Malang coffee value chain analysis: A case study of Taji arabica coffee

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Abstract. Taji is a coffee-producing area in Malang Regency, East Java, Indonesia. This study aims to analyze the coffee value chain produced by Taji villages that are distributed to cafes in Malang City. The study was conducted in Taji Village, Malang Regency and Angkot Café, Malang City. Value chain analysis is performed using the Hayami method. This study obtained actors, volume, and value mapping of Taji coffee. There are four main actors involved in the Taji arabica coffee value chain: the farmers, the collector, the first-stage processor, and the second-stage processor. The mapping of the value offered for every kilogram output received by farmers is IDR 7,000, the collector is IDR 10,000, the first stage processor is IDR 90,000, and the second-stage processor is IDR 220,000. The second-stage processor obtained the highest margin with the amount of IDR 99,239. All actors receive satisfactory margins.

1. Introduction
Coffee has an important role in the economy of Indonesia. The coffee export of Indonesia achieved 467,790 tons in 2017, making Indonesia the fourth largest coffee exporter in the world [1, 2]. The growth of the middle class and changes in the lifestyle of the Indonesian people also have boosted the performance of the domestic coffee processing industry [3]. East Java is one of the provinces in Indonesia with potential robusta and arabica coffee production. East Java contributes 9.28% of national coffee production [2]. One area that produces coffee in East Java is Malang Regency. In 2018, Malang Regency was ranked as the second-largest coffee producing area in East Java with 12,260 tons a year or 18.4% of the total coffee production in East Java province [4]. The geographical conditions of Malang Regency with its highlands provide its own potential in producing good quality coffee. One area in Malang Regency that contributes to producing coffee is Taji Village.

Taji coffee plantation is a coffee plantation area in Taji Village that management started in 2011. The Taji Village is in Jabung District, Malang Regency, East Java with an altitude of 1200 masl with 1000-2500 mm rainfall per year. This makes Taji Village very suitable for growing coffee. The three types of coffee grown in Taji Village are Arabica, Robusta and Excelsa coffee. Taji Village produces arabica and robusta coffee alternately with the main harvest period lasting 4-5 months with a frequency of picking coffee cherries every 10-14 days. The area planted with coffee is 28 hectares, producing 15 tons of coffee beans per year. Taji coffee can keep up with other coffee-producing centers in Malang Regency such as Dampit, Sumbermanjing, Tirtoyudo and Ampelgading Districts. This shows that Taji Village...
has the potential as a competitive coffee producing area. Value chain analysis needs to be carried out to analyze and increase the added value along the Taji coffee supply chain as well as lessons learned for other coffee centers.

An effective value chain can provide added value as a key to the competitive advantage of an industry. The industry can perform value chain analysis to increase value for consumers as well as examine the role that each activity performs differently on that value. The increase in added value and cost efficiency in each value chain activity in an industry can make the industry more competitive [5]. Analysis of the value chain of Taji coffee, especially arabica coffee, is expected to increase the competitiveness that can be created through coffee value chain activities in Taji Village. This research was conducted to analyze the arabica coffee value chain produced by Taji villages that were distributed to cafes in Malang City.

2. Material and Methods
The research was conducted at Taji Coffee Plantation located in Taji Village, Jabung District, Malang Regency, East Java and the Angkot Kopi company located in Malang City, East Java. This research focuses on Taji arabica coffee value chain.

The research was conducted by interviewing through questionnaires and direct surveys to coffee farmers, collectors, and processors. Sampling was carried out by purposive sampling with seven farmers, one collector, and two processors as respondents. The data and information collected related to the functions and relationships among value chain actors, the number of actors, as well as margins, and added value along the value chain. Value chain activities identification was based on field observations [6]. Added value calculation follows the Hayami method [7, 8, 9] which can be seen in Table 1.

Table 1. Hayami method for added value analysis.

| No  | Output, Input, Price                  | Formulation |
|-----|--------------------------------------|-------------|
| 1   | Output (kg/production)               | A           |
| 2   | Raw material input (kg/production)   | B           |
| 3   | Labour input (hour/production)       | C           |
| 4   | Conversion Factor                    | D=A/B       |
| 5   | Labour coefficient                   | E=C/B       |
| 6   | Product price (IDR/kg)               | F           |
| 7   | Wages rate (IDR/production hour)     | G           |
| 8   | Raw material input (IDR/kg)          | H           |
| 9   | Other current input (IDR/kg)         | I           |
| 10  | Product (IDR/kg)                     | J=DxF       |
| 11  | a. Value-added (IDR/kg)              | K=J-H-I     |
| 11  | b. Add value ratio (%)               | L=K/J       |
| 12  | a. Labour income (IDR/labour)        | M=ExG       |
| 12  | b. Labour’s share (%)                | N=M/K       |
| 13  | a. Profit (IDR/Kg)                   | O=K-M       |
| 13  | b. Profit rate (%)                   | P=O/J       |
| 14  | Margin (IDR/kg)                      | Q=J-F       |
| 14  | a. Direct labour income (%)          | R=M/Q       |
| 14  | b. Donations of other inputs (%)     | S=I/Q       |
| 14  | c. Company profits (%)               | T=O/Q       |
3. Results and Discussion

3.1. Taji arabica coffee value chain actors and volume mapping

Taji coffee agro-industry is an agro-industry that is on the rise in Malang. The actors involved in the supply chain of the Taji Arabica coffee agro-industry started from farmers in the upstream to coffee processors in the downstream. Arabica coffee agro-industrial supply chain network can be seen in Figure 1. The actors involved in the supply chain of the Taji Arabica coffee agro-industry are stakeholders who play a role in this supply chain. To maintain the sustainability of the supply chain, coordination between the actors is needed. The actors often hold events that are attended by all stakeholders of the Taji Arabica coffee agro-industry. The results showed that the actors involved in the coffee agro-industry supply chain consisted of 4 main actors, namely the farmers, collector, first-stage processor, and second-stage processor.

Figure 1. Value chain network.

In practice, the coffee farmers of Taji village cultivate mainly robusta and arabica coffee. The farmers cultivate various types of coffee in an area of 28 hectares. Arabica coffee production in this study reached 2300 kg with 96% of the production going to the collector and 4% being used for personal consumption.

The Taji coffee collector is currently run by one person. The collector is willing to buy all the farmers' coffee cherries if the farmers harvest red cherries. The collector is also willing to give prices that tend to be higher than market prices and are willing to take coffee directly to farmers' gardens. At the time of this research, the price of Arabica coffee at the farm level reached IDR 7000 to IDR 8000 per kg of red cherries. Collector sort the farmers' crops to be distributed to the first stage processor. Collector is also willing to give prices that tend to be higher than market prices. All cherries are sold for IDR 10,000 per kg to the first stage processor.

The first-stage processors buy sorted coffee from the collector to be processed into green beans. The first-stage processor receives 1899 kg of coffee cherry from the collector. This green bean is processed to produce 223.13 kg of ground coffee. The next stage of processing activities is carried out at the Angkot Coffee Company. The resulting ground coffee can be sold for IDR 220,000 per kg. This price can increase if ground coffee is sold in smaller packages.

The second stage of processing at the time of this study obtained 259.4 kg of green beans from the first stage processor. This green bean is processed to produce 223.13 kg of ground coffee. The second stage of processing activities is carried out at the Angkot Coffee Company. The resulting green beans can be sold for IDR 90,000 per kg. Most of the green beans produced are purchased by a second stage processor and the rest is distributed to another second stage processor or roastery companies.

The second stage of processing at the time of this study obtained 259.4 kg of green beans from the first stage processor. This green bean is processed to produce 223.13 kg of ground coffee. The second stage of processing activities is carried out at the Angkot Coffee Company. The resulting ground coffee can be sold for IDR 220,000 per kg. This price can increase if ground coffee is sold in smaller packages.

The calculation of the added value of Taji Arabica coffee can be seen in Table 2. The added value calculates using the Hayami method. The calculation is based on annual arabica coffee production.
Table 2. Added value of Taji arabica coffee.

| No | Output, Input, Price | Farmer’s value | Collector’s value | First-Stage Processor | Second-Stage Processor |
|----|----------------------|----------------|-------------------|-----------------------|------------------------|
| 1  | Output (kg/production)| 2208           | 1899              | 346.8                 | 223.13                 |
| 2  | Raw material input (kg/production)| 2208 | 2208 | 1899 | 259.4 |
| 3  | Labour input (hour/production) | 720          | 176               | 422.7                 | 234                    |
| 4  | Conversion Factor    | 1              | 0.860             | 0.183                 | 0.860                  |
| 5  | Labour coefficient   | 0.326          | 0.080             | 0.223                 | 0.902                  |
| 6  | Product price (IDR/kg) | 7000         | 10000             | 90000                 | 220000                 |
| 7  | Wages rate (IDR/production hour) | 5000       | 12500             | 6250                  | 9855                   |

Revenue and Profit

| No | Raw material input (IDR/kg) | 145 | 7000 | 10000 | 90000 |
|----|------------------------------|-----|------|-------|-------|
| 9  | Other current input (IDR/kg) | 2391 | 73 | 751 | 19656 |
| 10 | Product (IDR/kg)             | 7000 | 8600.543 | 16436.019 | 189239.013 |
| 11 | a. Value-added (IDR/kg)      | 4464 | 1527.543 | 5685.019 | 79583.013 |
|    | b. Add value ratio (%)       | 63.771 | 17.761 | 34.589 | 42.054 |
| 12 | a. Labour income (IDR/labour) | 1630.435 | 996.377 | 1391.193 | 8890.015 |
|    | b. Labour’s share (%)        | 23.292 | 11.585 | 8.464 | 4.698 |
| 13 | a. Profit (IDR/Kg)           | 2833.565 | 531.167 | 4293.826 | 70692.998 |
|    | b. Profit rate (%)           | 40.480 | 6.176 | 26.124 | 37.356 |

Reply services for production factors

| No | Margin (IDR/kg) | 6855 | 1600.543 | 6436.019 | 99239.013 |
|----|----------------|------|----------|----------|-----------|
| 14 | a. Direct labour income (%) | 23.785 | 62.252 | 21.616 | 8.958 |
|    | b. Donations of other inputs (%) | 34.880 | 4.561 | 11.669 | 19.807 |
|    | c. Company profits (%)         | 41.336 | 33.187 | 66.716 | 71.235 |

3.2. Taji arabica coffee value chain analysis
Value chain analysis of Taji arabica coffee in this research focused on main activities. Some supporting activities are mentioned in the main activities.

3.2.1. Inbound logistics.
Inbound logistics are activities needed to buy, receive, store, and manage raw materials from suppliers used for the production process [10, 11] or material flow activities [12]. Farmers can choose good coffee seeds. So far, coffee seeds are provided by collector. Collector controls the cherries by buying only red-picked cherry coffee. Collectors also dare to buy cherries at a higher price and facilities to pick up their crops to the location. The consistency of collector results in a habit of picking red among farmers. Farmers who do not pick red must sell cherries to collectors in other villages further away at a lower price and still require additional costs for transportation. The first-stage processors consistently only use raw materials from collectors and do not accept raw materials from other places due to the unclear previous processes. Coffee storage is also done in two layers of packaging. The primary packaging uses plastic, and secondary packaging uses gunny sacks. This packaging method is done to prevent damage to the coffee. The second stage processor receives raw materials from the first stage processor and stores it in the proper container. At the same time, the quality of the coffee is maintained until it is roasted.
3.2.2. Operations
Operations are activities that transform inputs into outputs [10]. It is required to produce and package products that will be distributed to customers. Operations at the farmers level are carried out with good coffee cultivation. Arabica coffee is cared for regularly to increase and maintain the consistency of the crop. Farmers also pick red cherries when harvesting. This method is to get optimal results.

The collector runs the business of collecting coffee from farmers in the form of taking the coffee they harvest directly on site so that farmers have no trouble distributing their harvest. Collectors also sort the farmers' crops to ensure that the coffee cherries have good product quality. Sorting is carried out as soon as the farmers' coffee cherries are received. The ability of the collector and the labor to separate the coffee cherries increase the productivity of the sorting products.

The first-stage processor performs coffee processing in a good way. The use of drying bed media for drying coffee produces coffee that maintains its taste. According to consumers demand [13], the processing is carried out by several methods, including natural, semi wash, fully wash, and honey.

The second-stage processor processes the coffee beans into ground coffee using the appropriate equipment. Production results are also packaged using good packaging so that the results can be distributed properly to consumers. Processing activities are also supported by a qualified workforce and standardized stages that give the product characteristics for consumers.

3.2.3. Outbound logistics.
Outbound logistics are activities needed to store goods produced in the company's warehouse and distribute products to customers or retailers [10, 11] or finished products/goods flow related activities [12]. The selection of the means of transportation used is adjusted to the distance and distribution objectives. The Taji coffee value chain actors carry out outbound logistics activities according to their roles.

Farmers storing the red cherries directly in plastic sacks so that they are easily taken by collectors. Collector store sorted coffee in plastic bags with a size of 50 kg. This is to facilitate the handling process in the first stage processor.

The first stage processor packs the products using two-layer packaging. The primary packaging uses a plastic bag to keep the green bean taste from being contaminated by unwanted things from the environment. Secondary packaging uses gunny sacks to make the primary packaging safer during storage and distribution to the second-stage processor and other parties who need green beans.

The second-stage processor packs the ground coffee production using standing aluminum foil packaging that is easy to carry and to store. The use of packaging also facilitates delivery to consumers who are outside Malang. The second stage processor collaborates with several shipping services to distribute their products outside the city. The second stage processor also makes packages in several sizes to suit consumer needs.

3.2.4. Marketing and sales
Marketing and sales are activities that are needed to get new customers and manage the company's relationship with existing customers to increase sales of the company's products. It is the process by which actors persuade consumers to buy from them [10, 12]. Marketing activities are carried out by the Taji Arabica coffee value chain actors using relatively controlled marketing channels. All farmers' products are ready to be purchased by collectors on the condition that they are red picked. The results of the collectors are also readily accommodated by the first stage processor. The results of the first stage collectors in the form of green beans are also ready to be accommodated by the second stage processors. However, the high demand for Taji Arabica coffee has caused some green beans to be marketed to several roastery companies. This is also a form of Taji coffee branding. The second-stage processors market their coffee to several places, including back to the shop in Taji Village and the Angkot coffee shop itself. In addition, marketing outside Malang is also carried out in collaboration with several shipping services. Production yields are still unable to meet all market demand.
3.2.5. Service
Service is an activity required to receive complaints and input from customers to maintain the condition and quality of products that have been purchased by customers [10, 12]. The actors of the Taji arabica coffee value chain perform customer service for every activity in the Taji arabica coffee value chain. The actors held educational tourism events to educate customers about the coffee production process from upstream to downstream directly at Taji Village [13]. The event is held during the coffee harvest period. This event is to increase customer satisfaction and loyalty and the opportunity for customers to provide input and complaints directly to the actors. During the event, all actors from farmers to second-stage processors and the government as extension agents were present and actively interacting and discussing with customers. Customer service is carried out by the Arabica Taji coffee agro-industry players openly. Coffee value chain actors also have several media to receive complaints and input from customers, from WhatsApp, telephone, email, and several social media.

3.3. Margin
Margin is the difference between the total value and the overall cost of performing value activities [5]. Margin calculation shows that the largest margin is obtained by the second-stage processor, followed by the first-stage processor, farmers, and collector, respectively. When viewed based on the number of people in each form of actor, the margin earned by the collector is greater than that of farmers. The margin of all actors has different forming ratios. Most actors receive the largest margin contributor is profit, except for collector whose largest contributor is direct labor income. The results of the analysis show that the RC ratio obtained by all actors is above 1 and the BC ratio is positive. This shows that all Taji Arabica coffee agro-industry actors receive satisfactory margins and profits. Increasing the margin can be done, among others, by utilizing process by-products [13].

4. Conclusions
Taji coffee value chain actors' mapping involves the farmers, collector, first-stage processor, and second-stage processor. The mapping of Taji coffee production volume found that farmers could sell 2208 kg (96% of production) to the collector in the form of red cherries. The collector was able to sell 1899 kg (86% of raw material) to the first-stage coffee processor in the form of good red cherries. The first-stage coffee processor produced 346.8 kg green bean, and the second-stage coffee processor was able to produce 223.13 kg ground coffee sold to consumers. The mapping of the value offered for every kilogram output received by farmers is IDR 7,000, the collector is IDR 10,000, the first stage processor is IDR 90,000, and the second-stage processor is IDR 220,000. The second-stage processor obtained the highest margin with the amount of IDR 99,239. All actors receive satisfactory margins.

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