

---

**RESEARCH ARTICLE**

## Cattle Supply Chain Transformation during Covid-19 Pandemic

Supriyo Imran<sup>1</sup> and Ria Indriani<sup>2</sup> ✉

<sup>1,2</sup>Department of Agribusiness, Faculty of Agriculture, State University of Gorontalo, Indonesia

**Corresponding Author:** Ria Indriani, **E-mail:** [ria.indriani@ung.ac.id](mailto:ria.indriani@ung.ac.id)

---

**ABSTRACT**

Beef cattle are a source of food for basic human needs, and their fulfillment is a part of the human rights of every Indonesian individual. The amount of beef consumption and production will potentially change along with the increasing number of cases of the Covid-19 pandemic in Indonesia. This study aimed to analyze the transformation of the beef supply chain during the Covid-19 pandemic. This study was conducted from June to August 2020 in Gorontalo regency. The data analysis used descriptive analysis, marketing margin, and breeder's share. The study showed that there are six distribution channels for cattle and beef cattle in Gorontalo regency, one of which are Channel: Breeder-Collector-Kalimantan Island. During the Covid-19 pandemic, there had been a change in this channel, namely Breeder-Collector - PT. Rizki Mandiri-Social Assistance. Neither the delivery time nor the quota sent can be precisely predicted. The only weakness is there is no written agreement at the breeders' level. The information on the price is not well integrated. The number of slaughtered or sold cattle was higher before the pandemic than that during the pandemic. On the other side, the prices for beef cattle and beef have increased during the Covid-19 pandemic. Of all the beef cattle distribution channels, channel 1 has the largest marketing margin value at IDR 5,500,000/head, and the smallest farmer's share is 38.8 percent.

**KEYWORDS**

Transformation; Structure; Supply Chain; Covid-19

**ARTICLE INFORMATION**

**ACCEPTED:** 01 December 2022

**PUBLISHED:** 04 December 2022

**DOI:** 10.32996/jhsss.2022.4.4.29

---

**1. Introduction**

Beef cattle are considered a source of food for basic human needs, and their fulfillment is a part of the human rights of every Indonesian individual. Animal food derived from livestock, such as meat, eggs, and milk, serve as a source of nutrients, primarily protein and fat, for humans. The amount of beef consumption increased every year from 2007 to 2010 by 11.77% (Directorate General of Animal Husbandry and Animal Health, 2012).

Based on Central Bureau of Statistics data, ruminant meat consumption significantly increased by 18.2%. It was 4.4 grams per capita per day in 2009 and 5.2 grams per capita per day in 2014. On the other hand, the supply of local beef has only fulfilled 65.24% of the total national demand, so the shortfall is still met from imports in the forms of feeder cattle and frozen meat.

The cases of the Covid-19 pandemic in Indonesia are continuously increasing. A Covid-19 pandemic is a form of danger that has the potential to threaten all aspects of people's lives, such as social, economic, health, and psychology. The public has got started to feel its impact in those sectors. The social welfare issue of the community has become a big concern (Ahsan, 2020). The uncertain end of corona pandemic will potentially have an impact on people's consumption patterns, especially beef.

Supply chain management for agricultural products represents the overall management from processing, distribution, and marketing, including the desired product, to reach the consumers, aiming to make the entire system efficient and effective, to

minimize costs of transportation and distribution, inventory of raw materials, internal materials, and processes, as well as finished goods (Marimin & Magfiroh, 2013).

The Indonesian government has implemented a Large-Scale Social Restriction (so-called PSBB) policy in several regions in Indonesia, including Gorontalo regency, as one of the efforts to prevent the spread of the coronavirus. The food and Agriculture Organization (FAO) of the United Nations (UN) has released a statement that food supply delays due to the policies to restrict human movement in several countries. It certainly has a big impact on food production and distribution. That condition will influence the availability of beef supply in the Gorontalo regency. Therefore, it has an effect on the amount of production from breeders to fulfill the demand for beef ordered by traders and consumers. The production facilities such as vitamins, feed, and medicines have also been affected by the restriction of the goods distribution. The situation has made it difficult for breeders to provide their infrastructure for production in the market.

Several studies on supply chains have been carried out. Pizutti *et al.* (2017) studied the beef supply chain model (Mesco) in Italy. The traceability aspect of the fruit supply chain in India was in more depth studied by Dandage (2016). Indriani (2019) examined the performance of the supply chain for cayenne pepper. Through those previously related studies, it is clear that no one has examined the food supply chain during the Covid-19 pandemic. Therefore, this study aimed to analyze: (1) the transformation of the supply chain for beef cattle before and during the COVID-19 pandemic and (2) the marketing margin of beef cattle and breeder's share.

## 2. Literature Review

A study on the other aspect of the supply chain concerned with the relationship between the barriers to wheat exports and the availability of supply throughout the wheat supply chain influencing the price fluctuations in domestic end consumers in Serbia (Djurics and Götz, 2016). Another study was about the price factor plays an important role in the supply chain mechanism, and the risk factors are also important in the sustainability of the tobacco supply chain in Temanggung, Central Java (Muchfirodin, Guritno, and Yuliando, 2015).

Uncertainty is a very frequent occurrence in the supply chain activities in agriculture. In dealing with uncertainty, the latest methods related to agribusiness supply chain management are required, covering efficiency, responsiveness, market competitiveness, and business integration (Borodin *et al.*, 2016). Due to the uncertainty in the supply chain, there requires supply chain resilience. The supply chain resilience study on the employees of electronics companies was conducted by Rajagopal (2016) in India.

Indriani *et al.* (2020) study showed the price factor has the highest value because the price of cayenne in Gorontalo Province very fluctuated following the market mechanism. The policy recommendation for developing the cayenne supply chain, which has the highest value and the first priority, was the policy of determining the government's purchase price.

## 3. Methodology

This research was conducted from June to August 2020 at Asparaga in Gorontalo regency. The sampling technique applied snowball sampling, starting from the breeders and traders to butchers. The data in this study used primary data and secondary data. The primary data was the cross-section data taken from the breeders, traders, and butchers totaling 16 people. The secondary data was obtained from the Livestock Service Office, the Central Bureau of Statistics, the district office, and other related offices. The data analysis employed in this study was descriptive, focusing on the marketing margin and breeder's share to describe the transformation of the beef cattle supply chain before and during the COVID-19 pandemic. Mathematically, the marketing margin and breeder's share can be expressed by using the formula for marketing margin and breeder's share as follows.

$$M = Pr - Pf \quad (1)$$

$$Pf(PS) = (Pf / Pr) * 100\% \quad (2)$$

In which:

M is the Marketing margin, Pf (PS) is Breeder's share, Pr is the Price at the retail level (retail price), and Pf is the Price at the breeder level.

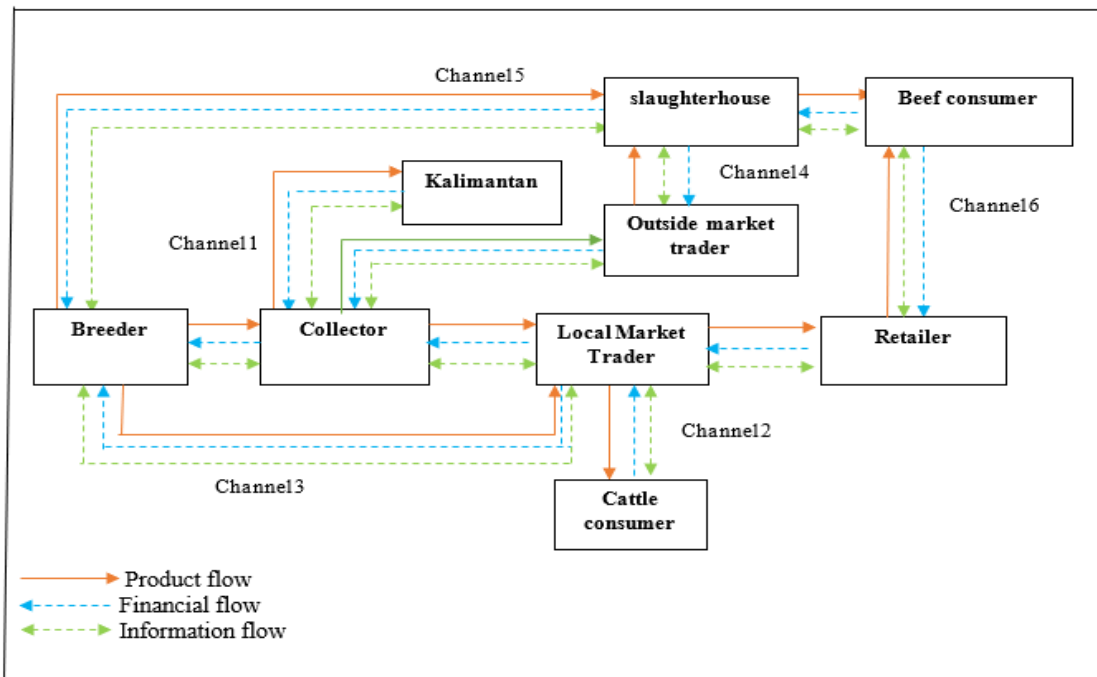
## 4. Results and Discussion

The production-distribution process is an integral part of the beef cattle supply chain. The distribution process will indirectly form a channel that connects every link involved in the supply chain for beef cattle in Gorontalo regency.

### 4.1. Supply Chain Structure

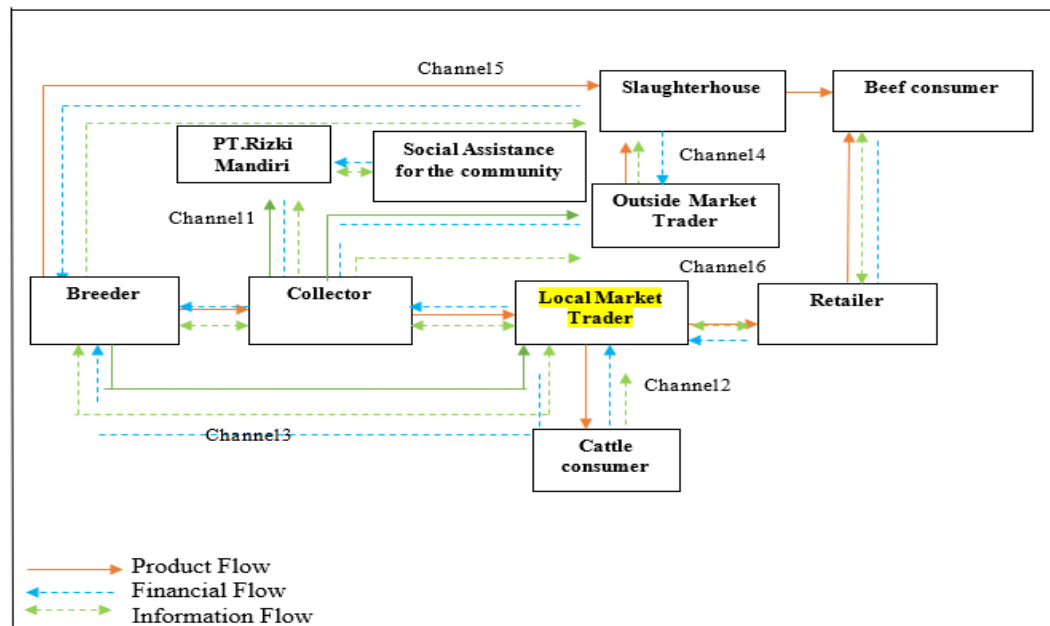
Before the Covid-19 pandemic hit Indonesia, especially Gorontalo Regency, there were six distribution channels for cattle. Channels 1, 2, and 3 were the cattle distribution channels. The first channel was Breeder-Collector-Kalimantan. The second channel was

Breeder-Collector-Market Trader-Consumer. The third channel was Breeder-Market Trader-Consumer. Channels 4, 5, and 6 were the beef distribution channels. The fourth channel was Breeders-collector-market traders outside the sub-district-slaughterhouses-consumers. The fifth channel was Breeder-Slaughterhouse-consumer. The sixth channel was Breeder- Collector-market trader-retailer-consumer. Its illustration can be seen in Figure 4.



**Figure 4. The Flow Patterns of Beef Cattle Supply Chain in Gorontalo Regency before COVID-19 Pandemic, 2020.**

Figure 4 shows the chain structure of beef cattle and meat in the Gorontalo Regency before the COVID-19 pandemic. There were 6 (six) distribution channels. The results indicated that only 20 percent of breeders used direct channels (channel 3), namely the direct distribution of beef cattle to market traders, and 80 percent of breeders involved collectors in the beef cattle distribution (channels 1, 2, 4, 5, and 6). During the Covid-19 pandemic, there was a change in the supply chain for beef cattle in Gorontalo Regency. It can be seen in Figure 5.



**Figure 5. The Flow Patterns of Beef Cattle Supply Chain in Gorontalo Regency during COVID-19 Pandemic, 2020.**

Figure 5 shows the changes in the distribution channels of cattle and beef before and during the Covid-19 pandemic. The policy of Large-Scale Social Restriction has made it difficult to distribute beef cattle out of the area, so channel 1, expected to send cattle to Kalimantan, has become the Breeder-Collector Trader - PT. Rizki Mandiri-Social Assistance to the Community. The social assistance was issued by the Ministry of Social Affairs of the Republic of Indonesia, in which PT. Rizki Mandiri has been chosen to be the representative. PT. Rizki Mandiri partners with collector-traders handling the activities to directly slaughter cattle and supply beef to the company. The flow patterns in the supply chain for beef cattle in Gorontalo Regency illustrate the flow of products, finance, and information that occur among the chain members. It can be observed in Table 1.

**Table 1. The Flow Patterns Transformation of Beef Cattle Supply Chain in Gorontalo Regency, 2020**

Flow Patterns	The Covid-19 Pandemic Period	
	Before	After
Product Flow	The purchase or slaughter of beef cattle was 4 heads a week	The purchase or slaughter of beef cattle has decreased to 2 heads a week
Financial Flow	The price of beef cattle per head was sold for IDR 5 to 6 million. The price of beef was IDR 110,000 per kg. It was easy to sell the livestock	The price of beef cattle has increased by IDR 7.5 to 11 million. The price of beef has increased by IDR 120,000 per kg. It has been difficult to sell livestock
Information Flow	Demand and availability of beef cattle, both quantity, and price, were sometimes not properly recorded, so the information obtained by members of the supply chain was confusing.	Information on the price of beef cattle and the amount of demand and supply of beef cattle has increasingly been unclear.

Source: Primary data, 2020

#### 4.2. Product Flow

The product flow starts with the breeder. The breeder raises the calves aged under one year old, keeps them for 1.5 - 2.5 years, and then will be for sale and brought to the collectors or market trader. The average sale of beef cattle is only 1 head. For consumption, the cattle are slaughtered by butchers at the slaughterhouses or market traders for beef supply during a single day. One cattle approximately results in 50-70 kg of beef. The beef will be taken directly to consumers or retailers for sale. In a week, the number of cattle slaughtered by the butchers is 1 through 2 heads. The flow of cattle and beef products from breeders to market traders has not been well integrated. There is no definite cycle of it. Neither the delivery time nor the quota sent can be precisely predicted. The price obtained also tends to show the same problem.

The number of sales or slaughter of beef cattle by market traders or slaughterhouses was higher before the pandemic. Before the pandemic, there were 4 cattle sold or slaughtered in a week. During the pandemic, there have been only 2 cattle a week. The lower consumer demand has made it so since there are no more cattle shipments to the other areas, especially Kalimantan. On the other hand, many markets had closed because of the Large-Scale Restriction regulation. Its consequence, of course, would have been experienced by the market traders with more problems in selling beef. Besides that, the Large-Scale Restriction regulation that prohibits wedding parties or social gatherings has made consumer demand for beef also decrease. Even though there has been a company (PT. Rizki Mandiri) in collaboration with the Indonesian Ministry of Social Affairs to distribute social assistance to the community in the form of beef, there is still no effect on the increase in demand for beef during the COVID-19 pandemic.

#### 4.3. Financial Flow

The financial flows originate from the market traders. The market traders distribute money to collecting traders and slaughterhouses. Next, the collector distributes money to the breeders. The form of payment for any transaction of cattle and beef sale by market traders, collectors, and slaughterhouses to breeders is cash.

The financial flow management of the beef cattle supply chain in Gorontalo Regency has been well managed. The weakness of the financial system in the cattle supply chain is that there is no written agreement between the breeders and the intermediary traders. Also, the price of cattle is determined by the collectors and the market traders. Sometimes there are price negotiations in which the traders want to lower the prices. On the contrary, the breeders want to raise cattle prices to earn more profits. However, the tougher the negotiation, the lower the price will be, and the breeders will suffer a loss. That is why the breeders rarely renegotiate the price set by the collecting traders.

There are differences in financial flows during the COVID-19 pandemic and before the pandemic. Before the COVID-19 pandemic, the price of slaughter cattle per head was sold for IDR 5-6 million. During the COVID-19 pandemic, the price of beef cattle has increased and reached IDR 7.5 to 11 million per head. Likewise, the price of beef has been higher during the Covid-19 pandemic than before the pandemic. In the past, the price of beef before the pandemic was sold for IDR 110,000 per kg. During the pandemic, it has increased and is valued at IDR 120,000 per kg. The most determining factor is the amount of beef supply which has been reduced due to the decreased frequency of beef cattle slaughter. In addition, the number of collecting traders and market traders who buy cattle from breeders has been decreasing. Some traders have stopped selling beef cattle during the pandemic. It is because of the lack of capital and higher living costs. During the COVID-19 pandemic, many markets were closed. This circumstance has become a difficult situation for market traders to sell beef.

#### **4.4. Information Flow**

The flow of information that occurs among the members of the supply chain includes prices, cultivation techniques, and the application of technology. The price information occurs among actors involved in the financial flows. That information flows from the market traders to the collectors and breeders. The weakness of the flow of information in the cattle supply chain lies between the demand and the availability of beef cattle in case of quantity and price. Both quantity and price are sometimes not precisely recorded, so the information obtained by the members of the supply chain is confusing and leads to fluctuations in prices.

The situation has been getting worse during the COVID-19 pandemic. The information on the price, the number of requests, and the availability of beef cattle have increasingly been unclear, especially the price determination by those collecting traders and market traders. It has led to fluctuating prices. The higher cost of living and the number of layoffs during the pandemic have led to a decline in consumer demand for beef. Besides that, the Large-Scale Social Restriction policy has made the delivery of beef cattle to other regions delayed, and the market closed. This condition has caused difficulties for the breeder or traders to sell their beef cattle and beef. Before the pandemic, many consumers held parties or celebrations. The Large-Scale Social Restriction, which bans mass gatherings or parties, especially weddings, has had an effect on beef consumption as the main dish at any party. It has certainly been an impact on the demand for beef.

#### **4.5. Supply Chain Members**

The beef cattle supply chain structure involves members of the supply chain. The members of the beef cattle supply chain in Gorontalo Regency are:

##### **a. Breeder**

Breeders are the institutions that act as the main producers in the supply chain for cattle. The production activities are fully carried out by the breeder. The maintenance of beef cattle in Gorontalo regency uses a traditional system in which cattle are not kept in pens. Besides that, animal feed is only in the form of grass and rice bran. The breeders also do not use vitamins or drugs. When their livestock is diseased, the breeders only give traditional ingredients to heal their livestock. The average number of respondents' livestock is 4 heads consisting of males and females with a maintenance period of 2- 6 years. The breeder sells one cattle at the age of 2 years to the collector, who collects it in the cowshed. Besides that, some breeders bring their cattle to the market to be directly sold to the market traders. The distance between the breeder's location and the market is approximately 10-15 minutes, with a transportation cost charged at IDR 50,000 per head. The selling price of cattle is IDR 3,500,000 - IDR 8,000,000 per head, depending on their age and body weight. The average weight of beef cattle sold is around 60-80 kg.

##### **b. Collectors**

Collectors are the first marketing agencies involved in the distribution of beef cattle. The location of the collectors is close to the breeders' residence, located in Asparaga. However, there are also some collectors from outside of Asparaga, namely Tolangohula, Boliyohuto, and Dungalio. The purchasing mechanism of beef cattle indicates that the breeders contact the traders. The collectors directly visit the breeder's house. The form of payment is cash. The collectors transport beef cattle by using a pick-up car to the market. The transportation costs are charged at IDR 100,000-IDR 150,000 per head. The selling price of beef cattle is IDR 8 million-IDR 10 million per head. However, there has been a selling price increase of beef cattle during the COVID-19 pandemic.

##### **c. Market trader**

Market traders are the marketing institutions that directly deal with the consumers and those around the market. The destination markets for traders are the markets in Gorontalo regency, located at Asparaga, Pulubala, Mohiyolu, Wonomulyo, and Moluho. There are two types of market traders, namely cattle traders and butchers. The market traders buy cattle from breeders or collectors. They then sell the cattle to the slaughterhouse or consumers to raise them. The purchases of beef cattle by market traders range from 1-2 heads at a price of IDR 7,500,000. The price is depended on the traders' determination

based on the weight of the cattle. The greater the weight of the cow, the more expensive it will be. The market traders sell beef cattle to consumers who want to raise them.

The market traders buy meat from animal slaughterhouses. However, there are also market traders who directly cut the cattle and then sell meat to retailers. The traders sell beef to the consumers for their daily needs or consumers who will carry it through a party or a celebration. The total demand for beef customers can be fulfilled by 5-7 kg per day. Before the Covid-19 pandemic, the beef sold by retailers reached 10-15 kg per day. The market traders' supply was 50-70 kg of beef. However, the supply was not sold out, and the remained 30 kg was stored. The selling price of beef is IDR 120,000 per kg now. There is an increase if compared to the price before the Covid-19 pandemic, valued at Rp. 110,000 per kg. The market traders stored the beef in storage boxes for 4-5 days due to the beef condition if no freezer, which may hold lengthier maintenance of beef. The payments are directly made by cash to the breeders, collectors, and butchers at the slaughterhouse. The market trader uses a pick-up car to carry beef cattle.

#### d. Slaughterhouse

A slaughterhouse is the chain link in the supply chain, which acts as a place to carry out the process of slaughtering cattle into beef. The slaughterhouses are situated at Asparaga and Boliyohut. The slaughterhouse has 2-5 butchers paid IDR 50,000 for one cattle. This kind of place holds a business license. The activity carried out by the butcher is cutting the cow into beef. The cutting is done three times a week. If you cut 1 cattle head, it will be about 50 kg-70 kg of beef. The selling price is IDR 120,000 per kg. The butchers only do beef storage for seven days because there is no freezer to keep beef fresh. The beef is not packaged and immediately brought to the market traders for sale. The market traders make payments by cash. During the COVID-19 pandemic, only one slaughterhouse has packed meat using plastic, even though no label is attached. The beef is then brought to PT. Rizki Mandiri, a social assistance supplier for distribution aimed at the public.

#### e. Retailer trader

A retailer is a marketing agency that sells beef to consumers. The total demand for beef that can be fulfilled is around 5-7 kg per day. Before the COVID-19 pandemic, beef sold by retailers could reach 10-15 kg per day. The retailer supplies 20-30 kg of beef, which can be stored for four days. The selling price of beef is IDR 120,000 per kg. There is an increase if compared to before the COVID-19 pandemic, valued at IDR 110,000 per kg.

#### f. Consumer

Consumers are links that consume or utilize beef cattle (whether or not to raise, to consume daily, or to be served a menu for a celebration or a party).

### 4.6. Marketing Margin and Farmer's Share

Marketing margin is the difference between the price paid by the consumers and the price received by farmers or the cost of marketing services. A farmer's share is a portion of the value paid by the final consumer received by farmers in the form of a percentage (Sudiyono, 2004). This analysis is useful to know the share of prices received by the producers from the prices paid by the consumers in each marketing channel (Fajar, 2014). Below is the value of the marketing margin and farmer's share of beef cattle based on the distribution channels. It can be seen in Table 2.

**Table 2. Value of Marketing Margin and Farmer's Share of Beef Cattle in Gorontalo Regency, 2020**

Marketing Channel	Selling price at Breeder (IDR a head)	Selling price at final level (IDR a head)	Marketing Margin (IDR a head)	Farmer's share (%)
1	3.500.000	9.000.000	5.500.000	38,8
2	4.000.000	8.000.000	4.000.000	50,0
3	5.000.000	8.000.000	3.000.000	62,5
4	4.000.000	9.000.000	5.000.000	44,4
6	4.000.000	8.000.000	4.000.000	50,0

Source: Primary Data, 2020

Table 2 shows that the first channel has the largest marketing margin value of IDR 5,500,000 per head, and the smallest percentage of the farmer's share is 38.8%. The first channel indicates the low share of the selling price received by the breeders because the selling price is quite low, IDR 3,500,000 per head. This is due to the cattle distribution for social assistance to the community. Meanwhile, the selling price at the collector level is IDR 9,000,000 per head, and the higher marketing margin is taken by the collector. According to Asmarantaka (2012), the more expensive the consumers pay for the price offered by traders, the less the share received by farmers. It is because agricultural commodities are sold at relatively low prices. Heryadi (2011) explains that the

process of price formation or determination will always be associated with the urgency of cash needs from breeders. If a breeder needs cash, he only acts as a price taker since the bargaining position is weak. Some marketing practices done by intermediary traders or brokers have the potential to harm the farmer's position.

Table 2 also illustrates the third channel, which has the smallest marketing margin, valued at IDR 3,000,000 per head, and the largest farmer's share is 62.5 %. The third channel indicates that the breeders get the most profit in direct selling to the market traders. According to Fajar (2014), a greater farmer's share value reflects a more efficient supply chain. The farmer's share value is the opposite of the marketing margin value. The larger the farmer's share, the smaller the marketing margin value. On the other side, the greater the proportion of prices received by farmers, the fairer the existing marketing system (Muslim and Darwis, 2012). This condition is believed to be able to stimulate the farmers to continue producing. Agriculture is a business with a high risk, so the farmers should have the right to get an adequate proportion of prices at the consumer level.

## **5. Conclusion**

The transformation of the supply chain for beef cattle during the Covid-19 pandemic is as follows: changes in the supply chain for beef cattle, especially on channel 1, where the delivery of cattle to Kalimantan Island has stopped because of government regulations. Government regulations are large-scale social restrictions (PSBB) in which the shipment of goods or people has been stopped. This caused the distribution of cattle that should have been to Kalimantan to turn into social assistance for the community, handled by companies appointed by the government. In addition, the flow pattern of the beef cattle supply chain shows that the number of cattle sales has decreased, the price of cattle has increased, and limited information is obtained by farmers due to many livestock markets being closed. The contribution of this research is the availability of information about changes in the beef supply chain before and during the Covid-19 pandemic. The limitation of this research is due to regulations restricting people from leaving their homes which made it difficult for researchers to take large samples for interviews due to the prohibition to leave the house; besides that, the pandemic caused many livestock traders to stop their activities. Further research on farmer income during the Covid-19 pandemic needs to be carried out to find out whether the covid pandemic has affected the income of cattle breeders and traders.

## **Originality, Funding, and Conflict of Interest**

I am fully agreed that the manuscript with the title of "Cattle Supply Chain Transformation During Covid-19 Pandemic" will be published in the Journal of Humanities and Social Sciences Studies. The manuscript is an original work from the author(s) and has never been published in any kind of publishing media. The author (s) will not publish the manuscript in any kind of publishing media when it has already been published in the Journal of Humanities and Social Sciences Studies. This research did not receive external funding, purely from independent research. This research does not have any conflict of interest; it only wants to contribute to the advancement of science.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflict of interest.

**Publisher's Note:** All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

## **References**

- [1] Asmarantaka R.W. (2012). *Agrimarketing*. Departmen of Agribisnis FEM-IPB. Bogor.
- [2] Borodin K. (2016). Handling Uncertainty in agricultural supply chain management: state of the art. *European Journal of Operational Research* 13619. 10.1016/j.ejor.2016.03.057
- [3] Chopra S and Meindl. P (2004). *Supply Chain Management: Strategy, Planning, and Operation*. Pearson Prentice Hall. United States of America.
- [4] Dandage K. (2016). Indian perspective in food traceability: A review. *Food Control Journal*.10.1016/j.foodcont.2016.07.005.
- [5] Djuric S & Götz, (2016). Export restrictions – Do consumers really benefit? The wheat-to-bread supply chain in Serbia. *Food Policy Journal* 63 (2016) 112–123.
- [6] Fajar, A.I (2014). *Analysis of the Corn Supply Chain in West Java Province*. Thesis. Postgraduate School. Bogor Agricultural Institute
- [7] Hastang. (2014). *Beef Cattle Supply Chain Based on People's Farms*. Dissertation. Postgraduate school. Hasanuddin University. Makassar.
- [8] Hastang, S. N. and Sirajuddin, A. A (2015). *Beef Marketing Efficiency in Regional Slaughterhouses (PD RPH) Makassar City*.PKP. Hasanuddin University. Makassar.
- [9] Heryadi, A.Y. (2011). Beef Cattle Marketing Patterns in Madura Island. *Jurnal Sosial Ekonomi Peternakan*. 38-46
- [10] Indrajit RE & Djokopranoto. R. (2002). *The Concept of Supply Chain Management: A New Way of Looking at the Supply Chain*. Grasindo. Jakarta.
- [11] Koesmara, H.S. and Nurtini, I.G.S. (2015). Factors Affecting the Marketing Margins of Beef and Beef Cattle in Aceh Besar District. *Buletin Peternakan*. 39 (1): 57-63.
- [12] Indriani, R. Darma, R, Musa, Y, Tenriawaru, A.N and Arsyad M. (2020). Policy Design of Cayenne Pepper Supply Chain Development. *Bulgarian Journal of Agricultural Science (BJAS)* .26 (3) June 2020.page:499-506.

- 
- [13] Marimin & Magfiroh, N. (2013). *Application of Decision-Making Techniques in Supply Chain Management*. IPB Press Publishing. Bogor.
- [14] Muchfirodin, G, Y. (2015). Supply Chain Risk Management on Tobacco Commodity in Temanggung, Central Java (Case study at Farmers and Middlemen Level). *Agriculture and Agricultural Science Procedia* 3 ( 2015 ) 235 – 240. The 2014 International Conference on Agro-industry (ICoA): Competitive and sustainable Agroindustry for Human Welfare
- [15] Muslim, C & Darwis. V (2012). National Soybean Performance and Farmer Share Analysis and Soybean Marketing Channel Efficiency in Cianjur Regency. *Journal SEPA*. 9 (1) September: 1-11.
- [16] Pizzuti, K (2017). MESCO (MEat Supply Chain Ontology): An Ontology for Supporting Traceability in the Meat Supply Chain. *Food Control Journal*
- [17] Rajagopal, (2016). Forecasting Supply Chain Performance Resilience Using Grey Prediction. *Electronic Commerce Research and Applications*.
- [18] Pane, I. (1993). *Cattle Breeding*. Gramedia Pustaka Utama. Jakarta.
- [19] Yulianto, P & Saporinto. C. (2010). *Intensive Beef Cattle Rearing*. Penebar Swadaya. Jakarta.