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Supply Chain Analysis and Marketing Margin of Black Pepper in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency

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ABSTRACT

Background: Black pepper (Piper nigrum L.) is a leading export commodity of East Lampung Regency, yet farmers' bargaining position remains weak due to a long, oligopsonistic marketing chain dominated by intermediaries.

Objectives: This study analyzed the product, financial, and information flows and measured the marketing margin and farmer's share of black pepper in Sukadana Baru Village, Marga Tiga Sub-District. A survey method was applied to 83 farmers selected using the Slovin formula and 6 marketing institutions (4 village collectors and 2 large traders) selected through a census/snowball technique.

Method: Data were analyzed descriptively-qualitatively for the supply chain flows and quantitatively for the marketing margin and farmer's share.

Result: Results identified two marketing channels: Channel I (Farmer – Village Collector – Industry) and Channel II (Farmer – Village Collector – Provincial Trader – Industry). Channel I generated a smaller marketing margin of Rp20,000/kg with a farmer's share of 82.61%, whereas Channel II produced a larger margin of Rp25,000/kg with a farmer's share of 75.00%.

Conlusion: These findings indicate that Channel I is more efficient and equitable for farmers. Strengthening farmer institutions and shortening the marketing chain are recommended to improve the distribution of marketing benefits. The findings carry a direct implication for regional pepper-sector development policy.

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INTRODUCTION

Efficient agricultural supply chains are a central determinant of how the value generated in commodity markets is distributed among producers, intermediaries, and processors. A supply chain links farmers, collectors, traders, and processing industries through interdependent flows of products, funds, and information, and the smoothness of these three flows determines both the cost of moving a commodity from farm to market and the share of the final price that returns to the producer (Arif, 2018; Syamil, A.,et.al, 2023). In export-oriented plantation commodities, smallholder farmers typically occupy the weakest node of the chain: they sell small and dispersed volumes, have limited access to price information, and depend on intermediaries for collection, transport, and liquidity.

Under such conditions, supply chain inefficiencies manifest as large marketing margins and a low farmer's share, which in turn reduce farmers' incentives to invest in production (Putriana et al., 2023). Understanding how supply chains operate at the farm-to-market interface is therefore essential for designing interventions that improve both market performance and smallholder welfare.

Black pepper (Piper nigrum L.) is one of Indonesia's principal plantation export commodities and continues to occupy a strategic position in the national agricultural economy (Statistik, 2023). Beyond its role as a source of farmer income and foreign exchange earnings, the pepper agribusiness also generates employment and supplies raw material for the food, pharmaceutical, and spice-processing industries (Kemala, 2015). Indonesia has been recognized as a major supplier to the global pepper trade since the sixteenth century, and pepper remains among the country's largest foreign-exchange-generating commodities to date (Hanifah, 2023).

Export data from the national statistics agency indicate that Indonesia's pepper exports reached approximately USD 775 million between 2018 and 2022, with an average annual trade volume of around 45,000 tons. Domestically, pepper production is concentrated in the Bangka Belitung Islands and Lampung Province, which contributed an average of 31.29% and 20.71%, respectively, of national output over the last five years, while other provinces each contributed less than 10%. National pepper production in 2025 was recorded at 63.46 thousand tons, with Lampung Province occupying a strategic position as a major producer of Black Pepper.

Table 1 shows that pepper production across regencies in Lampung Province declined between 2022 and 2023, falling from 9,169 tons to 8,045 tons at the provincial level. The largest producing regency in both years was Tanggamus, although its output fell sharply from 3,873 tons in 2022 to 2,892 tons in 2023, while East Lampung and West Lampung recorded modest increases of around 3 tons. The steepest proportional declines occurred in Bandar Lampung City (−75%) and Pringsewu Regency (−42.65%), reflecting an overall regional contraction of 12.26% within a single year.

Table 1. Black Pepper Production by Regency/City in Lampung Province, 2022–2023

Regency/City	2022 (tons)	2023 (tons)	Unit	Product Form
Tanggamus	3,873	2,892	Ton	Black Pepper
West Lampung	2,646	2,649	Ton	Black Pepper
East Lampung	1,134	1,137	Ton	Black Pepper
West Coast (Pesisir Barat)	1,060	1,052	Ton	Black Pepper
Pringsewu	211	121	Ton	Black Pepper
Pesawaran	157	157	Ton	Black Pepper
South Lampung	38	36	Ton	Black Pepper
Bandar Lampung City	4	1	Ton	Black Pepper

Source: Lampung Provincial Agriculture Office (2022–2023).

The contraction in production is attributable to widespread land-use conversion and declining interest among younger generations in managing pepper plantations (Novalia et al., 2022). Low adoption of superior planting material and the absence of modern irrigation systems have made pepper cultivation highly dependent on rainfall, while stem-base rot disease caused by the fungus Phytophthora capsici continues to suppress the productivity curve of smallholder plantations (Sastrahidayat, 2016). Pepper is Lampung Province's leading export commodity after coffee; however, over the past eight years (2018–2026) the export volume of Lampung black pepper has declined sharply as a consequence of shrinking raw-material supply at the farm level (Elvira, 2025). Annual export volumes that once reached approximately 32,000 tons have fallen to below 10,000 tons, notwithstanding a temporary rebound driven by global commodity price fluctuations in 2024–2025.

This decline is further compounded by the conversion of pepper plantations to other horticultural crops and residential land use. On the downstream side, Lampung black pepper frequently faces rejection in major export markets such as the United States and the European Union owing to *Salmonella* contamination and

pesticide residues that exceed maximum limits, both of which stem from largely traditional post-harvest handling practices. These upstream and downstream pressures are directly relevant to the present study because they are transmitted through the marketing chain: when supply contracts and quality requirements tighten, the terms of trade faced by smallholders are shaped largely by the structure of the supply chain and by the bargaining position of the actors within it.



Figure 1. Map of Black Pepper Plantation Area Distribution in Lampung Province, 2022
Source: Lampung Provincial Plantation Office (2024)

Figure 1 illustrates that East Lampung Regency is among the districts that contribute significantly to provincial pepper production. Pepper ranks among the five leading plantation commodities cultivated by Lampung farmers, alongside robusta coffee, black pepper, oil palm, cocoa, and cassava. As early as 2014, East Lampung Regency already possessed 5,104 hectares of pepper plantation area with a total output of 2,023 tons and an average productivity of only 610 kg per hectare, indicating substantial room for productivity improvement that has persisted for over a decade.

Pepper plants require three to four years depending on husbandry practices and soil fertility to reach a productive age (Pranata et al., 2019). This comparatively long gestation period demands a high degree of stability throughout the supply chain; in practice, however, upstream-to-downstream pepper trade continues to operate within an oligopsonistic local market structure. Such a structure weakens farmers' bargaining power, so that a disproportionate share of the marketing margin accrues to intermediary institutions while the farmer's share of the final price remains low (Putriana et al., 2023). This marketing problem is compounded by high global price volatility, which elevates economic risk and, in some cases, triggers security concerns such as pepper theft that force farmers into premature harvesting. The combination of unstable income, high input costs, and security risk significantly threatens the sustainability of pepper farming by discouraging farmers from replanting or rejuvenating their plantations (Lumbanraja, 2022).

A supply chain involves coordination among multiple actors farmers, local traders, and exporters to ensure an efficient flow of products from upstream to downstream (Syamil, A., et.al, 2023). Black pepper farmers in Sukadana Baru Village continue to face problems of dependency on intermediary traders (tengkulak), limited access to market price information, and underdeveloped logistics infrastructure, all of which erode the value added that should accrue to farmers. East Lampung Regency's black pepper production reached 15,989 tons with a plantation area of 663.5 hectares and an average yield of 2,000 kg per hectare.

Sukadana Baru Village possesses considerable pepper plantation potential; however, its distribution channel is frequently confronted with market-absorption uncertainty, limited transparency of price information for farmers, and recurring payment delays from intermediary traders or exporters (Amanah, 2022). Because pepper is a leading export commodity, efficient supply chain management in Sukadana Baru Village, Marga Tiga Sub-District, is critical both for farmer welfare and for the quality of products delivered to the global market. Nevertheless, the marketing chain frequently confronts challenges such as price fluctuation, limited market access, dependency on intermediary traders, and distributional inefficiency that ultimately depress farmer income.

Previous studies have approached these problems from three related but largely separate perspectives. The first group comprises pepper agribusiness studies in Lampung Province. Kemala, (2015); Novalia et al., (2022) formulated strategies for developing the pepper agribusiness system to improve farmer income, Naufal, (2022) examined the factors influencing pepper production, Hanifah, (2023) assessed the competitiveness of

Lampung pepper in the international market, and Elvira, (2025) evaluated the performance and sustainability policy scenarios of the provincial pepper agribusiness. At the local level, Amanah, (2022) analyzed the financial feasibility and development strategy of pepper farming in Sukadana, Firdaus, (2022) analyzed pepper farming and its development prospects in Sukadana Baru Village, and XFAN, (2023) described the pepper agribusiness system in Marga Tiga Sub-District. These studies underline the strategic importance of pepper and the structural constraints faced by its farmers, but their primary focus lies on production, feasibility, competitiveness, or the agribusiness system as a whole rather than on how products, funds, and information move between specific chain actors.

The second group consists of agricultural supply chain studies on other commodities in Lampung and elsewhere in Indonesia, including tomato (Paramita & Hasyim, 2019), the kelanting agroindustry (Putri et al., 2020), ground coffee and coffee beans (Mahdiahwati et al., 2024; Riantini et al., 2023), paddy (Pangestuti, M. D. et.al, 2019), and soybean (Fadhlullah, 2018). These studies demonstrate that mapping supply chain flows and assessing chain performance are useful for identifying bottlenecks in agricultural distribution systems; however, they do not address black pepper, whose long gestation period, export orientation, and oligopsonistic local market structure create distinct supply chain conditions. The third group comprises marketing channel, marketing margin, and farmer's share studies, such as those on palm sugar (Hardina & Hasbiadi, 2023), corn (Gurning et al., 2024), red chili (Natasha, 2024), coconut (Wijiati, 2025), oil palm fresh fruit bunches (Putriana et al., 2023), and pepper in Bone Regency (Ridwan et al., 2026). These studies provide price-based evidence on marketing efficiency across channels, but they tend to focus on price spreads and give comparatively less attention to the product, financial, and information flows that underlie those spreads.

In an effort to restore the competitiveness of black pepper in East Lampung Regency, the local government has in recent years revitalized pepper cultivation by designating it a leading commodity through the Pepper Cultivation Conservation Program in Sukadana Baru Village, Marga Tiga Sub-District (Zulkarnain & Ranchiano, 2019). Despite this policy support, empirical evidence on how the product, financial, and information flows actually operate at the farm-to-industry interface and how the resulting marketing margin is distributed among chain actors remains limited for this specific production center. This gap is the point of departure for the present study, which distinguishes itself from earlier pepper-related research in the region (e.g., studies on competitiveness, farming feasibility, and the pepper agribusiness system) by combining a structural mapping of the three supply-chain flows with a quantitative marketing-margin and farmer's-share analysis at the village level.

Accordingly, this study aims to analyze the product (upstream), information, and financial flows in order to identify solutions that better match market requirements, and to analyze the marketing margin within the black pepper supply chain in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency. Taken together, these three bodies of literature leave a clear research gap. To the best of the authors' knowledge, pepper studies in East Lampung have not examined the supply chain as a set of interacting flows, supply chain studies in Lampung have not addressed black pepper, and margin studies seldom explain why margins differ across channels.

Consequently, it remains unclear whether the low farmer's share associated with pepper marketing reflects the number of intermediaries, the way payments and price information are transmitted, or the functions performed by each actor. The novelty of this study therefore lies in integrating five analytical components within a single village-level case: (1) product flow analysis, (2) financial flow analysis, (3) information flow analysis, (4) marketing margin measurement, and (5) farmer's share evaluation. This integration allows the quantitative indicators of marketing efficiency to be interpreted in light of the qualitative mechanisms that produce them in Sukadana Baru Village, a production center designated under the Pepper Cultivation Conservation Program.

Based on the background above, the research problems addressed in this study are: (1) how do the product, financial, and information flows operate within the black pepper supply chain in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency; and (2) how is the marketing margin distributed within that supply chain. Correspondingly, this research aims to (1) analyze the product, financial, and information flows within the black pepper supply chain, and (2) analyze the marketing margin of the black pepper supply chain in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency. The findings are expected to benefit

future researchers as a reference, to provide decision-making information for actors involved in the black pepper supply chain, and to serve as policy input for the local government in strengthening the pepper commodity sector.

The expected contributions of this study are both theoretical and practical. Theoretically, the study extends the application of supply chain flow analysis to a smallholder export commodity by linking the structure of product, financial, and information flows with price-based indicators of marketing efficiency, thereby clarifying how chain length and intermediary functions shape the distribution of value. Practically, the findings are expected to (1) help farmers and farmer groups identify marketing channels and collective arrangements that improve their bargaining position; (2) help village collectors, large traders, and processing industries recognize coordination problems, particularly in information transmission and quality standards, that raise transaction costs along the chain; and (3) provide the East Lampung Regency government with an evidence base for designing pepper-sector policies, such as farmer institutional strengthening, market information provision, and farmer–industry partnership programs, that complement the ongoing pepper conservation program.

METHOD

Research Location and Time

This research was conducted in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency, Lampung Province, Indonesia. The location was determined purposively on the consideration that Sukadana Baru Village is one of the largest black pepper production centers in East Lampung Regency, where collection, primary-level processing, and economic transactions among supply chain actors farmers, village-level collectors, and large traders take place actively. Field observation and direct interaction with these actors were concentrated on smallholder plantation areas and pepper harvest-collection points distributed throughout the village. The research was conducted from April to June 2026. The study employed a descriptive survey design that combined qualitative description of supply-chain flows with quantitative economic measurement of marketing margin and farmer's share.

Population and Sampling

The population in this study comprised all black pepper farmers, village collectors, and large traders operating in Sukadana Baru Village, totaling 500 individuals, consisting of 494 farmers, 4 village collectors (tengkulak), and 2 large traders. The farmer sample was determined using the Slovin formula with a 10% margin of error:

$$n = N / (1 + N(e)^2)$$

Where n is the required sample size, n is the population size (494 farmers), and e is the tolerated margin of error (10%, or 0.10). Applying the formula, $n = 494 / (1 + 494(0.10)^2) = 494 / 5.94 = 83.16$, which was rounded to 83 respondents. Accordingly, 83 farmers were selected at random using the slovin formula with a 10% error tolerance. For the marketing institutions (village collectors and large traders), a census/saturated sampling technique was applied, in which the entire population of 4 village collectors and 2 large traders was used as respondents to enable analysis of the product flow and marketing margin. In total, 89 respondents (83 farmers and 6 marketing-institution actors) were interviewed.

Data Types and Sources

This study used both primary and secondary data. Primary data were obtained through direct interviews with black pepper farmers and village collectors at the research location, using a structured questionnaire together with field documentation. Secondary data were obtained from relevant institutions, including the Central Bureau of Statistics (BPS), the Agricultural Extension Agency (BPP), and prior literature and research related to the topic under study. The structured questionnaire and interview guide covered actor characteristics, product movement and post-harvest handling, transaction prices and payment systems, market and quality information, communication media, and the marketing functions performed by intermediaries. The available study documentation does not report a separate pilot test or formal validity and reliability statistics for the instrument; consequently, no unsupported validation results are claimed.

Data Analysis Method

This research focused on analyzing the activities of product flow, financial flow, and information flow in Sukadana Baru Village using a combination of descriptive-qualitative and quantitative analysis. The descriptive-qualitative method, derived from structured interviews with farmers, village collectors, and large traders, was used to map the real conditions in the field, covering (a) the product flow how black pepper physically moves from its raw form to the dried black pepper ready for sale; (b) the financial flow the payment systems between farmers and village collectors, and between village collectors and large traders; and (c) the information flow market price information, the quality standards required by buyers, and the communication media used among actors (direct contact, telephone, or digital messaging).

The quantitative-economic component analyzed the marketing margin and farmer's share. The marketing margin represents the difference between the price at the final marketing institution (large trader/industry level) and the price received by the farmer (producer level), calculated as: These indicators were selected because the margin captures the price spread generated along the marketing chain, while farmer's share shows the proportion of the final price retained at producer level; interpreted together with the mapped product, information, and financial flows, they permit a channel-level assessment without treating the price spread alone as evidence of inefficiency.

$$MP = Pr - Pf$$

Where MP is the total marketing margin of black pepper (Rp/kg), Pr is the price of black pepper at the large-trader/final institution level (Rp/kg), and Pf is the price of black pepper at the farmer level in Sukadana Baru Village (Rp/kg). The farmer's share, used to assess the proportion of the final price enjoyed by farmers and thus the equity of the marketing system, was calculated as:

$$FS = (Pf / Pr) \times 100\%$$

Where FS is the farmer's share or proportion of the price received by farmers (%), Pf is the price of black pepper at the farmer level (Rp/kg), and Pr is the price of black pepper at the large-trader/final-consumer level (Rp/kg). The decision criterion applied was: if FS > 50%, the price share received by farmers is classified as high (an efficient marketing channel for farmers); if FS ≤ 50%, the share received by farmers is low because the margin captured by marketing institutions is disproportionately dominant.

Operational Definitions

To ensure measurement consistency, the key variables in this study were operationally defined as follows: (1) the black pepper supply chain is the network linking farmers, village collectors, and large traders that channels black pepper from the upstream production point (Sukadana Baru Village) to the final market or consumer; (2) supply chain actors are the economic agents directly involved, comprising farmers who cultivate, harvest, and process pepper fruit into dried black pepper; village collectors who purchase black pepper directly from farmers in small volumes for subsequent resale; and large traders who purchase black pepper from village collectors or farmers in bulk for distribution to industry, processing plants, or exporters; (3) product flow refers to the physical movement of black pepper, including volume, delivery frequency, post-harvest handling (drying and sieving), weight shrinkage, and the mode of transport used from the farmer to the large-trader level;

(4) financial flow refers to the circulation of funds among chain actors, including purchase and selling prices, the payment system (cash, deferred payment, or advance/ijon arrangements), and the agreed transaction terms; (5) information flow refers to the dissemination of data supporting supply chain activity, including current price fluctuations, the quality standards required by the market, stock availability, and the communication media used (telephone, WhatsApp, or face-to-face contact); (6) the farm-gate price (Pf) is the amount received by the farmer per kilogram (Rp/kg) from the village collector or first buyer at the point of transaction; (7) the large-trader price (Pr) is the amount received by the large trader per kilogram (Rp/kg) when selling black pepper to the market or industry outside Marga Tiga Sub-District;

(8) marketing cost (Bi) comprises all real costs incurred by village collectors and large traders in distributing black pepper (Rp/kg), including transportation/fuel, loading and unloading labor, packaging (sacks), and weight shrinkage due to moisture loss; (9) marketing profit (Ki) is the difference between the marketing margin obtained and the marketing cost incurred by each marketing institution (Rp/kg); (10) marketing margin (MP) is the difference between the price of black pepper at the large-trader level and the price at the farmer level in Sukadana Baru Village (Rp/kg); and (11) farmer's share (FS) is the percentage ratio between the price received by black pepper farmers and the price paid by the final consumer or large trader (%).

RESULTS AND DISCUSSION

Overview of the Research Location

Marga Tiga Sub-District lies at an average elevation of 50 meters above sea level and covers an administrative area of 207.31 km², comprising 13 villages with a total population of 56,383 inhabitants (28,515 male and 27,880 female). Sukadana Baru Village, one of the thirteen villages in the sub-district, consists of eight hamlets (dusun) and covers an area of 18.52 km². The village is located approximately 15 km from the East Lampung Regency capital, 120 km from the Lampung Provincial capital, and 6 km from the Marga Tiga Sub-District capital. Plantation land use in the village totals 960.75 hectares, exceeding the area devoted to settlement (Balai Penyuluhan Pertanian, 2023). The village is bordered by Catur Swako Village to the north, Nabang Baru Village to the south, Tanjung Harapan Village to the west, and Surya Mataram Village to the east.

Characteristics of Respondents

This study involved 89 respondents, comprising 83 black pepper farmers and 6 village collectors/traders, selected using the Slovin formula described in the Research Method section. Respondent characteristics are described below in terms of age, gender, education, number of dependents, and farming experience.

Age of Respondents

Age is an internal factor that strongly influences a farmer's mindset, physical capacity, and decision-making ability in farm management (Yusliana et al., 2020). As shown in Table 2, the largest proportion of respondents (33.71%) fell within the 41–45-year age bracket, indicating that black pepper cultivation in Sukadana Baru Village is predominantly managed by farmers who are still physically robust and cognitively experienced. The combination of physically active younger farmers and experienced senior farmers constitutes a favorable asset for the long-term sustainability of pepper farming (Suswadi, 2022).

Table 2. Age Distribution of Respondents in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency

No.	Age (years)	Farmers	Traders/ Collectors	Total	Percentage
1	35–40	11	–	11	12.36%
2	41–45	28	2	30	33.71%
3	46–50	21	2	23	25.84%
4	51–55	12	1	13	14.61%
5	56–60	11	1	12	13.48%
	Total	83	6	89	100%

Source: Primary data, processed, 2026.

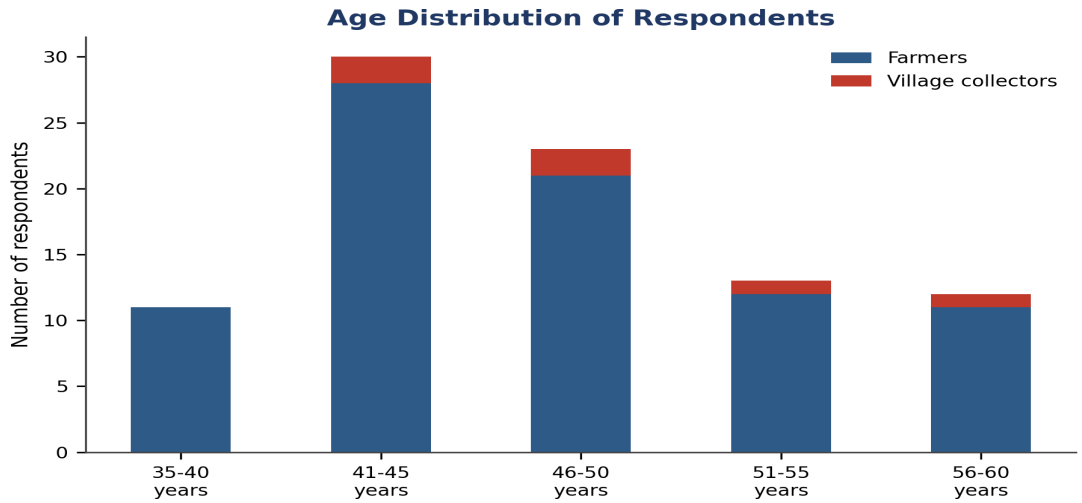


Figure 2. Age Distribution of Respondents

Gender of Respondents

Gender is often used as an indicator of farming productivity; on average, men are considered physically stronger than women in performing agricultural labor (Irdiana et al., 2023). As presented in Table 3, male respondents dominated both the farmer and intermediary-trader groups, accounting for 72 individuals (80.90%), while female respondents accounted for 11 individuals (12.36%).

Table 3. Gender Distribution of Respondents in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency

No.	Gender	Farmers	Intermediary Traders	Total	Percentage
1	Male	66	6	72	80.90%
2	Female	11	–	11	12.36%
	Total	77	6	83	100%

Source: Secondary data, processed, 2026.

Education Level of Respondents

The level of formal education attained by a farmer shapes their reasoning ability, mindset, and capacity to absorb new information (Kurniawan et al., 2025). Educational background is frequently associated with the rationality of farmers, particularly with respect to the speed of adopting technological innovation and comprehending materials delivered by agricultural extension officers. As shown in Table 4, most respondents (50.56%) had completed senior secondary education (SMA/SMK), followed by junior secondary education (SMP) at 34.93%.

Table 4. Education Level of Respondents in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency

No.	Education Level	Farmers	Intermediary Traders	Total	Percentage
1	Elementary School (SD)	12	–	12	14.45%
2	Junior Secondary (SMP)	29	–	29	34.93%
3	Senior Secondary (SMA/SMK)	39	6	45	50.56%
4	Bachelor's Degree (S1)	3	–	3	3.61%
	Total	83	6	89	100%

Source: Primary data, processed, 2026.

Number of Dependents

The number of household dependents relates directly to household economic burden, since a larger number of dependents increases the cost of living that must be met for food, education, and other needs (Ichsan, et.al, 2021). As shown in Table 5, most respondents (51.68%) had 4–5 dependents, indicating that the majority of households in Sukadana Baru Village are of medium size neither very small nor very large.

Table 5. Number of Dependents of Respondents in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency

No.	Dependents	Farmers	Intermediary Traders	Total	Percentage
1	2–3 persons	23	–	23	25.84%
2	4–5 persons	41	5	46	51.68%
3	6–7 persons	19	1	20	22.47%
	Total	83	6	89	100%

Source: Primary data, processed, 2026.

Farming Experience

Farming experience is a factor that shapes a farmer's skill and level of expertise in managing their farm (Kirana, 2023), and is typically correlated with the farmer's understanding of field conditions, pest and disease management, and strategies for coping with price fluctuation (Yaqin, 2023). As shown in Table 6, the dominant group of respondents (31.46%) had 26–30 years of farming experience, indicating that most respondents in Sukadana Baru Village have relied on the pepper plantation sector for their livelihood over a substantial period (Firdaus, 2022).

Table 6. Farming Experience of Respondents in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency

No.	Experience (years)	Farmers	Intermediary Traders	Total	Percentage
1	10–15	11	2	13	14.61%
2	16–20	25	1	26	29.21%
3	21–25	12	–	12	13.48%
4	26–30	28	2	30	33.71%
5	31–35	7	1	8	8.99%
	Total	83	6	89	100%

Source: Primary data, processed, 2026.

Land Area

Land area is a critical variable in characterizing respondents because the scale of land tenure directly determines production volume, which in turn shapes bargaining position within the marketing chain (Dewi, 2023). As shown in Table 7, most respondents (55.06%) cultivated 1 hectare of land, while the remaining 44.94% cultivated 0.5 hectares.

Table 7. Land Area of Respondents in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency

No.	Land Area	Farmers	Intermediary Traders	Total	Percentage
1	0.5 ha	39	1	40	44.94%
2	1 ha	44	5	49	55.06%
	Total	83	6	89	100%

Source: Primary data, processed, 2026.

Taken together, the respondent profile indicates that black pepper farming in Sukadana Baru Village is carried out predominantly by middle-aged, male, moderately-educated farmers with substantial farming experience and small-to-modest landholdings. This profile is broadly consistent with smallholder plantation demographics reported elsewhere in Lampung Province (XFAN, 2023), and it has direct implications for supply chain performance: farmers with long tenure and stable household structures tend to prioritize immediate cash liquidity over price negotiation, a tendency that, as discussed in the following sections, reinforces their dependence on village collectors and constrains their bargaining power within the marketing channel. These characteristics help explain farmers' bargaining position within the supply chain. First, landholdings of only 0.5–1 ha (Table 7) generate small and dispersed harvest volumes, so individual farmers cannot offer the volumes required by industry or provincial traders and must rely on village collectors to aggregate their output; small volume is thus a structural source of weak bargaining power (Dewi, 2023). Second, the predominance of households with four to five dependents (Table 5) increases the need for immediate cash, which is consistent with the finding that farmer–collector transactions are settled in cash and that selling frequency depends on farmers' urgent need for cash rather than on favorable price movements (Ichsan, M. W., et.al, 2021).

Third, long farming experience (Table 6) equips farmers with technical knowledge of cultivation and post-harvest handling, but this experience has been accumulated largely within the existing collector-based marketing system and does not necessarily translate into the market knowledge needed to negotiate prices or seek alternative buyers (Kirana, 2023). Fourth, although most respondents completed senior secondary education (Table 4), which in principle supports the use of mobile phones and digital messaging to obtain price information, the price information reaching farmers is still relayed mainly through collectors, so formal education has not yet been converted into independent market access. These conditions suggest that improving farmers' bargaining position requires collective rather than individual solutions, such as volume consolidation through farmer groups (Suswadi, 2022).

Black Pepper Supply Chain Analysis

Supply chain analysis in this study is grounded in the concept of the supply chain as a network involving all parties connected directly or indirectly in fulfilling consumer demand, from input suppliers and producer-farmers to marketing institutions and final consumers (Syamil, A., et.al, 2023). An efficient supply chain is characterized by the smooth operation of three principal flows product, information, and financial Arif, (2018) among the actors involved. These three flows were analyzed descriptively and qualitatively based on interviews with farmers and black pepper marketing institutions in Sukadana Baru Village, Marga Tiga Sub-District, East Lampung Regency.

Structure and Pattern of the Supply Chain

Field investigation identified two interrelated marketing channel patterns operating in Sukadana Baru Village, distinguished by the number of intermediary institutions involved between the farmer and the industry.

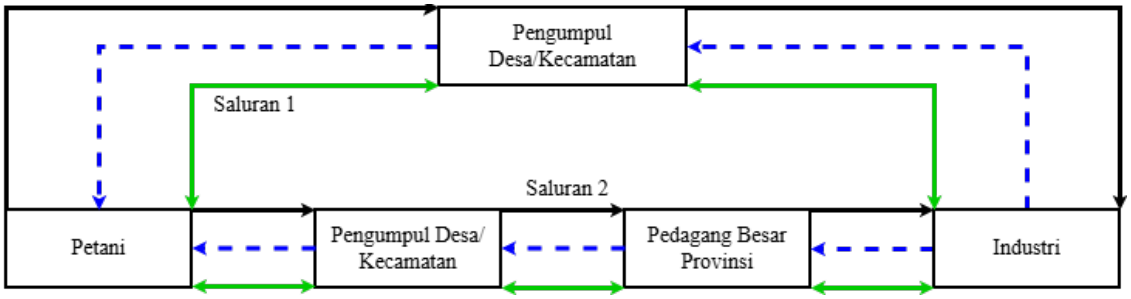


Figure 3. Product, Financial, and Information Flows within the Black Pepper Supply Chain

Channel I: Farmer → Village/Sub-District Collector → Industry. This is the shorter marketing channel, in which farmers sell their harvest directly to the village/sub-district collector, who then channels it directly to industry without passing through a provincial-level large trader. Because it involves only a single intermediary

institution, Channel I offers advantages in transaction speed and relatively more efficient price-information transmission.

Channel II: Farmer → Village/Sub-District Collector → Provincial Large Trader → Industry. This is the longer marketing channel, in which black pepper passes through a provincial-level large trader before reaching industry. Although this channel involves more marketing institutions, it exists because industry requires the aggregation of pepper volume at a larger scale before it can be absorbed, making the role of the provincial large trader necessary to bridge the supply capacity of multiple village/sub-district collectors.

Product Flow

The product flow describes how black pepper physically moves from upstream (farmer) to downstream (processing industry) through several sequential buy-sell stages (Suhartawan, 2025). At the initial stage, farmers in Sukadana Baru Village carry out cultivation activities planting, maintenance, and harvesting. After harvest, farmers perform simple household-level post-harvest processing, including threshing the fruit from its cluster, basic sieving, and sun-drying until moisture content reaches 12–13%, at which point the black pepper is ready for sale. The black pepper sold by farmers to village collectors is generally still in dried, ungraded form, and is evaluated using simple criteria: dryness level (12–13% moisture content), the darkness and glossiness of the bean (darker, glossier beans are considered higher quality), and cleanliness from stem fragments or other foreign material. These criteria form the primary basis on which village collectors set the purchase price, although the standards applied at the village level are generally less stringent than the quality standards set by industry.

Farmers do not sell pepper daily but rather follow the seasonal harvest pattern or sell once a sufficient stock has accumulated, so that selling frequency depends on harvest volume and farmers' urgent need for cash. Village collectors typically conduct a simple visual quality check assessing dryness and cleanliness before determining the purchase price through a bargaining process with the farmer, informed by the prevailing market price and price information the collector receives from traders further up the chain. Because farmers' bargaining position is relatively weak compared with that of collectors, the resulting price tends to follow the price unilaterally set by the collector.

Once sufficient volume has accumulated at the collector level, the product is channeled to the next marketing institution directly to industry under Channel I, or first to a sub-district/provincial large trader under Channel II with additional handling such as re-sorting, bulk packaging (sacks), and temporary warehousing typically performed at this stage. Quality standards become progressively stricter closer to the industry level, since processing industries generally impose specific quality requirements that must be met before the pepper can be further processed.

Information Flow

The information flow within this supply chain is bidirectional, particularly with respect to the product requirements and criteria desired by industry (Harjiyanto et al., 2026). From downstream to upstream, industry communicates the required quality specifications maximum moisture content, cleanliness from foreign material, bean size uniformity, and the prevailing purchase price to the provincial large trader, who relays this information to the village/sub-district collector, and ultimately to the farmer. From upstream to downstream, farmers and village collectors likewise transmit information regarding harvest conditions, including estimated volume/stock available, harvest timing, and current pepper quality, up the chain to industry, informing its raw-material planning.

This bidirectional information flow enables each actor to adjust to the others: farmers can identify the quality standards required to obtain a better price, while industry gains visibility into upstream supply availability. However, because information in Channel II must pass through more nodes (from industry to the provincial trader, to the village collector, and finally to the farmer), the information reaching farmers is more susceptible to delay or distortion compared with the shorter and more direct information pathway of Channel I. The interview-based mapping supports the existence of multiple information nodes in Channel II, but the available data do not quantify the duration or magnitude of information delay or distortion. The result should

therefore be interpreted as a structural vulnerability of the longer channel rather than as a measured causal effect.

Financial Flow

The financial flow within this supply chain concerns the payment system among actors and the operational costs incurred throughout the distribution process (Elvira, 2025). Payment from village collectors to farmers is made in cash at the point of transaction, without a deferred or credit-based payment system, reflecting farmers' need for immediate liquidity to meet daily household needs and subsequent farm operational costs. At higher marketing levels between the village collector and the provincial large trader, or between the provincial large trader and industry payment is sometimes made in installments or via bank transfer following quality inspection, reflecting the larger transaction volumes and more formal business relationships involved.

Throughout the distribution process, marketing institutions incur several categories of operational cost, including transportation/haulage costs between institutions, labor costs for sorting, packaging, and loading/unloading, and shrinkage costs arising from re-drying or moisture loss during storage. These operational costs are ultimately embedded within the marketing margin at each institutional level: the more marketing functions performed (sorting, packaging, storage), the higher the cost incurred, which in turn affects the profit captured by that institution and, correspondingly, the farmer's share ultimately received by the farmer.

Marketing Margin Analysis

The marketing margin represents the price difference between two or more levels of marketing institutions and the price received by the producer; in other words, it is the difference between the price at the consumer level and the price at the producer level (Hardina & Hasbiadi, 2023).

Marketing Margin — Channel I

Table 8. Marketing Margin of Black Pepper — Marketing Channel I

Marketing Channel I	Selling Price (Rp/kg)	Marketing Margin (Rp/kg)	Margin Share (%)
Farm-gate price	95,000	–	–
Village collector selling price	115,000	20,000	100.00%
Total margin		20,000	100.00%

Source: Primary data, processed, 2026.

Table 8 shows that under Channel I, farmers sold their harvest to the village collector at Rp95,000/kg, which was subsequently sold onward at Rp115,000/kg, generating a single-stage marketing margin of Rp20,000/kg. Because this channel involves only one marketing institution, the entire margin and the cost and profit embedded within it is captured at that single stage, resulting in a comparatively lean cost structure relative to the longer channel discussed below.

Marketing Margin — Channel II

Table 9. Marketing Margin of Black Pepper — Marketing Channel II

Marketing Channel II	Selling Price (Rp/kg)	Marketing Margin (Rp/kg)
Farm-gate price (farmer level)	90,000	–
Village/sub-district collector price	95,000	5,000
Provincial large-trader price	110,000	10,000
Industry price	120,000	10,000
Total marketing margin		25,000

Source: Primary data, processed, 2026.

Table 9 shows that the price of black pepper increased incrementally along Channel II, from the farmer level to the industry level. Between the farmer and the village/sub-district collector, the price rose from Rp90,000/kg to Rp95,000/kg, forming a margin of Rp5,000/kg; this relatively small margin reflects the fact that the village collector performs only basic marketing functions, namely short-distance collection and transport. Between the village/sub-district collector and the provincial trader, the price rose from Rp95,000/kg to Rp110,000/kg, forming a larger margin of Rp10,000/kg, likely attributable to more complex marketing functions aggregating larger volumes from multiple village-level collectors, further sorting/grading, long-distance transportation to the provincial center, and temporary warehousing. Finally, between the provincial trader and industry, the price rose again from Rp110,000/kg to Rp120,000/kg, forming a further margin of Rp10,000/kg, associated with the cost of meeting industrial quality standards (moisture, cleanliness, and size-uniformity testing), industry-specification packaging, and distribution to the processing plant. The total marketing margin along Channel II thus reached Rp25,000/kg — 25% higher than the margin recorded under Channel I.

A larger marketing margin, however, does not automatically indicate inefficiency. The margin is the sum of the marketing costs incurred and the profits earned by intermediaries, and part of it represents payment for functions that farmers cannot perform themselves at their current scale of production. In Channel II, the provincial trader aggregates volume from multiple village collectors, performs re-sorting and grading, bulk packaging, temporary warehousing, and long-distance transportation, and bears the cost of meeting industrial quality standards. The trader also bears price risk during storage, the risk of quality rejection by industry, and the financing burden associated with installment or transfer-based payment from industry.

The margin captured at this stage is therefore partly a return to these functions and risks, and whether it is economically justified depends on the proportion accounted for by real marketing costs relative to profit. Although this study recorded the categories of cost incurred by marketing institutions (transportation, labor, packaging, and shrinkage), a full decomposition of cost and profit for each institution was beyond the scope of the present analysis; accordingly, the margin comparison should be interpreted as an indicator of the relative distribution of the final price rather than as direct evidence of excess profit by intermediaries.

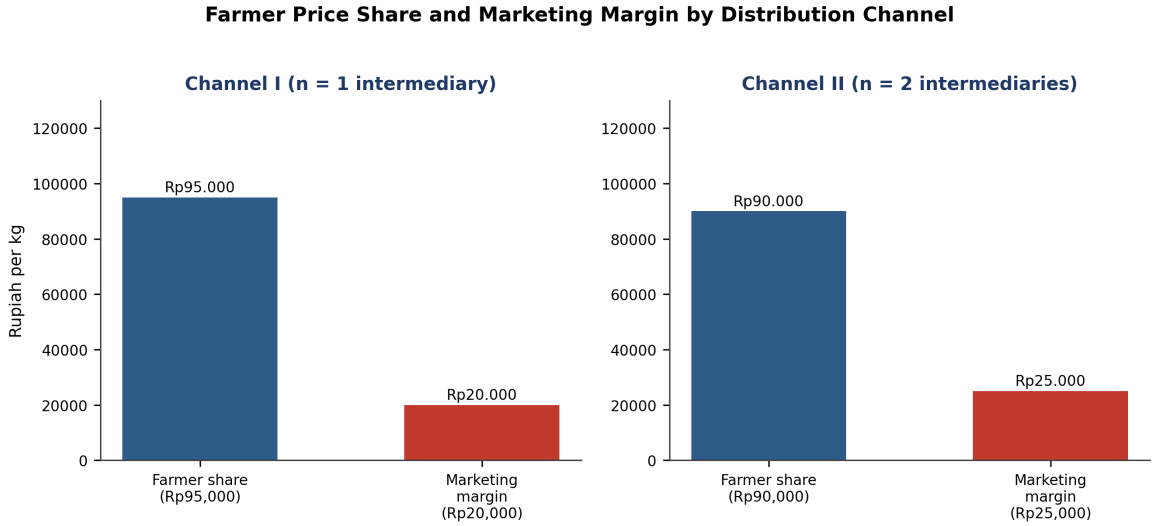


Figure 4. Farm-gate Price Share and Marketing Margin by Distribution Channel

Farmer's Share Analysis

Farmer's share is an indicator used to measure the price share received by farmers relative to the price paid by the final consumer or buyer within the marketing chain; the higher the farmer's share, the greater the benefit enjoyed by farmers and the more efficient the marketing channel is considered to be (Ridwan et al., 2026).

Table 10. Comparison of Farmer's Share of Black Pepper between Marketing Channel I and Channel II

Description	Marketing Channel I	Marketing Channel II
Price at farmer level	Rp 95,000	Rp 90,000
Price at final consumer/industry level	Rp 115,000	Rp 120,000
Number of marketing institutions	1 (village collector)	2 (village collector and provincial trader)
Total marketing margin	Rp 20,000/kg	Rp 25,000/kg
Farmer's share	82.61%	75.00%

Source: Primary data, processed, 2026.

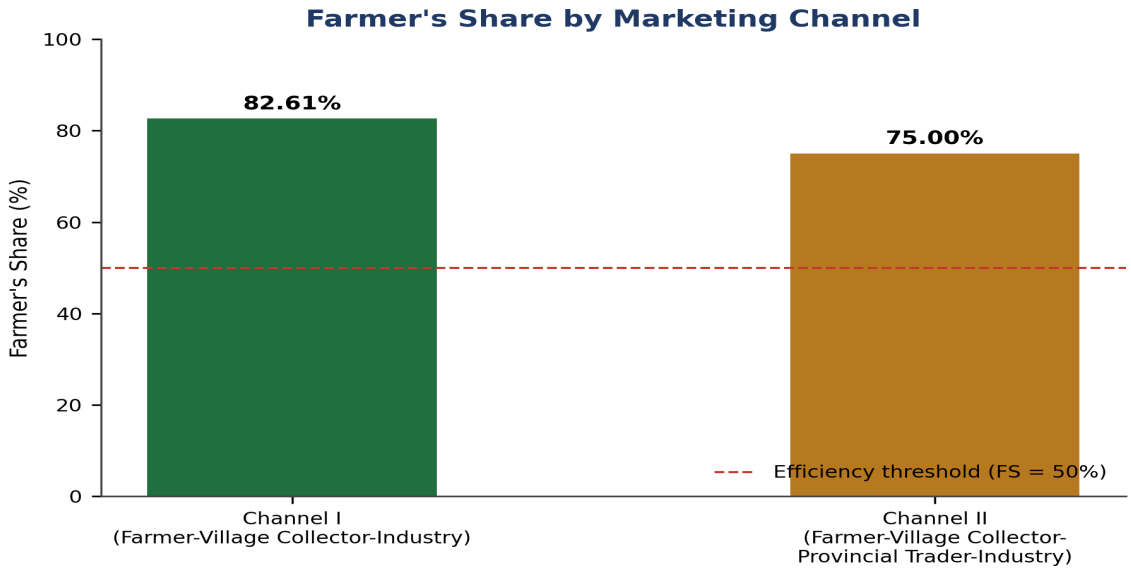


Figure 5. Farmer's Share by Marketing Channel

Table 10 shows that the farmer's share under Channel I reached 82.61%, compared with 75.00% under Channel II. This difference indicates that farmers selling through the shorter Channel I retain a substantially larger share of the final price than those selling through Channel II. The gap in farmer's share between the two channels is closely tied to the length of the marketing chain traversed: under Channel I, black pepper passes through only one intermediary institution, resulting in a shorter marketing process and, correspondingly, a lower total margin of Rp20,000/kg. Under Channel II, by contrast, the marketing chain is longer, involving two intermediary institutions the village/sub-district collector and the provincial large trader.

The longer the marketing chain a product traverses, the larger the cumulative marketing margin that must be divided among the institutions involved, so the share ultimately received by the farmer becomes smaller (Wijiati, 2025). Accordingly, Marketing Channel I can be regarded as more advantageous for farmers than Marketing Channel II. Nevertheless, Channel II should not be interpreted only negatively. The persistence of this longer channel, despite its lower farmer's share, indicates that it performs functions that the shorter channel cannot fully provide. Industry requires large, uniform, and regular volumes, whereas individual village collectors handle limited quantities and have limited working capital, storage capacity, and transport capacity.

The provincial trader bridges this gap by consolidating supply from several village collectors, absorbing pepper when direct access to industry is unavailable to a collector, and maintaining established commercial relationships with processing plants. For farmers and village collectors, Channel II is therefore likely to function as an assured outlet that guarantees the absorption of their harvest, particularly when harvest volumes are high. The coexistence of the two channels thus reflects a trade-off between a higher price share in Channel I and greater market certainty and aggregation capacity in Channel II.

Marketing Efficiency Analysis

Marketing efficiency can be assessed through several indicators, including the length of the marketing chain, the magnitude of the marketing margin, the distribution of cost and profit among institutions, and the size of the farmer's share received by farmers. The shorter the marketing chain, the smaller the resulting margin, and the greater the farmer's share, the more efficient the marketing channel is considered to be (Ridwan et al., 2026).

Table 11. Comparison of Marketing Efficiency Indicators between Channel I and Channel II

No.	Indicator	Marketing Channel I	Marketing Channel II
1	Number of intermediary institutions	1 institution	2 institutions
2	Farmer selling price (net)	Rp 95,000	Rp 90,000
3	Cost borne by farmer	Rp 0	Rp 0
4	Farmer net receipt	Rp 95,000	Rp 90,000
5	Price at final level	Rp 115,000	Rp 120,000
6	Total marketing margin	Rp 20,000	Rp 25,000
7	Farmer's share	82.61%	75.00%

Source: Primary data, processed, 2026.

Table 11 indicates that Marketing Channel I can be regarded as more efficient than Marketing Channel II, based on three converging pieces of evidence. First, in terms of chain length, Channel I involves only a single intermediary institution the village/sub-district trader whereas Channel II involves two institutions, the village/sub-district collector and the provincial/large trader; the shorter chain in Channel I enables a more direct and streamlined distribution process. Second, in terms of marketing margin, Channel I generates a smaller margin of Rp20,000, compared with the substantially larger margin of Rp25,000 recorded under Channel II; the larger margin under Channel II indicates that a greater share of the price difference between farmer and final consumer is captured by intermediary institutions rather than by the farmer. Third, in terms of farmer's share, Channel I provides farmers with a larger share of the final price (82.61%) compared with Channel II (75.00%).

Taken together, these results demonstrate that Marketing Channel I is more efficient than Marketing Channel II, since it delivers a larger price share to farmers through a shorter marketing chain, while Marketing Channel II is comparatively less efficient because it is less able to provide substantial benefit to farmers. This pattern is consistent with prior supply chain studies on other commodities in Lampung and neighboring regions. For instance, research on the soybean supply chain at UD Adem Ayem found overall marketing efficiency levels between 80–90% depending on the distribution network used (Fadhlullah, 2018), while research on the coffee supply chain in Gombengsari found that all observed distribution patterns were classified as highly efficient, with costs remaining below the conventional efficiency threshold (Melinda & Putra, 2024). The present findings extend this body of evidence to black pepper in East Lampung by showing that chain length rather than absolute price level is the primary determinant of the equity of benefit distribution between farmers and intermediary institutions. This reinforces the broader theoretical proposition that supply chain performance in smallholder agricultural commodities is governed less by the price ceiling set by end markets than by the number of institutional layers a product must traverse before reaching that market (Arif, 2018; Syamil, A., et.al, 2023).

From a policy and managerial perspective, these findings suggest that interventions aimed at shortening the marketing chain for example, by facilitating direct linkages between farmer groups and provincial-level or industrial buyers are likely to yield a more immediate improvement in farmer welfare than interventions focused solely on raising farm-gate prices within the existing channel structure. This is because a substantial portion of any price increase realized further downstream in a long chain tends to be absorbed by the additional cost and profit margins of intermediary institutions before reaching the farmer, whereas chain-shortening interventions act directly on the structural source of the low farmer's share observed under Channel II. Compared with previous studies, the present findings both confirm and refine existing evidence. The inverse relationship between channel length and farmer's share observed here is in line with the reasoning applied in marketing channel analyses of pepper in Bone Regency Ridwan et al., (2026) and coconut (Wijiati, 2025), and

with channel efficiency assessments of corn Gurning et al., (2024) and palm sugar Hardina & Hasbiadi, (2023) that rely on similar margin-based indicators.

It is also consistent with structure–conduct–performance evidence that concentrated buyer markets weaken smallholders' price position (Putriana et al., 2023). Supply chain studies in Lampung on tomato (Paramita & Hasyim, 2019), kelanting (Putri et al., 2020), and coffee Mahdiahwati et al., (2024); Riantini et al., (2023) have similarly used the mapping of flows between actors to assess chain performance. The present study adds to this literature by showing, for black pepper, that the difference in farmer's share between channels is linked not only to the number of intermediaries but also to the way price information and payment terms are transmitted through them, and by recognizing that the longer channel persists because it performs aggregation and risk-bearing functions. Moreover, the farmer's share in both channels exceeds the 50% threshold adopted in this study, indicating that the main issue is not an absolute lack of benefit for farmers but the distribution of benefits between channels and farmers' limited ability to choose the more favorable one.

These findings carry several theoretical implications. From a supply chain governance perspective, the black pepper chain in Sukadana Baru Village is coordinated mainly through informal, relationship-based arrangements in which price-setting power and access to market information are concentrated in intermediaries, while farmers act largely as price takers; improving chain performance therefore requires changes in coordination mechanisms rather than merely in price levels. From a smallholder empowerment perspective, the results indicate that farmers' weak position stems from small volumes, liquidity needs, and dependence on intermediaries for information, so that empowerment through collective action, such as farmer groups or cooperatives that consolidate volume and negotiate collectively, is a precondition for capturing a larger share of value (Suswadi, 2022). From a market access perspective, the study suggests that access is determined not only by physical proximity to buyers but also by access to timely price and quality information and to buyers capable of absorbing small volumes; interventions that improve information transparency and facilitate direct farmer–industry linkages can therefore expand the effective choice of marketing channels available to farmers.

CONCLUSION

This study demonstrates that the black pepper supply chain in Sukadana Baru Village operates through two marketing channels with product, financial, and information flows among farmers, collectors, traders, and industry. Marketing Channel I (Farmer – Village Collector – Industry) produced a smaller marketing margin of Rp20,000/kg and a higher farmer's share of 82.61%, whereas Marketing Channel II (Farmer – Village Collector – Provincial Trader – Industry) produced a margin of Rp25,000/kg and a farmer's share of 75.00%. These results demonstrate that Marketing Channel I is more efficient and farmer-favorable because it involves a shorter marketing chain. Therefore, strengthening farmer institutions, shortening the marketing chain, and strengthening farmers' direct linkages with downstream buyers can improve the distribution of marketing benefits and farmer welfare.

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