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Strengthening Agricultural Value Chains to Improve coffee Farmers' Economic Resilience in South Sumatera

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ABSTRACT

This study examines how strengthening agricultural value chains can improve the economic resilience of coffee farmers in South Sumatra, Indonesia, using a qualitative case-study design. Data were collected through semi-structured interviews with smallholder farmers and key value-chain actors (village collectors, district traders, processors, cooperative leaders, and extension stakeholders), complemented by field observations and document review. Thematic analysis indicates a predominantly trader-led chain in which price formation and quality grading are concentrated downstream, limiting farmers' bargaining power and weakening incentives for consistent quality improvement. Upgrading constraints cluster around post-harvest capacity, time and labor shortages, liquidity pressure that forces rapid sales, and uneven access to guidance and feedback. Institutions and local networks matter as practical resilience mechanisms: where farmer groups or cooperatives function well, farmers report clearer coordination, stronger learning, and more predictable market access, although compliance demands can exclude resource-constrained households. Resilience is also shaped by shock pathways along the chain; climate variability and quality losses translate quickly into income shocks when governance is opaque and service support is weak. The study proposes strengthening actions that are feasible at the farm gate: transparent and shared grading references, low-cost post-harvest upgrading support, strengthened collective marketing and governance, and better information and service linkages to reduce dependency and uncertainty. These measures can shift value-chain strengthening from isolated technical fixes toward inclusive governance improvements that stabilize income and enhance coping and recovery capacity for coffee households. Policy implications emphasize targeted extension, simple infrastructure, and fair incentives so that upgrading benefits reach vulnerable farmers directly.

Keyword: *Coffee value chain; Economic resilience; Smallholder farmers; Governance; South Sumatra*

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INTRODUCTION

The coffee value chain is a primary arena where smallholders' welfare is determined,not only by on-farm productivity but also by market access, quality standards, trading relationships, and the policies and programs that reach rural areas. In the Indonesian context, many value chain interventions are designed to improve quality upgrading, marketing efficiency, and rural development, yet the outcomes are not always distributed evenly across actors, especially farmers. Evidence from Indonesia shows that the link between coffee value chain interventions and rural development depends strongly on who benefits most from upgrading and how relationships among actors are structured (Vicol et al., 2018). A key question in strengthening value chains is "upgrading for whom," because quality improvement and integration into higher-value markets can reshape how benefits are distributed among farmers, local traders, and exporters. Vicol et al. (2018) underline that interventions that appear "pro-farmer" on paper may generate varied outcomes in practice, depending on farmers' bargaining power, the type of contractual relationships, and the governance structure of the value chain in each production area. This matters for coffee-producing regions such as South Sumatra, because farmers' economic resilience is shaped not only by prices, but also by their capacity to manage risk,

maintain quality, and secure stable market access. Therefore, value chain strengthening should be understood as institutional and power-related change, not merely a technical post-harvest issue (Vicol et al., 2018).

In many developing countries, certification is often framed as an instrument to advance sustainability while improving farmers' incomes, but empirical evidence shows mixed and highly context-specific results. A systematic review of agricultural certification finds that impacts on prices, income, and household welfare are not consistently positive, and frequently depend on compliance costs, extension support, and farmers' ability to meet standards (Oya et al., 2018). Research focused on the coffee sector likewise highlights that certification can open opportunities for market access and improved practices, yet the benefits may be limited or uneven, particularly for resource-constrained smallholders (Bray & Neilson, 2017).Beyond economic outcomes, institutional dimensions such as farmer organizations are crucial in determining whether certification and value-chain programs truly strengthen farmers' bargaining positions or instead add administrative burdens. Research on Indonesian smallholders' perceptions suggests that certification benefits are often layered: some farmers perceive improved knowledge and network access, but not always a substantial increase in income. Ibnu et al. (2018) emphasize that farmer organizations can serve as bridges for negotiation, collective learning, and compliance management, yet their performance depends on internal governance quality, the incentive structure, and external support. Accordingly, coffee value chain strengthening strategies should place farmer-organization capacity building at the core of intervention, rather than treating it as a supplementary component (Ibnu et al., 2018).At the same time, global coffee supply chains face increasingly complex sustainability risks, ranging from market volatility to rising social and environmental compliance demands. A sustainability-risk analysis of a cross-country coffee supply chain shows that risks can emerge at multiple points—production, aggregation, processing, logistics, and markets—and interact with one another as cascading risks. Bashiri et al. (2021) stress the importance of understanding risk dynamics as a basis for collaborative decision-making among actors, including buyers and producers. Within this framing, strengthening the coffee value chain to improve South Sumatran farmers' economic resilience should combine value-added upgrading with vulnerability reduction through more inclusive governance and effective institutional support (Bray & Neilson, 2017; Vicol et al., 2018).

Economic resilience among coffee farmers is increasingly understood as the capacity of farm households to sustain income, production, and well-being when exposed to market and production shocks. In this context, certification is often promoted as a strategy to enhance sustainability while improving farmers' economic performance, because it is assumed to strengthen farm practices, expand market access, and increase the likelihood of receiving better prices. However, evidence across settings shows that the effects of certification on yields and household income are not always uniform, since benefits depend on the availability of extension support, farmers' ability to comply with standards, and the incentive structure within the value chain. These findings suggest that certification-based value chain strengthening must be interpreted critically: certification can help some farmers raise productivity and income, yet others may be constrained by compliance costs and limited capacities (Jena & Grote, 2022). Therefore, policy and program designs should prioritize interventions that ensure tangible economic incentives, sustained technical assistance, and mechanisms to reduce compliance burdens so that certification can genuinely contribute to farmers' economic resilience.

Beyond market and standards-related factors, farmers' resilience is closely tied to the climate resilience of coffee agroecosystems. Climate change can reduce productivity, increase pest and disease risks, and lower bean quality, which ultimately undermines farmers' income and destabilizes supply within the value chain. A systematic review on opportunities to enhance climate resilience in coffee agroecosystems highlights that adaptation can be pursued through combined agronomic and landscape strategies, including improved soil and water management, shade and agroforestry systems, varietal selection, and diversified farming practices. Yet, the effectiveness of adaptation is strongly shaped by access to knowledge, inputs, finance, and market incentives that reward adaptive practices. This implies that value chain strengthening should not focus solely on quality upgrading for markets, but should embed climate adaptation within value chain governance—through strengthened extension services, adaptation financing schemes, and market incentives for consistent quality under climate variability (Bracken et al., 2023). Integrating climate adaptation into value chain strategies can strengthen farmers' economic resilience by reducing production risks and stabilizing quality and supply.

In addition to certification and climate factors, local socio-cultural contexts shape how farmers engage with markets and capture the benefits of upgrading processes. Evidence from a study of a robusta coffee value chain within a customary community shows that markets do not operate in a purely neutral manner; instead, trading relations, resource ownership, and informal local institutions can determine how benefits are

distributed along the chain. In such settings, value chain interventions that overlook local institutions may generate exclusion—for instance, when market standards conflict with customary practices or when trading arrangements disproportionately favor certain groups. Conversely, when interventions align with social capital, trust mechanisms, and local rules, coordination of quality, supply stability, and collective learning can be strengthened more inclusively. This underscores the importance of a context-sensitive approach: strengthening coffee value chains requires not only technical post-harvest improvements and market access, but also attention to local governance and social relations that structure production and marketing (Fauzi et al., 2023). In doing so, value chain upgrading can enhance economic resilience without undermining the social cohesion that often supports community-level resilience.

Strengthening farmer institutions through cooperatives is also a key pathway to improve bargaining power, reduce information asymmetries, and expand access to services within the value chain. Empirical evidence suggests that cooperative membership is shaped by multiple factors and can generate economic impacts through improved market access, input procurement, and supporting services for production. Nonetheless, cooperative benefits do not emerge automatically; cooperatives require sound internal governance, managerial capacity, and services that meet members' needs. When cooperatives can aggregate volumes, enforce quality standards, and secure more favorable market channels, farmers have greater opportunities to stabilize income and reduce vulnerability to price fluctuations. Accordingly, value chain strengthening aimed at enhancing farmers' economic resilience should place cooperative capacity building at the core improving transparency, accountability, negotiation capacity, and technical and marketing services because cooperative-based institutional pathways have been linked to improved economic outcomes among coffee farmers (Mojo et al., 2017). A stronger farmer organization can better equip households to withstand both market and production shocks.

Moreover, farmers' economic resilience can also be reflected in household resilience, including food security, because coffee income is closely intertwined with consumption patterns and household coping strategies. Research on coffee farmers' participation in cooperatives indicates that institutional benefits may extend beyond income, for example through more stable cash flow, collective support, and access to networks that help households maintain food consumption during economic stress. Yet, these effects remain context-dependent and are influenced by the quality of cooperative services and local conditions that shape who gains the most. The implication for coffee value chain strengthening is the need for strategies that balance value-added upgrading with vulnerability reduction at the household level, including institutional support that stabilizes income, enables livelihood diversification, and offers protection against risks. If value chain interventions focus only on improving quality for markets while neglecting household stability, farmers may remain fragile under climate and market shocks. Therefore, the effectiveness of value chain interventions should also be assessed in terms of their contributions to household resilience, including food security (Shumeta & D'Haese, 2018; Jena & Grote, 2022).

Strengthening regional coffee value chains needs to be understood within a global value chain framework that is increasingly shaped by sustainability standards and partnership schemes. In Indonesia, the implementation of sustainability standards in global coffee chains is not merely a technical matter of compliance; it also concerns how local actors farmers, traders, processors, and exporters adjust practices and transaction relationships to meet market expectations. Comparative evidence on the implementation of sustainability standards through global partnerships shows variation in adoption processes, the types of support farmers receive, and the implications for bargaining power and market access. This condition indicates that strategies to strengthen coffee value chains for improving farmers' economic resilience must treat global standards as an institutional reality that shapes incentives, governance arrangements, and value distribution. Therefore, policy efforts should not focus solely on increasing production, but also on enhancing local actors' capacity to navigate standards, partnerships, and global market mechanisms in a fair and sustainable way (Fadillah et al., 2019).

At the implementation level, inclusive business approaches provide a practical direction to ensure that value-chain upgrading does not benefit only a small set of actors, but also expands opportunities for smallholders. Evidence from Indonesian regions suggests that inclusive business models can operate through more transparent purchasing arrangements, strengthened extension and mentoring services, provision of inputs and access to finance, and clearer quality-coordination mechanisms. Comparisons across regions indicate that the success of inclusiveness depends strongly on partnership design, the capacity of farmer organizations, and the consistency of incentives that motivate farmers to maintain quality. This is highly relevant for South Sumatra because farmers' economic resilience depends not only on the ability to sell, but also on market certainty, income stability, and the capacity to reduce farm-level risks. Accordingly, resilience-oriented value-

chain strengthening should promote business models that reduce information asymmetry, shorten unproductive marketing layers, and increase the share of value added that returns to farmers (Mulyati & Indrawan, 2021).

Governance is a key factor that helps explain why value-chain interventions can produce different outcomes across locations. Research on robusta coffee value chain governance shows that coordination patterns among actors, quality and price-setting mechanisms, and the role of intermediaries in linking farmers to markets strongly determine both efficiency and benefit distribution. When governance is more hierarchical and concentrated, farmers risk being positioned mainly as raw material suppliers with limited negotiating space, making them more vulnerable to price volatility and demand uncertainty. In contrast, more collaborative and transparent governance can enable farmers to improve quality, obtain market information, and access schemes that reward quality. The implication for South Sumatra is that value-chain strengthening must carefully assess the governance structure operating in practice who controls information, how quality standards are enforced, and how value is distributed so that interventions are well targeted and genuinely strengthen farmers' economic resilience (Suryana et al., 2023).

However, standards- and certification-based strengthening will be ineffective if farmer participation is low or driven only by external pressure without adequate capacity readiness. Evidence on the determinants of farmers' participation in sustainability standards and certification indicates that decisions are influenced by economic factors (cost–benefit considerations), social factors (access to information and networks), and institutional factors (extension support and the role of organizations). When economic benefits are unclear or compliance costs are perceived as high, participation tends to weaken, meaning certification may become an administrative burden rather than a pathway to improved welfare. Therefore, value-chain program design must secure tangible incentives such as more reliable market access, better pricing opportunities, or input support while strengthening farmers' capabilities to meet standard requirements. In other words, participation must be built through a combination of education, mentoring, and institutional strengthening that makes certification a rational choice for farm households (Ibnu, 2019).The South Sumatran context, particularly areas such as South OKU, also shows that farmers' responses to certification policies (e.g., 4C) are shaped by perceptions of obligations and their capacity to meet standard requirements at farm and post-harvest levels. Evidence on farmers' obligations and responses to certification policies suggests that compliance is influenced not only by willingness, but also by the availability of technical support, clarity of procedures, and consistent field-level assistance. If obligations are perceived as added burdens without adequate support, certification can create compliance fatigue and weaken motivation for quality upgrading. Conversely, if obligations are accompanied by visible benefits market access, improved practices, and opportunities for income stabilization certification can become a pathway to strengthen farmers' economic resilience. Thus, strengthening coffee value chains to enhance the resilience of South Sumatran farmers requires integrating certification policies with strategies that reduce compliance burdens, improve extension services, and ensure fair incentive mechanisms so that upgrading truly translates into better farmer welfare (Oktarina et al., 2024).

METHOD

This study adopts a qualitative approach with a case study design to gain an in-depth understanding of how strengthening the coffee value chain can improve farmers' economic resilience in South Sumatra, Indonesia. A qualitative approach is appropriate because value chain issues are not only reflected in income figures, but also in socio-economic processes such as trading relationships, price formation, market access, and the role of institutions dimensions that are best explained through the lived experiences and perspectives of value chain actors.The research site is selected from a coffee-producing area in South Sumatra where value chain activities are clearly observable (farmers–collectors–traders/processors–markets). The site is chosen purposively based on the presence of smallholder coffee farmers, variation in marketing channels, and the existence of upgrading practices (e.g., post-harvest improvements, farmer group initiatives, or exposure to quality requirements).

Study participants include coffee farmers as the main informants and several value chain actors as supporting informants, such as village collectors, subdistrict/district traders, farmer group or cooperative leaders, processing actors, and supporting stakeholders (extension officers or relevant local authorities). Informants are selected through purposive sampling using criteria such as direct involvement in coffee transactions, understanding of price and quality determination, and at least one recent harvest season of experience.Data are collected through semi-structured interviews to explore participants' experiences regarding marketing

flows, pricing mechanisms, quality standards, transaction costs, information access, and coping strategies when facing price declines or production shocks. Interviews continue until the information becomes repetitive (an indication of data sufficiency), ensuring the study remains focused and efficient without expanding beyond the core objectives.

In addition to interviews, the study uses field observations of post-harvest activities and transaction practices, such as sorting, drying, storage, and interactions during sales. Observation is used to verify interview claims, for example how quality is assessed, how weighing is conducted, and how price negotiations occur.Simple documentation supports the analysis, including farmer group or cooperative records (when available), photos of post-harvest processes, basic transaction evidence, and information about training or assistance programs. Documentation strengthens contextual descriptions and ensures that findings are not based solely on interview narratives.Data analysis follows a thematic analysis procedure in three concise stages: data reduction (selecting relevant information), data display (organizing information into themes), and conclusion drawing. The main themes include (1) the value chain structure and flow, (2) governance and price formation, (3) quality upgrading practices, (4) the role of institutions and partnerships, and (5) farmers' economic resilience (coping strategies, income stability, and recovery capacity).Trustworthiness is ensured through source triangulation (comparing farmers' accounts with collectors/traders/cooperatives), method triangulation (interviews–observations–documentation), and brief member checking (confirming key summaries with selected informants). The study follows basic ethical principles: informed consent, confidentiality, and voluntary participation.

Table 1. Summary of the qualitative method

Component	Brief description
Approach	Qualitative, case study
Location	Coffee-producing area in South Sumatra (purposive selection)
Informants	Coffee farmers (main), collectors, traders, processors/cooperatives, extension/local authorities (supporting)
Sampling	Purposive (based on involvement and experience)
Data collection	Semi-structured interviews, field observation, documentation
Data analysis	Thematic analysis (reduce–theme–conclude)
Validation	Source & method triangulation, brief member checking
Ethics	Informed consent, confidentiality, voluntary participation

RESULT

1. Mapping the Coffee Value Chain Structure in the Study Area

The first key finding is that the coffee value chain in the study area in South Sumatra is dominated by a smallholder-based upstream structure and a trader-led downstream structure. Most farmers operate on a small scale, sell in relatively small volumes, and depend on immediate cash flow after harvest. As a result, farmers tend to prioritize speed of sale and liquidity over negotiating price or investing in post-harvest improvements, especially when household needs are urgent. This structural condition places farmers in a relatively weak position at the first point of exchange, where value capture is often limited.At the farm gate, the most common marketing route begins with farmers selling coffee cherries or dried beans to village collectors (local middlemen). This channel is favored because collectors are physically close, offer quick transactions, and often provide informal services such as transport, cash advances, or input support. In many

cases, the collector becomes the primary "market interface" for farmers meaning farmers' market information, price references, and quality feedback are filtered through collector relationships. This creates a relational dependency that can stabilize sales but also reduce farmers' bargaining space.

From collectors, coffee typically moves to district traders who aggregate larger volumes and connect to processing units or larger wholesalers. District traders play an important coordinating role: they may determine purchasing schedules, apply basic grading, and decide whether coffee will be sold as standard-grade or directed into higher-quality segments. At this stage, transactions become more sensitive to consistency of quality and volume, which often becomes a barrier for individual farmers acting alone. This is why aggregation functions whether through collectors, trader networks, or farmer groups shape the speed and direction of product flow in the chain.Downstream, two structures are commonly observed. The first is a conventional chain: farmer → collector → district trader → processor/wholesaler → external market. The second is a shorter, more coordinated chain, where farmers sell through a group/cooperative or directly to a buyer-linked processor when such arrangements exist. The shorter chain is not always dominant, but informants often describe it as more promising for price premiums and quality learning because feedback loops are clearer. However, access to these channels is usually selective, requiring compliance with quality protocols, minimum volume, and more disciplined post-harvest handling.

A crucial observation is that each chain configuration carries different implications for the distribution of roles and benefits. In the conventional chain, collectors and traders often manage logistics, sorting, and risk of price fluctuation, which strengthens their influence in price formation. Farmers, meanwhile, remain primarily as suppliers of raw material with limited influence on grading standards or final price outcomes. In more coordinated channels, farmers potentially gain better price clarity and structured quality requirements, but they also face stricter obligations (e.g., moisture standards, sorting discipline, delivery schedules). This indicates that "strengthening the value chain" is not only about shortening the chain, but also about improving coordination, transparency, and the capacity to meet quality demands.Overall, the mapping confirms that value chain strengthening in South Sumatra should begin by recognizing the chain as a set of functional roles: production, aggregation, trading, processing, and market linkage. The bottleneck is not merely the number of intermediaries, but the limited flow of information and quality incentives reaching farmers at the upstream end. For economic resilience, the most strategic leverage points lie in improving farmers' access to quality knowledge, strengthening collective aggregation (through groups/cooperatives), and improving transparency in grading and pricing so that farmers can reduce vulnerability to price swings and convert quality improvements into more stable income.

Table 2. Value Chain Map and Actor Functions

Value chain stage	Main actors (typical)	Key functions observed	Common product form	Main implication for farmers' resilience
Upstream production	Coffee farmers (smallholders)	Cultivation, harvesting, basic post-harvest (drying/sorting varies)	Cherries or dried beans	Income depends on timing of sale and ability to maintain quality
Primary aggregation	Village collectors	Collecting small volumes, cash payment, transport, informal credit/advance, basic grading	Mostly dried beans (some cherries)	Fast liquidity but higher dependency and weaker bargaining power
Secondary	District traders	Volume consolidation,	Dried beans	Quality and

aggregation/trading		stricter grading, coordination with processors/wholesalers		volume become decisive; individual farmers struggle without aggregation
Processing	Local processors/hullers	Hulling, drying refinement, sorting, packaging; prepares for larger markets	Green beans (or processed)	Determines whether coffee enters higher-value segments
Market linkage	Wholesalers/exporters/roasters (depending on chain)	Market access, contract/buyer requirements, price signals	Green beans / commercial lots	Standards and demand shape upstream incentives; transparency often limited
Alternative coordinated channel (when present)	Farmer group/cooperative + buyer-linked processor	Collective selling, quality protocols, clearer feedback, sometimes training	Dried/graded beans	Potential for more stable prices, but requires stronger compliance capacity

2. Price Formation and Quality Standards in the Local Coffee Chain

The second finding shows that price formation at the farm-gate level is largely driven by buyer-determined reference prices rather than open negotiation. Farmers typically receive a "daily price" communicated by collectors or traders, and this price is treated as the practical benchmark for transactions. In most interviews, farmers described limited room to negotiate unless they could offer larger volumes, deliver consistently, or demonstrate clearly higher quality. This indicates that price-setting power is concentrated downstream, while farmers function mainly as price takers.A dominant feature of the pricing mechanism is that quality assessment and price adjustment are bundled together during transactions, often without a detailed explanation to farmers. In conventional channels, collectors commonly apply rapid visual checks (e.g., cleanliness, dryness) and then decide whether the coffee will be bought as "standard" or "lower grade," which directly affects the price offered. Farmers noted that deductions or lower prices are frequently justified using broad terms such as "too wet" or "mixed quality," but the specific measurement basis is not always transparent. As a result, farmers often perceive grading as subjective and dependent on the buyer's discretion. The study also finds that the chain relies on a small set of informal quality indicators that are consistently mentioned across actors: moisture condition, presence of defects/foreign materials, bean uniformity, and post-harvest handling practices. Collectors prefer coffee that is easier to store and re-sell, meaning they emphasize dryness and cleanliness because these reduce risk of mold and shrinkage. Traders and processors, meanwhile, value consistency because it allows smoother aggregation and processing. However, because farmers commonly work with limited drying infrastructure, quality variation remains frequent and becomes a key reason for price dispersion at the farm level.Information asymmetry is another strong pattern shaping both prices and standards. Farmers generally access price information through buyers (collectors/traders) or peers, while formal price references are rarely used as direct bargaining tools in the village setting. Several

farmers described uncertainty about how their coffee is priced at the trader level, how quality upgrades translate into higher downstream prices, and whether premiums exist beyond "basic acceptance." This information gap weakens farmers' ability to plan upgrading investments because the economic return from better post-harvest practices is not consistently signaled at the point of sale.

When alternative channels (such as farmer groups/cooperatives or buyer-linked arrangements) are present, the pricing and grading process tends to be more structured. Informants described clearer quality requirements (e.g., stricter sorting and dryness targets), more explicit feedback, and occasionally a more predictable pricing scheme. Even so, these channels also impose stronger discipline delivery schedules, minimum quality thresholds, and collective rules which not all farmers can meet. In other words, "better governance" improves transparency, but it also raises entry requirements, meaning inclusiveness depends on whether farmers receive adequate support to comply.Overall, the evidence suggests that strengthening the coffee value chain in South Sumatra should focus on improving transparency and feedback in price and quality determination at the farm gate. Farmers' resilience is undermined when quality decisions are unclear and when price signals do not consistently reward upgrading efforts. Interventions that provide simple, shared grading references (especially moisture and defect standards), improve farmers' access to price information, and strengthen collective selling arrangements can reduce uncertainty, improve fairness, and make quality upgrading economically meaningful at the household level.

Table 3. How Price and Quality Are Determined Along the Chain

Transaction level	Who sets/controls price signal	Common quality checks used	How price is adjusted	Main issue observed
Farmer → Village collector	Collector sets "daily" buying price	Quick visual dryness check, cleanliness, mixed beans/defects	Discount for "wet/mixed"; premium rarely explicit	Low transparency; grading perceived subjective
Collector → District trader	Trader sets buying terms based on market and processing needs	Basic grading (dryness, defects), volume consistency	Price changes by grade and volume; risk buffer included	Farmers do not see this margin logic
Trader → Processor/Huller	Processor applies stricter quality targets	Moisture risk, defect ratio, uniformity, storage condition	Clearer price differentiation by grade/lot	Quality incentives do not fully pass upstream
Alternative channel (Group/Co-op → Buyer-linked)	More rule-based pricing mechanism	More explicit standards + feedback loops	More predictable; sometimes quality-linked premiums	Higher compliance requirements for farmers

3. Key Constraints to Upgrading Among Coffee Farmers

The third finding highlights that the main barriers to upgrading among coffee farmers in South Sumatra are concentrated at the post-harvest stage. Farmers repeatedly described that the ability to improve quality is strongly constrained by limited facilities, particularly for drying, sorting, and storage. When drying is highly dependent on weather and open spaces, coffee quality becomes inconsistent across batches, which then reduces farmers' confidence that upgrading will reliably lead to higher prices. This makes upgrading feel risky, especially for households that must sell quickly to meet daily needs. A second constraint is the mismatch between quality requirements and farmers' practical capacity. Buyers commonly demand dryness and cleanliness, but farmers often lack simple tools and infrastructure (e.g., tarpaulins, raised drying beds, covered drying areas, clean storage sacks, or basic moisture checking practices). As a result, many farmers rely on visual estimation and experience rather than standard indicators, which increases disputes about quality during transactions. The absence of clear, shared benchmarks at the farmer level makes upgrading difficult to implement consistently.

Third, time and labor limitations also reduce upgrading adoption. Post-harvest handling requires additional labor for sorting, repeated turning during drying, and careful storage management. In many households, labor

is shared with other activities, and peak coffee periods can collide with other livelihood demands. Farmers noted that when labor is tight, the priority shifts to completing harvest and selling quickly, even if quality might be compromised. This dynamic reinforces a cycle in which "speed of sale" dominates "quality optimization."Fourth, financial constraints are consistently reported as a direct obstacle. Even small investments such as better drying materials, storage improvements, or transport to a better buyer can be difficult when cash flow is limited. Some farmers depend on advance payments or informal loans, which often tie them to specific collectors and reduce their flexibility to pursue higher-value channels. In these situations, upgrading is not only a technical issue; it becomes a question of liquidity and negotiating freedom within the value chain.

Fifth, farmers described limited access to continuous technical guidance and quality feedback. Training may occur occasionally, but follow-up support is often weak, and farmers rarely receive structured information on how their quality compares to buyer expectations or what specific improvements would yield better returns. Without consistent feedback loops, upgrading becomes trial-and-error, and many farmers conclude that the price difference is not worth the effort. This weak learning system slows the diffusion of better practices.Overall, the constraints to upgrading are interconnected: limited infrastructure and labor reduce quality consistency, weak price incentives reduce motivation, and financial dependency limits channel choice. These findings suggest that strengthening the coffee value chain should prioritize low-cost, practical upgrading support especially simple post-harvest improvements while also reducing liquidity pressures that force quick sales. When farmers can upgrade with clearer standards, better feedback, and less dependence on a single buyer, upgrading becomes a realistic pathway to stronger economic resilience.

DISCUSSION

1. Value Chain Governance and Farmer Bargaining Power

The value chain governance observed in South Sumatra reflects a predominantly trader-led structure in which collectors and downstream traders act as the main coordinators, while smallholders remain largely positioned as price takers. In such settings, governance is expressed through everyday "rules of exchange" who sets reference prices, how quality is assessed, and how transactions are organized. This aligns with the view that value chain interventions and upgrading do not automatically deliver equitable rural development outcomes, because the distribution of benefits depends on how power and coordination are organized along the chain (Vicol et al., 2018).A core mechanism shaping bargaining power is information asymmetry, particularly regarding price signals and quality grading. When farmers rely on collectors as their primary interface to markets, market information and quality feedback are filtered and often simplified, which weakens farmers' ability to negotiate or to assess whether upgrading efforts will yield reliable returns. As governance becomes more concentrated downstream, the incentives for quality improvement may not be transmitted clearly to farmers, resulting in weak motivation to invest in post-harvest improvements and greater vulnerability to unfavorable price adjustments (Suryana et al., 2023; Vicol et al., 2018).

Standards and certification can alter governance by formalizing quality requirements and creating more structured buyer expectations, but their impacts on farmer bargaining power are not uniformly positive. While certification may enhance access to certain markets or encourage better practices, the benefits are often conditional on compliance capacity and the presence of effective support systems. Where compliance costs are high and premiums are unclear, certification can reinforce dependency rather than empowerment, because farmers may accept additional obligations without gaining stronger negotiation space (Oya et al., 2018; Jena & Grote, 2022).Institutional arrangements especially farmer organizations are therefore critical in rebalancing governance toward more inclusive outcomes. Farmer groups and cooperatives can strengthen bargaining power by aggregating volume, improving coordination, and creating collective mechanisms for meeting quality standards. Evidence from Indonesian smallholders suggests that organizations can serve as bridges for negotiation and learning, but their effectiveness depends on internal governance quality and consistent external support (Ibnu et al., 2018; Mulyati & Indrawan, 2021).Overall, the discussion indicates that strengthening the coffee value chain in South Sumatra should be understood as **governance upgrading**, not only technical upgrading. Efforts to improve farmers' economic resilience will be limited if price formation and quality assessment remain opaque at the farm gate. More transparent grading practices, clearer price communication, and stronger collective marketing mechanisms can reduce uncertainty and shift bargaining dynamics making value chain strengthening more likely to translate into stable, resilience-enhancing outcomes for coffee households (Vicol et al., 2018; Suryana et al., 2023).

2. Quality Upgrading as a Pathway to Economic Resilience

Quality upgrading especially improvements in post-harvest handling emerges as one of the most direct pathways through which farmers can strengthen economic resilience, because it can influence both market access and price stability. However, the evidence suggests that upgrading is not automatically "pro-poor"; it depends on who is able to adopt the required practices and whether the chain transmits clear incentives to farmers. In Indonesia, upgrading outcomes often vary because value chain interventions can redistribute benefits unevenly across actors, meaning that quality improvement efforts may not translate into proportional gains for smallholders if governance remains buyer-led (Vicol et al., 2018).

In practice, certification and sustainability standards are frequently framed as upgrading instruments, but their impacts on farmer welfare tend to be mixed and context-specific. Systematic evidence indicates that certification effects on income and welfare are not consistently positive, often because compliance costs, monitoring burdens, and uneven access to support shape who benefits most (Oya et al., 2018). Coffee-focused reviews similarly show that certification can improve practices and access to markets, yet price premiums or livelihood gains are not always reliable particularly when farmers face resource constraints that limit consistent compliance (Bray & Neilson, 2017; Jena & Grote, 2022). This implies that upgrading through standards must be accompanied by credible economic returns and sustained assistance if it is to strengthen resilience rather than add vulnerability.

Climate risk further reinforces the importance and complexity of upgrading. Coffee quality and productivity are increasingly threatened by climate variability, so upgrading cannot be separated from climate-resilient agronomic and post-harvest strategies. A systematic review of coffee agroecosystems highlights that resilience-enhancing practices (e.g., improved soil and water management, shade/agroforestry, and adaptive management) require knowledge, resources, and incentives that are often mediated by value chain arrangements (Bracken et al., 2023). When upgrading is designed only around market quality requirements, farmers may still remain economically fragile if climate shocks undermine yields and quality consistency; therefore, resilience-oriented upgrading must integrate market upgrading with climate adaptation support (Bracken et al., 2023).Another key condition for resilience-oriented upgrading is the institutional and cultural context in which upgrading is implemented. Evidence from a customary community coffee value chain illustrates that market-facing upgrading efforts interact with local norms, trust relations, and informal institutions that shape participation and benefit distribution (Fauzi et al., 2023). If upgrading demands are introduced without aligning with local practices and social arrangements, adoption can remain low or benefits can become concentrated among a smaller subset of farmers. This supports the argument that upgrading is not only technical; it is also institutional and relational, requiring attention to how coordination, trust, and local governance shape farmers' capacity to meet quality expectations (Fauzi et al., 2023).

Finally, the findings suggest that quality upgrading becomes a stronger pathway to economic resilience when farmers are supported by credible organizations and inclusive chain arrangements. Farmer organizations can reduce the individual burden of upgrading by enabling collective learning, aggregation, and more structured quality control, but their effectiveness depends on governance capacity and the clarity of market incentives (Ibnu et al., 2018; Mulyati & Indrawan, 2021). Where standards participation is driven mainly by obligations without visible benefits, farmers' motivation can weaken and compliance fatigue can emerge highlighting the need for realistic upgrading packages, transparent grading, and incentives that are meaningful at the farm-gate level (Ibnu, 2019; Oktarina et al., 2024). In short, quality upgrading supports resilience when it is matched with supportive governance, feasible compliance pathways, and market arrangements that consistently reward farmers' improvements.

3. Institutional Strengthening and Inclusive Value Chain Development

Institutional strengthening is central to making value chain development more inclusive, because smallholders rarely have sufficient scale, information, or bargaining power to secure favorable terms through individual transactions. The evidence from Indonesia suggests that farmer organizations can function as collective platforms for negotiation, learning, and compliance management yet their effectiveness depends on internal governance quality and the consistency of external support (Ibnu et al., 2018). In a trader-led chain, institutional capacity becomes the main mechanism through which farmers can reduce dependency on a single buyer, improve market access, and translate upgrading efforts into more predictable outcomes.Inclusive value chain development is not simply about shortening the chain; it is about redesigning relationships so that farmers can capture a fairer share of value and reduce vulnerability. Practical evidence from Indonesian coffee value chains shows that inclusive business models can expand opportunities for smallholders through more transparent purchasing arrangements, clearer quality coordination, and improved service access (Mulyati & Indrawan, 2021). This matters because inclusiveness directly shapes resilience:

when selling arrangements are more predictable and information is more transparent, farmers can plan production and post-harvest decisions with lower uncertainty, reducing exposure to adverse price adjustments and opportunistic grading.

However, sustainability standards and certification can create a paradox for inclusiveness. On one hand, standards may open access to certain markets and provide structured guidance for upgrading; on the other hand, standards can exclude resource-constrained farmers when compliance costs are high and benefits are unclear. Systematic evidence on certification in developing countries indicates that outcomes are frequently mixed, and distributional effects depend on who can meet requirements and who receives adequate support (Oya et al., 2018). In coffee contexts, certification programs can improve practices but do not always deliver consistent livelihood benefits, which means inclusiveness cannot be assumed simply because a program exists (Bray & Neilson, 2017).For inclusiveness to materialize, participation must be feasible and attractive for farmers, not merely mandatory. Evidence on determinants of farmer participation in sustainability standards indicates that adoption decisions reflect a cost–benefit logic shaped by information access, institutional support, and perceived economic returns (Ibnu, 2019). Where incentives are weak or uncertain, farmers may comply superficially, withdraw, or remain dependent on conventional channels. In South Sumatra specifically, farmers' responses to certification obligations illustrate that compliance is shaped by clarity of procedures, practical support, and the perceived fairness of the system suggesting that policy-driven standards require strong enabling mechanisms to avoid widening inequality among farmers (Oktarina et al., 2024).

Overall, institutional strengthening and inclusive value chain development should be treated as governance reforms that expand farmers' capabilities, rather than as add-on components. Strengthening farmer organizations, improving transparency in trading practices, and designing inclusive business arrangements can help ensure that upgrading benefits do not concentrate downstream. This supports the broader argument that value chain interventions must be evaluated by "who benefits" and whether institutional arrangements genuinely shift bargaining power and value distribution toward smallholders (Vicol et al., 2018). When institutions are credible and inclusion is operational through services, coordination, and fair incentives value chain strengthening is more likely to translate into sustained economic resilience for coffee farmers.

4. Risk, Shocks, and Resilience Mechanisms Along the Chain

The evidence indicates that coffee farmers' economic resilience is shaped by how risks and shocks are distributed and managed along the value chain. In practice, smallholders are exposed to multiple shocks price volatility, production variability, and quality losses yet they often have the least control over the market mechanisms that determine how these shocks affect household income. This reinforces the argument that value chain upgrading can produce uneven outcomes: even when chain interventions exist, resilience gains depend on whether governance arrangements reduce farmers' vulnerability or simply shift risk upstream while value capture remains downstream (Vicol et al., 2018).

A key risk mechanism is the uncertainty surrounding quality and price adjustments at the farm gate. When quality grading is opaque and price signals are transmitted through intermediaries, farmers face a "double risk": they may invest effort in post-harvest improvements without clear returns, while still being exposed to sudden discounts when buyers deem quality insufficient. Certification and sustainability standards may reduce uncertainty by formalizing requirements, but systematic evidence shows that certification effects on welfare are mixed and context-dependent particularly when compliance costs are high and support is uneven (Oya et al., 2018). In such cases, standards can become an additional risk layer if obligations are not matched with consistent incentives and practical assistance (Ibnu, 2019).

Climate variability amplifies these vulnerabilities because it directly affects both yields and quality consistency two determinants of market outcomes. A systematic review on coffee agroecosystems emphasizes that resilience requires integrated strategies such as improved soil and water management, shade-based systems, and adaptive agronomic practices, yet adoption depends heavily on farmers' resources and the enabling environment (Bracken et al., 2023). When value chain arrangements do not provide technical support and market incentives that reward stable quality under variable conditions, climate shocks can quickly translate into income shocks, undermining household resilience.

Institutions and collective arrangements are therefore critical resilience mechanisms because they can reduce exposure to shocks and improve farmers' coping capacity. Farmer organizations can support aggregation, coordinate quality control, and strengthen market access, which can stabilize sales and reduce dependence on a single buyer (Ibnu et al., 2018; Mulyati & Indrawan, 2021). Evidence from cooperative participation also suggests that collective engagement can improve economic outcomes through better market linkage and service access, although benefits depend on institutional quality and governance effectiveness (Mojo et al.,

2017). In this sense, institutions operate as "risk-sharing" structures that can buffer households when markets or production conditions worsen.

Finally, resilience should be understood not only as short-term coping, but also as the capacity to recover and reinvest after shocks. Farmers' responses to certification policies in South Sumatra highlight that resilience-related outcomes depend on whether obligations are experienced as burdens or as structured pathways to better market participation (Oktarina et al., 2024). Where compliance is supported by clear procedures, credible assistance, and fair incentives, standards can strengthen adaptive capacity; where these conditions are absent, compliance fatigue can reduce motivation and reinforce vulnerability. Overall, strengthening the coffee value chain to improve economic resilience requires aligning governance, standards, and institutional support so that risks are reduced at the farm gate and farmers gain practical mechanisms to manage shocks and sustain livelihoods.

CONCLUSION

This study shows that coffee farmers' economic resilience in South Sumatra is strongly shaped by how the value chain is organized and governed. The prevailing structure remains largely trader-led, which means many farmers face limited bargaining power, weak price transparency, and uncertainty about how quality is rewarded at the farm gate.

A key insight is that "strengthening the value chain" is not only about increasing production or linking farmers to markets, but about improving the rules that shape exchange especially how prices are formed and how quality is assessed. When grading is unclear and market information is uneven, farmers carry higher risk and are less willing to invest in quality improvements because returns are uncertain.

Quality upgrading is still an important pathway to resilience, but it is constrained by practical barriers. Post-harvest limitations (drying, sorting, storage), time and labor constraints, and liquidity pressure that pushes quick sales make it difficult for farmers to achieve consistent quality. Without predictable incentives, upgrading efforts can feel costly and risky.

Institutions and networks particularly farmer groups and cooperatives emerge as critical enablers of resilience. Where these organizations function well, they help farmers aggregate volume, coordinate quality practices, access training and services, and reduce dependency on a single buyer. However, uneven organizational capacity can also create unequal access to benefits across farmers.

Risk and shocks travel quickly along the chain. Climate variability and quality losses directly affect income stability when governance is opaque and support systems are weak. Resilience therefore depends not only on coping strategies at household level, but also on chain-level mechanisms that reduce uncertainty and support recovery after shocks.

Overall, the study concludes that the most feasible resilience-building strategy is governance-oriented strengthening at the farm gate: clearer and shared grading references, low-cost post-harvest support, stronger collective marketing arrangements, and improved linkages to information and services. These actions can make upgrading more inclusive and translate value chain strengthening into more stable livelihoods for coffee households.

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