Investigating the Value Chain-Based Model of the KOMASTI Variety Agroindustry in Indonesia

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Article Info:	Abstract
	Purpose: This research was conducted to analyse the strengthening of the KOMASTI coffee agro-industry as a strategy to improve farmer welfare and national economic resilience through the integration of the *Asta Gatra* framework to achieve sustainable development. **Study Design/Methodology/Approach:** This study adopted a mixed method, with data obtained through in-depth interviews, focus group discussions, and field surveys with coffee farmers and agro-industry players in Dairi Regency, North Sumatra. Analysis of product value addition was done based on the Hayami model to determine production efficiency and distribution of economic value throughout the supply chain. **Findings:** The findings show that the economic value is still centred on downstream agents, and upstream farmers do not sufficiently benefit from market access and processing technology. The originality of this contribution lies in its argument for that necessary cooperation while illustrating the preliminary structure of a new integrative model which synthesises both supply chains by also relying on traditional territorial productiveness, thus anchoring us in the position where citizens will be able to hope for an expanded PAS simultaneous blended economic value sharing and regional resiliency. **Originality/Value:** This study makes theoretical and practical contributions to the literature on value chains and national resilience. The developed instrument shows that the enhancement of the local resource coffee agro-industry is a matter of both economic strategy and policy for building strong, resilient, inclusive and sustainable national resistance.

INTRODUCTION

The coffee agro-industry is a strategic sector that serves as a supporting mechanism for national development. Its business activities have a multiplier effect, contributing to the economy by improving the welfare of farmers. Socially, the coffee agro-industry creates jobs and thus increases national competitiveness in the global market. The coffee agro-industry encompasses the entire chain of activities, from cultivation and harvesting to processing and packaging, to marketing. Limited access to any link in this chain has a multiplier effect on economic stability and rural development (Candelo et al., 2018; Machado-Vargas et al., 2018; Priyanto, 2024). Strengthening the sustainability and competitiveness of the coffee industry is a key strategy for strengthening national economic resilience by balancing natural aspects *Tri Gatra* i.e. geography, demography, natural resources and *Panca Gatra* i.e. ideology, politics, economics, socio-culture, defense and security (R.Z. Panca Putra S et al., 2024; Salsabila et al., 2024; Utomo & Setiyono, 2024).

Theoretically, Porter's (1985) and Barney, (1991) have suggested the terms contextually for competitive advantage and industry resilience, including an integrated approach based on innovation, poverty, and supply chain management. The value chain and resource perspectives explain how value creation and competitive performance depend heavily on the effective use of resources, the creation of new resources, and coordination across production levels. However, the Indonesian coffee agro-industry considers these theories to be of very limited effectiveness. Fadhil et al. (2018) argue that Indonesian coffee production is limited to the upstream sector, resulting in low value, inadequate downstream innovation capacity, and inadequate market diversification.

Therefore, the conflation between theory and practice demonstrates the limitations of integrating desire and innovation strategies into the management of the national coffee agro-industry. Agustin et al. (2024); Fachrurazi et al. (2023); Huda et al. (2022), and Fadhil, Qanytah, et al. (2018) emphasise in their research that the implementation of successful business models and technologies is crucial for achieving greater market share and a strong competitive advantage. However, this approach has not been applied to the Indonesian coffee business sector, resulting in fragmented intermediation, institutional coordination, and low farmer productivity. The result of this condition is instability outside the national coffee sector, which is influenced by fluctuations in international coffee bean prices, weather changes, and a strong European preference for ethical products. Based on this, this study aims to answer the question, "How can a coffee agro-industry development strategy increase added value and competitiveness through an integrated approach based on sustainability, innovation, and the supply chain to support national resilience?"

LITERATURE REVIEW

Theoretical Studies

The Value Chain Theory, the Resource-Based View, and the Social Capital Theory are used in this study to explain the strategic role of the coffee agro-industry in strengthening national economic resilience. In the Value Chain Theory, Porter, (1985), explains that competitive advantage is achieved through organisational efficiency and effectiveness at every stage of production through distribution, which generates added value. Barney Resource-Based View (1991) emphasises that economic strength depends on the ability to manage valuable, scarce, and difficult-to-imitate resources, including land, technology, and human skills. Meanwhile, social capital theory (Putnam, 2015) emphasises the importance of trust, social networks, and institutional collaboration between farmers, researchers, and the private sector in building socio-economic resilience. This framework is supported by the soft systems methodology (Adda et al., (2022) which helps understand the dynamics of relationships between actors in the agro-industrial system, as well as the application of digital technology and the Internet of Things (Wang, 2022) to improve the efficiency and sustainability of the value chain. Hayami & Ruttan (1977) value-added distribution model reinforces economic equality among supply chain actors, while (Creswell & Plano Clark, 2023) mixed-methods approach allows for a more comprehensive socioeconomic analysis. Conceptually, all these theories link the natural dimension, or *Tri Gatra*, encompassing resource and environmental management, with the social dimension, or *Panca Gatra*, encompassing human, economic, and institutional development, enabling the coffee agro-industry to become a driver of sustainable and competitive national resilience.

The Role of the Indonesian Coffee Agroindustry in KOMASTI Variety Innovation

KOMASTI is an interspecific Arabica coffee variety released in 2013 by the Indonesian coffee and cocoa research institute (ICCRI). This category is highly resistant to leaf rust disease and superior in earliness to the local cultivars. Nevertheless, this institutional type is not well distributed, mainly because of inadequate dissemination of knowledge and adoption centres to smallholder farmers. To remedy this, ICCRI partnered with world coffee research to create a demo plot in West Java in 2022 to show how the variety performs on real farms. Field trials indicate that KOMASTI can maintain good productivity and quality under harsh environmental pressures, with the vision of becoming a benchmark in sustainable coffee landscapes for Indonesia (World Coffee Research, 2023). Given this hard evidence, it can be concluded that locally bred superior varieties could help in enhancing production efficiencies, reducing susceptibility to plant diseases and fortifying local economic bases, which would all contribute to national security.

Farmer Empowerment and Value Chain Integration

Farmers' participation in the agro-industrial value chain mechanism has important effects on the fair distribution of added value and welfare increases. According to Jin et al. (2024) , this very important role results in the final outcomes of equity, welfare gain, and improvement (in terms of higher productivity, better distribution, and knowledge transfer). Secondly, cooperation could result in broader access to the market and more balanced profit-sharing schemes. Thus, under the *Panca Gatra* concept, the practice of the collaborative principle may contribute to social resilience by reinforcing both economic solidarity and autonomy among villagers.

Strengthening Production Capacity and Technology

Adda et al. (2022) confirms that the improvement of human resource capacity is a decisive factor for agro-industrial systems to be efficient. By preparing and training the farmers to modernise their production methods, they could use environmentally friendly technologies. These systems create cooperative links between like-minded organisations that share a common goal, providing them with the ability to work together in times of changing markets and climates. These findings support the *Tri Gatra* strategy to develop human and natural resources for increasing national economic resilience.

Technology Integration and Supply Chain Efficiency

According toWang (2022) applying digital technology and the Internet of Things (IoT) in agriculture will enhance operation efficiency and food safety, as well as lower the cost of production. Thus, in the coffee agroindustry context, IoT implementation should be focused on facilitating monitoring of harvest quality, controlling supply chain logistics and predicting selling prices with minimised market uncertainties.

Distribution of Added Value and Economic Justice

The distribution of value-added in the agro-industry reflects economic justice, which determines the sustainability of the agricultural system. Shi & Wang (2023) assert that the success of agricultural cooperatives depends on a balanced revenue- and risk-sharing mechanism between farmers, processors, and retailers. Cooperative involvement in the supply chain increases farmers' bargaining power through production-sharing contracts that ensure a fair distribution of benefits while reducing risk inequality. Khan et al. (2022) corroborate the findings of this study by demonstrating the link between cooperative governance and modern technology in increasing production efficiency and farmer incomes in rural areas. Therefore, the principle of justice in the distribution of added value, as stated by Hayami and Ruttan (1977), emphasises the importance of balancing economic benefits and social stability, which is fundamental to the sustainability of the agribusiness system. The appropriate implementation certainly supports the intent of the socio-economic dimension of *Asta Gatra*, where the equitable distribution of economic benefits is a fundamental element in strengthening national resilience through inclusive and equitable rural development.

Regional and Socio-Economic Aspects of KOMASTI Coffee

The development of the KOMASTI coffee variety can maintain the socio-economic ecosystem in the long term while also balancing ecological dimensions, positively impacting the local strength of regional resilience. Meanwhile, from a socio-economic perspective, its function is to empower local communities and economies, as well as to increase the capacity of agribusiness institutions to adapt to market and environmental changes. Therefore, the synergy of ecological and socio-economic dimensions aligns with the intent of the *Asta Gatra* concept developed by the National Resilience Institute. Furthermore, its success will positively impact coffee agro-industry management, strengthen economic resilience, and promote a stable, inclusive, and equitable social order.
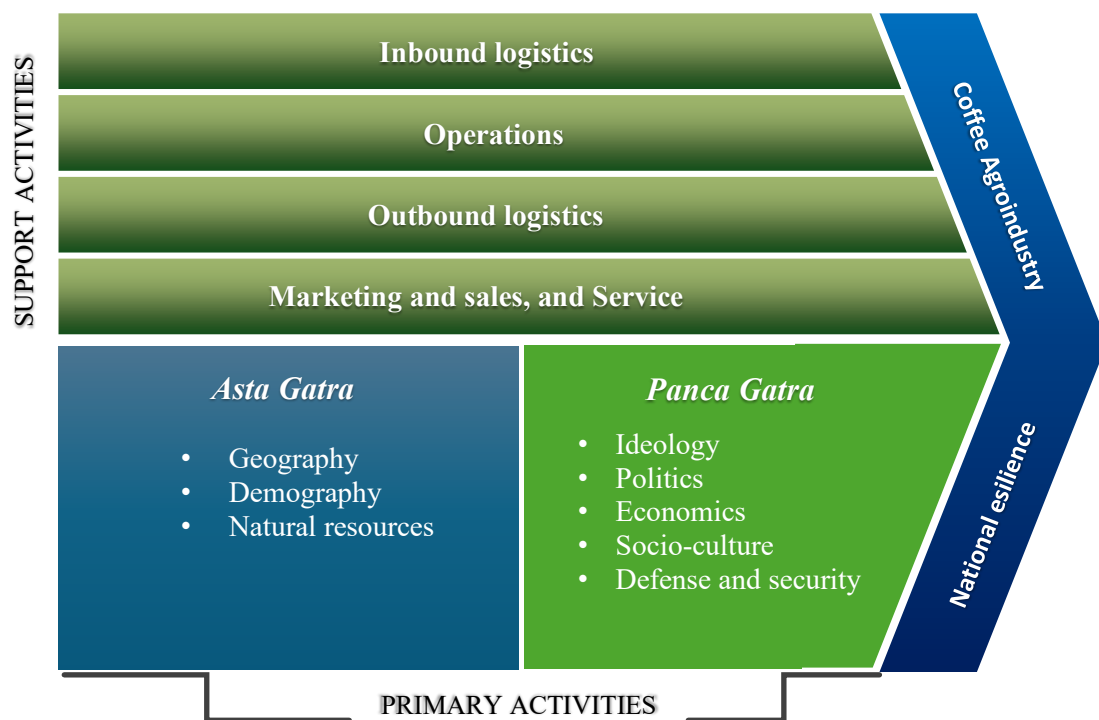

Figure 1: Conceptual Framework for Strengthening the KOMASTI Coffee Agroindustry for National Economic Resilience (adapted from Porter, 1985, and *Asta Gatra* Lemhannas RI).

Figure 1 explains the connection between the primary and supporting activities in the value chain of the coffee agro-industry at KOMASTI and *Asta Gatra* as a foundation for improving national resilience. *Asta Gatra* and *Panca Gatra* are the main policies that can reinforce the socio-economic system and enhance the added value of the agro-industrial sector by supporting all primary activities through sustainable and efficient resource utilisation.

National resilience is not simply about economic strength but also about maintaining a balance of natural resource capacity and effective social governance. In fact, the integration of these two social forces should enhance the productivity of the coffee agro-industry, improve community welfare, and improve regional social and economic stability. Therefore, the presented conceptual model hopes that the development of KOMASTI coffee varieties can become part of a national strategy to build a resilient, independent, and sustainable economic system to support national resilience.

METHODS

Research Design

The research method adopted in this study is a hybrid approach combining qualitative and quantitative methods to produce a comprehensive outcome with respect to the enhancement of the KOMASTI coffee agro-industry as part of economic resilience at the national level. This method permits checking connections between social, economic and institutional determinants under an empirical test to the agroindustry's economic performances. This stance is coherent with the methodological works of Creswell and Plano Clark (2023), who point out that merging numerical and narrative data helps us obtain a better view of the corresponding phenomenon.

Data Collection Locations and Techniques

The research was conducted in Dairi Regency, North Sumatra Province. The research location was chosen because the regency is one of the main production centres for the KOMASTI coffee variety in Indonesia. Data collection techniques included surveys, in-depth interviews, focus group discussions (FGDs), and a literature review. The survey technique was used to collect quantitative data on production inputs, labour costs, raw material prices, and output volumes from farmers and agroindustry players. In-depth interviews and FGDs were conducted to obtain qualitative information on socio-economic dynamics, institutional roles, and coffee value chain development strategies at the local level. Secondary data sources included scientific publications, reports from the regional agricultural office, and official statistical data. Data triangulation was used to ensure the validity and reliability of the findings by comparing results from various data sources and collection methods (Creswell and Plano Clark, 2023).

Data Analysis Techniques

The data were analysed using two primary methods. The first was value chain analysis mapping direct and supporting steps in the coffee agro-industry system as suggested by Porter (1985). This work intends to discover the phases which input the most in value-added generation. Second, the Hayami and Ruttan (1977) value-added model was used to calculate the value-added, labour income, and profit levels at each stage of the coffee production process.

The Hayami model links the relationships between inputs, outputs, and labour to determine the value-added ratio and economic efficiency within a production cycle. The reason for this method is that it has proved effective in productivity analysis and the degree of equitable sharing between agricultural and agro-industrial industries,

particularly plantation crops in developing countries, including the coffee sector in Indonesia (Hayami and Ruttan, 1977).

Table 1. Analysis of Value-Added Input, Output, and Coffee Production Price at the Bolon Coffee Factory, Dairi Regency (Hayami Model)

Variable	Unit	Measurement
Input	Kg/period	Raw materials used to produce coffee in one production process.
Output	Kg/period	Total Arabica coffee production produced by the agro-industry
Labour	HOK/period	Number of person-days worked in one analysis period
Conversion Factor	Kg/period	Conversion Factor = Output / Input
Labour Coefficient	HOK/ kg	Labour Coefficient = Labour / Input
Price of Output	Rp/kg	The product price prevailing in the period analysis
Average Wage of Labour	Rp/period	Average wage received by workers per period, based on HOK.

Source: Hayami et al. (1987)

Table 2. Analysis of Value Added, Revenue, and Profit Using the Hayami Model for the Bolon Coffee Production Process in Dairi Regency

Variable(s)	Unit	Measurement
Raw Material Price	IDR/Kg	Price of the main raw material (coffee cherries) during the analysis period.
Other Input Contribution	IDR/Kg	Contributions or costs of other inputs, consisting of the cost of auxiliary raw materials, depreciation costs, and other inputs.
Output Value	IDR/Kg	Output Value = Conversion Factor x Output Price
a. value Added	IDR/Kg	Value Added = Output Value - (Raw Material Price + Contribution of Other Inputs)
b. % Added Value Ratio	IDR/Kg	Percentage Added Value Ratio = Added value / output value x 100%
a. Labour Income	IDR/Kg	Labour Income = Labour Coefficient x Average Labour Wage
a. Processing Profit ***	IDR/Kg	Profit = Value Added - Labour Income
b. Profit Rate %	%	Profit Rate = (Profit / Output Value) x 100%

Source: Hayami et al. (1987)

Notes: one-time production process. *Other inputs = packaging (sacks), yarn, needles, processing machine drivers, and ***profit is valued at operating costs** (raw materials, other inputs, and labour).

RESULTS AND DISCUSSION

Results

Value Chain Mapping

The prevailing inequality in the field is that KOMASTI coffee farmers in Dairi Regency receive a small share of added value compared to other value chain actors. This inequality is caused by traditional value-added practices and limited access to markets and post-harvest facilities (Fitriana, 2020). As a result, these situations give rise to to low economic efficiency throughout the value chain and reduce coffee farmers' negotiating strength.

The analysis focused on grade 1 (speciality) green coffee beans produced by *Kopi Bolon*, a reputable coffee processing company in Dairi Regency, to attain a more comprehensive understanding of the distribution of added value as depicted in Hayami (1977) model by observing how efficient their production is, how much labour they involve and what the portion of added value that came from each stage of processing was.

Table 4. Inputs, Outputs, and Prices of Value-Added Analysis - Hayami Model for Green Bean Grade 1 (Specialty) at Bolon Coffee, Dairi Regency

Variable(s)	Unit	Statistics
Input	Kg/period	155
Output	Kg/period	135
Labour	HOK/period	30
Conversion Factor	Kg/period	0,870
Labour Coefficient	HOK/ Kg	0,000193
Price of Output	IDR/Kg	104
Average Wage of Labour	IDR /period	2.100.000

Table 4 presents the analysis of average raw material, output, labour, and price used in processing grade 1 green coffee at *Kopi Bolon* (Dairi district). During the 2024 processing season (from September to October), approximately 155 tonnes of green coffee were received and processed by the company, which are collected in the area from smallholder farmers and collectors. The supply volume depends largely on market conditions, including contract frames, harvest availability and the stock situation of each year and price fluctuations. This resulted in the equivalent of 135 tonnes of clean grade 1 green coffee being produced from these total raw materials, at a conversion factor of 0.87, which illustrates a high process efficiency as almost all raw material is converted to export-quality product.

Processing is done by 30 workers, all of whom work on drying, sorting, and packing. The labour coefficient of 0.000193 HOK/kgm shows that processing of the coffee is mostly skill-intensive but not labour-intensive. The IPS per worker wage of IDR

2,100,000 period was derived from the contribution to production figure (4.1) and an assumed income of about IDR 500 per kg of product produced. The marketing price of the coffee bean is fixed through a trading contract made between the management of KBC and outward buyers at an average value of IDR 104,000 per kg, which represents the standard quality of speciality coffee (where the beans have a uniform shape as well as moisture content).

Value-Added Analysis of Grade 1 Green Coffee Beans: Revenue and Profit

A value-added approach was used to determine the economic contribution resulting from first-grade green coffee beans processed at *Kopi Bolon*, Dairi District. The variables were measured by the Hayami Model (1977) to estimate production efficiency, labour income share, and profit level per kilogramme of raw material processed. The calculated values are shown in Table 5.

Table 5. Income and Profit – Hayami Model Value-Added Analysis for Green Bean Grade 1 (Specialty) at Bolon Coffee, Dairi Regency

Variable(s)	Unit	Statistics
Raw Material Price	IDR/Kg	47
Other Input Contributions**	IDR/Kg	640
Output Value	IDR/Kg	90,48
a. value Added	IDR/Kg	42,84
b. % Added Value Ratio	%	47,34
a. Labour Income	IDR/Kg	405
a. Processing Profit ***	IDR/Kg	42,435
b. % Rate of Profit	%	46,89

Source: Results of primary data processing (2025), adapted from Hayami and Ruttan (1977)

The value-added, revenue, and profit calculation of processing grade 1 green coffee beans at *Kopi Bolon Dairi* Regency based on the Hayami model (1977) is shown in Table 5. Products were based on the quality of coffee from assisted farmers, which is used as raw material and incorporated in the contract clause for agro-industrial management partners, yielding raw materials with an average price of IDR 47,000/kg. Other input contributions of IDR 640 per kg were for packaging, energy and production machine maintenance. The value of export quality (green coffee) was up to IDR 90,480 per kg, indicating the processing process is quite effective. Contributed value added of IDR 42,840 per kilogram was produced (ratio of 47.34 per cent from total output value),

indicating that local processing plays a crucial role in the overall economic value of the product.

Business selling price Wage ($407 per Kg): Labour wage: was $405 based on sorting and packaging labour. The net return of processing was IDR 42,435/kg with the profitability level of 46.89 per cent. These figures show the efficiency of the agro-industry in generating cost economising and respective income partition. Higher added value and high profit margins are reinforcing the KOMASTI coffee agro-industry as a local resource-based business model that can compete to grow sustainably towards regional economy strengthening.

Production Costs and Added Value of NC Green Coffee

A production cost analysis was performed to determine the percentage of return between each production factor in processing grade 1 green coffee beans at *Kopi Bolon*, Dairi Regency. The computations relied on the Hayami model (1977) to explain labour income, extra input returns, and processing profits in terms of the total value added. The analysis results have been presented in Table 6 below.

Table 6. Cost of Services for Production Factors – Hayami Value-Added Analysis Model for Green Bean Grade 1 (Specialty) at Bolon Coffee, Dairi Regency

Variable	Unit	Value
Profit Margin	IDR/Kg	43,48
a. Labour income	%	0,93
b. % Contribution of other inputs	%	1,47
c. % Profit	%	97,59

Source: Results of primary data processing (2025), adapted from Hayami and Ruttan (1977)

The cost structure of production factor services in the processing of grade 1 green coffee beans, as shown in Table 6, shows the dominance of the profit component in the total added value. The profit margin reached IDR 43,480 per kilogram, while the contribution of labour was only 0.93 percent, and additional inputs were 1.47 percent of the total economic value of the product. This distribution certainly indicates the presence of service value in the production process, which is concentrated in net profit, amounting to 97.59 per cent of the total added value. Therefore, this provides an understanding of operational efficiency and effective use of production factors at *Kopi Bolon*, where most of the economic value is obtained from processing activities with high product quality. The large proportion of profit indicates that investment in increasing production capacity and processing technology can have a significant economic impact on the performance of the KOMASTI coffee agro-industry.

Strengths and Weaknesses

The KOMASTI coffee variety characterises a uniform bean quality and is supported locally by farmer groups and cooperatives, resulting in strengthening its position within the value chain as well as gaining access to the speciality segment. The main challenges comprise inadequate postharvest technology, poor land productivity and lack of financing; the same findings were reported in a study on the Indonesian coffee value chain and upgrading practices at the farmer-trader level (Fauzi et al., 2023). Furthermore, the proposed development model prioritises upstream-downstream integration through strengthening cooperatives, increasing human resource capacity, adopting postharvest technologies, utilising digital platforms for marketing and supply chain efficiency, and fostering cross-stakeholder collaboration. Evidence of the role of cooperatives and digital transformation in the performance and sustainability of coffee cooperatives in Indonesia is demonstrated by a recent data-based study (Wardhiani et al., 2023). For value-added aspects, the application of the Hayami Model to coffee cooperatives in Indonesia provides a methodological reference and evidence of margin improvement through appropriate processing and market orientation.

Discussion

Structure and Connectedness Patterns of the *KOMASTI* Coffee Value Chain

The upper and lower actors in the value chain at KOMASTI Coffee in Dairi Regency are not yet optimally integrated. Based on interviews and focus group discussions, farmers still contribute minimally to production and initial drying activities without involvement in the milling, sorting, and packaging processes. This lack of involvement results in an uneven distribution of economic value and weakens the competitiveness of local products. This finding aligns with studies by Astuti et al. (2015); Neilson and Pritchard (2011); Reardon et al. (2009) which explain that smallholder farmers in developing countries often serve only as raw material suppliers due to weak vertical integration and limited market information.

Interviews of cooperative managers revealed that effective mechanisms particularly contracts farming or modern cooperative models are not yet put in place, so farmers do not have any legal protections which help guarantee their price. C. Dolan and Humphrey (2004) also corroborated that missing strong intermediary institutions disempower farmers in the negotiation process with middlemen. The pattern of the relationship indicates that the socio-economic foundation is still weak in rural areas; thus, further attention must be paid to fulfilling the elements of *Pancagatra* as part of national resilience.

Governance and Value Transfer Under Downstream Power Domination

The downstream players like processors, wholesalers and exporters are in control of a significant part of value addition, including washing, sorting, packaging and marketing. Export managers in Dairi also expressed that their dominance is strengthened

by having easier access to capital, infrastructure and international trade contracts. This hegemonic pattern is consistent with the buyer-driven GVC model posited by Gereffi et al. (2005), where quality standards, certifications, and trade mechanisms are also established by larger firms that tie up small producers.

The market hegemony created through this control reflects the concentration of economic value in downstream actors and limits farmers' opportunities to obtain proportional benefits. Daviron and Ponte (2005); Ponte (2002) and Giovannucci et al., (2008) found a similar phenomenon in the global speciality coffee commodity, where certification and pricing are dominated by large entities in importing countries. Based on Putnam's (2015) social capital theory, low trust and collaboration among value chain actors leads to unequal distribution of information and innovation flows. Therefore, the formation of a strong partnership and institutional network between farmers, processors, and buyers is necessary to strengthen the efficiency of value chain governance.

Distribution of Added Value Along the Value Chain

Analysis of added value using the Hayami Model indicates that the largest portion of the economic value of KOMASTI coffee is created during the processing and export stages. Field data indicates that farmers only receive around 25 per cent of the final retail value, whereas processors and exporters receive a significantly larger portion. This distribution pattern supports research by Wahyudi and Jati, (2012) and Bacon et al. (2008), which asserts that most of the global coffee commercial value is concentrated in consuming countries due to limited access to technology and institutions at the farmer level.

Processors at *Kopi Bolon* interviewed say using semi-washed and fully washed methods enhances the quality and therefore price of coffee beans, but they have scanted technical knowledge as well as equipment for it. The possibility of additional value is supported by reports from Wahyudi and Jati, (2012) and WCR News (2022), wherein the KOMASTI variety exhibits excellent quality attributes in terms of cupping and has good levels of resistance, offering high profitability. Expanding processing capabilities at the farmer level is an important step towards broader-based value distribution and a stronger regional economy overall (Narayanan and Gulati, 2002).

Value Chain Strategy to Strengthen Nations' Economies During Crises

The value chain strengthening model, developed through a mixed approach, identifies four key strategies relevant to enhancing the competitiveness of the KOMASTI coffee agro-industry. The first requirement is integration of production (upstream) and processing (downstream) units by strengthening cooperatives and farmer partnership programmes. Second, enhance human resource capacity that is trained for livelihood activities and that has entrepreneurial mentorship and coaching on post-harvest technology (Barclay, Robert W.; Lamb, John E.; Velez, 2005; Beuchelt and Zeller, 2011). The third is that we must do a much better job of leveraging the digital world so that we can expand market networks and help supply chains run more effectively. (4) Collaborate across stakeholders (government, academe, business and civil society) for local economic governance improvement (Murray-Prior, 2020).

The interviews revealed that the implementation of the KOMASTI coffee agro-industry strategy has the potential to increase production efficiency and farmer incomes, as well as expand access to export markets. The findings align with Barney's (1991) hypothesis, which suggests that the control of unique and valuable resources is the foundation for competitive advantage. Therefore, focussing on the national resilience principles of maximising natural resources and developing socio-economic capital, including digital resources, will contribute to building regional economic resilience.

The link between *Tri Gatra* and *Panca Gatra* in this research finding is in the efficiency of natural resource management, the implementation of which will strengthen the geographical, demographic, and natural resource aspects. Furthermore, its simultaneous impact will provide institutional development, economic strengthening, and social empowerment, increasing socio-economic stability. Indeed, the congruence of views corroborates the findings of Giovannucci et al. (2008), (2009); Kaplinsky and Morris, (2000); Mulyati and Indrawan (2021); Umaran et al. (2022) and Gereffi et al. (2005), in the sense that valorising the KOMASTI coffee value chain is not only an economical strategy but also a vehicle of sustainable national resilience.

CONCLUSION

This study indicates that the development of the North Sumatera KOMASTI coffee agro-industry value chain has played a role in increasing farmers' welfare and strengthening national economic resilience. The examination reveals that economic value is kept with the downstream players, and only small gains fall to the upstream farmers. Integrated value-chain-enhancing models, both upstream and downstream, as well as the strengthening of cooperative institutions and their technological orientation and the digitalisation of markets, have assumed the potential to enhance efficiency by enabling equitable distribution of economic value. The integration of *Tri Gatra* elements (resources, demography, and territory) with the *Panca Gatra* element (economics, socioculture, ideology, and political security) also shows that strengthening the KOMASTI coffee value chain is an economic strategy consistent with strengthening national resilience in a sustainable manner.

This study suggests that the government and other agencies should improve farmers' institutions through professional cooperatives, enhance entrepreneurial orientation and advocate for the adoption of green technologies. To extend market reach and enhance supply chain visibility, pro-poor financing support and digitisation of marketing are required. The confined nature of this research in one region signals the call for similar studies elsewhere in coffee-producing regions to evaluate long-term socio-economic implications and extend the examination of how digital innovation and trade policies have facilitated integration between sectors towards a resilient and adaptive national resilience.

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