

FRESH GARLIC SUPPLY CHAIN IN THE NORTH THAILAND

Nivit Charoenchai, Kitisak Phimkan

Department of Industrial Engineering, Chiang Mai University, Thailand

Introduction

Garlic is one of Thailand economic plant .In the year 2017, total of 65,695 rai was planted across the country) 1 rai =0.16 acre(and made 69,504 tons of production, according to the data from the Office of Agricultural Economics . Most of all is in the northern part including 24,967 rai in Chiang Mai, 17,176 rai in Mae Hong Son, Phayao 6,939 rai, Lamphun 4,865 rai, Tak 4,131 rai and Lamphun 3,272 rai .

In 2016, Thailand ranked as the 16th garlic producer of the world lead by China as the first productive of 12,750 million tons a year .The second garlic producer was India of 645 million tons, followed by South Korea as 375 million tons)Department of Agriculture, 2016 .(Most of garlic produced in Thailand was consumed within the country for households and food processing industry such as paste and sauces factories .80 percent of produced garlic was used as fresh product while the other 20 percent was used as processed garlic, for example, pickled garlic, fried garlic, powdered garlic, and extracted garlic .Thailand exports garlic and its products of 500 -1,000 tons per year, however, 20,000 – 50,000 tons of garlic were imported to fulfill the consumption in the country.

As an economic plant, garlic price was highly sensitive with uncertainty change .In 2014, garlic price downed to the lowest point .When the price of fresh garlic was not high enough, farmers would not sell the garlic right after the harvest time .They held the product until the price raised .But some farmer had to split their stocks to sell just enough to cover their daily expenses . Some had to loan money and wish the increasing price would cover the interest their owed .

The structure of garlic prices in Thailand was also interrupted by the imported garlic from the neighbor countries, both legal and illegal .Since the cost of garlic plantation in Thailand was higher almost one half than the competitors such as China, India, Korea, there were illegal smuggled into the country border . Therefore, even the demand of garlic in the country was increased, the price of Thai garlic would not get higher .

To stay in the competitive market, the improvement of garlic supply chain is considered to be a suitable way to lower the garlic production cost .The study of the garlic supply chain structure since plantation until deliver to the factory were studied in this survey .

Research Methodology

Four garlic cultivation areas in the north part of Thailand were selected to study : A.Pai, Mae Hong Son; A. Li, Lamphun; A.Mae Wang, Chiang Mai; A. Samoeng, Chaing Mai. Field study included depth interview and questionnaire related cultivation were implemented .

A questionnaire was developed to use as a tool to gather the information from the farmer in the four selected area .The principle of supply chain operations reference :SCOR model is used as a guide to develop the content of the questionnaire .The gathering information included the farmer's activities in planning, preparation, production, delivery and repatriation .Production cost, logistics cost and total cost were investigated as well. Following was some examples of questionnaire's contents .

Operation cost: details and expenses

1 .Cost of production

- Fixed cost -rent, agricultural equipment depreciation cost
- Variable costs -materials and tools using in plantation process, wage and other expenses such as electricity, tap water phone bills and agricultural tools repairing cost, etc.

2 .Logistics costs

- Transportation cost -cost of transportation equipment
- Insurance fee for transportation equipment
- Interests from purchase the equipment

- Cost of equipment maintenance
- Cost of import transportation
- Cost of export transportation
- Cost of reverse transportation
- Cost of wage for transportation
- Costs related to keeping product -cost of keeping space
- Cost of inventory services
- Cost of risks of inventory
- Cost of wage to keep and take care of inventory

3 .Total Costs -total cost of production and logistics

Farmer, middle man and company survey

Farmer

- 10 Garlic agriculturists, Pai district, Mae Hong Son province, 10 Garlic agriculturists, Lee district, Lamphun province, 10 Garlic agriculturists, Mae Wang district, Chiang Mai province, 10 Garlic agriculturists, Sa Moeang district, Chiang Mai province

Middleman

-2 middlemen, Pai district, Mae Hong Son province, 2 middlemen, Lee district, Lamphun province, 2 middlemen, Mae Wang district, Chiang Mai province, 2 middlemen, Sa Moeang district, Chiang Mai province

Company's representative

- 1 representative from transportation company, Pai district, Mae Hong Son province, 1 representative from transportation company, Lee district, Lamphun province, 1 representative from transportation company, Mae Wang district, Chiang Mai province, 1 representative from transportation company, Sa Moeang district, Chiang Mai province

Research result

Structure of garlic supply chain

1. When start at farmer, we found the connection to various levels of the chain .Farmer played the role since plant, maintain, harvest, keep and sell .There were two methods of selling .1 .Contact farming :the farmer made the sell contract with the local middle man before the plantation or sometime between plantation time .Most of it, between the plantation time because the local middle man could monitor and predict both the quantity and quality of the product then evaluation for price .After the harvest, the local middle man came to take the product at the field .2 The selling after the harvest, after harvest the farmer sold directly to the middle man if it was the best price .If not, the farmer kept the garlic for another 2-3 days by hanging drying then sold out if the price matched .To sell out this way, the product would be mixed quality .However, if the price still could not be accepted the farmer which did not have financial problem would hold the product for a while until the price increased .
2. the local middle man collected the garlic from the farmer then hanging drying and keep in the inventory and sold out if the price was acceptable .
3. Merchant bought the fresh garlic from farmer or local middle man then hung drying in their inventory .They would split sold lot by lot after the garlic were decorated by root cut and grading and mixed in many forms such as binding as a bundle, cut each seed, separated to split-seed . The different style of product will be delivered to whole sale market which the biggest one was in Bangkok .Then the product would be sent to the other parts of the country .
4. Retailer in Bangkok and any other parts of the country separated the garlic bundle then re-packaging and sold to the consumer.
 - a. Food factories bought the garlic from retailer .The price was considered from the quality of the garlic at the trading time.
 - b. Supermarket received garlic from retailer and sold to the customer by re-packaging.

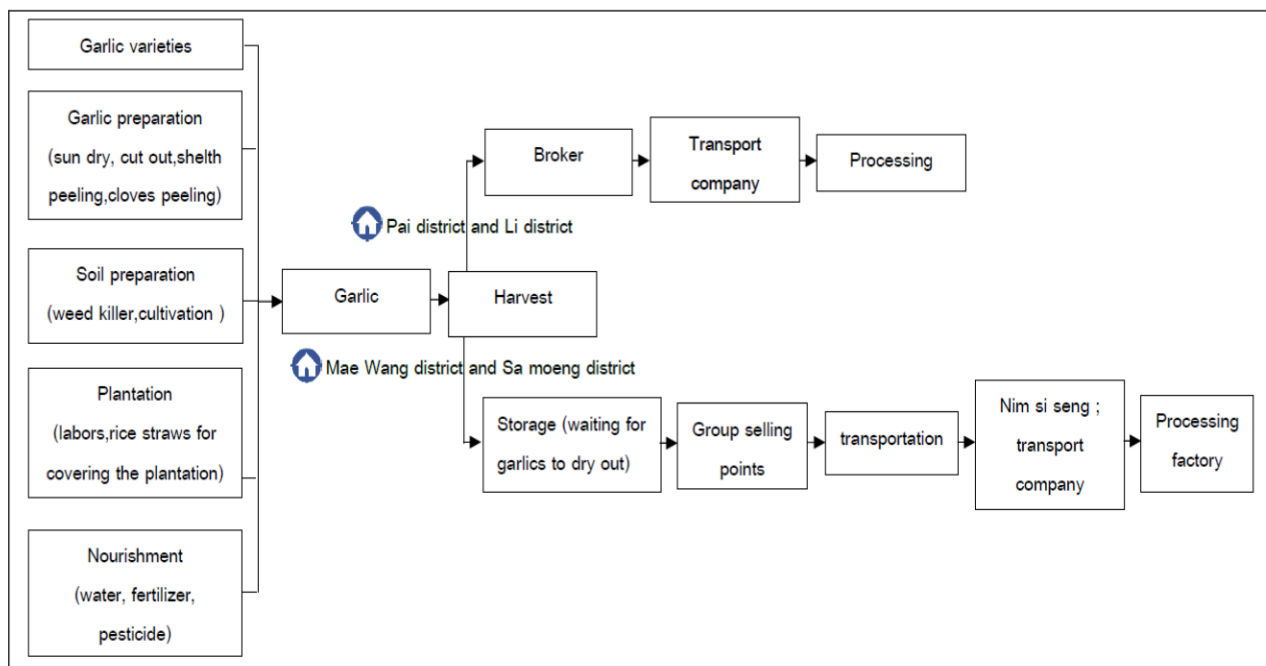


Figure 1 .Supply Chain Structure

Supply chain of the survey areas

The study found that the overall of fresh garlic supply chain in the survey areas were quite similar .Only a small differer could divided the structure in to two groups as in figure 1 . The first group was farmer in Pai and Li .These two places sold their product to the middle man)broker .(After harvest, the product was delivered by the transportation company by the expense of the middle man.

The second group was farmer in Mae Wang and Sa Moeang .Their activities were similar .After harvest, garlic would be hung drying first .After that, the representative of the group would take all product to the transportation company and delivered to the factory .This side, the delivery cost was paid by the factory .

Supply chain cost in the survey area

It was found from the interview with the farmer as following;
 Farmers from Pai, Li, Mae Wag and Samoeng had experienced from garlic plantation in the average of 25 years, 11 years, 10 years and 7 years, respectively .Most of the farmers had their own field but rent some more field from their cousin or neighbors . Farmers in Pai, Samoeng, Li, and Mae Wang had the average of plantation field as 10.4 rai, 4 rai, 3.5rai and 1.5 rai, respectively . The garlic are well growth in sandy loam .Farmer in Pai used their local breed 70 %as 100-120 kilograms per rai .All farmers use organic fertilizers such as bat dung, cow dung, but they put these fertilizers at only the beginning of the plant process .The garlic could be harvested at the age of 100-120 days .The experienced farmer could make fresh garlic as 2,000-5,000 kilograms per rai .the average costs of farmers in Pai district, Li district, Mae Wang district, Samoeng district are as follows; 23,848, 28,133, 26,092, and 27,106 baht per rai respectively, These equal to 7.95, 9.38, 15.65, 12.55 baht per kilogram respectively.

Table 1 .Yields and average cost

	A.Pai	A.Li	A.Mae Wang	A.Samoeng
Average cost(Baht/rai)	23,848	28,133	26,092	27,106
Average yield (Kg / rai)	3,000	3,000	1,667	2,160
Cost (Baht/ Kg)	7.95	9.38	15.65	12.55

Table 2. The production and logistics cost

Production and Logistics Cost (Baht/ Kg)		A.Pai	A.Li	A.Mae Wang	A.Samoeng
Production Cost	Fixed cost	0.2	0.5	0.5	0.4
	Variable cost	7.5	8.43	15.05	11.95
Total		7.7	8.93	15.55	12.35
Logistics Cost		0.25	0.45	0.1	0.2
Total Costs		7.95	9.38	15.65	12.55

Acknowledgement

This research has been completed with supported fund from National Science and Technology Development Agency, Thailand, as well as, good cooperation with the department of Industrial Engineering, Chiang Mai University and farmers in the survey districts. Besides, the assistance from industry, Nithi Foods Co., Ltd, was very appreciation.

Reference

- HE Kailun, XU Huijun and XU Maohua . The Application of Probabilistic Neural Network Model In the Green Supply Chain Performance Evaluation for Pig Industry . International Conference on E-Business and E-Government, 2010.
- Jirapa Jomtaisong, the study of garlic product management, Bureau of agricultural commodities promotion and management, 2008
- Juthamas Nethpunya, Increasing potential of logistics and supply chain for fresh strawberry in Chaing Mai province, Master thesis . Department of Industrial Engineering, Faculty of Engineering, Chiang Mai University, 2013
- Kanokporn Meekaew . The Analysis of garlic wholesalers business management in Lamphun and Chiang Mai Provinces using value chain model . Master thesis . Department of Industrial Engineering, Faculty of Engineering, Chiang Mai University, 2010
- Nattharinda Thiticharoehpong, Evaluation of canned corn supply chain efficiency Master thesis . Department of Industrial Engineering, Faculty of Engineering, Chiang Mai, University, 2009
- Vachon,S. , Klassen,R . “Green project partnership in the supply chain : the case of the packageprinting industry” .Journal of Cleaner Production, 14)2006(, 661-671.