Balancing Canned Pineapple Supply Chain in Thailand

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Abstract

This research study was aimed at analyzing an imbalance between demand and supply in canned pineapple industry in Thailand. By applying economics theory, it was used for reinforcing the econometric model that describes characteristics of those involving in the canned pineapple supply chain. . The Eviews 2.3 program was used as a tool to analyze a correlation between each formula. In order to identify consumer's requirement of the canned pineapple, this research investigated any factors affecting to the consumer's decision making such as selling price of the canned pineapple in Thailand, in Philippines, and Indonesia. In the mean time, factors affecting a quantity of pineapple such as selling price at farm site, agriculture area, rainy quantity, labor cost of storage, and labor cost of harvesting, etc were also identified. It is aimed to analyze imbalance of demand and supply in the canned pineapple industry in Thailand. A ratio of utilization for pineapple was used to fulfill several objectives, as well as ratio of pineapple processing used for canned pineapple was also considered altogether. The results analysis shown that demand of canned pineapple was higher than supply produced by harvesting fresh pineapple on a yearly basis, except harvesting season. It was illustrated that Thai canned pineapple industry shows an imbalance of demand and supply in a market. This research considered the influence factors that were resulted from some varied factors have on cultivation of fresh pineapple. Therefore, increasing or decreasing such factors might cause production cost reduced that partially impacts selling price to be decreased. Even though, it may lead to a change of demand and supply intentionally. It was therefore an opportunity to expand market by developing a systematic transportation network, materials requirement procedure, cultivation promotion, and complete supply chain management development in the future.

Keywords: Logistics and Supply Chain, Balancing, Canned Pineapple, Econometric model, Multiple Regression Method

1. Introduction

Thailand is one of the large producers for agricultural products processing that are acceptable to international markets. It is ranked as top five of the world in exporting consumable products. It is due to its potentiality of industry development used for exports purpose and readiness of raw materials as well as potentiality development of Thai entrepreneurs. This result in a capability of quality development and products' characteristics required for international markets. Thai agricultural industry is one of the vital industries yield to country development that generates income of 11 percents of Gross Domestic Product (H.Yriola , el at ,2003). In 2010, Thailand exported agricultural products with the value of 6,176,292 million baths divided as follows: agricultural products of 1,088,633 million baths (agricultural products and foods of 823,554 million baths, industrial agriculture of 265,079 million baths, non agricultural products of 5,087,659 million baths). The products classified as agricultural products have the highest value in the ASEAN countries of 397,792 million baths, incremental from last year of 321,695 million baths or 23.66 percents. Succeeding, the ASEAN countries have a trading value of 217,150 million baths incremental from last year of 164,113 million baths or 32.32 percents. Moreover, the North America has a trading value of 172,260 million baths, incremental from last year of 148,249 or 16.20 percents. Lastly, the European Union has a trading value of 126,517 million baths, incremental from last year of 113,738 million baths or 11.24 percents (Thailand Foreign Agricultural Trade Statistics, 2010).

The canned pineapple processing industry is one of the highest potentiality industries in Thailand due to the fact that

its geography of locating in monsoon season. It is essential for growing pineapple with a good taste demanded for the world markets (Vijit Wangni, 2002), and generates income of 300 - 400 million US$ or 13,000 million baths. Thailand is ranked as the top of the countries exporting pineapple with a market share of 40 – 50 percents. Its competitors are as follows: USA, Germany, Spain, the Netherlands, etc (Office of Agricultural Economics, Basis Data Agricultural Economics year , 2011). Meanwhile, Philippines is found to be the top of the countries exporting pineapple juice as well as Indonesia is secondly ranked for exporting fresh pineapple and pineapple juice (V.N.Asopa, 2003). With the above reasons, the canned a pineapple processing industry can generate more revenue for agricultural products and increase sustainability for those farmers cultivating pineapple. Besides that, there was coordination between farmers, producers, transportation service providers, and distributors, etc.

2. Logistics and Supply Chain of Canned Pineapple in Thailand

Logistics and supply chain of Canned Pineapple industry in Thailand is an integration of agricultural producers (farmers), manufacturers, and end consumer (export or domestics) and various logistics activities such as, transportation, warehouse, inventory, etc., as seen in Figure 1.
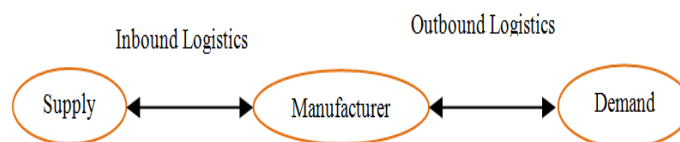

Figure 1. Logistics and Supply Chain of Canned Pineapple Industry in Thailand

Thailand canned pineapple processing industry started in 1967 in Prachuabkirikan Province. A first stage of the process may lack of raw materials while a producer may use pricing strategy to give incentive for farmers to cultivate more pineapple. In order for raw materials to be sufficient for the requirement of Thailand becoming the top exporters of the world, pineapple cultivation was further focused by considering distribution planning nearby prachuabkirikan, petchburi, chonburi, and rayong provinces, and so forth. Famous pineapple species are described as follows: Pattavia species appropriate for fresh consuming and used for raw materials in producing canned pineapple (Sulsan Sutipaiboon) and cultivating all year around. The best seasons used for cultivating were November to May.

A farmer has its responsibility in cultivates pineapple for transporting to production process, started from procuring raw materials such as fertilizers and species used for cultivation. Planning the cultivation needs more used for cultivation. Planning the cultivation needs more understanding of best practices in agriculture used for growing pineapple. It was made as a direction to increase quality level of pineapple production up to determined standard and safety condition for consumers. Also, the recording data was done and used for further inspection to rest assures the needed quality level, as well as maintenance, harvesting, data collection, products movement to production line (Department of Agriculture, Ministry of Agriculture, 2002) . Furthermore, a factor plays a key role in processing products to fulfill customer requirements. There were different kinds of canned pineapple such as Slide, Spear, Chunk, Tidbits, Cube dice, Juice, or etc. For those who require Thailand canned pineapple were divided into 2 categories: domestic and international consumers. There was 70 percents of exports to USA, Germany, Japan, France, etc., but other 20 percepts were for domestic consumption such as hotel, restaurant, (P.Eapsirimetee et al, 2011)

In addition, logistics activities used for supporting production process were procurement in which the factor could procure raw materials into a production line with two patterns: (1) procuring fresh pineapple from farmers or intermediaries that slide pineapple contract farming, procurement from other farmers, or procurement from intermediaries; and (2) procuring fresh pineapple from intermediaries store (Charoenchai Khompatraporn, 2006) , including segmentation and packaging, etc. (Ministry of Agriculture, 2004)

3. Methodology in Econometric

This study simulated the econometric model that was found in theory and empirical study. By combining both sources together and the use of statistical analysis, it was aimed at investigating an economical correlation. Analyzing data with the econometric model according to a conceptual framework, it appeared to identify parameter. Simulating such data allowed testing of a correlation between each parameter illustrated in Figure 2

A study on Economics allows most of researchers to reduce economical problem by analysis, understanding, learning, and drawing a conclusion from a sample. Mean while, normal Economics theory can be used for explaining a correlation between each parameter relevant to Economics. Using different theories allows clear understanding of production, human resources, and distribution for uncertain decision making. With this reason, the Economics and Statistical theories are also closely related to decision making under uncertainty and the way in which data can be used for explanation and recommendation. Both theories are differing from each other, but relevant to how data can be developed. Therefore, it is a must to comprehend a process of Economics and how to improve decision making with further strategic development

3.1 Demand and Supply Analysis

An analysis of demand and supply for any products made for domestic or international market is relevant to pricing analysis, market demand or supply analysis started from developing tables, graph, or complicated mathematical tool. Mostly, any analyses tend to estimate coefficient or value of parameter in order to assume a direction and policy in forecasting. The Economics theory proposes a broad view for identifying an analysis of the empirical study with a market demand model. Assumingly, a quantity is based on a selling price of the product used for an exemplary case study. Other than, it may include other incomes or factors such as population, season, etc. Therefore, demand theory will pinpoint a correlation between quantity and price of a product in different directions. However, one theory cannot classify a specific correlation of each factor or coefficient for the product to be linear. Most of the quantitative analysis is found as follows: (1) a study of behavior of time series data with trend, seasonal, cyclical; (2) demand and supply study; and (3) regression analysis. (Aree Wiboonpongse)
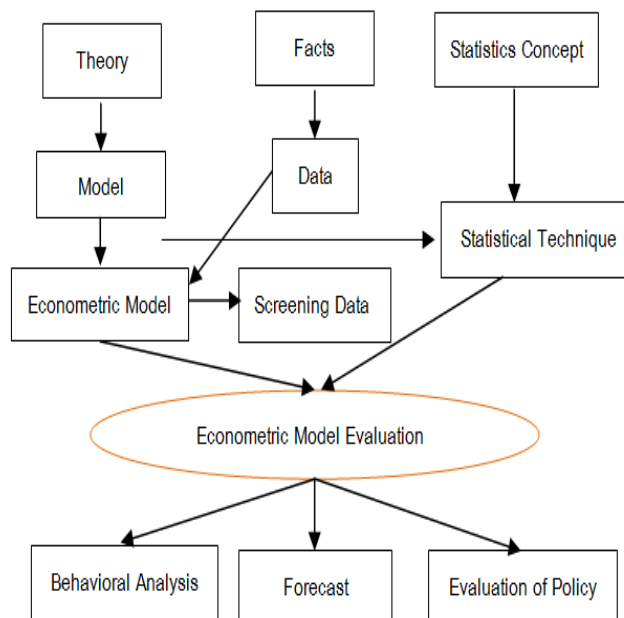

Figure 2. Method and Target of Econometric Model

3.2 Economic Model

For the Economical point of view, an analysis of demand and supply is thought to be vital for production planning required for customer satisfaction. In the model of demand and supply, quantity will be assumed based on selling price of a product, other incomes, or other factors such as population and season, etc. A theory of demand and supply will pinpoint a correlation between quantity and price of a product in different directions. However, one theory cannot classify a specific correlation of each factor or coefficient for the product to be linear (Robin Bade & Michael Parkin 2002 , Michael Oistone , A.Thompson, www.nvcc.edu/home/mheslop/fds.htm,www.blurtit.com/9437759.html ,www.csun.edu/~dgw61315/PTlect2y.pdf,www w.bus.msu.edu/econ/brown/pim/pdffiles98/demand98.pdf ,www.economicsnetwork.ac.uk/adivec/hyperppt.ppt and Doug Gorman).The above factors can be used to generate the Econometric model employed for demand forecast found in Formula 1 and 2

$$Q^d \;=\; \beta_1 - \beta_2 Pt + \beta_3 Pp + \beta_4 Pi + \beta_5 Gdp + \varepsilon \tag{1}$$

$$Q^s \;=\; \beta_1 - \beta_2 P_1 + \beta_3 A + \beta_4 R + \beta_5 X_1 + \beta_5 X_2 + \beta_6 X_3 + \beta_7 X_4 + \beta_8 X_5 + \beta_9 X_6 + \beta_{10} X_7 + \beta_{11} X_8 + \varepsilon \tag{2}$$

Where

Q^d is Demand Forecasted of canned pineapple of Thailand

Q^s is Pineapple Quantity

P_t is Thailand Pineapple Selling Price in Market

Pp is Philippines Pineapple Selling Price in Market

P_i is Indonesia Pineapple Selling Price in Market

P_1 is Average Selling Price at Farm Site

A is Harvesting Area

R is Rainy Quantity

X is Other Production Factors such as Labor Cost of Harvesting} Fertilizers Cost, and Pesticides

The Eviews 2.3 program was used for analyzing the functions of the formulas for a requirement of Thailand canned pineapple in the world market. It was related to the factors affecting decision making in purchasing such as Thailand Pineapple Selling Price in Market (P_t) , Competitors' Pineapple Selling Price in Market (Philippines P_P; and Indonesia P_i) etc. shown in formula 3. The correlation was statistically significant with R-square of 0.825.

$$Q^d \;=\; -\,31271925.2 - 30081.99*PtSa\ (2) + 20981.67 PpSa + 33787.17*PiSa + 3432.82*GdpSa \tag{3}$$

R-squared statistics value is 0.825, Adjusted R-squared statistics value is 0.798, Durbin-Watson statistics value is 2.606 and F-statistic statistics value is 30.801

The formula of correlation between supplies of pineapple quantity in Thailand is illustrated in formula 4. Several factors contained in the formula are as follows: (1) quantity of harvesting area, (2) rainy quantity, (3) selling price at a farm site, (4) labor cost for storage, (5) labor cost for harvesting, (6) fertilizers and pesticides cost, and (7) others. By testing a statistical correlation, it was found that there was significantly correlated with R-square equals to 0.995.

$$Q^S = 20755095.15 + 2055.755866*P_1 + 0.6041982593*A + 14.10*R + 65481.62*X_1 - 90226.87*X_2$$
$$+\ 48043.93*X_3 - 42275.95*X_4 + 771103.45*X_5 - 41465.23*X_6 - 2322309.26*X_7 + 67381.74*X_8 \tag{4}$$

R-squared statistics value is 0.995, Adjusted R-squared statistics value is 0.993, Durbin-Watson statistics value is 2.354 and F-statistic statistics value is 407.579

Where

Q^s is Quantity of Pineapple

A is harvesting area

R is rainy quantity

P_1 is selling price at a farm site

X_1 is Labor Cost of Storage

X_2 is Labor Cost of Harvesting

X_3 is Fertilizers Cost

X_4 is Pesticides Cost

X_5 is Fuel and Oil Cost

X_6 is Agricultural Supplies Cost

X_7 is Agricultural Equipment Maintenance Cost

X_8 is Investment Interest

4. Analysis of Balancing Between Demand and Supply in Thailand Canned Pineapple Industry

Furthermore, an analysis of supply or productivity of pineapple in Thailand was conducted and aforementioned in 3.2. Nevertheless, important factors used for considering in the analysis of balancing between demand and supply for Thailand canned pineapple is as follows: (1) ratio of pineapple utilization according to its target is found that there was 70 percents productivity of pineapple compared to the total. Other 30 percents were consumed in different patterns (Ravipim & Sureerat, 2007) and (2) ratio of fresh pineapple processing used for producing canned pineapple was approximately 3.3 kilograms: 1 kilogram (Office Agricultural Economics, 2011)

Results of the demand for canned pineapple and productivity of pineapple in Thailand is illustrated in Table 1. It was found that demand of canned pineapple was higher than supply of the pineapple harvested on a yearly basis, except the third quarter (fresh pineapple harvesting season). Only one quarter in each year has a sufficient supply; thereby this illustrated that there was imbalance of demand and supply of Thailand canned pineapple industry. By considering a series of supply formulas, it appeared that a reduction of the cost of some factors such as labor cost of harvesting, pesticides cost, agricultural supplies cost may lead to an increasing productivity. In the mean time, a series of demand appeared to proof that if a selling price of Thailand canned pineapple was lower than expected; it would increase a level of demand. Therefore, reducing cost of production would decrease a selling price that leads to expected and desirable demand and supply.

The above analysis illustrated that reducing variable cost was fairly important for supporting Thailand canned pineapple industry to be expanded in the future. According to a current situation, however, it appeared that fed fresh pineapple to production line was delivered from the closest distance of suppliers to the manufacturer. It was due to a higher of transportation cost. Besides that, solving the problem of transportation cost should be done properly. This research, therefore, planned materials requirements by coordinating with those parties in supply chain owing to receive information between farmers and manufacturers. The ultimate goal was to expand the canned pineapple product to the world market.

5. Conclusions

Thailand, nevertheless, is one of the potential countries where exporting pineapple ranked as the top country in the world especially canned pineapple and pineapple juice. It is anticipated that there is opportunity for Thailand industry like to significantly grow, but still facing uncertainty of fresh pineapple in each season the year. Hence, in order for Thailand canned pineapple to continuously grow, all parties must firmly cooperate and put into practices (i.e., governmental sector, factory, and farmer) of production plan. Also, there should be a way to cultivate fresh pineapple in a large scale, develop a systematic transportation network, and determine a policy of procuring materials from other sources.

By analyzing the functions from the above formulas (related to Thailand canned pineapple sold in the world market), it seems to find out a value of R-Square can be used for explaining how correlation between each factors is valid or not. However, it is still uncertain to identify such correlation accurately. In the future research, the researcher will discover a new technique and other tools such as developing formula to justify how correlation can affect decision making or forecasting technique that increase it's more accuracy and reliability.

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Table. 1. Results of Blanking between demand and supply

Quarter	Demand (Tons)	Supply (Tons)	Diff. (Tons)
2003q1	132,918	100,727	-32,191
2003q2	135,662	100,727	-34,935
2003q3	93,400	100,727	7,327
2003q4	113,281	100,727	-12,554
2004q1	134,663	111,416	-23,247
2004q2	134,949	111,416	-23,533
2004q3	96,132	111,416	15,284
2004q4	112,335	111,416	-919
2005q1	115,684	115,780	96
2005q2	145,748	115,780	-29,968
2005q3	110,701	115,780	5,079
2005q4	142,954	115,780	-27,174
2006q1	157,045	143,456	-13,589
2006q2	160,897	143,456	-17,441
2006q3	138,757	143,456	4,699
2006q4	163,462	143,456	-20,006
2007q1	163,575	115,886	-47,689
2007q2	149,489	115,886	-33,603
2007q3	96,070	115,886	19,816
2007q4	158,913	115,886	-43,027
2008q1	169,369	120,812	-48,557
2008q2	194,363	120,812	-73,551

Table 1. (Cont)

Quarter	Demand (Tons)	Supply (Tons)	Diff. (Tons)
2008q3	110,222	120,812	10,590
2008q4	144,553	120,812	-23,741
2009q1	120,175	100,485	-19,690
2009q2	144,232	100,485	-43,747
2009q3	111,659	100,485	-11,174
2009q4	132,904	100,485	-32,419
2010q1	134,621	102,065	-32,556
2010q2	134,984	102,065	-32,919
2010q3	104,014	102,065	-1,949
2010q4	145,355	102,065	-43,290
2011q1	143,003	99,820	-43,183
2011q2	140,827	102,415	-38,412
2011q3	138,956	100,248	-38,708
2011q4	137,419	100,005	-37,414
2012q1	136,102	103,748	-32,354
2012q2	134,979	104,256	-30,723
2012q3	134,117	102,909	-31,209
2012q4	133,330	98,737	-34,593
2013q1	132,662	100,462	-32,200
2013q2	132,078	99,577	-32,500
2013q3	131,586	99,104	-32,482
2013q4	131,175	99,703	-31,472

Table 1. (Cont)

Quarter	Demand (Tons)	Supply (Tons)	Diff. (Tons)
2014q1	130,827	99,543	-31,284
2014q2	130,535	99,151	-31,384
2014q3	130,292	98,968	-31,324
2014q4	130,078	100,328	-29,750