Indonesia Robusta Coffee Value Chain: Mapping and Upgrading Opportunities

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Abstract. Coffee, one of the agricultural commodities, aligns with specific relevant SDGs in addressing its sustainability challenges. This study aims to map and analyze the value chain to identify areas where upgrading interventions could be implemented to enhance the chain’s sustainability. This research was conducted in Bogor Regency, West Java, and Pagar Alam City, South Sumatra, in 2022. 112 farmers and 23 downstream actors participated in this study as respondents. The research utilized the qualitative descriptive method, incorporating the M4P (Making Markets Work for the Poor) approach, Ishikawa analysis, and Gereffi concept. The research discovered that a wide range of actors is involved in the chain, including small farmers, intermediaries traders, cooperative, processing industries, roasteries, retail, and coffee shops. The finding reveals robusta value chain includes several stages of transformation: input, production, processing, trading, roasting, and marketing. Four types of upgrading can be carried out. First, process upgrading by increasing productivity through implementing Good Agricultural Practices and improving post-harvest handling and processing that optimizes water usage and minimizes waste. Second, product upgrading involves product differentiation by producing red-picked green beans. Third, functional upgrading through coffee industrialization by enhancing partnerships in the production network. Fourth, inter-sectoral upgrading by finding new coffee markets. Implementing these interventions is expected to improve the sustainability of Indonesia robusta coffee value chain.

Keywords: Coffee Value Chain, Sustainability, Upgrading Interventions, Value Chain Analysis, Robusta Coffee

1 Introduction

Sustainable Development Goals (SDGs) are global goals agreed by the United Nations to address social, economic, and environmental concerns. As one of the agricultural products, coffee aligns with specific SDGs that are particularly pertinent. Almost 100 million people in coffee-producing nations depend on it for their livelihoods [1]. Sustainable coffee
practices, such as fair trade and equitable wages, can help create decent jobs and foster economic growth in coffee-producing countries. It connects small-scale growers in the global south to discerning consumers in the global north, offering economic benefits at every value chain stage. Partnerships are crucial for knowledge sharing, capacity building, and implementing sustainable practices throughout the coffee value chain. Based on the International Coffee Organization (ICO), there has been a substantial increase in global coffee production since 1990, with a growth rate of nearly 88 percent. The significant growth in global coffee production can be attributed to several factors. These include rising coffee consumption in emerging economies, increasing demand in established markets, a growing preference for specialty, certification, or sustainable coffees, and introducing new flavors and innovative products to satisfy consumer preferences [2–5]. Furthermore, the coffee industry presents a promising market with significant economic potential for all participants in the value chain, including coffee farmers and collector traders in the upstream segment and processors, roasters, industry, and retailers in the downstream segment [1,6].

Coffee plays a vital role in Indonesia’s economy, making significant contributions. In 2022, Indonesia produced 793 thousand tons of coffee beans, which will provide a source of income for 1.89 million farming households [7]. It supports farmers’ livelihoods by providing income opportunities, as a source of industrial raw materials, and contributes to the country’s export earnings and regional development [8]. However, the coffee industry faces numerous sustainability obstacles across environmental, social, and economic aspects. Like other coffee-producing countries, Indonesia faces challenges along the value chain. At the upstream stage, coffee farmers often encounter obstacles such as limited access to financing, inadequate market access, and insufficient skills in modern agricultural management. Additionally, climate change and pests attack can threaten the productivity and sustainability of coffee production in Indonesia.

The relationship between actors in the upstream and downstream segments of the coffee value chain also presents its challenges. Power imbalances and uneven market access can result in unfair and unsustainable pricing for farmers. Processors, retailers, and coffee exporters hold greater bargaining power, which can impact farmers’ profits. Sustainability concerns are also a focal point of the Indonesian coffee supply chain. Uncontrolled deforestation, excessive water usage, and inadequate waste management can negatively impact the environment and local communities. It is essential to implement sustainable farming practices, protect biodiversity, and ensure the well-being of farmers and workers in the coffee sector.

In light of these circumstances, this study aims to contribute to developing the sustainable Indonesian robusta coffee value chain. To ensure sustainable value chain development, it is required to undertake a value chain analysis along the coffee value chain in South Sumatra and West Java Province, as these two provinces contribute significantly to Indonesia’s production. This study aims to investigate the input-output structures among various actors in the robusta coffee value chain, identify the issues along the value chain’s stages, and propose potential upgrading strategies to improve the robusta coffee value chain.

2 Materials and methods

The study applied a case study approach as this research aim is to understand the coffee value chain in a specific area. The research was conducted in 2022 in Pagar Alam city, South Sumatra Province, which focused on three sub-districts, which is Dempo Utara, Dempo Selatan, Dempo Tengah; and Bogor regency, West Java Province, focused on
Sukamakmur sub-district. South Sumatra is the largest coffee producer in Indonesia, contributing 26.10 percent to the total coffee production in Indonesia or 36.15 percent to the total production of robusta coffee in Indonesia [7]. While West Java is not currently ranked among the top ten coffee-producing regions in the country, coffee has historically held a significant position in the economy of this province since the Dutch colonial era. The province has gained recognition for its unique coffee varieties known for their distinct flavors and aromas [9].

In order to understand the various actors involved in the chain and the connection between them, illustrating the journey of coffee from production and processing to retailing and its final consumption by the end consumer, we use value chain frameworks. The respondents of this study comprised 112 smallholder coffee farmers, 12 collector traders, one cooperative, eight coffee processors, and two roasting companies and coffee shops. Purposive sampling is applied to choose farmers who produce and sell green coffee beans for the coffee processing industry as respondents. Snowball sampling technique was employed for value chain actors in the downstream sector to ensure that the flow and value chain actors involved could be determined accurately. Then, the data were analyzed by qualitative descriptive method incorporating the M4P (Making Markets Work for the Poor) approach [10] which ACIAR has previously employed to generate mapping the value chain activities and actors, Ishikawa analysis [11] for identifying the cause and effect of value chain problems, and the Gereffi concept [12] to identify upgrading opportunities in the robusta coffee value chain.

3 Result and discussion

The initial step in developing the robusta coffee value chain is identifying and mapping indicators or input-output structures linked to the value chain. Following the mapping process, identifying issues and challenges allows us to uncover opportunities for upgrading the robusta coffee value chain.

3.1 Mapping the robusta coffee value chain

In mapping based on the M4P approach [10], the focus is on identifying the key activities within the value chain and the actors involved. The robusta coffee value chain in Pagar Alam and Bogor can be classified into five significant segments: production, post-harvest and initial processing, trading, advanced processing, and marketing (Figure 1). The value chain actors include small coffee farmers, small-scale collectors, large-scale collectors, regional traders, cooperative, small processing companies, large processing industries, retail, shops, roasteries, and cafes (Figure 2).
Production. The coffee farmers in the research location are small-scale farmers with an average land size of 1.34 hectares. With an average of 22 years of coffee farming experience, these farmers have a good understanding and knowledge. However, the productivity is not yet optimal due to the aging trees on the plantation and the application of fertilizers below the recommended level. The cultivated coffee variety is robusta, producing 3,151 kg/ha of coffee cherries in 2022. The harvesting season lasts about 3–4 months, with two harvest seasons yearly. The harvesting method varies, with red picking practiced in Pagar Alam and random picking practiced in Bogor. The difference in picking methods is determined by the specifications set by the lead firm in each location. Generally, farmers do not sell coffee cherries directly; they process them collectively into green beans. Only a few sell the cherries to collector traders. The price of coffee cherries ranges from Rp3,500 to Rp6,000 ($0.25 to $0.4) in 2022.

Initial processing. Farmers in the research location play dual roles as coffee cherry producers and green bean suppliers. At this stage, coffee cherries are processed into green beans using wet processing (washed) in Pagar Alam and dry processing (natural) in Bogor. Wet processing offers the advantage of reducing drying space and time. However, excessive water usage in the process adversely affects environmental sustainability. Moreover, the significant amount of waste generated poses a serious environmental issue in the surrounding area. Generally, the value-addition process from cherry to green bean involves several steps, including harvesting, cherry sorting, pulping, soaking/fermentation, washing, drying, and hulling. In the dry processing method, pulping and washing steps are omitted. As the lead firm, the industry sets specifications and standards for green beans, such as moisture content of 11–13%, no defect beans, and free from mold and insects. In this research, the Pagar Alam industry sets the specification for red picking, while the Bogor industry does not. The average production of green beans in the research location is 630...
kg/ha/year. Generally, green beans are not stored but sold directly to collector traders, processing industries, or roasteries and cafes. Green beans are sold in 60 kg bags without sorting and grading by processor farmers. The lead firm determines the price, which refers to the international market price. The price of robusta coffee beans at the farmer level ranges from Rp28,000 to Rp35,000 ($1.89 to $2.36) for red picking and Rp24,000 to Rp28,000 ($1.62 to $1.89) for random picking.

Fig. 2. Actors in stages of the robusta value chain

Advanced processing. For the Bogor chain, collectors sell the green beans to small-scale industries in Bogor and large-scale industries outside West Java province, such as Surabaya in East Java province and Lampung province. These large-scale industries include national companies such as Mayora and Kapal Api and multinational corporation such as Nestlé. These processing industries purchase green beans from collectors at Rp30,000 to Rp32,500 ($2.02 to $2.19) and process them into ground, instant, and ready-to-drink coffee. Green beans sold to local roasteries and cafes get a higher price, twice the amount, due to the higher specifications demanded by these industries. Roasteries then process them into roasted and ground coffee, selling directly to end consumers at around Rp250,000 per kg ($17). However, in the research location, only a few choose this channel.

As for the Pagar Alam chain, collectors sell the green beans to small and medium-sized enterprises (SMEs) in Pagar Alam, which process them into premium-grade red-picked ground coffee. Coffee SMEs purchase red-picked green beans at Rp33,000 to Rp50,000 ($2.22 to $3.37) and sell them as premium-grade coffee grounds at Rp150,000 to Rp200,000 ($10 to $13.5). This value-addition process supports previous research [13] that domestic processing industries provide added value and enhance the competitiveness of Indonesian plantation products.

Marketing. Pagar Alam ground coffee is marketed at local markets in South Sumatra and beyond, including in major cities such as Jakarta, Yogyakarta, Surabaya, Batam, Bandung, et cetera. It is commonly sold directly to end consumers by SMEs or souvenir shops. On the other hand, Bogor coffee is marketed through retail channels, e-commerce platforms, and local roasting houses and cafés.
3.2 Issues and challenges of the robusta coffee value chain

Figure 2 depicts the transformation of coffee carried out by the actors at each stage, which serves as a characteristic of value addition in the chain. Several issues and challenges occur in the robusta coffee value chain throughout the process. These problems were analyzed using the Ishikawa analysis method [11] and summarized in a cause-and-effect diagram in Figure 3.

![Cause and effect diagram for robusta coffee value chain](image)

*Fig. 3. Cause and effect diagram for robusta coffee value chain*

Based on Figure 3, various issues contribute to the suboptimal state of the robusta coffee value chain. On the production side, the problems in Pagar Alam and Bogor are similar to the general issues faced by the coffee industry in Indonesia. Implementing Good Agricultural Practices (GAP) for coffee has not been well executed, such as aged coffee trees in the plantations, various varieties of coffee seeds used, and inadequate fertilizer application. Farmers face difficulties in adhering to GAP because it increases production costs. Regarding harvesting, the consistency of following the Standard Operating Procedure (SOP) set by the coffee SMEs is declining among Pagar Alam farmers. In contrast, previous studies have shown that the adoption level of agricultural practices depends on farmers’ perception of the technology [14]. Therefore, ongoing guidance from the lead firm or agricultural extension agents is needed to encourage farmers to apply the standard practices.

On the processing side, production still relies on time-consuming conventional methods. Processor farmers, who are small-scale farmers, do not have pulping and hulling equipment, resulting in the need to pay for service for these processes. Distribution and
trade-related challenges include limited market access, forcing producers to rely on intermediaries to sell their green beans. This dependency on intermediaries reduces the bargaining power of processor farmers. Additionally, insufficient infrastructure hinders the mobility of coffee products in the Sukawangi sub-district of Bogor. While in Pagar Alam, there are street robberies (begal), further heightening security risks in distributing coffee products.

The degree of coordination is still low regarding institutional and governance aspects of the robusta coffee value chain in this study. The lack of trade agreements amongst chain participants demonstrates this. Farmers may sell their coffee beans to collectors or directly to the industries of their choice, and the targeted traders and businesses may vary. In contrast, a partnership between producers and lead firms would facilitate the transfer of information and knowledge, enhancing the capabilities of producers and generating innovation in coffee products [15,16]. Moreover, power asymmetry in the value chain is more pronounced downstream, as the lead firm, the processing sector, determines product specifications and coffee pricing. The processing industry’s dominant position and bargaining power give it greater control over decision-making, resource allocation, and the requirements for actor involvement in the coffee value chain. Consequently, farmers are in a disadvantageous position and have limitations in negotiation.

From a sustainability perspective, coffee crops are highly susceptible to local climatic conditions, and the yield of coffee is mostly affected by climate patterns, especially during the plant’s vegetative and reproductive stages [17]. It has also occurred at the study sites, specifically Pagar Alam. The surge in rainfall intensity from April to May 2021 disrupted the coffee flowering and fruit development processes. As a result, the increase in coffee cherry production, which typically occurs in May, did not happen. Additionally, the wet processing method used to produce green beans leads to excessive water usage, posing a threat to environmental sustainability. Moreover, the significant amount of waste produced poses a severe environmental problem for the nearby areas.

3.3 Upgrading opportunities of the robusta coffee value chain

Based on mapping activities and actors and identifying the issues mentioned earlier, here are the solutions for upgrading the robusta coffee value chain, categorized according to Gereffi’s concept [12]: process, product, functional, and inter-sectoral upgrading.

Process upgrading. Process upgrading refers to enhancing the value chain’s efficiency by raising the output quantity, reducing the expenses of reorganizing the production system, or introducing superior technology [18]. Process upgrading can be achieved through the improved implementation of Good Agricultural Practices (GAP), including proper fertilization to ensure optimal plant growth. Government policy support is needed to facilitate the regeneration of aging coffee plants, which can lead to increased coffee productivity. Extension workers are expected to assist farmers in adopting sustainable agricultural practices that reduce environmental impact and enhance the quality of coffee products.

In addition, process upgrading can be achieved by improving post-harvest handling and processing. It can be done by strengthening integration with downstream actors to facilitate the transfer of information and new technologies to producers, thereby speeding up the production process or reducing losses. Furthermore, it encourages using more efficient and modern processing methods, such as responsible wet processing, that optimizes water usage and minimizes waste generation. Facilitating small-scale producers with pulping and
hulling equipment through farmer groups or cooperatives enables them to process coffee more independently and efficiently, reducing their dependence on rental services.

Product upgrading. Product upgrading involves introducing new sophisticated product lines or upgrading existing ones with more excellent value and higher prices [18]. For Indonesian robusta coffee, product upgrading can be achieved by differentiating the produced coffee. The red-picked green beans, implemented in Pagar Alam, should be maintained and considered for implementation in other regions. To raise its value, Pagar Alam’s Robusta Coffee, certified as a Geographical Indication (GI) coffee since 2020 [19], must be advertised and highlight its excellent flavor profile. Indonesian robusta coffee also needs to educate the market by promoting its premium coffee through awards it has received. Pagar Alam coffee is one of the six coffee varieties in Indonesia that has been awarded by the Agency for Valorization of Agricultural Products (AVPA) in France. In 2020, Pagar Alam coffee was awarded the Gourmet Medal in the puissant amer category (strong bitter taste) [20]. Similarly, in 2018 Sukawangi Bogor coffee received the Bronze Gourmet title in the “Coffees Roasted at Origin” competition organized by AVPA to support producer countries in boosting their value of agricultural products and promoting their roasted coffee in Europe [21].

Functional upgrading. Functional upgrading involves adopting new functions or eliminating existing ones to improve the overall performance of the chain’s activities [18]. The added value of robusta coffee beans can be enhanced by developing instant and roasted coffee for domestic and international markets. Government policies on coffee industrialization can assist farmers in functional upgrading by providing small-scale processing equipment such as pulpers, hullers, milling machines, graders, or roasting machines for coffee SMEs. However, attention should be given to the scale of operations and the suitability of production quality for the facilitated equipment, such as the issue of easily burnt roasting machines facilitated by the local government in Pagar Alam. Moreover, it is vital to address the issue of equipment ownership, which is often controlled by a few local elites. In Pagar Alam, for example, the roasting equipment facilitated by the local government is monopolized by only one SME. This circumstance also occurred in three other coffee production centers in other provinces, where interventions from foreign roasters are captured by local elites (the leader of a farmer group, village chief, or the head of a cooperative), who effectively take control of the producer organization and function it as if it were their private business [16]. The role of cooperative needs to be further strengthened. Currently, cooperative in the research location are limited to trading green beans, albeit with added activities such as sorting and grading. On the contrary, cooperative can provide channels that facilitate interventions from downstream actors. Additionally, the premium prices paid by cooperative to farmers for their cherry fruits or the labor savings associated with selling cherry fruits rather than coffee beans can serve as forms of economic and social upgrading for farmers [16].

Intersectoral upgrading. Inter-sectoral upgrading involves firms shifting to new, often relevant sectors [18]. It can be achieved by exploring new coffee chains or markets and penetrating new markets with coffee beans or roasted coffee. Promoting products based on quality, as mentioned in the product upgrading section, premium or specialty markets can become more accessible. To encourage this, the government can improve infrastructure accessibility for distribution, including road improvements and transportation facilities to reduce mobility barriers.
4 Conclusions

The robusta coffee value chain in Pagar Alam and Bogor can be classified into five significant segments: production, post-harvest and initial processing, trading, advanced processing, and marketing. The value chain actors include small coffee farmers, small-scale collectors, large-scale collectors, regional traders, cooperatives, small processing companies, large processing industries, retail, shops, roasteries, and cafés. Four upgrading categories can be implemented to develop the robusta coffee value chain. First, process upgrading can be achieved through improved implementation of GAP, aged coffee tree regeneration, and enhancing post-harvest handling and processing to make it more efficient and modern, which optimizes water consumption and reduces waste for sustainable coffee production. Second, product upgrading involves differentiating coffee products, such as red-picked coffee, promoting GI certification, and highlighting the awards received as premium coffee. Third, functional upgrading can be achieved through coffee industrialization by enhancing the role of cooperative institutions and other downstream actors in improving the capabilities of upstream actors. Lastly, intersectoral upgrading involves entering new coffee beans, roasted and ground coffee markets. Through these upgrading solutions, it is expected that the Indonesian robusta coffee value chain can be enhanced holistically, including product quality, process efficiency, active participation of farmers, and better sectoral collaboration. It will increase competitiveness, sustainability, and the stakeholders’ welfare in the coffee value chain.

References


