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Food Supply Chain Strategies during the COVID-19 Pandemic

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Abstract— *Due to its role in fulfilling the community's need for nutrition and a strategic economic commodity, beef is considered pivotal. The early system of beef commodity distribution obliges manufacturers to process beef in several stages, starting from beef cattle farmers to retail beef traders, beforeit reaches consumers. Such a long beef supply chain is allegedly one of the causes which bring about its expensive price, especially during the COVID-19 pandemic. Accordingly, this research aims to collate a beef supply chain strategy during the COVID-19 Pandemic. This research was conducted in GorontaloIndonesia in June-August 2020. Sampling was done using the snowball sampling technique, from the farmers, traders, and butchers. Data analyzed in this research were primary and secondary. The data analysis used was the SWOT analysis. Our findings led us to formulate four beef supply chain strategies, i.e., 1) SO strategy: developing beef cattle breeding centers, delivering technical guidance and intensive socialization to farmers, developing reliable and sustainable institutional partnerships, and socializing agricultural waste-based food processing technology to farmers; 2) WO strategy: exerting the government's supports, i.e., equipment, capital, fodders, breeds, vitamins, storage equipment, and drugs for cattle and farmers, orienting the management system to semi-intensive and intensive patterns through a crop-livestock integration system), socializing a marketing information system to farmers, and using information properly; 3) ST strategy: protecting domestic markets, overcoming reproductive diseases and maintaining cattle health, and socializing digital marketing and product diversification; and 4) WT strategy: developing agribusiness markets and market operation, granting business credits to traders, and complying with the government regulation on the standard price for the sale of beef cattle and beef.*

Keywords— *resilience, food, availability, consumption, distribution.*

I. BACKGROUND

The aim of agricultural development is to manifest food resilience so Indonesia can regulate and fulfill its community needs for food in a resilient way (Anugrah, 2020). Food resilience by definition is a condition in which we can confirm food fulfillment in households. It is reflected by adequate food availability, in terms of either the number or the quality, which is secure, evenly distributed, and affordable. Developing food resilience is literal community empowerment which builds their independence and capacity, allowing them to make an active engagement in manifesting food availability, distribution, and consumption from time to time (BKP Pertanian, 2020).

In its attempt to fulfill its population needs for food, Indonesia must require food availability in a sufficient number, fulfilling consumption adequacy and the national stock, in accordance with operational requirements of extensive and evenly distributed logistics, especially during the COVID-19 pandemic, which is a non-natural disaster. The COVID-19 Pandemic has started its fifth-month transmission in Indonesia, as of March in which the first confirmed-positive case took place, and now has been

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In its attempt to fulfill its population needs for food, Indonesia must require food availability in a sufficient number, fulfilling consumption adequacy and the national stock, in accordance with operational requirements of extensive and evenly distributed logistics, especially during the COVID-19 pandemic, which is a non-natural disaster. The COVID-19 Pandemic has started its fifth-month transmission in Indonesia, as of March in which the first confirmed-positive case took place, and now has been

extensively impacting various domestic sectors. Trading, transportation, and tourism sectors, including agricultural sectors cannot avoid the impact of the havoc. The ever-increasing COVID-19 cases generate unaccessible food sources and inevitable moving restrictions. Burgui (2020) argues that a global pandemic will result in an increase in famine and malnutrition cases.

Agricultural sectors which produce protein, energy, vitamins, and minerals are growing due to raised awareness of the need for nutrition to elevate life quality among the community. One of the animal proteins mostly consumed is beef. Prevailing as a strategic economic commodity, beef is considered crucial in the fulfillment of the community's need for nutrition (Yulianto and Saparinto, 2010). Beef consumption had apparently increased by 18.2%, from 4.4 gram/cap/day in 2009 to 5.2 gram/cap/day in 2014. In other words, in the same timeline, local beef availability reached the percentage of 65.24% of the total national need. The shortage was covered by importing beef, either feeder or frozen beef (DirektoratJenderalPeternakan dan Kesehatan Hewan, 2015).

Supply chain constitutes the sequence of processes (decision-making and execution) and flows (materials, information, and money) which occurs in nature and between stages, from the production to consumption stages, with which producers, transporters, service providers, logistics, retailers, and consumers are engaged (Poerwanto, 2012). The primary objective of a supply chain is to satisfy customers and thereby giving profits to the company. Supply chain activities start from consumers' demand and end when a customer or consumer has been satisfied (Chopra and Meindl, 2010). Meanwhile, a supply chain which is capable of creating and delivering a product and service in a required condition is considered strong (Blackhurst *et al.*, 2011). A supply chain strategy is a set of strategic activities and actions in the supply chain, creating reconciliation between what is needed by customers and the capacity of resources existing in the supply chain (Pujawan, 2014).

The food commodity, in September 2019, contributed to the poverty line by 73.75% (Artha, 2020). As such, all states made policies as the intervention to maintain primary and strategic food price stability. A food price and supply, especially beef, is two interrelated strategic indicators which are often used to identify a food distribution status, several issues engendered by an inefficient primary food distribution food chain, starting from producers to consumers, and food shortage in a region. In the early

system, the beef commodity should pass through several stages before reaching consumers. The stages start from cattle cow farmers to intermediating traders, from intermediating traders to butchers, from butchers to retailers, and from retailers to final consumers. Such a long beef supply chain is considered one of the problems which yield an expensive beef price, especially during the COVID-19 pandemic. Therefore, this research sets an aim to formulate a beef supply chain strategy which is effective to be applied during the COVID-19 pandemic.

II.   METHODS

This research was undertaken in June-August 2020. The research location was Gorontalo Gorontalo Indonesia. The location was selected based on the cow population bred by farmers in Gorontalo District. Sampling was conducted using the snowball sampling technique, starting from farmers, traders, to butchers. Data used in this research were primary and secondary. The first data, which were primary, were in the form of cross-section data taken from farmers, traders, and butchers, which were 20 people in number, and collected through direct interviews built upon a list of questions. Meanwhile, the secondary data were collected from the Animal Husbandry Department, Statistics Indonesia, the subdistrict office, and other relevant institutions. Data analysis used in this research was the SWOT analysis which allowed us to collate a beef cattle supply chain strategy which would likely mitigate uncertainty risks during the COVID-19 pandemic. The SWOT analysis is defined as follows.

1. *Strength*is evidence regarding the condition of resources and capabilities an organization owns as a positive comparison in a market.

2. *Weakness* is a negative internal aspect of an organization which likely affects its performance.

3. *Opportunity*is the future condition of an environment which is possible to achieve for the sake of an organization's sustainability.

4. *Threat* is the future condition which potentially impacts enterprise sustainability in an organization (especially the profit one).

III.   FINDINGS AND DISCUSSION

To eradicate uncertainty risks in the beef cattle supply chain during the COVID-19 pandemic in Gorontalo

District, a beef cattle supply chain policy strategy was formulated using a SWOT matrix.

Rangkuti (2005) clarified that the SWOT analysis was a strategic planning method used to evaluate the strengths, weaknesses, opportunities, and threats of a project or business speculation. The four factors then convened the SWOT acronym. SWOT allowed us to determine speculative business or specific project objectives and identify both internal and external factors which supported and did not support the achievement of the objectives. The analysis was implemented by analyzing and sorting aspects which influenced the four factors which then were mapped in a SWOT matrix. The SWOT matrix of the beef cattle supply chain in Gorontalo is indicated in Table 1.

Table 1 The SWOT Matrix of Beef Cattle Supply Chain in Gorontalo 2020

Internal Factors / **External Factors**	Strengths (S) S1= Land carrying capacity S2 = Local superior commodities S3 = Abundant agricultural waste availability S4 = Experienced worker availability S5 = Adequate transportation and communication systems	Weaknesses (W) W1 = Farmers' limited equipment and venture capital W2 = Traditional maintenance system and poor management and technology applications W3 = Non-transparent information flow from traders to farmers, including the price and selling price determined by traders W4 = Long and inefficient distribution, high marketing margin, and farmers' low share W5 = Speculative weight-based selling price without actual weighing
Opportunities (O) O1= Market demand O2 = Physical infrastructural supports O3 = Easiness in the business permit application and recommendation for cattle export/import O4 = High beef cattle demand and distribution outside the region	SOStrategies 1. Developing beef cattle breeding centers 2. Delivering technical guidance and intensive socialization to farmers 3. Developing reliable and sustainable institutional partnerships 4. Socializing agricultural waste-based food processing technology to farmers	WO Strategies 1. Exerting the government's supports, i.e., equipment, capital, fodders, breeds, vitamins, storage equipment, and drugs for cattle and farmers 2. Orienting the management system to semi-intensive and intensive patterns through a crop-livestock integration system 3. Socializing a marketing information system to farmers 4. Using the price information properly
Threats (T) T1= Imported products/meat T2= Beef cattle production competition between regions T3= Closed cattle markets due to the pandemic T4= Cattle reproductive and health disorders T5= Unstable beef prices	ST Strategies 1. Protecting domestic markets 2. Overcoming reproductive diseases and maintaining cattle health 3. Socializing digital marketing 4. Diversifying products	WT Strategy 1. Developing agribusiness markets 2. Conducting market operation 3. Granting business credits to traders 4. Complying with the government regulation on the standard price for the sale of beef cattle and beef

Sources: Primary Data Analysis, 2020

Elaborating Table 1, we explain internal factors which are strengths and weaknesses, and external ones which are opportunities and threats as follows.

1. Strengths

a. Land Carrying Capacity

Gorontalo was a highland 50 meters above the sea level and located between 00.24"-10.02 North Latitude and between 1212.59"-123°.32 East Longitude. The area of Gorontalo was 2,125.47 km², and the widest subdistrict was Asparaga with a total area of 20.25% of the area of Gorontalo District. Furthermore, Gorontalo had a Carrying Capacity of the Agricultural Waste Index (IDDLP) of 5.62. The Index indicates that Gorontalo was secured in terms of fodders, rendering more opportunities for adding cattle.

b. Local Superior Commodity

Gorontalo was one of the three districts we selected to undertake a crop-livestock integration system program besides Bone Bolango and Boalemo. The district selection was based on the district agricultural and cattle potencies from which we expected the economic growth. The Gorontalo community focused on several primary commodities, two of which were corn and chilies, whose waste could be used to cattle fodders. Developing cow cattle in Gorontalo was supported by the ever-increasing cow population. In 2016, the cow cattle population in Gorontalo was 81,586 in number, which was then increased by 85,576 and 89,110 in 2017 and 2018, respectively (Statistics Indonesia in Gorontalo, 2019). It indicates that beef cattle were one of the superior commodities in Gorontalo following corn and chilies.

c. Abundant Agricultural Waste Availability

Gorontalo had a highuse potency of waste-based fooderby 2,471,770 tons when the need for fodder was only 439,884 tons.

d. Experienced Worker Availability

50 experienced beef cattle farmers who had been running their business for 2-20 years were still operating in Gorontalo.

e. Adequate Transportation and Communication Systems

The transportation and communication systems in Gorontalo had been considered adequate. Traders transferring beef cattle using pick-up trucks and passed through asphalt road to cattle markets or other markets in other subdistricts. Besides, farmers and traders had been equipped themselves with a communication tool or mobile phone, facilitating them with accessible information.

2. Weaknesses

a. Farmers' Limited Equipment and Venture Capital

Farmers used their own money, which was limited in number, as venture capital. It was difficult for them to borrow money from banks as they did not have collaterals. Additionally, traders, especially butchers, had to confront another challenge due to no beef storage equipment, such as freezers. They might have the equipment but very limited in number. As a consequence, beef could not be stored for long.

b. Traditional Maintenance System and Poor Management and Technology Application

Farmers, in general, did not bother themselves to build cowsheds as cow shelters or toilets. Also, they still used modest tools, e.g., cow drinking places, water places, machetes, and broomsticks. The method used to raise cows was grazing in any season, in either dry or rainy season. Farmers spent for one-two hours a day to graze their cattle which was often tied in the yard. Furthermore, they fed their cattle with green fodders, i.e. Napier grass, as the primary fodder and additional fodder which was bran (Konga). Likewise, farmers had to face several challenges, one of which was diseases. In an attempt to cure their cattle, farmers concocted traditional herbal medicine which was not costly. Besides, they gave neither vitamins nor chemical drugs to their cows due to the medicine expensive rate.

c. Non-transparent Information Flow from Traders to Farmers, Including the Price and Selling Price Determined by Traders

Information flow, especially in regard to price, from farmers to traders was not transparent. Traders never mentioned the actual cow price to farmers, making farmers unable to offer cows at a high price. Farmers preferred merchant collectors as they had a bond, in the form of either kinship or loans. Merchant collectors or market traders would determine a cow price, in which they occasionally negotiated to cut the price and make profits when farmers would increase their cows' price. However, farmers did not have a bargain position in a price determination as farmers did it by only estimating cow weight. Nevertheless, when the negotiation went nowhere, farmers would likely suffer from loss because the price would go lower. As a result, farmers rarely bargained the price determined by merchant collectors.

d. Long and Inefficient Distribution, High Marketing Margin, and Farmers' Low Share

A long and inefficient distribution was brought about by the engagement of four marketing institutional levels, which were merchant collectors, market traders, butchers, and cross-regional traders. It created the highest marketing margin value, which was IDR5,500,000.00/cow and the smallest farmers' share which was 38.8%, as on Channel 1. Channel 1 indicates the low selling price accepted by farmers due to a low selling price at the farmer level, which was IDR3,500,000/cow for the beef cattle was distributed to the community as social assistance with a selling price at the collector level which was IDR9,000,000/cow. Meanwhile, merchant collector pleased themselves by a high marketing margin. Channel 1 indicates a low selling price accepted by farmers, which was only IDR3,500,000/cow as the beef cattle would be distributed to the community as social assistance when collectors would sell them by IDR9,000,000/cow. In other words, the latter group took the high marketing margin.

e. Speculative Weight-Based Selling Price, without Actual Weighing

Farmers would sell a cow aged 1-2 years old to merchant collectors who would pick the cow up at home. However, some other farmers preferred to carry their cows to the market and sold them there. A beef cattle cost at IDR3,500,000-8,000,000. The price fluctuated, depending on the age and weight of the cow, which was 20-60 kg.

3. Opportunities

a. Market Demand

The demand for beef cattle or beef was considered high, especially the demand of consumers who were arranging a celebration or preparing meals for religious holidays, e.g., Eid al-Fitr, Eid al-Adha, and Christmas.

b. Physical Infrastructural Supports

Gorontalo had both physical facilities and infrastructures to develop beef cattle, i.e., ULIB (Artificial Insemination Location Unit) and RPH (slaughterhouses).

c. Easiness in Business Permit Application and Recommendation for Cattle Export/Import

Beef cattle businesses in Gorontalo had been supported by administrative infrastructures, namely easiness in the business permit application and recommendation permit provision to export/import cattle.

d. High Beef Cattle Demand and Distribution Outside the Region

The demand for beef cattle outside Gorontalo was considered high. Evident reveals that before the COVID-19 pandemic attacked, merchant collectors made beef cattle selling-purchase transactions with other traders outside Gorontalo who would send the cattle to Kalimantan. Nevertheless, the PSBB (Large-scale Social Restrictions) application in Gorontalo halted the cross-regional beef cattle trading.

4. Threats

a. Imported Products/beef

Imported beef to Indonesia, especially from India, created an unstable beef price. Imported beef cost lower which was IDR100,000/kg than local beef, which was IDR120,000/kg. This situation threatened the sustainability of domestic beef production.

b. Beef Cattle Production Competition between Regions

Gorontalo District was not the only beef cattle producer in Gorontalo. Another district, namely Boalemo, which was adjacent to Gorontalo District, also produced the same commodity. That situation engendered high competition in terms of supplying beef cattle in Gorontalo.

c. Closed Cattle Markets due to the Pandemic

During the pandemic, the government stipulated PSBB (Large-scale Social Restriction), causing most cattle markets to halt their operation and thereby generating a situation in which many farmers and traders found it was difficult to sell beef cattle.

d. Cattle Reproductive and Health Disorders

Reproductive and health disorders might harm the sustainability of beef cattle production. Poorly handled reproductive and health disorders might result in a decline in beef cattle production. Field evidence suggests that farmers rested on traditional medicine to cure ill cattle.

e. Unstable Beef Prices

Beef cattle price, at either the retailer or farmer level, fluctuated, especially during the pandemic. The fluctuated price affected beef prices, which before the pandemic occurred, one kilogram of beef cost IDR110,000 but then increased to be IDR120,000.

A strategic matrix of the interaction between internal and external factors is formulated as follows:

5. SO Strategies

a. Developing Beef Cattle Breeding Centers

Beef cattle breeding centers, through a group institutional development system, could be built in Asparaga and Boliyohuto. Beef cattle breeding centers could be developed at either the provincial or district level to increase the number of cattle, accelerating beef self-sufficiency. The government had stipulated that Gorontalo would be the breeding center or an artificial insemination location unit (ULIB) and thus was allowed to produce superior breeds which could be used by farmers, either local or from other adjacent regions or provinces.

b. Delivering Technical Guidance and Intensive Socialization to Farmers

Delivering technical guidance and intensive socialization to farmers using a hands-on practice concept to alter their breeding technique and increase production. Also, the farmer group function could be optimized by the intensive assistance and supports from the government and private parties/organizations as well as their members and technical and entrepreneurship training.

c. Developing Reliable and Sustainable Institutional Partnerships

Developing a beef cattle supply chain to mitigate marketing risks requires a partnership between farmers (farmer group, *Gapoktan*, cooperation) and traders, business actors, or industries. Asir (2018) argued that one of the sustainable attempts to eradicate problems identified in a commodity supply chain was to amplify a partnership between farmers and business actors or marketing institutions (traders, industries, and exporters). The partnership urgently needed by business actors or stakeholders was price contracts or pricing under the government's stipulation which was directive and controlling. Besides, private supports also contributed to the growth and development of various associations, cooperations, and partnerships profitable. Supports from farmers/members in the form of member participation, cooperation between members and the committee to serve what members needed (production facility procurement, capital, and partnership with other parties) were also pivotal to achieve group independence.

d. Socializing Agricultural Waste-based Food Processing Technology to Farmers

Technology should be socialized to farmers. The technology needed was usually in the form of fodder technology, artificial insemination, and crop-livestock farmer business waste management technology. The use of land resources was optimized by increasing the number of cow breeds, integrating plants-cattle, and optimizing a group function in production facility provision and product marketing.

6. ST Strategy

a. Protecting Domestic Markets

Imported meat, which was cheaper, prompted a decline in domestic beef prices. Protecting domestic markets could be conducted using the following attempts: protecting the development center areas, developing industries by a means of the government's regulations, conducting a strict technical investigation to imported meat products, and fixing the quota of imported beef continually.

b. Overcoming Reproductive Diseases and Maintaining Cattle Health

Communicable reproductive diseases would interfere with the reproductive process, yielding an inefficient cattle reproduction. In Indonesia, several communicable reproductive diseases in beef cattle, such as brucellosis, leptospirosis, and infectious bovine rhinotracheitis (IBR), had been identified. The diseases were potential for spreading without thorough prevention and control by the government and farmers, especially through the program of mitigating reproductive disorders by the government. Adjid (2004) clarified some recommended alternative diseases control strategies which were (1) protecting individuals in a group from communicable reproductive diseases, (2) elevating biosecurity, and (3) performing the artificial insemination (IB) program using communicable reproductive disease cement.

c. Socializing Digital Marketing

Digital marketing constituted all marketing attempts which used electronic devices/the Internet with multiple marketing tactics and digital media, with which producers communicated with potential consumers spending most of their time online. Potential consumers were facilitated with various options to access what was being offered by producers. They could explore any website, blog, social media (Instagram, WhatsApp, Line, and so on) which

promoted certain products. From there, they would be able to communicate with producers. Meanwhile, meat was one of the most consumable food ingredients, especially during religious occasions. It should be an opportunity for beef cattle farmers to supply fresh beef. Marketing fresh beef meant concerning beef quality and hygiene and prioritizing health. Several strategies to market packaged beef in retail were establishing a team, paying attention to product quality, providing proper places, determining a target, determining a reasonable price, and promoting.

d. Diversifying Products

Product diversification meant producing multiple variants of processed beef which would be launched at the market to minimize loss due to a decline in beef price and abundant beef production. Aligned with an increase in beef cattle farming businesses and population numbers, processed beef product diversification was absolutely required. It was subsequently followed by a shift in the community consumption pattern in processed dairy products, especially meat. From consuming fresh meat, they turned to consume fast-food products. The community farming dominated beef cattle farming in Gorontalo. Most farmers only owned one-four cows. Based on the Data Collection of Beef Cows, Dairy Cows, and Buffalos (PSPK, 2011), the beef cow population in Gorontalo had been able to fulfill the community's need for beef despite a low number of cows slaughtered. There were many ways developed to enhance the usability and storage time of fresh meat, e.g., processing the meat into sausages, meatballs, and shredded meat.

7. WO Strategy

a. Exerting the Government's Supports, i.e., Equipment, Capital, Fodders, Breeds, Vitamins, Storage Equipment, and Drugs for Farmers and Traders

The government's supports in the form of breeds, fodders, vitamins, and drugs rendered to farmers contributed to an increase in beef cow production in Gorontalo. Most beef cow management systems were traditional in nature. Besides, the government's supports were aimed to provide services, namely IB, Poskeswa, RPH, instructors, and Central and Local UPT. Likewise, the supports were required to provide frozen meat storage equipment for traders, preserving the meat longer, and thus encouraging traders to earn more profits.

b. Orienting the Management System to Semi-intensive and Intensive Patterns through a Crop-livestock Integration System

The beef cow breeding system in Gorontalo was traditional in general. One of the solutions considered effective to enhance beef self-sufficiency was implementing a livestock integration program with plantation crops, crops, or horticulture. The concept delivered a synergic profit or a manifold profit acquired from the interaction between plants and cattle. Also, a crop-livestock integration system was aimed to support the Beef Self-sufficiency Program which was also related to the fodder development aspect. Imran (2020) concluded that the fodder development program remained faithful to the achievement of (fodder) main ingredient self-sufficiency. The program was manifested in several activities, one of which was the application of Ruminantialivestock integration activity, particularly beef cows. Meanwhile, developing the integration between crop-livestock through cattle waste processing into organic fertilizer and plant waste processing for cattle, especially in plantation, plants, and horticulture centers was one of the indicators of Ruminantia cattle production improvement program with local resource empowerment to sustain beef self-sufficiency.

c. Socializing a Marketing Information System to Farmers

A marketing information systemwas an activity conducted by an individual or an organization or a company who was determined to ease and accelerate an advantageous exchange relationship within a dynamic milieu through distributing promotion and determining agoods price.

d. Using the Price Information Properly

The market information, which was accurate, precise, punctual, and accountable, regarding agricultural commodities was required to corroborate the market information networking regarding agricultural commodities and accelerate information service delivery to market actors/policymakers. Kusumaningsih (2015) believed that asymmetrical market information flow regarding agricultural products resulted in imperfect price transmission, indicated by a significant price disparity between farmers and consumers.

8. WT Strategies

a. Developing Agribusiness Markets

Agribusiness markets were aimed to restrict middlemen's practices by gathering farmers in a cattle market in which a beef cow production auction was held. As a result, farmers might enjoy an increased beef price as

evidence suggests that traders took the largest portion of profits.

b. Conducting Market Operation

The market operation was the government's attempt to avoid an increase in beef price by a means of dropping or injection which would increase beef supplies through traders or directly through retailers when the cow price was increasing. The objective of the attempt was to mitigate price volatility by selling goods when the market price was increasing and purchasing when it was declining. The market operation was typically performed on goods with a strategic worth, such as beef.

c. Granting Business Credits to Traders

The government should render capital assistance to traders through easy business credit with low interest, ushering them necessary capital to beef marketing which required a high marketing cost, which was one of the subjects causing an inefficient distribution channel. Padjung (2018) conveyed that inefficiency in a supply chain might be rectified by creating a business environment where all supply chain actors upheld honesty. It was easily achieved by information openness, especially regarding product price and quality. Besides, a transparent information channel was supported by adequate infrastructures sustaining a product flow from farmers to retailers.

d. Complying with the Government Regulation on the Standard Price for the Sale of Beef Cattle and Beef

The government had set a policy on purchasing and stipulated the lowest and the highest retail price for the beef commodity, protecting both producers and consumers, as we all knew that a beef price fluctuated. The government should make a regulation on stipulating the Reference Price for Purchases at Farmers and the Reference Price for Purchases at Consumers, especially in regard to strategic food commodities, i.e. rice, corn, soybean, sugar, onion, chili, and beef. Likewise, incentive socialization should be delivered to both farmers and traders.

CONCLUSION

Food supply chain strategies during the COVID-19 pandemic were:

1. SO strategies:developing beef cattle breeding centers,delivering technical guidance and intensive socialization to farmers, developing reliable and sustainable institutional partnerships, and socializing agricultural waste-based food processing technology to farmers.

2. WO strategies: exerting the government's supports, i.e., equipment, capital, fodders, breeds, vitamins, storage equipment, and drugs for cattle and farmers, orienting the management system to semi-intensive and intensive patterns through a crop-livestock integration system, socializing a marketing information system to farmers, and using the price information properly

3. ST strategies: protecting domestic markets, overcoming reproductivediseases and maintaining cattle health, socializing digital marketing, and diversifying products.

4. WT strategies: developing agribusiness markets, conducting the market operation, granting business credits to traders, and complying with the government regulation on the standard price for the sale of beef cattle and beef.

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