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Analysis of The Efficiency of Value Chain on Livestock (Case Study: Chicken Meat)

Hana Catur Wahyuni^{1*}, Ika Ratna Indriastuti², Rima Azzahra

Universitas Muhammadiyah Sidoarjo, Sidoarjo, Indonesia

Email: hanacatur@umsida.ac.id¹, ikaratna@umsida.ac.id²

Abstract. In health, livestock products are a source of animal protein which is important for human health. However, in its development, there is a problem of inefficiency in the value chain of livestock products. This study used a case study on the chicken meat value chain. The research objective was to identify the value chain flow of chicken meat, identify the types of inefficient activities, and measure the level of inefficiency of each of these activities. The research method used is Failure Mode Effect Analysis (FMEA). The research was conducted in two stages. The first stage is carried out through observation to identify value chain flows and types of inefficient activities. The second stage is used to conduct an assessment so that the results of the inefficiency level are obtained. The results showed that there were several actors in the chicken meat value chain, including breeders, chicken distributors, chicken slaughter companies, chicken meat distributors, and chicken meat retailers. Overall, there are 25 inefficient activities in the chicken meat value chain. Activities with a high level of inefficiency occur in the process of slaughtering chickens. Therefore, the process of slaughtering chickens needs to be a priority for improvement in the future

Keywords: Livestock; value chain; FMEA; efficiency

1. Introduction

Animal husbandry is the motor of development in rural areas. Livestock is also an agribusiness industry that includes upstream and downstream with high economic value. Data from the Ministry of Agriculture shows that livestock has a contribution of 16.35% to GDP in 2018 and absorbs 4.83 million workers (an increase of 2.73% from 2015). In terms of health, livestock products are a source of animal protein which is needed by the body to form antibodies, enzymes, hormones, and repair and maintain body tissues. The level of consumption of livestock products affects the quality of human health so that it affects the level of availability of livestock foodstuffs and the income level of farmers. Chicken meat is one of the livestock products that are widely consumed by the community. To meet nutritional needs, it takes an average consumption of chicken meat of 113, 48 g / day [1]. As the human population grows, the demand for chicken meat is increasing. Therefore, the demand for chicken meat has increased significantly from year to year. However, in the process of fulfilling these needs, there are problems related to the chicken meat value chain. In this context, the chicken value chain is an important element in the food system, especially in policy analysis and intervention [2]. It is feared that the involvement of various parties in the chicken meat value chain, such as breeders, producers, retailers, the government, and third parties [3], is feared to lead to a decrease in efficiency, thereby hindering the productivity growth of the chicken meat industry. In this case, efficiency is necessary so that the profits of each party in the chicken value chain can increase to encourage productivity growth. In this study, the analysis tool to determine the efficiency of each activity in the



supply chain for chicken meat is the FMEA (Failure Mode Effect Analysis) method. This study aims to: (1) identify the systems and actors involved in the chicken meat *value chain*, (2) *identify the activities and their level of efficiency in the chicken meat value chain*.

2. Literature Review

The value chain is one aspect of increasing productivity through improving quality, efficiency, and product differentiation [4]. Corrective action in the value chain is carried out by identifying activities that provide business value, determining positions, and eliminating activities that do not provide value to products or services [5]. [6] states that the value chain is also a company development strategy by focusing on value-added activities for customer satisfaction. The value chain structure is adjusted to the company's strategy and traditions so that it differs between companies or between products [7]. Value chain management has a positive impact on companies, especially to monitor developments in costs and prices and encouraging productivity growth through managing product specialization, technology adoption, and efficient knowledge transfer [8]. The importance of value chain analysis has prompted various companies to carry out this analysis. In the agricultural sector, value chains are used to develop an environmentally friendly crop protection strategy by reducing the use of synthetic garden protection products [9]. In the food industry, value chains are used in the preparation of mitigation measures to eliminate processes that result in undetectable food loss [10]. In the context of the value chain, it is often found that activities that are inefficient value slow down business development. One of them, inefficiencies in the use of production inputs occurs because the purchase of raw materials has not been carried out collectively, so there is no discount in the process even though discounts are a form of production cost savings [11]. There are two ways for companies to streamline their value chains, namely by optimizing costs, saving various activities that require high costs, and streamlining various activities by eliminating activities that do not add value to their production process [12].

The implementation of value chain efficiency has been described in several previous studies. [13] researched the beef value chain associated with climate change and semi-arid land investment options in northern Kenya. The results of this study indicate that all beef value chain actors feel the impact of climate change on livestock and investment is needed for fattening or feedlot so that it can improve the quality of the meat produced. [14] uses the value chain concept as a policy instrument for aquaculture, horticulture, and dairy products in Southwest Bangladesh. In determining efficiency in the value chain, efficiency assessments can be carried out using the FMEA method. This method was first developed by NASA in 1963, then expanded to various car manufacturing industries to identify and measure the level of potential defects at the product design stage. Defects that occur in products are a form of inefficient activities. In its development, the use of the FMEA method can be used independently [15;16] or integrated with several other methods, such as Fuzzy [17], HACCP [18] and the QFD and ABC method [19].

3. Prepare Your Paper Before Styling

In its implementation, this research uses a case study of the chicken meat value chain in Sidoarjo, East Java, Indonesia. In the process, this research uses 3 stages, namely:

3.1 Activity Identification Stage

This stage aims to identify various activities carried out by all actors and business processes in the chicken meat value chain. Identification is carried out through observation at various locations, for example, traditional markets, chicken slaughterhouses, companies, and others. Interviews were conducted with value chain actors who already understand all activities in the chicken value chain.

3.2 Data Collection Stage

This stage aims to collect the necessary data in the measurement and analysis process with FMEA. Data collection is done by filling out questionnaires by value chain actors. The questionnaire consists of respondents' assessments of severity, detection, occurrence [20].

3.3 Measurement Stage And Efficiency Analysis

This stage aims to measure the efficiency value based on the RPN (Risk priority number) value. The RPN value illustrates the risk of inefficient activities. The higher the RPN value, the less efficient the activity is. The analysis is carried out by compiling recommendations to increase the efficiency of activities in the value chain.

4. Result

The value chain for chicken, from breeding to processed products that is ready for consumption by consumers, involves many parties. The parties involved in the value chain in this research area carry out various activities that are interrelated and influence each other. The chicken meat value chain consists of:

- a. Input supplier. The input suppliers consist of the actors providing chicken seeds, chicken feed, and medicines and vaccines. In this study, it is known that the type of input supplier can come from large, medium, or individual companies according to the size or size of the farms that will be supplied. Other results indicate that some of the actors in chicken breeding have relationships (subsidiary companies) with the actors of chicken farms or producers of processed chicken meat. This is done to ensure the quality of the meat produced.
- b. Production. Chicken breeders produce chicken meat in the value chain. Production includes the availability of land used for livestock, provision of food, and health checks which function to maintain the quality of chickens.
- c. Marketing. Marketing is carried out to market live chickens to consumers through traditional markets or live chicken distributors. Marketing for traditional markets is carried out by individuals who buy chickens on farms and sell them to household consumers. Meanwhile, live chicken distributors buy chickens from breeders in large quantities and sell them to chicken processing companies such as sausages, nuggets, meatballs, etc. Live chickens purchased by distributors are chickens of a certain size (flat) in bulk.
- d. Chicken meat processing. Chicken meat processing is carried out by large or medium-sized companies that will produce products made from chicken meat. This processing involves food additives, labor, and technology. Chicken processing companies will market their products through distributors/retail or directly to household consumers, caterers, hotels/restaurants.
- e. Distributor / retail. Distributor/retail is an actor in the supply chain that markets processed chicken products to consumers. Distributors have storage warehouses to ensure product availability is demanded by consumers.
- f. Consumer. In the chicken meat value chain, consumers consist of 3 (three) types, namely household consumers, caterers, hotels/restaurants. These consumers will process chicken/chicken processed products into dishes to be served and consumed by end consumers.

Based on a map of the chicken meat value chain, then identified the activities carried out by each actor as in Table 1.

Table 1. Value Chain Activities

Value chain actors	Activities	Potentially inefficient
Chicken breeding	Chicks health check (A1)	Time and accuracy of the examination
	Physical examination of chicks (size, weight) (A2)	Time and accuracy of the examination
	Feeding (A3)	An excessive amount of food
	Dosage of drugs, vitamins (A4)	Excessive dosage
chicken farm	Land availability (B1)	Not according to the number of

Value chain actors	Activities	Potentially inefficient
		chickens
	Cage temperature control (B2)	Temperature incompatibility with an age of chickens
	Feeding (B3)	An excessive amount of food
	Cage hygiene control (B4)	Not clean
	Physical examination of chickens (B5)	Time and accuracy of the examination
Traditional market	Chicken offer (C1)	Prices do not match the purchasing power of household consumers
	Waiting for buyers (C2)	Location is not strategic
	Chicken health check (C3)	Time and accuracy of the examination
Live chicken distributor	Chicken delivery (D1)	The mode of transportation is not suitable
	Physical examination of chickens (D2)	Time and accuracy of the examination
	Route selection (D3)	The furthest route
Chicken processing company	Physical examination of chickens (E1)	Time and accuracy of the examination
	Chicken Slaughter (E2)	Chickens die before being cut
	Removal of chicken feathers (E3)	The removal of chicken feathers is not clean
	Separation of chicken meat (E4)	The separation of chicken meat is not clean
	Production process (E5)	Processing time
	Processed product storage (E6)	Time, storage temperature
Distributor of processed chicken products	Delivery of processed chicken products (F1)	Incorrect mode of transportation
	Selection of delivery services (F2)	Delays in delivery
	Selection of distribution router (F3)	The furthest route
	Processed product storage (F4)	Time, storage temperature

Efficiency assessment for each activity in the value chain is as follows:

Table 2. Value Chain Assessment

Activities	Occurrence (O)	Severity (S)	Detection (D)	RPN (inefficiency priority)
A1	4	3	4	48 (1)
A2	4	3	3	36 (2)
A3	3	3	2	18 (3)
A4	3	2	2	12 (4)
B1	2	2	2	8 (4)
B2	4	4	4	64 (2)
B3	3	3	3	27 (3)
B4	2	2	2	8 (4)
B5	4	4	5	80 (1)
C1	4	4	3	48 (2)
C2	4	4	4	64 (1)
C3	4	4	3	48 (2)
D1	2	2	2	8 (3)

Activities	Occurrence (O)	Severity (S)	Detection (D)	RPN (inefficiency priority)
D2	4	3	4	48 (1)
D3	3	3	3	27 (2)
E1	4	4	5	80 (1)
E2	2	2	3	12 (2)
E3	2	2	2	8 (3)
E4	2	2	1	4 (4)
E5	2	2	1	4 (4)
E6	2	2	3	12 (2)
F1	2	2	2	8 (3)
F2	2	2	3	12 (2)
F3	2	2	4	16 (1)
F4	2	2	1	4 (4)

In table 1, the O, S, and D assessments of the respondents (people who are experts in the chicken meat value chain) were also assessed. The product of O, S, and D is the RPN value. The results showed that there were 25 potentially inefficient activities carried out by value chain actors. From table 1 it is known that the highest RPN value is found in the physical inspection of chickens on chicken farms and chicken meat processing. This activity has the potential for inefficient activities because it is related to the time and accuracy of the workforce who performs it. This activity requires a high level of expertise, so it requires a special workforce who is familiar with the chicken inspection system. If not, the inspection will take a long time and the results do not guarantee quality. The highest RPN value for each supply chain actor indicates the potential for inefficiency so that improvements must be made to optimize the results in the value chain. Therefore, based on these results, recommendations for improvements to increase efficiency in the chicken meat value chain are:

- Increase the ability of workers in the process of physical health checks for chickens, so that this activity can be carried out accurately and quickly
- In the marketing process, especially for target household consumers, a strategic location is needed to speed up time and price agreements between buyers and sellers.
- It is necessary to adopt technology to ensure that the route was chosen in the distribution process for processed chicken products is the best (shortest, safest, and fastest). The choice of distribution route is related to the quality of the product being sent.

5. Conclusion

Efficiency analysis is important to do in the chicken meat value chain. This is to identify various potentially inefficient activities so that they can be avoided. This research shows the complexity of the value chain in chicken meat which involves many parties. The results showed that there were 6 actors involved in the chicken meat value chain, which consisted of input (chicken breeding), producers (chicken breeders), marketing (live chicken sellers/distributors), chicken meat processing (companies / SMEs), distributors/retail for processed chicken and consumer products (household, catering, hotels, restaurants). Of the 6 value chain actors, 25 activities have the potential to result in inefficient chicken value chains. This potential inefficiency can be avoided by increasing the ability of workers to carry out health checks for chickens so that they can carry out their duties quickly and precisely. This section requires the role of government, especially from the element of animal health, socialization and training on animal health are needed to increase the knowledge and expertise of animal inspectors.

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