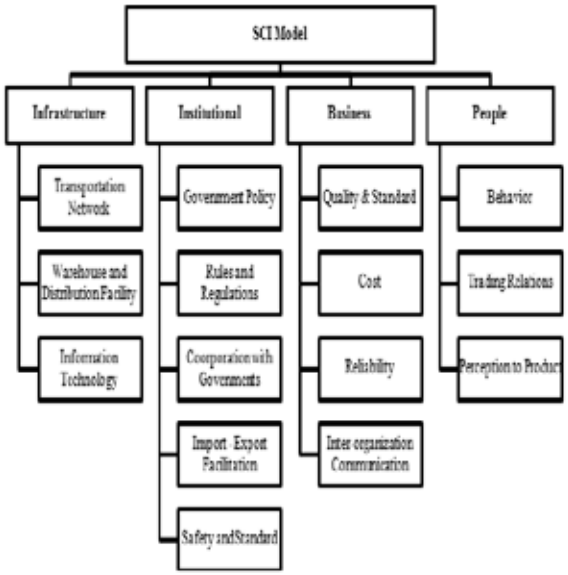

Fig. 1 SCI model

3 METHODOLOGY

In this research, the study started from investigating the supply chain of imported mangoes by using Business Process Mapping (BPM), and then, comparing the differences of supply chain links between Thailand and Japan, in order to find ways to improve the supply chain.

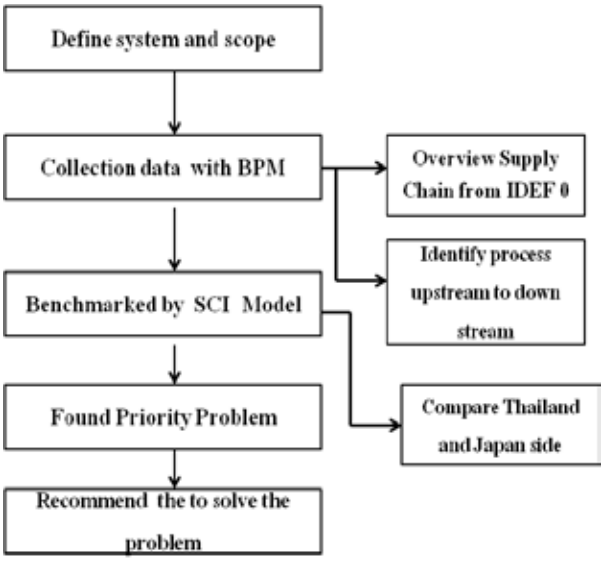

Fig. 2 Concept to improve Supply Chain

3.1 Business Process Mapping

An overview of the supply chain system was investigated using IDEF0 on events that occurred in the mango supply chain in Thailand. The current condition (AS-IS) as the actual order is used to find improvement in the future (TO-BE). The process began from upstream to downstream. Farms and middle man, which was used to gather information, are an union in Amphoe Phrao in Chiang Mai Province. Other supply chain member, ie, the exporter, the vapor heat treatment factory and the freight forwarder are in Bangkok. Data was collected during June to August 2010.

3.2 Supply Chain Integration Model (SCI Model)

The research team, from the Supply Chain and Engineering Management research unit of Chiang Mai University, has collected the information regarding to the SCI Model requirement and therefore has found a correlation between agencies of the food exported supply chain to Japan, starting from the production, delivery, distribution and export from Thailand. Also included is the import, shipping and distribution to consumers within Japan. This shows that there are many sectors concerned. The focus can be separated into 4 areas per the SCI Model, ie, the infrastructure, institutional, business and people. Infrastructure and institutional are basically the support and promotion

from the government. Business is, on the other hand, to determine the effectiveness of the private sector such as cost time and reliability[14]. Here, LPAT (Logistics Performance Assessment Tools)[15] is used as the assessment of the logistics performance of the supply chain member. Finally, people is the section that indicates an overview of the individual. The evaluation is based on 1-5 ranking, where "5" is the highest ranking (for example, the organization or government can well corporate to joint venture to another organization) and "1" is the lowest ranking (for example, the organization ignore all activities that are performing at the present, not be assimilated to the present circumstance). The expert evaluation and the research team have then scored in the query.

4 RESULT AND DISCUSSION

This research focused on Thai popular mango – "Nam Dok Mai" cultivar. The supply chain separates into 5 activities as show in Figure 2.

(1) Farmer: the activity starts from the input as the purchasing order by the middle man (whereas the exporter have made a contract and purchase directly to middle man). Before flowering mango, farmer will realize the approximate quantity of mangoes and will confirm these figure to the middle man 1-2 days before harvesting. The process of growing mangoes will start with "Planning growth", "Sourcing materials", "Production technologies", "Prevent oriental fruit", "Agrochemical control" and "Harvest". Farmer has to get "Good Agricultural Practices (GAP)" from the Department of Agriculture (DOA). The output from farmer is ripe yellow mango (farmer will grade mangoes) and then be sent to middle man.

(2) Middle man: the input is the purchasing order from exporter and sent to farm to confirm order. Before the harvest, middle man have to sample the product to the Department of Agriculture (DOA) to check the agrochemical substances. After get the result (around 1 week), middle man will inform the farmer to start harvesting mangoes. When middle man receive product from farmer, they recheck the size and the ripeness of the mangoes before sending it to the exporter. Mangoes will be packed in plastic container and load to the truck, covered with canvas. The transportation will take around 8-12 hours.

(3) Exporter: after exporter receives the customer requirement and purchasing order from Japan, they will plan the operation, prepare the export document, purchase raw material and contact the middle man. When the mangoes arrive, exporter will check size, color and ripeness. Mangoes will be washed by water with the fungicides and boiled in fungicides at 50 C for 5 minutes. After pack in plastic container, mangoes will be sent to vapor heat treatment plant.

(4) Vapor heat treatment: the treatment is commonly controlled by Japan delegate. The mango must be subjected to vapor heat treatment to kill fruit fly larvae and pathogens causing anthracnose and blossom end rod adhering to ripe yellow mango from field. It takes approximately 1 hour per 2000 kg in this process. Mangoes will then be sent to air pressure drier. Then weight selection and in case of no blemish, cleaning the skin, the label will be attached to indicate code for traceability and be kept in warehouse.

(5) Freight forwarder: The documents for import include the certificate of Pesticide and Residues Phytosanitary certificate. The truck that use for transport mangoes to airport have to be a cold storage truck.

Total duration in Thai Mango supply chain can be up to 1-2 days , including harvest mango transportation, vapor heat treatment and export to Japanese Market. Studies have found that traceability does not existed since there are no label or identification to the mango lots. Where the basket has the same color and no identification, should any pesticide has been detected, they will be rejected as a whole lot. Then it cannot be exported.

5 BENCHMARKING THAI MANGO SUPPLY CHAIN

The objective of this research is use SCI Model to benchmark between Thai and Japan sides. In figure 3 SCI Model compared Thai and Japan sides to benchmark is shown. It is obvious that the Japan side shows good performance than Thai side in overall. Where the Thai gets lower points in all fields than the Japanese in approximately 1-2 rank. The worst criteria of Thai side, as scored 2, are in the sub-criteria "Transportation Network", "Safety and Standard" and "Behavior". Where in the Transportation network criterion, Thailand is far behind Japan. In Japan, the transportation is well controlled as in the "cold chain". In Thailand, the transportation is still based on normal truck and temperature is uncontrollable. Also from the inspection, it can be found that the Safety and standard in Thailand is diverse on various standards such as GAP or GMP. The sub-criteria "Behavior" is found a big gap where Japanese customer do not realize the Thai mango characteristics where Thai Mango is only popular in summer only. Therefore Thailand's Government should exploit and show the different way to consume such as how to cook mango and to make confidence about food safety and food quality in Thai Food.

However, in some criteria, it can be found that Thai side get the same level as the Japanese such as

Information Technology and Trading Relations.

It shall be noted here that the scoring is based on the weakest link (in each country). For example, the sub-criterion Safety and Standard, Thailand is scored 1. Whist investigate into the supply chain member, even though middle-man, exporter, vapor heat treatment and freight forwarder were scored 2, 4, 4 and 4 respectively. However, farmers are scored 1. Therefore, for this sub-criterion, Thailand is scored 1 (see Table 1).

Table 1 Thailand's Safety and Standard Sub-Criterion

KPIs	Member in the Supply Chain					Overall Score
	Farmer	Middle-Man	Exporter	Vapor Heat Treatment	Freight Forwarder	
Safety and Standard	1	2	4	4	4	**1**

For Japanese side, the best practice (scored 5) is presented in sub-criteria as "Cooperation with Government", "Quality and Standard", "Reliability" and "Inter-organization Communication".

6. CONCLUSION

The objective of this research is use SCI Model to benchmark between Thailand side and Japan side to indicate the weakest link in the supply chain linkages. This study applied IDEF0 and adapted SCI model in the case study to analyze Thailand Mango Supply Chain.

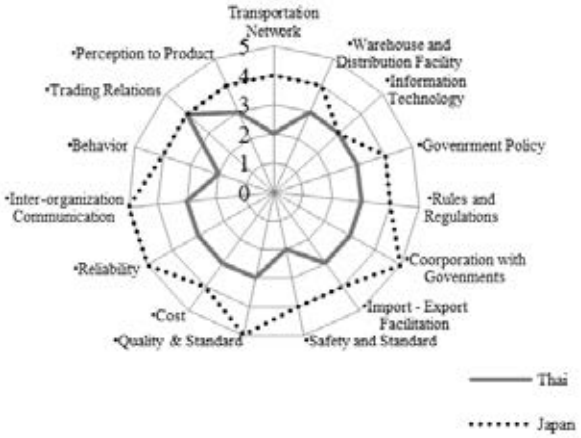

Fig. 3 SCI model compared Thailand and Japan

The weakest link is found to be a farmer and middle man. Where they do not realize the important of the supply chain and ignore a contract farming with exporter. This is a somewhat a big mistake that will cause a lot of problem. The problem is mostly found at the upstream in Thai side such as traceability, contract missing and lack of information. This problem initiate the gap within SCI Model. In terms of sub-criteria, "Transportation Network", "Safety and Standard" and "Behavior" are among the weakest link of Thai supply chain members.

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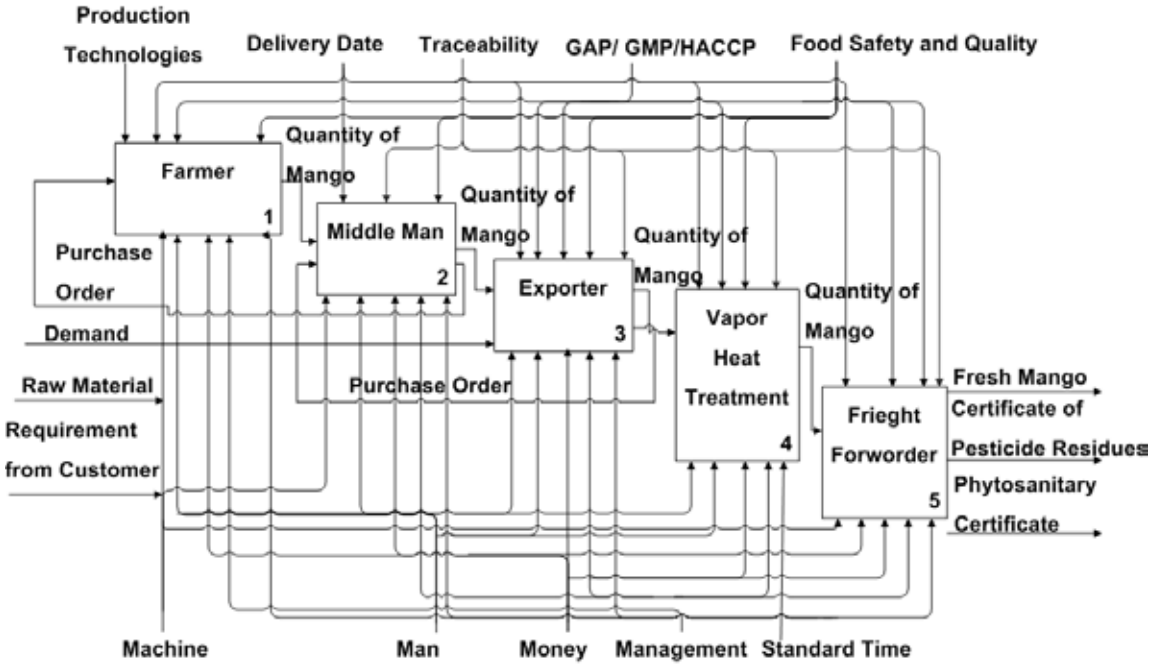

Fig. 4 Business process mapping Thai mango supply chain in japan market

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