

FP-SCM-012-ID071

# Supply Chain Analysis of Local Beef in Malang, Indonesia

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Received: 12 August 2018; Accepted: 25 August 2019; Published: 6 January 2020

**Abstract:** The price of beef at retailers and end consumers tend to rise due to a lot of members are involved in its supply chain. Several aspects that may affect the distribution process to the final consumer such as product flow, information flow, and financial flows should be considered for beef supply chain management. This study aimed to determine the supply chain map, function, and relationship between members in the supply chain of beef in Malang, Indonesia. The respondents in this study were three butchers with all their supply chain members. Descriptive analysis of the value chain was conducted using the six-step approach of value chain analysis with mapping of supply chain analysis using SCOR Level 2 method. The value chain analysis approach in this study was only conducted in 4 steps, i.e. engaging the chain, understanding the market, mapping the flows, and the identification of opportunities and challenges. The results showed that the speed of the supply chain in providing products to consumers and the agility of producers in responding to demand changes were perfect. The butchers should cooperate with cattle suppliers to improve the performance of the supply chain.

**Keywords:** beef; butcher; slaughterhouse; supply chain

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## 1. Introduction

The Indonesian population is increasing almost in all region. The population of Malang City increased from 828,491 in 2011 to 851,298 people in 2015 [1]. The demand of products for the fulfillment of nutrition is also increasing along improvement of the living standard and the development of the Indonesian population. One of increasing food demand was beef as a source of animal protein [2]. National Socio-Economic Survey of the Ministry of Agriculture of the Republic of Indonesia (2016) showed that beef consumption per capita per year was fluctuating, but it tent to increase from 2010 to 2015. Beef consumption in Malang also contributed to the behavior of national beef consumption. Beef production in Malang had fluctuated from 2011 to 2015. Beef production declined from 4,165,767 kg in 2011 to 3,305,767 kg in 2015, meanwhile the prices tent to increase [3]. National Socio-Economic Survey of the Ministry of Agriculture of the Republic of Indonesia (2016) showed the price of beef feom 2011 to 2015 tent to increase by 9.58% from IDR 69,642 to IDR 104,326.

The highest of prices at retail and end-consumer levels due to the cost of adding value, transaction costs, actors' profits, shrinkage value, retribution, illegal fees, transportation costs and distribution channel efficiency. The arrangement of beef distribution channels is important due to a lot of stakeholders are involved in the beef supply chain [4]. The supply chain of beef needs to pay attention to several aspects affecting the beef distribution to the end consumer such as product flow, information flow and financial flow [5]. Therefore, the analysis of beef supply chain in Malang should be carried out.

Some researches of beef supply chain in Indonesia had been carried out with different aims. Author [6] analyzed value added analysis of beef cattle supply chain actors micro-scale community farm based on Regional Enterprise Slaughterhouse Makassar (RESM). Author [7,8] investigated how

beef producers can increase supply chain performance (SCP) flexibility by improving supply chain practices. Author [9] analyzed the supply chain of beef industry and the factors affecting meat prices in Indonesia. Author [10] improved the beef supply chain with the support of simulation model to assess the existing system and to develop some scenarios to improve the system performance. Author [11] improved the quality of beef in traditional markets by proposing a supply chain model that involves the schemes of investment and government incentive for improving the distribution system. Author [12] planned actions to control probability of halal risk in Indonesian beef supply chain. Author [13] described the supply chain management of imported frozen beef from Australia to Indonesia then determined the strategy of it based on the strengths, weaknesses, opportunities, and threats for the frozen meat distributor and analyzed alternatives of cooperation between imported frozen beef distribution with local beef distribution chain. Author [14] identified risk issues in Indonesian fresh meat supply chain from the farm until to the "plate". All those researches had not considered the value chain.

A responsive value chain provides high service levels, short lead times, and a range of innovative products and quantities, whereas an efficient supply chain produces and supplies a smaller range of products at the lowest possible cost [15]. A value chain is focused on identifying and satisfying well-defined customer demands, whilst a supply chain is focused on logistical efficiency which is one component of value chain formation. The purpose of the value chain analysis is improving supply chain performance. The understanding of the product flows, information flows, as well as management and control in the value chain are required in this analysis [16]. Therefore, this research aimed to get the value chain map, function, and relationship between the members in beef supply chain in Malang.

## 2. Materials and Methods

The research was only focused on local beef. It was conducted at slaughter house of Malang Regional Company and traditional market of Malang. Survey was carried out related to the function and relationship between the value chain members and the number of members of supply chain, i.e. cattle ranchers as suppliers, butchers as processors, slaughter house of Malang Regional Company as service provider of processors, retailers, and consumers.

### 2.1. Value Chain Analysis

Author [17] developed value chain approach from six steps reported in the literature as follows:

1. Engaging the chain

The first and fundamental step of engaging the chain determines the way the chain members interact throughout the value chain analysis process.

2. Understanding the market

The importance of the end-user is recognized in the value chain analysis process by the inclusion of "understanding the market" as an early step. It is necessary for the industry to understand what it is that consumers value in the products and services they create and modify the business accordingly

3. Mapping the current state of the chain

The step of mapping the chain is a fundamental component of value chain analysis. The three elements that mapping covers are the flow of products, information and relationships [16]. Product flow requires the mapping of the physical flow of goods through the value chain. Information flow is a two-way process in the value chain. Information regarding the end-user (e.g. preferences, demand specifications and quality) can be transferred back along the chain to the producers, where the producers can then notify the market of supply and quality issues [17]. Relationship flow describes the way chain members relate to each other. The supply chain mapping process in this study used the Supply Chain Operations Reference (SCOR) Model level 2. Beef supply chain activities can be seen through the AS-IS Phase which is the current state of the chain. AS-IS modeling maps the current state of the plan, source, make, and deliver processes. Financial flows in the supply chain are also considered in this research.

#### 4. Identification of opportunities and challenges

Identification of opportunities for improvement at different stages was carried out through an analysis of product flows, information flows and relationships. Identification of such opportunities then can be an effective catalyst for change.

#### 5. Implementation

Once the opportunities and challenges have been identified, the chain members will need to select the areas that they would like to implement to achieve greater value. The actors of the chain must accept full responsibility for the implementation to ensure the commitment of the chain to the improvement process.

#### 6. Evaluation

The final step in the value chain analysis approach is an evaluation of the implemented opportunity, as well as an overall performance evaluation of the value chain approach by the value chain actors. This step has been included to provide feedback as a method for continuous improvement and also a measure of the value to the stakeholders of undertaking such a process.

Implementation and evaluation steps of value chain analysis were not carried out in this research due to limited time of research.

### 2.2. Performance Measurement

The identification of opportunities and challenges in value chain analysis was also supported with performance measurement which was done by referring to performance metrics of SCOR as follows [18]:

#### 1. Perfect Order Fulfillment

Perfect Order Fulfillment is the percentage of orders meeting delivery performance with complete and accurate documentation and no delivery damage or defects

#### 2. Order Fulfilment Cycle Time

Order Fulfilment Cycle Time is a continuous measurement defined as the amount of time from customer authorization of a sales order to the customer receipt of product.

#### 3. Upside Supply Chain Adaptability

Upside Supply Chain Adaptability is the maximum sustainable percentage increase in quantity delivered that can be achieved in 30 days

#### 4. Downside Supply Chain Adaptability

Downside Supply Chain Adaptability is the maximum percentage reduction in quantities ordered that can be sustained at 30 days prior to delivery with no inventory or cost penalties.

## 3. Results and Discussion

### 3.1. Supply Chain Structure

Supply chain structure is the composition of the activities or network of procurement of goods or services that work together and related to each other to create and distribute physical and non -physical products [19]. A supply chain consist of primary members who are directly involved with the products, secondary member who are not directly involved with the flow of product [20], and those who facilitate the activities of the supply chain in providing the raw materials required [21]. The primary members of the local beef supply chain in Malang are cattle ranchers and cattle sellers in traditional markets as cattle suppliers, butchers as suppliers of beef and its side products, beef retailers in the traditional markets of Malang, potential consumers (food sellers which use beef as raw materials of their products) and end consumers. The secondary member of the supply chain is slaughter house of Malang Regional Company as provider of animal slaughtering service. Some consumers buy the beef directly from the butchers and the others buy the beef at traditional market in Malang. The relationship between consumers and the sellers is only transactional relationship. Meanwhile, contractual relationship in this chain are between the butchers and the beef sellers in traditional markets as well as between the

butchers and the cattle sellers or cattle ranchers. The structure of supply chain of local beef in Malang is shown in Figure 1.

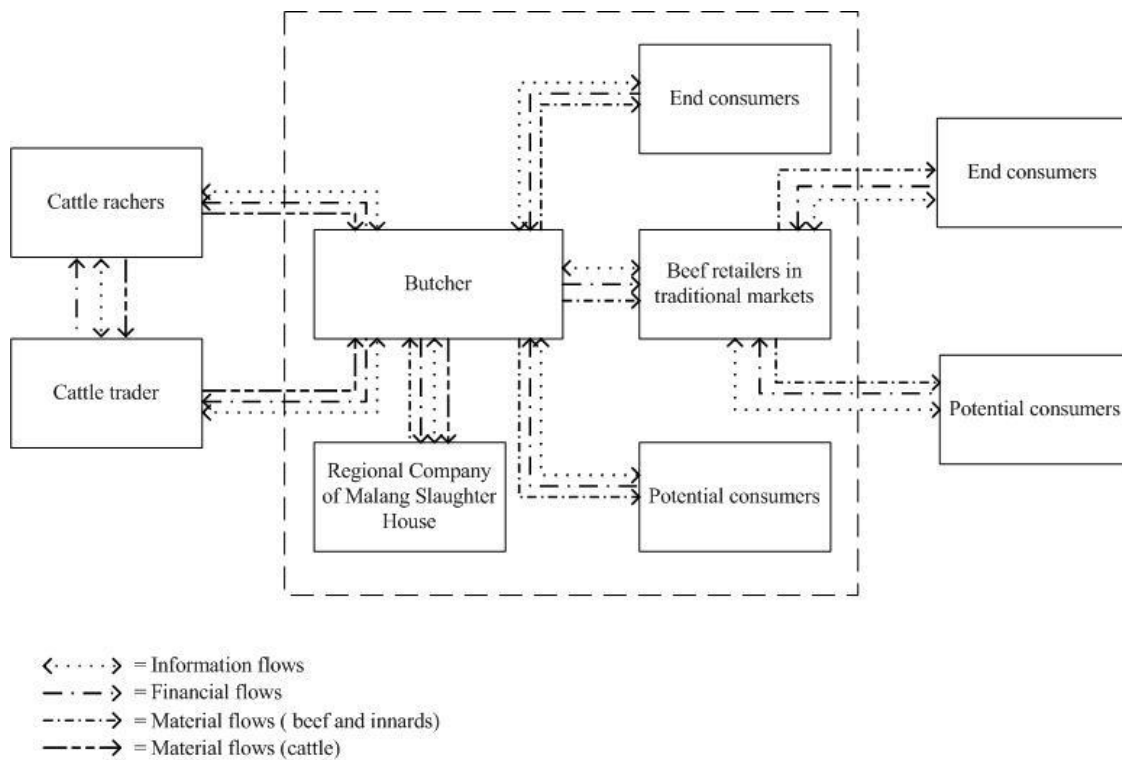


Figure 1. Structure of local beef supply chain in Malang.

This research only took 3 respondents of butchers who slaughtered animals at slaughter house of Malang Regional Company and sell beef in Malang. The respondents' identities in this study are shown in Table 1.

Table 1. The respondents of butchers

Type of service	Butcher 1	Butcher 2	Butcher 3
Gender	Man	Man	Man
Age	35 years	29 years	27 years
Last education	Primary school	Primary school	Bachelor degree
Main job	Butcher	Butcher	Butcher
Trading experience	17 years	8 year	4 year

Slaughter house of Malang Regional Company is a public company which provides animal slaughtering service in Malang. An animal should be examined for its health (ante mortem) by the animal farm officer from the Livestock Farming Service before being slaughtered. The cost of service in slaughter house of Malang Regional Company is shown in Table 2.

Table 2. The cost of cattle slaughter and cattle breeding in slaughter house of Malang Regional Company.

Type of service	Cost
The slaughter of cattle	IDR 49,500 / cattle
The slaughter of cattle at out of service hour (forced / emergency)	IDR 60,500 / cattle
Rent a cattle barn	IDR 10,000 / plot per day

The procedure of cattle slaughter in slaughter house of Malang Regional Company is justified according to Islamic Shari'a. Implementation of cattle is done to create a SAFE, HEALTHY, WHOLE,

and HALAL beef so the slaughter is carried out by adopting Islamic law and supervised by a veterinarian or *keurmaster* officer. Supervision and execution of inspection is carried out before and after the slaughter then the beef is stamped with "GOOD city of Malang". The implementation of cattle slaughter is separated from the implementation of pig slaughter. It is also executed using different place, labor, and tools. Products of cattle slaughtered are separated into some categories, i.e. quality 1, beef quality 2, beef quality 3, side products, skin, legs, head and muzzle cattle. Physical quality of beef is based on National Standardization institutions on quality of carcass and beef [21].

### 3.2. Local Beef Value Chain Analysis in Malang

The value chain is all the activity to distribute the product or service from the starting point, through several stages of production, involving transformation activities and various service inputs, then delivering the product to the end consumer [22]. Value chain analysis is generally conducted to identify improvements in product quality and design that enable producers to gain more value on the product [23]. Analysis of the value chain model or condition is one of the first steps in conducting supply chain management analysis [24].

#### 3.2.1 Engaging the Chain

Members involved in supply chain 1 are a cattle seller as a cattle supplier, butcher 1 as a beef producer, and beef retailers in traditional markets. Members involved in supply chain 2 are a cattle seller as a cattle supplier, butcher 2 as a beef producer, beef retailers in traditional markets, potential consumers and end consumers. Members involved in supply chain 3 are a cattle rancher as a cattle supplier, butcher 3 as a beef producer, and beef retailers in traditional markets. The relationship between butcher 1 and butcher 2 with cattle sellers in the market is only a transactional relationship, meanwhile butcher 3 has contractual relationship with a cattle rancher. Transactional relationship occurs when a price agreement is established, then transactions are made and products move from producer to consumer [22]. The linkages between actors in the value chain can be formal and informal rules. Informal rules are without any written contract between actors. The agreement is based on trust, reliability and long-term relationships [23].

#### 3.2.2 Understanding the Market

Consumers are the central point of attention in the process of marketing a product. Understanding of consumer demand will lead producers to appropriate and efficient marketing policies. The consumers of beef and side product of slaughtered cattle are beef retailers in traditional markets, potential consumers and end consumers. Most potential consumers are meatball sellers. Consumers, products sold, the prices offered from each butcher is shown in Table 3.

**Table 3.** The consumers and products of the butcher.

Butcher	Consumers	Products	Price
1	Beef retailers in traditional markets	Beef quality 1	IDR 105,000/kg
		Beef quality 2	IDR 90,000 / kg
		Beef quality 3	IDR 85,000 / kg
		Cowhide	IDR 14,000 /kg
		Innards	IDR 32,000 / kg
		Head, legs, and muzzle	IDR 28,000 / kg
2	Beef retailers in traditional markets Potential consumers End consumers	Beef quality 1	IDR 105,000/kg
		Beef quality 2	IDR 95,000 / kg
		Beef quality 3	IDR 60,000 / kg
		Cowhide	IDR 15,000 / kg

**Table 3.** The consumers and products of the butcher (continued).

Butcher	Consumers	Products	Price
2	End consumers	Innards, head, legs, and muzzle	IDR 2,820,000 / cattle
3	Beef retailers in traditional markets	Beef	IDR 105,000 / kg
		Cowhide	IDR 13,500 / kg
		Innards, head, legs, and muzzle	IDR 4,380,000 / cattle

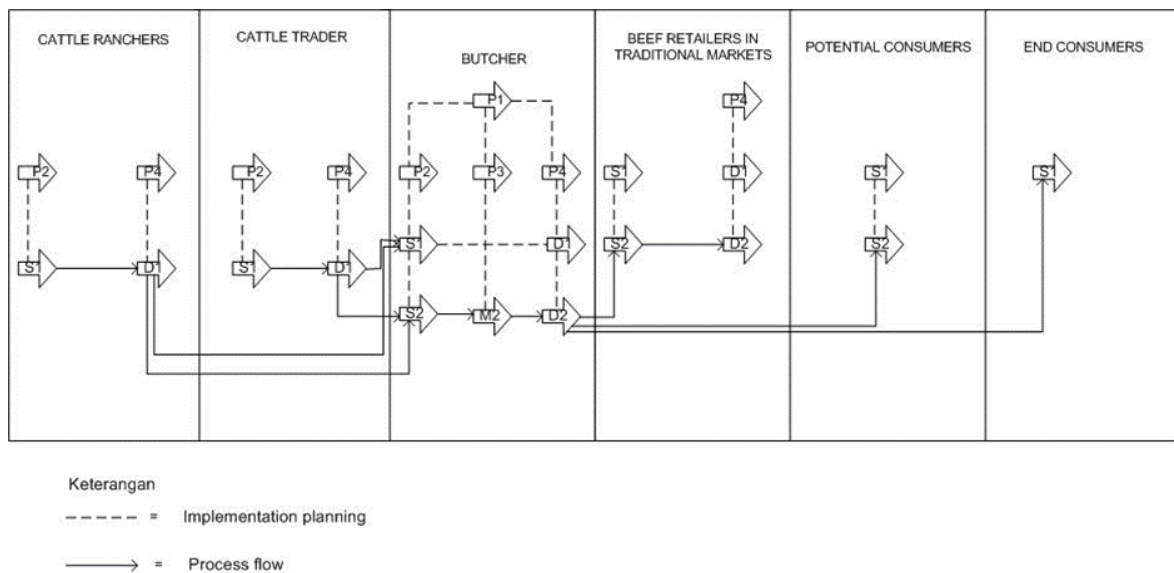
The types of products offered from the three butchers are different. Butcher 1 and 2 sell beef with different qualities, i.e. quality 1, quality 2 and quality 3. Prices offered are also slightly different. This is because the characteristics of beef sold are different although the definition of quality is the same. Quality 3 meat on butcher 1 is meat that still has more fat than quality 1 and 2, while beef quality 3 on butcher 2 is meat for soup. The target consumers of butcher 1 and 2 are also different so the prices for the same quality are also different.

### 3.2.3 Mapping the Flows

In the supply chain there are members directly or indirectly involved. The supply chain structure describes the related parties and their job as well as the flow of information, products and finances [25]. The flow of information relates to production capacity, delivery status and the number of raw material orders, and the number of product orders distributed to the market. The flow of information begins from the butchers that provides information about the needs of the cattle to be ordered. Supplier of cattle will provide information to the butcher related to the number, type of cattle, gender, weight and the price of cattle per kilogram or per cattle.

Information flows between the butcher and the part of slaughter house of Malang Regional Company begins when the butcher gives information to the slaughter house of Malang Regional Company that will entrust animals, will do the slaughtering of animals, and information related to the number of animals to be slaughtered and entrusted in slaughter house of Malang Regional Company. Slaughter house of Malang Regional Company will provide information regarding the availability of barn to rent, the fees to rent the barn, and the fees for slaughtering. Information flow between butchers and beef retailers in traditional markets begins from retailers providing information on the beef requirements to be ordered. Butcher provides information regarding the amount of beef available, the quality and price of beef. The buyer of cowhide provides information to the butcher related the cowhide needs to be ordered. Butcher provides information regarding the amount (in kg) of cowhide and the price per kg. Potential consumers inform the slaughter of the amount of beef to be ordered and the time for beef to be ready. Butcher will provide information regarding the amount of beef available, the price of meat and the time of order fulfillment. The end consumer informs to the butcher of the amount to be ordered and the time for the beef to be ready. Butcher provides information regarding the amount of beef available, the price of beef and the beef fulfillment time.

Material flow is the main raw material flow of cattle to the end consumers of beef. This will produce a product flow map, identifying each activity involved in the production, and where and how much inventory is held (Bonney and Fearn, 2009). Design of AS IS flow material based on data obtained from survey results and in depth interview can be seen in Figure 2.



**Figure 2.** Material flow of AS-IS condition

Financial flow is the movement of money between the members of beef supply chain. Financial flow in the beef supply chain in Malang is from downstream to upstream. The money flows from the butchers to the ranchers. The payment system is carried out in cash. The transaction will occur if there is an agreement and conformity of the cattle between ranchers and the butchers. The price per kilogram of cattle is determined by weighing the cattle directly in the ranchers' place. This also happen in the financial flows between cattle sellers and butchers where prices are determined by estimating the weight of cattle directly in the animal market. The money also flow from the butchers to slaughter house of Malang Regional Company as slaughter service provider. The butchers pay slaughter house of Malang Regional Company officer in cash for slaughtering and renting a barn (for butchers who do not have their own ranch at home). The butchers will get money from the beef retailers the day after the beef pickup from the butcher, meanwhile the butcher will get money from cowhide buyers in cash based on their agreement. Cash payment system is also done by potential consumers and end consumers when they buy beef from the butchers.

### 3.2.4 Identify Opportunities and Challenges

A complete mapping of a chain can put out many problems and opportunities for improvement. The flow value mapping model directly leads to the classification of problems related to physical flows and information flows [26]. Problems relating to material flows are the transactional relationship between cattle suppliers and butchers (on butchers 1 and 2) which makes the uncertain availability of cattle, uncertain demand (at slaughter 1, 2 and 3), and uncertain availability of beef due to unscheduled cattle slaughtering process. Problems relating to financial flows are uncertain profit and loss of the butchers due to the bulk purchase system of innards, the high cost of product sale, and uncertain cash flow due to the delayed payment system from beef retailers to the butchers. Problems related to the flow of information are the butchers have never forecasted their demand which makes problem in controlling the availability of the beef, the butchers have never made financial statements for controlling the cash flow, and unavailability of information about the demand of the consumers.

The improvement of the chain is also based on the performance measurement of the chain. Measurement of beef supply chain performance was done using SCOR Level 1 method. In SCOR model, performance attribute function determines supply chain characteristic and to describe supply chain strategy [27]. The metrics used to measure the chain performance are perfect order fulfillment, order fulfillment cycle-time, upside supply chain adaptability and downside supply chain adaptability. The performance of the butcher in local beef supply chain in Malang is showed in Table 4.

**Table 4.** Butcher performance

SCOR Metrics	Actual		
	Butcher 1	Butcher 2	Butcher 3
Perfect Order Fulfillment	100%	100%	100%
Order Fulfillment Cycle Time	1 day / 247,8 kg	1 day/200,7 kg	1 day / 363,3 kg
Upside Supply Chain Adaptability	100%	100%	100%
Downside Supply Chain Adaptability	100%	100%	100%

All butchers have the same performance for perfect order fulfillment, upside supply chain adaptability and downside supply chain adaptability. Butcher 3 has the highest performance for order fulfillment cycle time because butcher 3 has a contractual relationship with beef retailers in traditional market which makes butcher 3 has more predictable demand.

Overall, contractual relationship should be carried out by all butchers for improving the chain of their business, Contractual relationship between with the cattle ranchers and the butchers will guarantee the availability of cattle, meanwhile contractual relationship between the butchers and the consumers (especially the beef retailers in traditional market) will help the butchers to predict the demand of their products. The butchers also should not sell the side products in bulk which makes uncertain income for the butchers, meanwhile slaughtered cattle has a large part of side products which needs high cost to handle them. Selling product based on the quality grade per unit weight will be better both for the sellers and the buyers regarding the quality and the price. Cash payment system and managing the financial by recording the cash flow also should be considered by the members of the chain to improve their performance.

#### 4. Conclusion

Based on the results of the research, performance of local beef supply chain in Malang can be improved for improving their value chain. Clear and complete information is needed in communication between suppliers and butchers as well as between butchers and their consumers. The butchers as consumers of the cattle sellers / cattle ranchers should have information about the availability of cattle, types of cattle, cattle's weight, cattle's sex and cattle's physical condition from suppliers regularly. The butchers as suppliers also need regular information from retailers regarding the quantity and quality of beef and the side products. Meanwhile, regular information from the butchers to their consumers is necessary regarding availability, price, payment method and delivery method of beef and the side products. This strategies will help the members of the chain to decrease the unsold products due to miss-information between the members of the chain.

Cooperation or partnership between the members of the chain should be done to improve the performance of supply chain and value chain. Some scenarios of the coordination and partnership model can be analyzed in further research by simulating the local beef supply chain system in Malang using system dynamics.

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