

Original Research Paper

Value-Added Analysis of Duck Meat Supply Chain in Malang, Indonesia

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Abstract: This study aims to analyze the added value of the duck meat supply chain in Malang, Indonesia. The respondents in this study were duck farmers, distributors, suppliers, duck meat restaurants and consumers. The study was conducted through a survey with purposive and snowball sampling methods and then analyzed descriptively. The results showed that there were two distribution channels of the duck meat supply chain in Malang. The first distribution channel (Channel I) consisted of duck farmer, duck supplier in Blitar Regency, fried duck restaurant and consumers in Malang; while the second distribution channel (Channel II) consisted of duck farmer, distributor, duck supplier in Blitar Regency, fried duck restaurant and consumers in Malang. The results showed that the highest added value was found in Channel I, with 75.19% added value was obtained. The study concludes that Channel I had a better distribution channel of duck meat supply chain in Malang as indicated by the higher obtained added value.

Keywords: Distribution Channel, Duck Farming, Marketing, Profitability

Introduction

Duck farming for meat and egg production has a promising potential to be developed in Indonesia. The current duck farming practice is still done through the conventional farming method without any modern technological approach (Susanti *et al.*, 2020; Basriwijaya *et al.*, 2021). The duck meat production in Indonesia was about 36.4 thousand ton in 2017, while in 2020 increased to about 37.5 thousand ton (DGLAHS, 2020). While in Malang, duck meat production reached 15.9 ton in 2017 and increased to 26.1 ton in 2018 (CBSJT, 2019). The condition reflects the increasing demand for the product as well, with restaurants in Malang, Indonesia, have served fried duck as their main dish. Moreover, there are two types of consumers on the fried duck restaurants, the first type is consumers who come to dine in and the other would order the fried duck through an online-based application to order their food without the need to come to the restaurants.

The high demand for a fried duck food in Malang attracts duck meat suppliers even from duck farmers who raised their ducks outside of Malang. To improve the current condition, a good supply chain management of the duck meat is then become essential. A supply chain is a structured manufacturing process of raw materials into finished goods and delivered to the end-user/consumer. The supply chain would involve suppliers, manufacturers and retailers who directly or indirectly work together to fulfill the consumer's need. The supply chain would give

added value to the product during the delivery process through the involved participants (Janvier-James, 2012).

The supply chain mechanism of agricultural products in developing countries like Indonesia is characterized by weak products and weak market share. On the other hand, both the product and market would determine the sustainability of the supply chain, whether in a conventional or modern market chain. Marimin and Maghfiroh (2010) described that a conventional market chain started when farmers sell their products directly to the market or to brokers/distributors who will then sell the products in the traditional/modern market. In a study by Dawan and Darana (2018), there were three marketing channels of ducks meat, including: (a) Farmers as producers continue to collector traders, retailers and then to consumers, (b) farmers to wholesalers, retailers and then to consumers and (c) farmers continue to wholesalers, distributors, retailers and consumers.

In the supply chain system, the marketing of the product is done by involved participants who increase the value of the product or commonly known as added value. Sihombing and Sumarawu (2015) defined that added value as the increased value of a commodity due to whether processing, shipping, or even storing in its production process. In this study, we determine and analyze the value-added of duck meat supply chain in Malang, Indonesia. The result of this study is hoped to provide information on the duck meat supply chain in Malang so that a robust business model or policy could be made for all involved stakeholders.

Table 1: Value-added analysis (Hayami *et al.*, 1987)

Variable	Unit	Value supply chain
Input, output and price		
Output	Ducks/period	A
Raw material	Ducks/period	B
Direct labor	Person	C
Conversion factor		D = A/B
Coefficient of direct labor	Person/duck	E = C/B
Output price	IDR ¹ /duck	F
Labor wage	IDR/period ²	G
Revenue and profit		
Raw material price	IDR/period	H
Other input prices	IDR/period	I
Output value	IDR/period	J = A x F
Value-added	IDR/period	K = J-H
Value-added ratio	%	L = K/J x 100
Profit	IDR/period	M = J-H-I-G
Profit rate	%	N = O/J x 100

¹IDR = Indonesian Rupiah, ²one rearing period equals to 40 days

Materials and Methods

The study was conducted in the established fried duck chain restaurant in Malang, Indonesia. The data was collected from duck farmers (n = 15), distributors (n = 3), suppliers (n = 7), restaurants (n = 1) and consumers (n = 145) in December 2018. The duck farmers and restaurant were chosen through the purposive sampling method (Campbell *et al.*, 2020), with the criteria as follow: (1) The restaurant should serve duck meat as the main dish; and (2) the duck farmers should have duck farming as their main source of income. The snowball sampling was done by following Drăgan and Isaic-Maniu (2012) to determine the involved participants in the duck meat supply chain, starting from the duck farmers to the restaurant in Malang. The snowball sampling showed that several duck farmers and duck meat suppliers are located in Blitar Regency, around 75 km and can be traveled in 2 h from Malang, while the distributors, restaurant and consumers are located in Malang. The value-added analysis was done by following Hayami *et al.* (1987), with the formulation as presented in Table 1.

Results and Discussion

The distribution channel flow of duck meat in Malang is presented in Fig. 1. It can be seen that the supply chain of duck meat in Malang is divided into two distribution channels. The first channel (Channel I) consisted of duck farmer; supplier; restaurant; and consumer, while the second channel (Channel II) consisted of duck farmer; distributor; supplier; restaurant; and consumer as the distribution participants. Moreover, the study also showed the occurrence of added value process by each participant. The added value is the change of product's value due to the processing by participants, such as additional processing or distribution during the supply chain. The supply chain analysis would determine the value-added and retribution of each participant. Xun and Cuixia (2012) explained that livestock-based products supply chain is

different than other supply chains. The object of the livestock product supply chain is the livestock products and it coordinates the interest demand between the capital goods supplier of livestock products, farmers, livestock slaughtering and processing enterprises, livestock product brokers and consumers. The chain begins from the purchase of feed, veterinary medicine and livestock to finish a series of processes of the product production, processing and distribution. The livestock products supply chain is not only a production chain but also a value-added chain that increases its value during the process of processing, packaging and transportation of livestock products in the supply chain. In this study, the chain began from the farmer, who purchase the feed, medicine, breeding and raise the duck and end in the consumers who buy the fried duck dish as the final product.

The value chain approaches have been widely utilized to capture the interactions of complex markets in developing countries and to examine the inter-relationships between diverse actors involved in all stages of the distribution channel (Dolan and Humphrey, 2000; Kaplinsky, 2000; Schmitz and Knorringa, 2000; Giuliani *et al.*, 2005; Bair and Peters, 2006; Pietrobelli and Saliola, 2008; Bolwig *et al.*, 2010). Pica-Ciamarra (2005) described that the livestock chain systems are characterized by long marketing chains featuring great distances, numerous phases of weight gain and feeding regimes, many levels of traders and transactions, a multitude of steps and stages of processing and a variety of employment-creating services and inputs. On the consumer side, the delivery of livestock products through informal markets tends to serve poor consumers, creating an even tighter focus on the poor and with potential multiplier effects for pro-poor development interventions. However, in this study, we found that the livestock chain system in duck products is relatively short, consisted of four to five distribution participants.

The supply chain of duck meat in Malang found in this study involves duck farmers as the producer, distributor who ship the duck to the supplier, supplier who slaughter and ship the meat duck to the restaurant and restaurant where the duck meat will be cooked for the end consumers. The chain is following the supply chain defined by Singh and Verma (2018) who stated that the supply chain is the flow from supplier to the customer through value-added processes and distribution channels, which begins in the source of supply and ends at the end of consumption in an integrated structure model through the feedback information flow and feedback materials and information flow. In this study, each of the distribution participants has been involved in the value-added process which will be further discussed in the following section. Supply chain management would be required to secure the integrated process starting from the initial supplier to the end-users,

whether for goods or services, in which its value will be added during each process (Lambert *et al.*, 1998).

Yu and Li (2012) explained that there are some problems to be solved in the current livestock supply chain: The cost of transportation and herds, serious waste of the middle part, shortage of professional logistics talents, lack of financial support and no use of the concept of the total cost. In this study, we focused on the financial analysis of each distribution participant, while other factors such as produced waste and logistics are excluded. Fugate *et al.* (2006) further explained that the success of supply chain operations required high coordination of all participants in the whole chain and in turn, the implementation of supply chain management will affect the performance of all aspects. Moreover, Li *et al.* (2020) found that the computer database technology could be utilized to improve sales efficiency, targeted marketing design for products, avoid competition risk, reduce cost, provide accurate information to customers and then improve the whole society and economic benefits. In this study, the computer database technology were only utilized by the restaurants to distribute the product to the consumers through an online application. The utilization of computer database technology by other participants is then suggested to improve the overall supply chain management.

Added Value at Duck Farmer

Many of the development agencies have promoted poultry farming as a route out of poverty (McLeod *et al.*, 2009), thus poultry farming is widely considered as a means to identify micro entrepreneurs. Khaleda (2013) explained that the poultry farmer activity in the value chain consisted of breeding, rearing and poultry raising. In this study, the main activity by the duck farmer is rearing and raising the duck. The duck farms in this study are located at Blitar Regency, East Java. The total reared

duck population was varied from 1,000 to 1,750 ducks/period. The ducks were reared approximately for 40 days until weighed at 1.1 to 1.3 kg before sold to the supplier or distributor. The reared duck was Alabio and Mojosari crossbred, which served as dual purpose ducks (as egg and meat producer).

The laborers for duck farming were mainly from the farmer's family, while some farmers hired some laborers to support the duck rearing. The overview of duck farms in distribution channels I and II are presented in Fig. 2. The farmers sold their ducks through different distribution channels. It can be seen that the output price of the duck on Channel I was higher compared to Channel II (Table 2).

The output prices of the duck in Channel I and II were IDR 31,500 and IDR 25,000, respectively. The higher output price in Channel I is due to direct selling by the farmers to the supplier. Moreover, the labor input in Channel II is mostly from free labor and the conversion factor from the production input and output calculation in Channel I and II were 0.96 and 0.95, respectively. The result showed that the ducks rearing had low mortality due to the intensive farming system. It was reported by Dawan and Darana (2017) that the intensive farming system resulted in the low mortality of the reared animals. Low mortality rates in the intensive production system is probably due to the proper management, diet and health programs. The obtained value-added at duck farmer in this study was IDR 36,384,000 with the ratio of 75.19% in Channel I and IDR 29,250,000 with the ratio of 68.42% in Channel II.

Fałkowski *et al.*, (2017) mentioned that the farmers have always been in a weak position in the supply chain and are easy to be suffered due to the high transaction costs, cost of the contract and the relatively unstable feed price. However, a different result was shown in this study as duck farmers had the highest added value ratio compared to other participants (Table 2 - 5).

Table 2: Added value analysis at duck farmers

Variable	Unit	Value supply chain	
		Channel I	Channel II
Input, Output and Price			
Output	Ducks/period	1,536	1,663
Raw material	Ducks/period	1,600	1,750
Direct labor	Person	1.33	-
Conversion factor		0.96	0.95
Coefficient of direct labor	Person/duck	0.001	-
Output price	IDR ¹ /duck	31,500	25,000
Labor wage	IDR/period ²	1,330,000	-
Revenue and Profit			
Raw material price	IDR/period	12,000,000	13,500,000
Other input price	IDR/period	20,631,000	11,291,000
Output value	IDR/period	48,384,000	42,750,000
Added value	IDR/period	36,384,000	29,250,000
Added value ratio	%	75.19	68.42
Profit	IDR/period	14,423,000	17,959,000
Profit ratio	%	29.81	42

¹IDR = Indonesian Rupiah, ²one rearing period equals to 40 days

Table 3: Added value analysis at the distributor

Variable	Unit	Value supply chain
Input, output and price		
Output	Ducks/period	6,000
Raw material	Ducks/period	6,000
Direct labor	Person	2
Conversion factor		1.0
Coefficient of direct labor	Person/duck	0.003
Output price	IDR ¹ /duck	35,500
Labor wage	IDR/period ²	2,666,000
Revenue and profit		
Raw material price	IDR/period	150,000,000
Other input price	IDR/period	3,608,000
Output value	IDR/period	213,000,000
Added value	IDR/period	63,000,000
Added value ratio	%	29.58
Profit	IDR/period	56,726,000
Profit ratio	%	26.63

¹IDR = Indonesian Rupiah, ²one rearing period equals to 40 days

Table 4: Added value analysis at the supplier

Variable	Unit	Value supply chain	
		Channel I	Channel II
Input, output and price			
Output	Ducks/period	3,200	2,120
Raw material	Ducks/period	3,200	2,120
Direct labor	Person	3	3
Conversion factor		1.0	1.0
Coefficient of direct labor	Person/duck	0.009	0.01
Output price	IDR ¹ /duck	53,000	53,000
Labor wage	IDR/period ²	3,999,000	3,999,000
Revenue and profit			
Raw material price	IDR/period	100,800,000	213,000,000
Other input price	IDR/period	17,474,000	30,265,000
Output value	IDR/period	169,600,000	318,000,000
Value added	IDR/period	68,800,000	105,000,000
Value-added ratio	%	40.57	33.01
Profit	IDR/period	47,327,000	70,736,000
Profit ratio	%	27.9	22.25

¹IDR = Indonesian Rupiah, ²one rearing period equals to 40 days

Table 5: Value-added analysis at the fried duck restaurant

Variable	Unit	Value supply chain
Input, output and price		
Output	Ducks/period	9,200
Raw material	Ducks/period	9,200
Direct labor	Person	8
Conversion factor		1.0
Coefficient of direct labor	Person/duck	0.007
Output price	IDR ¹ /duck	100,000
Labor wage	IDR/period ²	11,200,000
Revenue and profit		
Raw material price	IDR/period	487,600,000
Other input price	IDR/period	565,348,000
Output value	IDR/period	920,000,000
Value added	IDR/period	432,400,000
Value-added ratio	%	47.00
Profit	IDR/period	144,148,000
Profit ratio	%	15.67

¹IDR = Indonesian Rupiah, ²one rearing period equals to 40 days

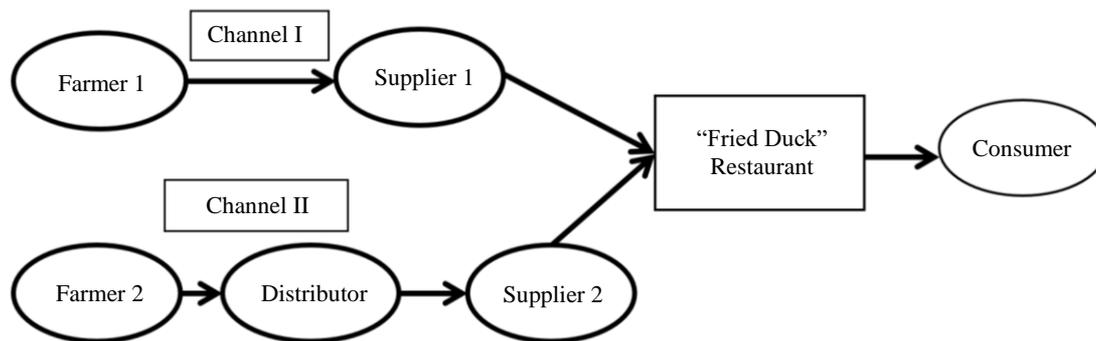


Fig. 1: Distribution channel of duck meat



Fig. 2: The overview of duck farm in distribution Channel I (a) and Channel II (b)

This finding probably because most of the duck farmers are joined in the farmers' association so that they have good position in the supply chain. Moreover, the current result is probably also related to the relatively short supply chain of the duck meat, added with the condition that the farmers reared their ducks independently, so the transaction costs can be suppressed. Besides, the risk factors are excluded from this study, while in this supply chain farmers would suffer the highest risk due to the unstable price of farming materials (feeds, medicine, etc.) as well as the farming failure (sickness, low production, or high duck mortality).

Added Value at Distributor

The added value analysis at the distributor is presented in Table 3. The distributor in this study hired 2 labors to sell 6,000 ducks in 40 days (one period) to the supplier. The output at the distributor in this study was IDR 213,000/period with the added value at IDR 63,000/period at the ratio of 29.58%. Moreover, the

obtained added value was from the marketing activities by the distributor, before reduced with labor cost.

Magdelaine *et al.* (2008) described that the role of the distributor is to mark the products with quality signals, such as by giving commercial labels, official certifications, logos, etc. Those activities would then tackle problems faced during marketing the product to the consumers and provide consumers with product recognition. In this study, the only added value activity by the distributor is to deliver the ducks from farmers in Blitar Regency to the duck supplier in Malang. Although the activity resulted in a low added value ratio (Table 3), the activity has a low operating cost. Moreover, product recognition is still considered not important by the duck supplier.

Added Value at Supplier

Supplier is one of the main participants in the supply chain with relatively similar interest (Chopra and Meindl, 2007). The supplier is the first product provider from the producer to the next user in the

supply chain. The product could be in the form of raw materials, additives, or finished products.

The supplier's activity in this study was processing the ducks into carcass for the fried duck restaurant. The processing includes slaughtering the ducks and remove the guts to produce carcass. Also, the duck guts were sold to the supplier. The carcass was cut into 4 parts and packaged before distributed to the fried duck restaurant daily.

The added value analysis at the supplier is presented in Table 4. In Channel I, every 3,200 carcass distribution required 3 laborers in a period with the output value at IDR 169,600,000 and value-added at IDR 68,800,000 at the ratio of 40.47%. In Channel II, every 3,120 carcass distribution required 3 laborers in a period with the output value at IDR 318,000,000 and value-added at IDR 105,800,000 at the ratio of 33.01%.

Manning *et al.* (2008) suggested that the development of suppliers requires the organizations involved to commit financial, capital and personnel resources to the development task and to share timely and sensitive information for performance improvement. Suppliers should focus on the consumer's demand, while also maintain product quality and continuity to ensure flexibility and quality of service with other members in the supply chain (Barratt, 2004; Manning and Baines, 2004). In this study, duck suppliers are obliged to provide duck meat to the restaurants. In this study, it is found that the duck suppliers' activity is focused on providing the duck meat suiting to the demands of the restaurant.

Added Value at Fried Duck Restaurant

The added value analysis in this study was done by measuring the obtained value-added in duck processing during distribution. The added value analysis in agricultural products can be done by measuring the increased value for each kilogram of the raw product after

processing. Hayami *et al.* (1987) mentioned that the factors which affect value-added can be categorized as technical and market factor.

The fried duck restaurant in this study obtained the duck meat from suppliers and then processed the meat before distributing it to the consumer. The processing activities which give value added at the duck restaurant include separating and frying the duck parts and provide spicy tomato sauce to complete the dish for the consumer (Fig. 3). In Table 5, it can be seen that the restaurant could distribute as much as 9,200 duck/period, which required 8 labors in the process. Among the laborers, one of them works as administrators who works for 10 h/day for 7 days and paid as much as IDR 2,000,000/month. The other laborers were responsible to prepare the food and drink, serving the consumers, cleaning, packaging and managing the payment.

The value-added was analyzed by following the Hayami *et al.* (1987) method showed that the obtained conversion factor is 1.0, which is calculated from the output and raw material during the distribution. The output value is calculated by multiplying the output price with the total output. The obtained output value in this study was IDR 920,000,000 at the ratio of 47%, thus the obtained added value was IDR 432,400,000. Moreover, the result of this study showed that value-added at the fried duck restaurant was higher compared to the duck farmer, distributor, or supplier. This indicates that the distribution activity at the fried duck restaurant was better compared to other activities by other distribution participants in the supply chain. The result of supply chain analysis in this study is different from the supply chain analysis of honey products by Qashiratuttarafi (2018), which showed that the highest value-added was obtained by packaging and distribution activity by the marketing outlet (supplier) with the added value ratio at 64%.



Fig. 3: Fried duck dish as the final product

Conclusion

The study concludes that:

1. There were 2 distribution channels in the duck meat supply chain in Malang. Channel I started from the duck farmer and supplier at Blitar Regency, fried duck restaurant and consumers in Malang. On the other hand, Channel II started from the duck farmer, distributor and supplier at Blitar Regency, fried duck restaurant and consumers in Malang
2. The highest added value ratio was obtained by duck farmers in Channel I (75.19%), while the highest profit ratio was obtained by duck farmers in Channel II (42%) in the duck meat supply chain in Malang
3. Distribution Channel I is recommended in the duck meat supply due to the shorter chain and consequently lower price

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Author's Contributions

Nanang Febrianto and Alditya Putri Yulinarsari: Conception and design, data collection and analysis, drafting the article, and give final approval of the version to be submitted and any revised version.

Budi Hartono: Conception and design, data collection and analysis, reviewing article critically for significant intellectual content, and give final approval of the version to be submitted and any revised version.

Ethics

The authors declare that there are no ethical issues may arise after the publication of this study.

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