The evaluate of pineapple production by Data Envelopment Analysis (DEA): In Thasud Sub District, Muang, Chiangrai

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Abstract

At present, most farmer in Thasud subdistrict, Muang, Chiangrai are moving to be fresh pineapple producer caused by the increasing of demand from domestic and foreign market. The critical causes of this moving are the coming of Chinese contact farming. Moreover, Farmers in Thasud Sub district are facing production problem. The efficiency of production should be evaluated. The purposes of this research are 1.) Study of local supply chain of fresh pineapple in Thasud Sub district, Muang, Chiangrai and 2.) evaluate of pineapple production in each Thasud Sub district’s villages by the tool is Data Envelopment Analysis (DEA). For input and output determination, Researcher collected data by ethnography observation and interviewing refer to production function in economics. In each decision make unit (DMUs), researcher use Farming Land, Labor and operating cost for input and Fresh pineapple harvested per Rai for output. The researcher found that they use much more in inputs are labor and operationing cost. The suggestions are assigned other job for that over labor to processing position and useless in additional input (fertilizer, Hormone) that can gain more benefit in pineapple lost.

Keywords: Thasud Sub District, Fresh Pineapple Production, Data Envelopment Analysis (DEA)

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Rational to study

Pineapple is the important economy agriculture in Thailand. It can make the benefits yearly of 23,000-25,000 million baths by 2 main types of product are canned and freshen juice. By 50% of export canned pineapple in world market, Thailand was being top exporter of canned pineapple in the world. The main trader countries are European Union, United Stated of America, Japan and Middle East. Kasikorn Bank Research center (June 2017) reported that “Thailand can keep the competitiveness of canned pineapple export while decreasing export value and increasing cost from material and labor. Comparing with other exporter, Thailand has the best production performance by the amounts of production and global standard factories supporting by straightness from small business or household sector. Even the tax issues, Thailand got highest import tax to European Union. Thailand can get most priced from Europe”.

Not just for Macroeconomics, Pineapple industry was make the benefits to microeconomics especially household. These products are made by value added production. Pineapple need skilled labor for growing by best quality of material. It can make the career for many household. Moreover, in factories, they need skilled labor for many parts of productions such as peeling or selection to keep each quality for their brand. This industry was linking between agricultural sectors to industrial sectors in totally. The value-added products (canned and juiced pineapple) was produced by 1.80-2.00 million tons of all agricultural products and another 20% left of the production are fresh eaten pineapple in domestic and border markets.
Pineapple production in Thailand

Figure 1: Pineapple’s Industrial Structure in Thailand

From figure 1, pineapple products in Thailand will start at farmer position. In this position, pineapple was growth by farmer growing. This position will produce fresh pineapples. After that, most of fresh pine apple will be sold to middle man and co-operative in the area. For other fresh pineapples, farmer will sell their fresh pineapple to factories mostly by contact farming and domestic market in the area.

Next step is value added, fresh pineapple from people above will be sold to factories. The factories respected to transform fresh pineapple to final products. There are 2 main type of final products. First is canned pineapple and other is juiced pineapple. Food intelligence center, national food institute (2015) reported that “there are more than 75 factories in Thailand. They can be separated to 19 big-scale factories and other small-scale factories that approved by industrial standard. For big-scale, most of them located in Prachuap Khiri Khan at west of Thailand. Most of big-scale factories will transform fresh pineapple to canned pineapple and juiced pineapple. For small-scale factories, they should be called Small and Medium
Enterprises located diffusion in Thailand farming area. This group of factories produce other types of final products such as jammed pineapple or dried pineapple.

Last part is marketing. All of final product will be sold in 2 markets are domestics market and foreign market. For domestic market, merchandise will buy final products from factories and then they sell spready in any area of Thailand. Not just for merchandise flow, domestic market will sell fresh pineapple that received directly from farmer and middle man. For foreign market, exporter will buy the final products from factories and export to any countries such as European Union, United Stated of America, Japan and Middle East.

Pineapple production in Thasud subdistrict

Thasud subdistrict is the location of Mae Fae Luang University. This sub-district located in top north of Muang district by 18 kilometers. The areas are 81.86 kilometers square or 51,163.5 Rai. North and West of this area are close to Maechan district while South and East are close to Muang District. This subdistrict was separated from Nanglae subdistrict by 8 villages in November 16, 1995. In September 11, 1999, Ministry of interior was established the Sub districted Administrative Organization (SAO) for Thasud subdistrict administration and their council. In April 8, 2012, Thasud SAO was upscaling to be Thasud Municipality with 11 villages at present

In the past, most of farmer in this subdistrict was farming rice, rubber and hunter. But there are more interesting in pineapple plantation after coming of Chinese business. They coming to do pineapple contact farming and more contact are interested to be signed. The trend of farming was changed. Farmer in this area was farming by only the trend from their community and municipal supports. It may cause to over demand in the same type pf products and lost a lot of over order products. They need to define how are their productions? to find out the solutions of this situations

Research Objective

➢ To study of supply chain of fresh Pineapple from Thasud subdistrict.
➢ To evaluate and compare pineapple farming in each villa of Thasud subdistrict.
➢ To suggest the solution to keep or improve farming efficiency.

Literature Reviews
Data Envelopment Analysis (DEA) was presented originally in 1978 for evaluating non-profit and service company performance. It can be applied with other optimal theoretical of each company. By this idea, the company need to design their decision-making units (DMUs). It can be group of productions or branches of the company or other. The profit of this idea to evaluate the production efficiency in all measures variables and units. Nowadays, these ideas are becoming popular to evaluate the efficiency of production.

In healthcare industrial, this is the service that ever evaluated by Data Envelopment Analysis (DEA). The researchers can use the collected data since 2007 to 2008 from Tigray Health Bureau, Ethiopia along with questionnaire data which is environmental factors for their inputs. Finally, they got the result and suggestion to more closer monitoring of health extension programmed to achieve the best possible performance for their nation. Sebastain M. and Lemma H. (2010).

Other sample that used Data Envelopment Analysis to evaluate was published by Sebastian K., Schoenfelder J., Fugener A. and Brunner O.J. (2018). They use DEA to evaluate healthcare with focus on hospital. The started their research by groping their research goal for 4 topics. After that they applied downstream technique to define their using inputs and outputs. Together with 262 reviewed paper, they finally get the discussion to utilize the scientific tool to instrument by manager and policy maker.

In Information technology industrial, there are the researches that using of Data Envelopment Analysis (DEA). Jatoh C., Gangadharam G.R., Fiore U. (2016) published their research. They use DEA to find the way to select could service of the customers. To design their Decision-Making Units, the use many related methods. AHP, ANP was chosen to analyze with modified super-efficiency data envelopment analysis (SPDEA). Moreover, they performed sensitivity analysis, adequacy to changes in service, adequacy to support decision making and modeling uncertainty of proposed methods in their research. Finally, they got the result of the best cloud service provider among the available service providers.

Data Envelopment Analysis (DEA) is very adaptive tool. The research can use this tool to evaluate the efficiency of the most data collecting. The important are depend on how researcher design them.
Research Methodology

Data Collecting

To study the local supply chain, the researcher uses ethnography and observation to collects data. Researcher has observed in real place, real time with real people in main position of local chain stating from farmer and finishing to middleman who are the last position in local chain. Moreover, researchers use secondary data that collected by Municipal of Thasud Sub district for modeling.

Data Envelopment Analysis

After the local supply chain was studied, the researcher use collected data to evaluate the efficiency of production by Data Envelopment Analysis (DEA) with following functions.

1. Maximize efficiency

Maximize Efficiency\(\alpha = \frac{(\mu_\alpha \times \pi_\alpha)}{((v_1 \times L_\alpha) + (v_2 \times O_\alpha))}\)

Where:
- \(\mu, v\) = The constrained variable (\(\leq 0\), determination ignored)
- \(\Pi\) = Products (Pineapple harvested)
- \(L\) = Labor
- \(O\) = Operating Cost (Fertilizer, Hormone and etc.)
- \(\alpha\) = Data of each village filled

2. Maximize efficiency

Maximize Efficiency\(\alpha = (\mu_\alpha \times \pi_\alpha)\)

Subject to efficiency of each village: \((\mu_\alpha \times \pi_\alpha) - ((v_1 \times L_\alpha) + (v_2 \times O_\alpha)) \leq 1\)

Where:
- \(\mu, v\) = The constrained variable (\(\leq 0\), determination ignored)
- \(\Pi\) = Products (Pineapple harvested)
- \(L\) = Labor
- \(O\) = Operating Cost (Fertilizer, Hormone and etc.)
- \(\alpha\) = Data of each village filled
The researcher was calculated all of above data by Window for DEAP (Win4DEAP a), DEAP ver. 2.1 program.

**Conclusion**

From observation, the researcher found the result as below:

From figure 2, the researcher found the flow of fresh pineapple in local market. Fresh pineapple was harvested by farmers and sold to middleman and cooperative. For cooperative, they were sell fresh pineapple to domestic market and sometime middleman depend on price in that periods. For middleman, after they got fresh pineapple then they were sell those to domestic market, foreign market and local market. The last position is consumer. They can access this product by all type of market in the area. For china contact farming, the contact from Chinese people can change overtime. They will only order the fruits that popular or seasoning in that period. So, the researcher suggests to maximize the production for long-time benefits.

From modeling, researcher got the result as below:

**Figure 2: Thasud Subdistrict’s supply chain**

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From modeling, researcher got the result as below:

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<th>Firm</th>
<th>Output: 1</th>
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**Figure 3: Data Envelopment Analysis Result**

<table>
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<th>SUMMARY OF INPUT TARGETS:</th>
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From figure 3, the maximize technical efficiency (te=1) was targeted. The result show that, the 3rd and 8th village are farming pineapple at maximize efficiency point. For 2nd village, they need to reduced their labor about 16 percent or 3 persons. For 6th village, they need to reduced their labor about 16 percent or 1 persons. The last is 9th village. they need to reduced their labor about 70 percent or 14 persons. Moreover, farmers in 9th village need to reduce their operating cost about 33 percent or 100,000 bath/rai too.

Discussion and suggestion

Most of farmers in this area still use doesn’t have their own farming plan. They will be farming only the plan from their community or municipal promotion. Once their harvested, the harvested products will over demand. For example, is pineapple. In the past, they were allocated their area for farming in many types of pineapple. When they harvested their product, there are many types of market the can preferred the demand for them. Different for present, many people farm their pineapple for Chinese market only. At last, the harvested pineapple will over demand because Chinese people are preferred other fruits in this seasons and pineapple in over order will lost.

Actually, the researcher suggests to gain the benefits from the their too much input. In empirical outputs, we found that most of farmer in each village use too much of labor. The farmer can assign their labor to farming less in fresh pine and move to processing. The might establish processing cooperative that conclude all of over labor in this sub district. In this processing position, they can collect all of over order fresh pineapple to be other products that can prefer more long-life products. The example are dried pineapple or oven soup or shampoo. So, they can save more pineapple and expand type of demand together. For farming sector, researcher
suggests to useless in some additional input such as hormone or fertilizer. The farmer can use the service from the government to analyze their soil and calculate their appropriated amount of them and they will save more costs too.

Reference


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