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Value Chain Analysis for Chicken Layer Industry on Districts in Limapuluh Kota Regency, West Sumatera

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***Abstract*—Eggs and chicken meat are poultry products, and their demand continuously increases yearly. Limapuluh Kota Regency is the home of the largest chicken layer industry in West Sumatra. This district's total population of chickens reaches as much as 10 million. This industry has made a significant contribution to the district's economy. In contrast, the number of farmers decreased significantly due to the low profit margin, while the egg market price was comparatively high. Our study aimed to investigate the value chain in the poultry product industry, especially in West Sumatra, and how the added value is shared among the actors. We want to determine the distribution channels, the actors, value creation, and value distribution along the supply chain. We analyze the value chain of the chicken layer industry, identify activities performed by each actor, and value creation in each stage. Value added was analyzed using a value-added Hayami method, defining the value added as the difference between the output and input values. The results showed that the structure of the industry value chain of chicken layer farms in Limapuluh Kota Regency consists of poultry shops (PS), breeders, traders, wholesalers, small traders, and consumers. Comparative analysis showed that wholesalers gain the most significant value-added distribution at 29.11 %, the second the breeder at 29.05 %, then small traders at 20.07 %, and then poultry shops at 14.17 %, and the last is traders at 7.60 %.**

***Keywords*—Added value; value chain; poultry supply chain.**

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I. INTRODUCTION

The agricultural sector is one of the critical sectors for developing the Indonesian economy [1]. We may observe evidence from the number of employees from 2006 to 2016 indicating that the agricultural sector is still the most significant contributor to Indonesian jobs. The agricultural sector in Indonesia consists of food crops, plantation crops, livestock, forestry, and fisheries. The livestock sector is one sub-sector of agriculture that is the leading food provider that sustains the economic growth rate. According to [2], as a driving force for national and regional development, the livestock sector plays an essential role in society's economy.

The magnitude of the role of the livestock sector in the community economy certainly increases business opportunities in animal husbandry. Another researcher [3] states that a lifestyle with high Per capita Purchasing Power (PPP) has increased meat consumption and production. The high business opportunities in animal husbandry are due to the yearly demand for livestock products. Among the livestock sectors, poultry farming is an activity that considerably influences national development. Eggs and chicken meat are a product of the poultry industry, which has a growing demand yearly. An increase in national income also accompanies increased egg consumption.

Egg consumption continues to increase from year to year, as shown in Table 1. The table shows that consumption in Indonesia increased by 21% during that period, making it the third most extensive worldwide. This figure also indicates that business prospects in the chicken layer field are still high. Household consumers and the food industry generally choose race chicken eggs because they are larger but cheaper [4]. In Indonesia, the poultry industry has become a vital sector of the national economy [5]. Broiler chicken is one of the leading commodities in the province of West Sumatra. There were 6,399 broiler-raising households, including 2,957 and 3,442 broiler-raising households. Egg production in West Sumatra has been able to meet demand. Table 2. shows statistics on poultry farming in West Sumatra from 2012 to 2016.

TABLE I
EGGS CONSUMPTION IN SEVERAL COUNTRIES 2012-2021 (PER CAPITA)

Country	2012	2021	% change
China	11.98	15.34	28%
India	2.01	2.76	37%
Indonesia	5.35	6.48	21%
Israel	64.80	68.83	6%
Malaysia	45.35	49.57	9%
Saudi Arabia	41.87	44.68	7%
United States	44.24	47.80	8%
Vietnam	11.73	14.26	22%

TABLE II
STATISTIC CHICKEN LAYER IN WEST SUMATERA 2012-2021

Year	Local chicken	Broiler chicken	Chicken layer	Duck
2012	4,872,190	17,439,623	8,130,585	1,201,265
2013	4,919,283	15,357,013	8,519,893	1,167,620
2014	5,031,885	17,921,143	8,393,469	1,215,872
2015	5,135,810	18,445,762	8,436,629	1,238,492
2016	5,238,526	18,790,036	8,332,868	1,275,076
2017	4,054,846	62,235,590	10,157,884	1,127,066
2018	3,974,889	65,436,217	11,235,623	1,101,263
2019	4,177,699	57,893,566	15,775,761	1,143,702
2020	4,219,452	54,364,507	21,612,067	1,169,392
2021	4,376,360	59,442,387	20,648,473	1,185,955

The research location is Limapuluh Kota Regency, shown in Figure 1. It is one of the regencies with the largest chicken layer population in West Sumatra. The chicken population has increased every year as a response to the increasing demand for eggs from year to year.

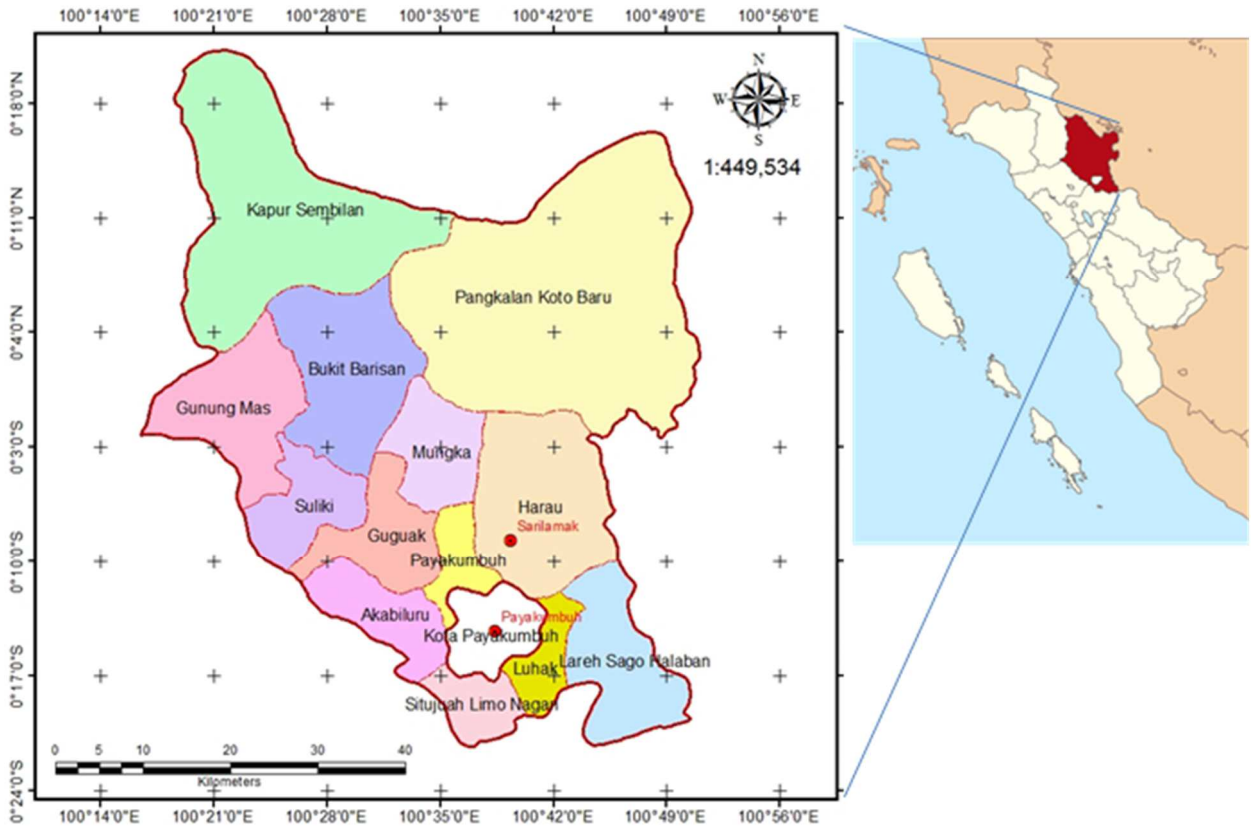

Fig. 1 Districts in limapuluh kota regency, West Sumatera, location of the research

According to [6], there was a decrease in the number of chicken layer households by 33.02%. The decline in the number of laying broiler breeders is due to pressure to increase production costs, which are not followed by an increase in selling price. The low sale price results in low value-added acquired by farmers. This unfortunate situation is related to its weakness in bargaining power compared to its buyer. Then sometimes forces some farmers to be quick in the business.

Traditional distribution patterns involve many market players acting individually according to their interests. Furthermore, each party in each stage wants higher profits from the transactions carried out—the supply chain practice sets farmers as the weakest in bargaining power than other players. Moreover, the farmers need more access to market demand and prices. In addition, long traditional distribution channels contribute to the high cost of goods sold (COGS), leading to lower profit.

Topics on the value chain for small industries have gained significant attention from many researchers, and the objects of investigation vary, as found in the paper presented by [6], [7], [8]. Khaleda and Murayama [9] investigate the value chain of poultry supply and value chain in Gazipur, Bangladesh. They focused their study on constraints in value chain development related to its physical and infrastructural Environment. The objective was to provide recommendations for overcoming the conditions that lead to higher profit levels for poor farmers. They found that feed costs absorb more than

70% of the total poultry production cost. Moreover, transportation is another significant factor that drives the total price. So, profitability can be improved by increasing the availability of good quality feed and better transportation arrangements.

Khoi [10] studied the value chain of the poultry industry in Vietnam. He found that the value-added distribution among different players in the value chain of the dairy sector is unfair. Players in production activities received a significantly low value-added portion due to the high input cost. Enormous profitability is enjoyed by big companies that manage processing activities. At the same time, Vietnamese consumers have only a few choices and must accept high prices due to the limited number of dairy companies in the market.

Choudhary et al. [11] present their report on an action research project to develop farmers' resilience by upgrading their position in the value chain of Malta orange products. The research was conducted with farmers in the Chamoli district of Uttarakhand. They focused on the production, processing, and marketing stages with a community-based development approach. They found that the share of value received by the farmer was so low that some farmers were frustrated and even cut the trees down. The research was conducted using a framework based on a value chain approach. In this method, they performed a value chain analysis considering economic, environmental, and social factors. After two years of implementation, they found that the action research improved productivity, value addition, and increased income. Moreover, new employment opportunities were also generated due to integrated community-based value chain development.

Investigating the supply chain of table grapes in China using a value chain analysis perspective has been published in [12]. The researchers pointed out that crucial actors still have problems regarding value distribution earned. Even though there is an apparent difference between the price at the farm gate and retail, Vine growers made much less than expected. It implies inequality of the profit shared among actors involved in the supply chain.

A study of the value chain of Commercial layer and indigenous chicken farming in Nairobi has been reported in [13]. The researchers used value chain mapping to investigate the challenges faced by producers. The research found that among the obstacles were poor feed quality, lack of space for expansion, insecurity, the occurrence of diseases, and a lack of sources of information on chicken management.

Other researchers have studied an evaluation of the banana industry value chain in Zimbabwe, which focuses on postharvest losses [14]. The authors assessed the current banana postharvest handling systems, estimated losses at each stage along the value chain, and investigated factors contributing to the postharvest losses at each location. It was found that the total postharvest losses were very significant, ranging between 24-27 percent of the whole production value. The leading causes of the failures are related to the length of distance between producer and processor, poor facilities and ripening techniques, lack of marketing experience, uncontrolled handling, flawed transport system, lack of a cold chain, and perishability nature of bananas.

The literature shows that problems arise in agricultural products' traditional value chain system, mainly due to the poor distribution of value created along the chain. The relatively low value received by production actors was actually for small farmers. This issue has been investigated by [15] and [16]. This situation affects the performance of the supply chain [17], [18], [19]. Preview researchers also raised this situation [20] and [21].

There are many publications on unfairness value distributions around the globe, such as in Europe, [22], [23], India [24], cases in Africa [25], [26], [27], in Brazil [28], [29], in Asia [30] and [31]. These studies dealing with different commodities inform us that this area of research is quite challenging. However, we have yet to find any publication on the value chain of the chicken layer industry in west Sumatra, which is one of the significant economic activities located in the Limapuluh Kota regency. We understand that value chain analysis is a tool to understand the process flow and value creation distribution. All actors involved are analyzed in detail to determine each player's value-added distribution and optimal profit. In this research, we want to choose the actors involved in the value chain of the layer chicken layer industry in Districts in Limapuluh Kota Regency. We also want to know how each actor obtains added value. This information will be valuable for the government in designing a suitable intervention to protect small farmers.

II. Materials and Method

We conducted a preliminary study to understand the context of the industry. We visited the district and interviewed local key players to understand the supply chain pattern. Next, we identify critical actors along the supply chain, the cost structures, and the selling price to calculate the added value obtained by each actor. We used purposive sampling because the researchers considered that chicken farmers had the information needed for this study. Purposive sampling is a sample taken with a specific objective and purpose. Purposive sampling consists of two types of models: judgment and quota. This study uses quota sampling because the samples are proportionally proportional but not randomly selected by chance.

The samples comprised 30 farmers, three collecting traders, four large and small traders, two poultry shops, and six consumers. The category we used is based on the classification made by the Ministry of Agriculture, as shown in Table 3 [31]. From the initial study, we assumed that our selected number of samples taken was sufficient to describe the whole situation of the industrial value chain of the chicken layer. We found that the respondent's information is generally homogeneous, with little difference.

TABLE III
Classification of Breeders in Limapuluh Kota Regency

No	Category	Chicken Population
1	Large	More than 65.000
2	Med	15.000 – 65.000
3	Small	Less than 15.000

There are 13 sub-districts in Limapuluh Kota Regency. The location of chicken farming is distributed in most sub-districts in this area, as shown in Table 4. However, four sub-districts have more chicken farming populations., i.e., Situjuh Limo

Nagari, Harau, Mungka, and Guguak sub-regency. Based on Table 4, the study sample was selected from 4 sub-districts: Payakumbuh, Harau, Mungka, and Guguak. The reason is that these four sub-districts have many farms, as shown in Table 4.

TABLE IV
RACE CHICKEN KEEPER HOUSEHOLD OF LIMAPULUH KOTA REGENCY

Sub-District	Laying hens	Broilers
Payakumbuh	71	119
Akabiluru	18	52
Luak	53	20
Lareh Sago Halaban	93	92
Situjuh Limo Nagari	29	193
Harau	78	104
Mungka	258	152
Guguak	373	71
Suliki	12	0
Bukit Barisan	2	2
Gunung Omeh	2	0
Kapur IX	0	1
Pangkalan Koto	1	0
Total	**990**	**806**

Based on Table 4, the study sample was selected from 4 sub-districts: Payakumbuh, Harau, Mungka, and Guguak. This is because these four sub-districts have many farms. The following is the number of respondents selected in each sub-district and the classification of farmers. Table 5 shows the number of samples in Guguak District for one category. The reason is that there are no breeders in the Guguak Subdistrict, having a population of more than 65,000 chickens. In the Guguak Subdistrict, the dominant breeders are farmers with a population of <15000, so we took more respondents in this category.

Data processing in this study begins with calculating each actor's income and expenditure and the added value of each actor. Next, we analyze the value-added distribution obtained by each actor in the value chain. Value-added distribution is obtained through each actor's product flow analysis, including output, input, and goods flow. We use the Hayami approach to analyze the added value, where the added value is the difference between the output and the input value.

TABLE V
NUMBER OF RESPONDENTS

Sub-District	Population	Classification of Breeders			Total
		<15.000	15.000-65.000	>65.000	
Payakumbuh	71	3	1	2	6
Mungka	258	4	4	1	9
Guguak	373	7	2	0	9
Harau	78	3	2	1	6
Total	780				30

Based on the references from Hayami's model, we calculate the added value and profits as presented in Figure 2.

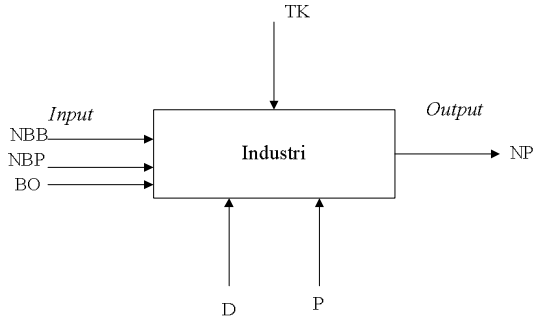

Fig. 2 An overview of Hayami's calculations

The calculation of value added by the Hayami method can be formulated as follows:

$$NT = NP - (NBB + NB) \quad (1)$$

While the benefits of each actor can be formulated as follows:

$$NT = NP - (NBB + NBP + TK + P + D) \quad (2)$$

Information:
NP = Product Value
NBP = Value of Supporting Materials
NBB = Value of Raw Materials
BO = Operational Costs
TK = Labor Cost
D = Depreciation
P = Tax

III. RESULTS AND DISCUSSION

This Section outlines the results of a study on the value chain analysis of the chicken layer industry in the Districts in Limapuluh kota regency. The analysis includes identifying actors, value chains, and marketing channels to distribute each actor's value-added value.

A. Actors in the Chicken Layer Industry Supply Chain

Many actors play a role in the chicken layer farm industry, from providing production facilities to marketing and distributing products to consumers. The actors involved in the chicken layer industries in Limapuluh Kota Regency consist of poultry shops, farmers (producers), traders, and consumers. Some agencies/institutions are also involved in the chicken layer industries, such as the Livestock Service Office and Banking Institutions, as shown in Fig. 3.

1) Supply chain players at the poultry shop level: Poultry shops play a vital role in providing production supplies for farmers. Poultry shops in Limapuluh Kota Regency Districts provide DOC, feed, medicines, and cage equipment for the chicken layer. Poultry Shops usually also act as egg traders. The chicken feed, DOC, and medications provided by poultry shops are purchased from companies and suppliers outside Limapuluh Kota, such as Medan, Padang, Pasaman, and others. Based on the interviews, the poultry shop needs help getting feed ingredients such as corn, bran, and soybean because seasons affect the supply of raw materials. Acquisition costs of these raw materials are higher during low season or shortage

periods. The poultry shop transfers the cost to its customers by selling them at higher prices. Aside from feed, poultry shops sometimes also need help supplying DOCs because companies that provide DOCs are far from Limapuluh Kota Regency.

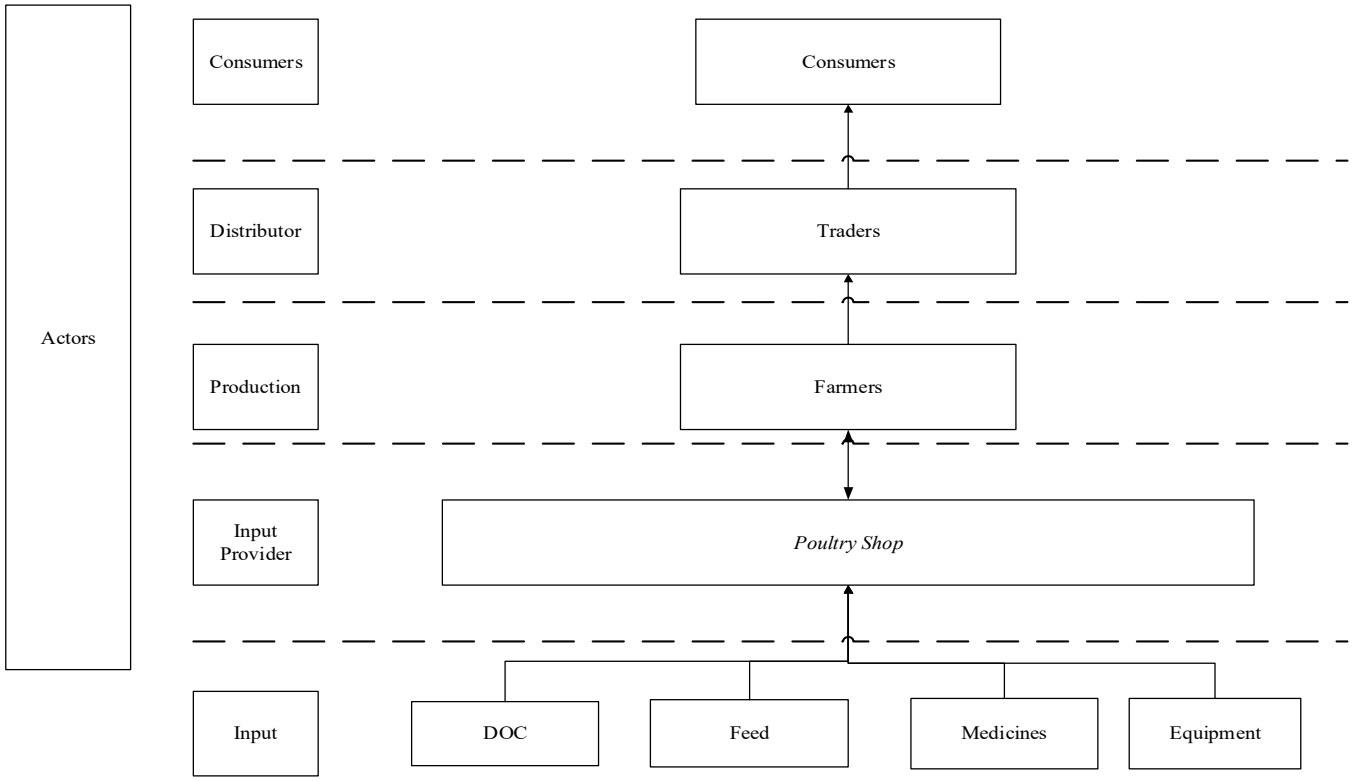

Fig 3. Supply chain actors of the chicken layer industry in Districts in Limapuluh Kota Regency

2) Supply chain actor at the farmer level: Farmers have the most crucial role in the chicken layer breeding industry because they act as producers or chicken layers to produce eggs. The number of farmers in Limapuluh Kota Regency, according to data from the Livestock Service Office (2013), is 990. The availability of facilities and infrastructure primarily determines the productivity of egg production in this industry: quality DOCs, feeds, medicines, and chicken layer equipment. Farmers claim to have problems with the supply of corn, beans, and soybeans for chicken meals. The obstacles are due to the market's limited availability, which results in high feed prices. The high feed price adds to the burden on farmers regarding production costs, which impacts the selling price of eggs, which must be adjusted accordingly. Unfortunately, the bargaining power of the small farmers is relatively low, so they need to be able to set the selling price.

Pricing by farmers is determined based on market price conditions and consideration of production costs incurred; besides that, farmers seek price information from other farmers in setting the selling price. The results of the field research show that most farmers sell egg production through collectors, and the rest are sold directly to consumers or through poultry shops.

3) Supply chain actors at the trader level: The supply chain of the chicken layer in the Limapuluh Kota Regency consists of several traders, namely traders, wholesalers, and small traders (retailers). Collecting traders, also called mobile traders (tauke), manage eggs from one farmer to another. The eggs collected by the collecting traders are sold to wholesalers outside the production area, but some collectors sell directly to consumers. Collector traders in the District of Limapuluh Kota distribute their egg products to places such as Jakarta, Padang, Pekanbaru, Siak, Dumai, and Palembang, so the determination of the selling price of eggs is also influenced by selling location. Collecting traders often face various risks in distributing eggs, such as product damage during transport and handling, which results in significant losses. Large traders sell large quantities of their products (eggs). They buy eggs from collectors, but it is also a common practice that they buy directly from farmers. Large traders sell eggs to retailers or direct consumers. The difference between large and small traders is merely based on their trading quantity.

4) Customers: End consumers are the last supply chain actors in the chicken layer industry. End customers are the parties who buy eggs from farmers, collectors, wholesalers, or small traders. The end customers for eggs produced by farmers in Limapuluh Kota are spread out from local areas of West Sumatera and Cities in Java.

B. Value Chain and Marketing Channels

A value chain is a series of activities carried out by a company to produce products or services. It includes actions from raw materials to after-sales handling. The value chain also includes activities that occur due to relationships with suppliers and consumers. The range of measures contained in a value chain aims to create and increase added value and competitive advantage for companies or actors in a value chain.

The value chain of the chicken layer industry in Limapuluh Kota Regency, from farmers to consumers, consists of several marketing stakeholders, namely poultry shops, traders, wholesalers, and small traders. Marketing is conducted not

only for the Limapuluh Kota Regency area but also for areas outside Districts in Limapuluh Kota Regency, such as Jakarta, Padang, Pekanbaru, Siak, Dumai, and Palembang. Overall, the value chain in the chicken layer industry is shown in Figure 4.

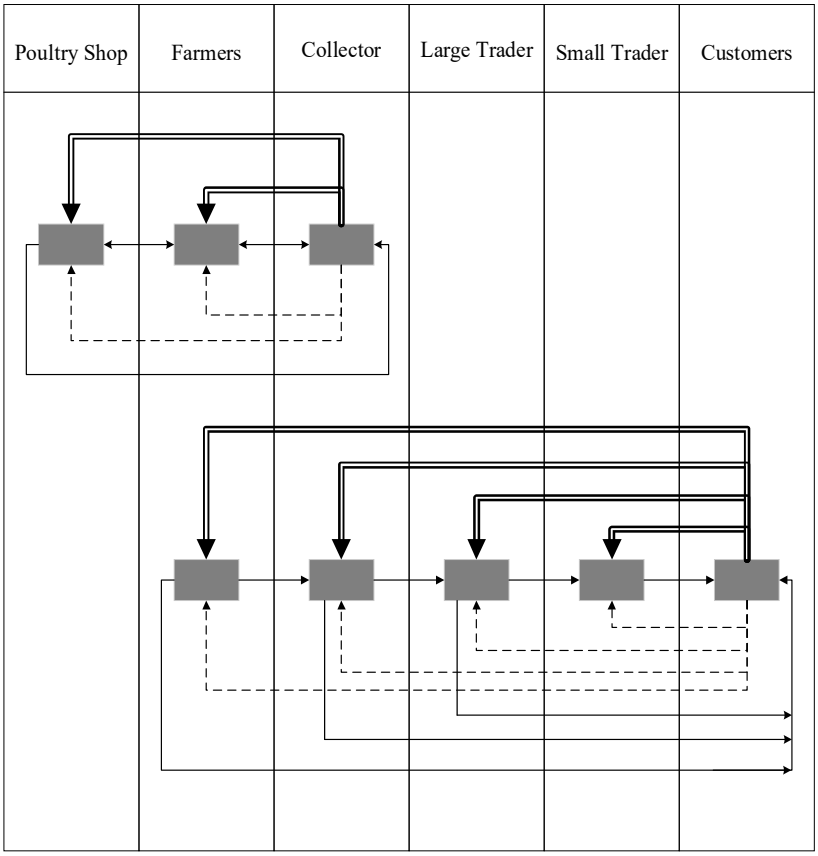

Fig .4 Value chain in the chicken layer industry

Note:
The flow of goods :
The flow of Money :
The flow of information :

Figure 4 shows the value chain of the chicken layer industry, which starts with the purchase of DOC (day-old chick) by farmers to the poultry shop to be cultivated. The poultry shop also provides production facilities such as feed, medicine, and chicken layers. After the chicken layer produces eggs, farmers sell eggs through collectors or direct consumers. Collectors, consumers, or poultry shops usually transport eggs using small trucks. In some cases, farmers deliver eggs directly to buyers.

After collectors get eggs from farmers or poultry shops, collectors directly bring eggs to wholesalers or their consumers. Collecting traders are exposed to some risks during transportation, such as eggs breaking or falling during the trip. This unexpected event will increase containing traders' costs. After the eggs reach the wholesalers, large traders sell eggs directly to retailers or end consumers.

The distribution of eggs requires information flow to achieve the supply chain objectives. A Good information flow between supply chain actors may lead to excellent and transparent relationships to increase trust and commitment to cooperate. The flow of information in the laying industry supply chain consists of market information, prices, and cultivation techniques of the chicken layer.

The information farmers require includes feed availability, such as corn, bran, and soybean meal. The farmers also need to know which companies sell at a lower price. Collectors and poultry shops require information about farmers' needs and product availability. All supply chain members need information regarding egg demand, supply costs, and conditions.

Limapuluh Kota Livestock Service Office also provides technical information on cultivation, price, and market information, such as daily egg price information. Breeders usually obtain price information from collectors or poultry shops that buy eggs. Some farmers seek information from peer farmers who have made recent transactions. Sales or price information is also exchanged among traders based on traditional relationships. Most farmers receive information from their customers based on trust.

This trust grows due to long business relationships between farmers and their egg buyers. However, such conditions rarely exist. Traders generally have greater bargaining power to set their favorable prices. When the price of eggs decreases in the market, the information is conveyed immediately to the farmer. Still, if the cost of eggs increases, the data is kept for

quite a long time, so the buyers enjoy a more significant margin.

In addition to product and information flow, financing is essential to the chicken layer's industrial supply chain. The breeders mostly use their funding and loans from banks. Based on our interviews, farmers need help expanding their business due to the supply chain's need for smoother cash flow. Managing cash flow and challenges have become significant reasons many farmers go bankrupt.

The money flow between actors is only sometimes smooth due to non-cash transactions. Some farmers buy chicken feed, DOC, and other consumables by a non-cash model transaction. They take the item first and then pay later after selling eggs. Similarly, the flow of money between traders and farmers, or collectors and poultry shops, could be smoother, influencing the players' cash flow. On the other hand, the flow of funds between large traders and traders and wholesalers and retailers can be classified as smooth since they usually run their businesses more professionally.

The marketing channel for egg products in Limapuluh Kota Regency involves all existing stakeholders. Traders help farmers market the eggs quickly to consumers. However, if the marketing channel is quite long, the price the consumer will receive will be higher. Limapuluh Kota has nine marketing channels for the chicken layer, from farmers to consumers. The marketing channels for the chicken layer can be seen in Figure 5.

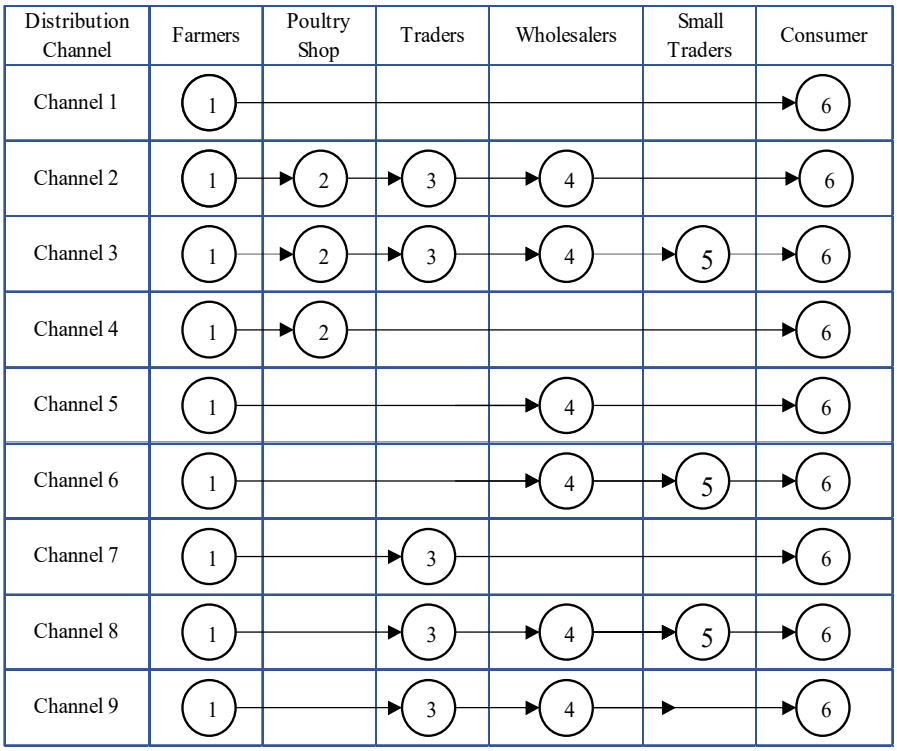

Fig. 5 Marketing channel of eggs production in Limapuluh Kota Regency

In Figure 5, we can see the channel of egg distribution in Limapuluh Kota Regency. It begins with farmers selling eggs in three ways: direct sales to consumers, sales to poultry shops, and sales to collectors. In addition, the marketing actors involved in channeling eggs into the hands of consumers consist of traders, wholesalers, and small traders.

Distributing products to end consumers may follow short or lengthy channels according to the player's choice. The difference in marketing channel selection is due to several reasons, such as choice of business models, selling prices, transportation options, and sales quantity. Egg marketing paths are varied; this is a result of the vast marketing area. Most Eggs from Districts in Limapuluh Kota Regency are marketed to areas outside West Sumatera, such as Jakarta, Padang, Pekanbaru, Siak, Dumai, and Palembang.

Based on our study, 63.2% of respondents sold their products through channel 7, channel 8, and channel 9. While 6.6% of the breeders sell eggs using channel 2, channel 3, and channel 4, namely through poultry shops, and 13.2%, sell eggs using channel 1, selling eggs directly to end customers. The remaining 17.0% of eggs are sold through channels 5 and 6.

It is also expected that farmers sell eggs via multiple channels, including channel 1, channel 7, channel 8, and channel 9. However, most products were sold to collecting traders (99%). Only about 1% goes to direct consumers. Furthermore, some breeders sell through channels 2, 3, 4, 7, 8, and 9, as well as collectors and poultry shops. The proportion of eggs channel of sale is 50 percent via traders and 50 percent via poultry shops.

Egg marketing primarily uses channels 7, 8, and 9, namely, selling eggs through collectors. These channels are flexible in quantity and can accommodate any order size. By selling through this channel, farmers do not have to worry about the risk of unsold products. If the farmers sell directly to consumers, it is considered inefficient since it will increase transportation costs.

C. Distributions of Value-Added in the Chicken Layer Industry

We analyze the value-added distribution among actors in the value chain and calculate the percentage of value-added share in each supply chain model. The activities in the chicken layer industry begin with the preparation of materials, production of eggs, distribution, and sale to end customers. Each stage consumes resources and adds value to the product.

The added value calculation is conducted based on total sales from all actors. Value-added distributions can be obtained by calculating each actor's income using the chicken population's equivalence. All total revenues are converted into cost per chicken by having the number of eggs produced and the expenditure of one laying chicken. A chicken can lay as many as 300 eggs per year. While the amount of expenses according to Sularso et al. [33], the cost of spending for one chicken in one month is IDR 17,562. Value-added distribution calculations are based on the sample of our 30 respondents (breeders), two poultry shops, three egg collectors, and four representatives for wholesalers and small traders. The small number of samples does not affect the results because the respondents' information is generally homogeneous, and there is little difference between them.

TABLE V
VALUE-ADDED DISTRIBUTION AMONG ACTORS

Variable	Value Chain Actors					Total
	Poultry Shop	Farmer	Collector Trader	Larger Trader	Small Trader	
Total Value Added	2,049,600,000	1,511,298,623	330,210,560	80,232,000	4,781,250	1,926,522,433
Chicken Population Equivalent						
Source of Main Revenue (IDR)	35,600	19045	15909	1009	87	
Other source of revenue	17,340					
Total	52,940	19,045	15,909	1,009	87	88989
Value Added (IDR/Equiv. Chicken/ Year)	38,716	79352	20757	79529	54810	273163
Chicken Population	5,543,388					
Value Added estimated (IDR)	214,616,849,879	439,979,924,576	115,062,401,559	440,857,962,261	303,834,526,090	1,514,250,664,364
Value Added Distribution (%)	14.17%	29.06%	7.60%	29.11%	20.07%	100.00%

Based on Table 5, traders gained the most significant value share (29.11%). The reason is that the selling price increased significantly compared to the price at the farmer level. In addition, large traders can observe market opportunities and have access to direct contact with end consumers because most consumers tend to buy from large traders.

Breeders earn the second highest share of value-added, at 29.05 percent. Selling eggs, chicken, used bags, and chicken manure adds value to the company. Farmers' added value could be better than other actors who only get added value from egg sales. Furthermore, the number of farmers far outnumbers the number of different players. The low value-added obtained by each farmer is due to the low bargaining position of farmers as producers compared to other actors, where farmers are only the recipients of prices from parties who have the power to bargain. A lack of market and information access harms farmers' bargaining power.

The collecting trader obtained the smallest added value (7.60%). The low value added at the level of the collector is because they only act as an intermediary between farmers or poultry shops with wholesalers or end customers. In addition, traders have more significant expenditures than other traders, namely transportation costs. Retailers obtain the third largest share of value-added, amounting to 20.07%. Usually, retailers sell eggs in small quantities, so retailers set a higher margin. In addition, the cost of goods sold for retailers mainly comes from the purchase of eggs and small marketing costs resulting in higher profits.

The distribution of added value at the poultry shop level comes from selling feed, DOC, medicines, and cage equipment, with egg sales being an extra revenue. The value added received by the poultry shop is around 14.17%. The poultry shop does not control the price for feed, DOC, medicines, and cage equipment; it only follows price patterns formed by the top companies that supply them. Each actor's inequality of added value share indicates marketing inefficiency, where business only benefits certain parties. The farmers need more access to price information. Farmers need more market information to sell their products at the best possible profit.

Price information received by chicken farmers is often different from market prices. Small traders set their prices by bargaining with wholesalers. In comparison, large traders set prices based on market opportunities. Large traders have access to more up-to-date market information. For this reason, it is necessary to have supervision from the government to increase and equalize the value-added distribution of the chicken layer industry. Government support is needed because the chicken layer industry has high value-added potential if the government can integrate agribusiness communication in an integrated manner both horizontally and vertically. Government policy on the chicken layer industry in Limapuluh Kota Regency is required to protect small farmers' fair share of the value created along the supply chain.

The significant price differences among supply chain actors must not disadvantage farmers. There is a need to establish close collaboration between industry players. Districts in Limapuluh Kota regency may act as information providers and counselors for farmers. They can assist in cultivation techniques, producing local feed formulas, cage environmental management, and ensuring feed availability for the chicken layer industry. Furthermore, the government body may also help small players access cheap funding or business loans.

In addition, the government should promote cooperation among large-scale and small-scale layer chicken farmers. Consolidating among all farmers may help match supply and demand while stabilizing the market in the case of high egg demand. Unrealistic price increases and market scarcity of eggs can be avoided. Furthermore, each actor should build an

integrated livestock agribusiness system from upstream to downstream to address the existing issues, particularly the need for price transparency and limited information. A strong distribution network is also required to ensure that each actor communicates with one another.

IV. Conclusion

The value chain structure in the chicken layer industry in Limapuluh Kota Regency consists of poultry shops (PS), breeders, collectors, wholesalers, small traders, and consumers. The value chain of chicken layer industry activities begins with farmers purchasing DOC (Day Old Chick) from a poultry shop to be cultivated. The poultry shop also sells production supplies such as feed, medications, and chicken layer equipment. Farmers sell their products to collectors, but some sell directly to consumers or poultry shops. Collector traders transport eggs directly from farmers or poultry shops to wholesalers or consumers who buy eggs from them. After the eggs reach the wholesaler, the eggs are sold to retailers or consumers.

There are nine different types of marketing channels. The following are the types of media in the chicken layer industry:

- Breeders–Consumers;
- Breeders-Poultry Shop-Collector Traders-Wholesalers – Consumers;
- Breeders-Poultry Shop-Collectors-Wholesalers-Small traders–Consumers;
- Breeders - Poultry Shop – Consumers;
- Breeders - Wholesalers – Consumers;
- Breeders - Wholesalers - Small traders – Consumers;
- Farmers - Collectors - Wholesalers - Small traders – Consumers;
- Breeders - Collector Traders – Consumers;
- Breeders - Collecting Traders - Wholesalers – Consumers.

The results of the value-added distribution analysis show that the most extensive value-added distribution is 29.11% and 29.05% gained, respectively. Small traders secure 20.07% of the share, poultry shops at 14.17%, and the last collector traders at 7.60%. The uneven distribution of value added is due to the need for more price transparency caused by limited information between actors.

Future research can explore the value-added distribution in different areas of Indonesia since it is interesting to understand the general situation of Indonesia's chicken layer value chain system. We also need to investigate the fairness aspects of value distribution among the actors. It is also essential to consider risk aspects and identify factors affecting fairness for four sub-districts in the Limapuluh Kota regency to display the results of more optimal value chain statistics.

References

[1] Ul Khairiyakh and J. Handoyo Mulyo, "Contribution of Agricultural Sector and Sub Sectors on Indonesian Economy," 2015.

[2] P. Priyono and A. Priyanti, "Perspective on the Production Availability of Animal Protein Source from Livestock in Indonesia," Indonesian Bulletin of Animal and Veterinary Sciences, vol. 28, no. 1, p. 23, 2018, doi: 10.14334/wartazoa.v28i1.1410.

[3] V. Tenrisanna and S. N. Kasim, "Trends and forecasting of meat production and consumption in Indonesia: Livestock development strategies," IOP Conf Ser Earth Environ Sci, vol. 492, no. 1, 2020, doi:10.1088/1755-1315/492/1/012156.

[4] N. Khoiriyah, R. Anindita, N. Hanani, and A. W. Muhaimin, "Animal food demand in Indonesia: A quadratic almost ideal demand system approach," Agris On-line Papers in Economics and Informatics, vol. 12, no. 2, pp. 85–97, 2020, doi: 10.7160/aol.2020.120208.

[5] C. Ferlito and H. Respatiadi, "Policy Reforms on Poultry Industry in Indonesia Discussion Paper," 2018.

[6] J. Thorpe, "Procedural Justice in Value Chains Through Public–private Partnerships," World Dev, vol. 103, pp. 162–175, 2018, doi: 10.1016/j.worlddev.2017.10.004.

[7] L. T. Tham, J. Pretzsch, and D. Darr, "Asian timber value chains- a systematic review and research agenda," For Policy Econ, vol. 112, no. January, p. 102116, 2020, doi: 10.1016/j.forpol.2020.102116.

[8] D. C. Little, J. A. Young, W. Zhang, R. W. Newton, A. Al Mamun, and F. J. Murray, "Sustainable intensification of aquaculture value chains between Asia and Europe: A framework for understanding impacts and challenges," Aquaculture, vol. 493, no. October 2017, pp. 338–354, 2018, doi: 10.1016/j.aquaculture.2017.12.033.

[9] S. Khaleda and Y. Murayama, "Geographic concentration and development potential of poultry microenterprises and value chain: A study based on suitable sites in Gazipur, Bangladesh," Soc Sci, vol. 2, no. 3, pp. 147–167, 2013, doi: 10.3390/socsci2030147.

[10] N. V. Khoi, "Wicked problems: A value chain approach from Vietnam's dairy product," Springerplus, vol. 2, no. 1, pp. 1–7, 2013, doi: 10.1186/2193-1801-2-161.

[11] D. Choudhary, M. S. Kunwar, and G. Rasul, "From Farmers to Entrepreneurs - Strengthening Malta Orange Value Chains Through Institutional Development in Uttarakhand, India," Mt Res Dev, vol. 35, no. 1, pp. 4–15, 2015, doi: 10.1659/mrd-journal-d-14-00036.1.

[12] L. Deng, R. Wang, T. Dong, J. Feng, and M. Weisong, "Assessing the table grape supply chain performance in China – a value chain analysis perspective," British Food Journal, vol. 118, no. 5, pp. 1129–1145, 2016, doi: 10.1108/BFJ-09-2015-0310.

[13] M. Carron et al., "The broiler meat system in Nairobi, Kenya: Using a value chain framework to understand animal and product flows, governance and sanitary risks," Prev Vet Med, vol. 147, pp. 90–99, Nov. 2017, doi: 10.1016/j.prevetmed.2017.08.013.

[14] B. Mvumi, L. T. Matsikira, and J. Mutambara, "The banana postharvest value chain analysis in Zimbabwe," British Food Journal, vol. 118, no. 2, pp. 272–285, 2016, doi: 10.1108/BFJ-08-2014-0293.

[15] H. Bin Aslam, P. Alarcon, T. Yaqub, M. Iqbal, and B. Häsler, "A Value Chain Approach to Characterize the Chicken Sub-sector in Pakistan," Front Vet Sci, vol. 7, Jul. 2020, doi: 10.3389/fvets.2020.00361.

[16] L. A. German, A. M. Bonanno, L. C. Foster, and L. Cotula, "'Inclusive business' in agriculture: Evidence from the evolution of agricultural value chains," World Dev, vol. 134, 2020, doi:10.1016/j.worlddev.2020.105018.

[17] D. T. Armanda, J. B. Guinée, and A. Tukker, "The second green revolution: Innovative urban agriculture's contribution to food security and sustainability – A review," Glob Food Sec, vol. 22, no. August, pp. 13–24, 2019, doi: 10.1016/j.gfs.2019.08.002.

[18] C. Makate, "Effective scaling of climate smart agriculture innovations in African smallholder agriculture: A review of approaches, policy and institutional strategy needs," Environ Sci Policy, vol. 96, no. January, pp. 37–51, 2019, doi: 10.1016/j.envsci.2019.01.014.

[19] A. de Janvry and E. Sadoulet, "Using agriculture for development: Supply- and demand-side approaches," World Dev, vol. 133, p. 105003, 2020, doi: 10.1016/j.worlddev.2020.105003.

[20] T. Hooks, O. McCarthy, C. Power, and Macken-Walsh, "A co-operative business approach in a values-based supply chain: A case study of a beef co-operative," Journal of Co-operative Organization and Management, vol. 5, no. 2, pp. 65–72, 2017, doi:10.1016/j.jcom.2017.10.001.

[21] S. W. Purcell, B. I. Crona, W. Lalavanua, and H. Eriksson, "Distribution of economic returns in small-scale fisheries for international markets: A value-chain analysis," Mar Policy, vol. 86, no. September, pp. 9–16, 2017, doi: 10.1016/j.marpol.2017.09.001.

[22] F. Qin, F. Mai, M. J. Fry, and A. S. Raturi, "Supply-chain performance anomalies: Fairness concerns under private cost information," Eur J Oper Res, vol. 252, no. 1, pp. 170–182, 2016, doi:10.1016/j.ejor.2016.01.033.

[23] H. M. Stellingwerf, A. Kanellopoulos, F. C. A. M. Cruijssen, and J. M. Bloemhof, "Fair gain allocation in eco-efficient vendor-managed inventory cooperation," J Clean Prod, vol. 231, pp. 746–755, 2019, doi: 10.1016/j.jclepro.2019.05.232.

[24] P. K. Mishra and K. Dey, "Governance of agricultural value chains: Coordination, control and safeguarding," J Rural Stud, vol. 64, no. January, pp. 135–147, 2018, doi: 10.1016/j.jrurstud.2018.09.020.

[25] T. Duguma, “Value Chain Analysis of Ethiopian Coffee (Coffea arabica),” Archives of Current Research International, vol. 11, no. 1, pp. 1–15, 2017, doi: 10.9734/acri/2017/31486.
[26] K. O. Lugusa, O. V. Wasonga, Y. A. Elhadi, and T. A. Crane, “Value chain analysis of grass seeds in the drylands of Baringo County, Kenya: A producers’ perspective,” Pastoralism, vol. 6, no. 1, pp. 1–16, 2016, doi: 10.1186/s13570-016-0053-1.
[27] M. Demont and M. Ndour, “Upgrading rice value chains: Experimental evidence from 11 African markets,” Glob Food Sec, vol. 5, pp. 70–76, 2015, doi: 10.1016/j.gfs.2014.10.001.
[28] H. S. De Figueiredo, M. P. M. Meuwissen, I. A. Van Der Lans, and A. G. J. M. Oude Lansink, “Beyond upgrading typologies – In search of a better deal for honey value chains in Brazil,” PLoS One, vol. 12, no. 7, pp. 1–23, 2017, doi: 10.1371/journal.pone.0181391.
[29] A. H. V. Bevilacqua, R. Angelini, J. Steenbeek, V. Christensen, and A. R. Carvalho, “Following the Fish: The Role of Subsistence in a Fish-based Value Chain,” Ecological Economics, vol. 159, no. February, pp. 326–334, 2019, doi: 10.1016/j.ecolecon.2019.02.004.
[30] K. A. Thi Nguyen and C. M. Jolly, “Balancing interests of actors in the ocean tuna value chain of Khanh Hoa province, Vietnam,” Mar Policy, vol. 98, no. September, pp. 11–22, 2018, doi:10.1016/j.marpol.2018.08.033.
[31] G. Luitel, “Value chain analysis of coffee production in central Nepal,” no. November, 2017.