Efficiency of Layer’s Supply Chains in Indonesia

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Abstract. Research on the efficiency of egg’s supply chain focused on various markets is expected to provide input to maintain the existence of small scale layers’ farming. This study aim is to analyze the efficiency of supply chain of small-scale layers’ farming. This research is conducted in April-October 2017 in Blitar Regency, in East Java; Sidrap Regency, in South Sulawesi; and Kabupaten 50 Kota, in Payakumbuh City and Pariaman Regency, in West Sumatra. The number of respondents used are 139 people consisting of officers in related institutions, poultry shop entrepreneurs, traders, breeders association farmers, supermarket managers, hotels, restaurants and caterings. The data collected is analyzed using the Data Envelopment Analysis (DEA). The results concludes that traders naturally seek efficient supply chains so that their business can be endured. Factors that influence supply chain efficiency are share farmer, profit and marketing cost ratio, and number of actors involved. The higher the farmer share, and the profit-to-cost ratio, and the fewer marketing channel in a supply chain, the more efficient the supply chain system. Large capital farmers are advised to be able to shorten the supply chain by marketing directly to consumers such as hotels, supermarkets, restaurants, hospitals and caterings. The egg supply chain can also utilize the Indonesian Farmer Shop (TTI) developed by the Ministry of Agriculture so that it can increase farmer’s income and stabilize prices.

Keywords: DEA, egg, efficiency, supply chain

1. Introduction

Small scale chicken businesses have low efficiency [1]. Efficiency is an important consideration in the layer industry to have competitiveness which is influenced by production costs, economies of scale, business climate, vertical integration and the ability to adopt new technologies [2]. One way to improve efficiency is to do vertical integration because it increases added value and economic of scale [3]. The distribution aspect also determines the development of the layer industry. Damaged, narrow and congested road conditions and unclean market conditions have an impact on costs and pose a risk to the quality of layer product [4, 5]. In 2016, the population of layer was 162 million with 1.4 million tons of egg production [6]. Layer business is carried out by 30.5 thousand households, 143 legal entities, and 55 other business units [7]. Egg’s layer contribute 72.5% of national egg production. The large share of industrial production is supported by the use of technology in order to produce affordable products, good nutritional quality, and high accessibility to consumers. Therefore, their
existence needs to be maintained, including by streamlining the supply chain so that the market is not only domestic but also for export. The study of the efficiency of egg supply is oriented to various market segments is expected to provide input to maintain the existence of small-scale layer businesses in certain segments and also supply prime quality products for other market segments. This study aims to analyze the supply chain efficiency of small-scale layer’s breeder. Output that is expected to produce efficient supply chain development policy recommendations in the layer industry that is competitive and improves the welfare of farmers.

2. Methodology
Farmers who were sampled were small-scale commercial farmers with a business scale of less than 30,000 per cycle [8]. The supply chain for eggs includes producers, egg traders, processors, and institutional consumers (Hotels, Restaurants and Catering).

This research was conducted between April-October 2017. The research locations were selected in the three main production centers of eggs production in Indonesia, namely in Blitar Regency, East Java; Sidrap Regency, South Sulawesi; and Kabupaten 50 Kota, Payakumbuh City and Pariaman Regency, West Sumatra.

In addition to producers, other supply chain actors include eggs traders to retailers. The direction of the supply chain also looks at institutional consumers. The choice of institutional consumers is determined by ease of access, relatively large supply volumes, and egg commodities are the largest inputs of consumers. Supply chains from upstream to downstream are traced to the province of research location.

This study used primary and secondary data and information. Primary data was collected using an instrument in the form of a questionnaire. Secondary data is collected through various documents from related institutions, both collected directly and through the internet network. To analyze the supply chain efficiency of egg business, the Data Envelopment Analysis (DEA) method is used. This method is also used by [9, 10, 11], respectively to study the efficiency of catfish, broiler supply chains and product marketing distribution.

3. Results and Discussion
The supply chain currently carried out by each trader is already the most efficient supply chain. Traders continue to make adjustments so that the business continues. The indication is, if it is observed in the supply chain map, each trader, especially inter-regional traders in the production center and port areas in consumer centers has their respective market segments both in terms of spatial and business actors. Medium and large scale of egg producers sell eggs directly to retailers, distributors, and institutional consumers in consumer centers. Conversely, retailers and distributors buy directly to the manufacturer. Another effort made by traders is to improve the efficiency of transportation equipment by adjusting the volume and size of trucks, and having more than one market destination area.

Based on supply chain maps that can be obtained in this research, available data and can be analyzed as much as 18 supply chains of eggs in East Java, West Sumatra and South Sulawesi. Marketing margins vary from Rp 1,267 to Rp10,317 per kg of eggs. Marketing costs vary from Rp 70 eggs to Rp 2,703 per kg of eggs. Meanwhile, profits vary from Rp 267 to Rp 5,514 per kg of eggs.

The performance of the marketing channels for eggs at the research location can be seen in Table 1. Channels 1 - 6 locations were from Blitar Regency to Surabaya City in East Java; channel 7 - 11 locations were from Kabupaten 50 Kota, Payakumbuh and Pariaman to Kota Padang; and channels 12 - 18 locations were from Sidrap Regency to Makassar City in South Sulawesi. Actors involved from producers/breeders to household consumers range from 2 to 5 units. The details of the actors involved in each region were in East Java 3 - 5 units, West Sumatra 2 -5 units, and South Sulawesi 3 - 4 units.

The Farmer Share of growing layers were varies in the range of 61.58% - 100%. The results of the analysis of the efficiency of the supply chain of eggs with the DEA method used three outputs namely profit, farmer share, profit and marketing cost ratio, and two inputs namely marketing margins and
marketing costs can be seen in Table 1. The results are six marketing channels that achieve the highest efficiency of the 18 existing marketing channels with relative efficiency values (VRSTE) 1. The six channels, 3 are in East Java, namely channel 3, channel 5 and channel 6. One channel in West Sumatra is channel 11, and two channels in South Sulawesi namely channel 14 and channel 17. These six channels do not have slack output and input slack or are zero, meaning all parties receive optimal benefits.

The combination of the analysis results is juxtaposed with the magnitude of the farmer share and the actors involved (Table 1), information can be obtained that supply chain efficiency does not occur in a chain that is too long (have 5 actors or more) such as marketing channels 1 and 7. Efficiency occurs in 3 channels with a chain of 3 units. The size of the share farmer does not determine efficiency. But there are 5 supply chains or marketing channels, namely channels 3, 5, 6, 11, and 14 where the farmer share is 85% - 100% is an efficient channel and one channel, that is channel 17, farmer share is only 61.58%. This means that the size of the farmer share is not enough to be used as an indicator of supply chain efficiency, such as the approach used by [12].

Slack output and slack input on the efficient channel is 0 and has the highest VRSTE value that is 1. Meanwhile, the most inefficient channel is channel 10, the lowest VRSTE value is 0.843 but the input slack value and output slack are not the greatest values. This condition occurs in West Sumatra. Based on Table 1, it can be seen that the factors that influence supply chain efficiency are share farmer, profit and marketing cost ratio, and number of actors involved.

Table 1. The efficiency of eggs’ supply chain, 2017

| Marketing Channels | Explanation  | VRSTE | Slack Output | Slack Input | Farmer’s share (%) | Benefit (Rp/Kg) | Margin (RP/Kg) | Cost (Rp/Kg) | Number of Actors Involved (unit) |
|-------------------|-------------|-------|--------------|-------------|--------------------|----------------|---------------|-------------|----------------------------------|
| 1                 | Blitar-Surabaya | 0.877 | 8.72         | 0           | 84.74              | 292.04         |               | 89.47       | 5                                |
| 2                 | Blitar-Surabaya | 0.973 | 6.29         | 0           | 90.45              | 26.83          |               | 89.47       | 4                                |
| 3                 | Blitar-Surabaya | 1     | 0            | 0           | 89.47              | 0              |               | 89.47       | 3                                |
| 4                 | Blitar-Surabaya | 0.958 | 6.19         | 0           | 89.69              | 48.33          |               | 89.69       | 4                                |
| 5                 | Blitar-Surabaya | 1     | 0            | 0           | 85.00              | 0              |               | 85.00       | 3                                |
| 6                 | Blitar-Surabaya | 1     | 0            | 0           | 89.47              | 0              |               | 89.47       | 3                                |
| 7                 | Pdg-P.Kumbuh-Padang | 0.960 | 26.51        | 0           | 74.33              | 169.56         |               | 74.33       | 5                                |
| 8                 | Pet-P.Kumbuh-Padang | 0.893 | 12.63        | 0           | 84.47              | 280.15         |               | 84.47       | 4                                |
| 9                 | Pet.B.P.Kumbuh-Padang | 0.875 | 10.16        | 0           | 81.08              | 374.79         |               | 81.08       | 4                                |
| 10                | Pet.K.P.Kumbuh-Padang | 0.843 | 27.89        | 1.24        | 84.20              | 401.95         |               | 84.20       | 4                                |
| 11                | Pet.B.P.Kumbuh-Hotel Padang | 1     | 0            | 0           | 100.00             | 0              |               | 100.00      | 2                                |
| 12                | Sidrap-Makassar | 0.950 | 2.82         | 0           | 89.85              | 52.90          |               | 89.85       | 3                                |
| 13                | Sidrap-Makassar | 0.916 | 3.28         | 0           | 87.92              | 123.48         |               | 87.92       | 4                                |
| 14                | Sidrap-Makassar | 1     | 0            | 0           | 92.88              | 0              |               | 92.88       | 4                                |
| 15                | Sidrap-Makassar | 0.875 | 1.18         | 294.56      | 69.61              | 939.40         |               | 69.61       | 4                                |
| 16                | Sidrap-Makassar | 0.913 | 0.76         | 81.17       | 66.80              | 603.61         |               | 66.80       | 4                                |
| 17                | Sidrap-Makassar | 1     | 0            | 0           | 61.58              | 0              |               | 61.58       | 4                                |
| 18                | Sidrap-Makassar | 0.955 | 24.68        | 0           | 79.49              | 164.21         |               | 79.49       | 3                                |
| Avg               |              | 0.944 | 5.80         | 22.42       |                   | 193.18         |               |             |                                  |

Resource: primary, computed.
In East Java, farmers who directly sell to retailers (channel 3, channel 5 and channel 6) then each retailer sells to end consumers namely households, catering/bakery and hospitals, only involve 3 supply chain actors as the most efficient channel, compared to other channels involving 4 - 5 actors. In West Sumatra, the most efficient marketing channel is only one channel, namely channel 11 which only involves 2 supply chain actors, namely large-scale farmers who directly sell their products to hotels. In South Sulawesi, the most efficient marketing channel is channel 14 and 17 involving 4 supply chain units. These two channels are more efficient than the two channels which only involve 3 unit chains, namely channel 12 and channel 14 with VRSTE values of 0.950 and 0.955 which are second and third respectively in South Sulawesi.

4. Conclusions
Traders have done business efficiently by shortening supply chains, concurrently as producers and penetrating markets in certain areas so that every trader has a market area as a destination, as well as increasing transportation efficiency. The price of eggs is more determined by supply and demand, as well as large-scale breeders' interference with reference to prices in the consumption center and production center areas.

Factors that influence supply chain efficiency are share farmer, profit and marketing cost ratio, and number of actors involved. The higher the farmer share, and the profit-to-cost ratio, and the fewer links in a supply chain, the more efficient the supply chain. Another factor that also determines efficiency is the payment system and sales turnover.

In order for the formation of egg prices not to be dominated by certain parties, even though in the process refers to prices in several regions, the government needs to provide electronic price information on the location and various related production and consumption centers.

Large capital farmers are advised to be able to shorten the supply chain by marketing directly to institutional consumers such as hotels, supermarkets, restaurants, hospitals and catering. The egg supply chain can also utilize the Indonesian Farmer Shop (TTI) developed by the Ministry of Agriculture to increase farmers’ income and stabilize prices.

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