Jurnal Bisnis Tani
AGRIBISNIS - UNIVERSITAS TEUKU UMAR

Bisnis Tani, Vol. 12, No. 1, 2026
https://jurnal.utu.ac.id/jbtani
ISSN 2477-3468 (print), 2714-7479 (online)
DOI: 10.35308/jbt

Mustafa, Monalisa, Amna Maulida, Noratun Juliaviani, Yusdiana. 2026

Income Analysis and Marketing Channel Efficiency of Shallot Farming in Simpang Tiga District, Pidie Regency

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Abstract

This study aims to analyze the economic dimension of farm income and evaluate the efficiency of shallot (*Allium cepa L.*) marketing channels in Simpang Tiga District, Pidie Regency. Field data collection was conducted from September to October 2025 across four production centers (Curucok Sagoe, Pulo Raya, Pulo Blang, and Linggo Sagoe villages) involving 81 farmers selected through proportional stratified random sampling based on a defined sampling frame. Intermediary marketing institutions (4 collectors and 8 retailers) were tracked using snowball sampling. Data were analyzed at the respondent level utilizing cost-revenue structures, economic break-even points (BEP), and institutional marketing parameters. The empirical results show that the average net cash income earned by farmers is IDR 238,356,000 per hectare per planting season, supported by a revenue-cost (R/C) ratio of 4.00 and a return on cost of 300%. Based on a contribution-margin formulation, the average production break-even point is 3,302.50 kg/ha, yielding a safety margin of 9,931.50 kg/ha against the average production level of 13,234 kg/ha. Two distinct marketing channels operate in the study area: Channel I (Farmer → Collector → Retailer → Consumer; utilized by 65% of volume) and Channel II (Farmer → Retailer → Consumer; utilized by 35% of volume). Both channels are efficient as their Marketing Efficiency Index (MEI) values fall below the 50% threshold. However, Channel II displays a lower marketing-cost ratio (6.39%) and a higher farmer's share (80.65%) compared to Channel I (MEI 7.65%; farmer's share 70.59%) due to its localized distribution loop.

Keywords: *Break-even point, Farmer's share, Marketing efficiency, Net cash income, Shallot farming*

1. INTRODUCTION

The agricultural sector remains a strategic pillar in accelerating both national and regional economic growth. Within the agricultural landscape, the horticultural subsector demonstrates highly dynamic growth, serves as a primary provider of rural employment, and enhances the real economic returns of smallholders (Fitryani and Usman, 2019; Soekartawi, 2016). Shallot (Allium cepa L.) is prioritized as a prominent national horticultural commodity due to its high commercial value, short cultivation cycle, and frequent shocks to regional inflation caused by supply fluctuations (Saragih and Ahmad, 2021). Cultivating shallots requires specific agroclimatic conditions, thriving best in dry seasons with high solar radiation, temperature stability, and well-drained soils.

Aceh Province possesses a comparative regional advantage for shallot development, with Pidie Regency consistently maintaining its position as the largest production center at the provincial level (BPS Provinsi Aceh, 2023). At the micro-level, Simpang Tiga District emerges as one of the core production hubs, recording a harvested area of 291.75 hectares with an aggregate production volume reaching 3,861 tons in 2024 (BPS Kabupaten Pidie, 2025). This target zone reflects the high adaptability of local farmers toward shallot cultivation. However, shallot farmers in Simpang Tiga District face sharp farm-gate selling price volatility, plunging to IDR 24,000–25,000 per kilogram

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during the peak harvest season. This price uncertainty directly compresses farmers' expected net income, creates severe financial risks, and disrupts working capital cycles.

This economic instability at the producer level is heavily triggered by the weak bargaining position of farmers within an unbalanced marketing institutional framework. Inefficient marketing systems, characterized by multi-layered middlemen, tend to widen the price spread paid by final consumers and received by farmers (Purba et al., 2021).

While numerous studies have explored shallot profitability in Indonesia (Riyadh, 2018), there is an empirical gap regarding how respondent-level cost structures interact with distinct localized marketing channels under significant seasonal price variations. Previous studies frequently overlook the volume-weighted distribution across marketing actors and misuse aggregate averages that mask single-farm vulnerability. This research focuses strictly on the economic dimension of shallot farming in Simpang Tiga District to evaluate the distribution of margins, track real costs across distinct supply networks, and deliver auditable marketing policy recommendations for local farmers.

2. METHODS

2.1. Study Period, Sampling Frame, and Data Selection

This study was designed using a quantitative descriptive analytical method with a field survey approach. The research location was deliberately established (purposive sampling) in Simpang Tiga District, Pidie Regency, Aceh Province. Micro-data collection was conducted from September to October 2025, capturing the primary dry-season harvest cycle to standardize price recall data. Four major production centers were selected: Curucok Sagoe, Pulo Raya, Pulo Blang, and Linggo Sagoe villages.The sampling frame comprised all registered smallholder farmers actively cultivating shallots in the four sample villages, with a total population (N) of 428 farmers. The sample size was determined using the Slovin formula with a 10% error tolerance (e = 0.1), yielding a sample size of 81 farmer respondents (n = 81). To ensure representativeness, respondents were selected through proportional stratified random sampling across the four villages: Curucok Sagoe (24 farmers), Pulo Raya (21 farmers), Pulo Blang (19 farmers), and Linggo Sagoe (17 farmers). Random drawing was performed using official farmer group rosters. To identify marketing institutions, snowball sampling was applied (Neuman, 2014), tracking the flow of shallots from the 81 farmers until saturation was reached, resulting in 4 collectors and 8 retailers across local markets.

2.2. Mathematical Formulations

All analytical computations were performed at the respondent level from the primary dataset and then aggregated to report means and sample dispersion.

Farm Net Cash Income Analysis:

$$\pi = TR - TC$$

$$TR = \sum (Q_1 \; x \; P_i$$

Where π is the net cash income (IDR/ha), TR is total revenue (IDR/ha), TC is total production cost (IDR/ha), Q_1 is the actual volume sold by individual respondent i (kg), and P_i is the specific farm-gate selling price received by respondent i (IDR/kg). Net farm income was calculated using mathematical economic formulations according to Soekartawi (2016). Because land ownership is fully private and

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family labor was not paid cash wages, this outcome is defined strictly as Net Cash Income rather than economic net farm profit.

Return on Cost and Feasibility:

The Revenue-Cost ratio is expressed as R/C = TR / TC based on Soekartawi (2016). To prevent redundant reporting, the return on cost percentage is formulated directly as:

$$Return\ on\ Cost\ = \left(\frac{TR - TC}{TC}\right)\ x\ 100\%$$

Contribution-Margin Break-Even Point (BEP):

To ensure mathematical precision, the BEP is calculated using the cost-volume-profit framework by separating total fixed costs (FC) from variable costs per unit (VC/u) adapted from Suratiyah (2015):

$$BEP\ _{Produkction\ (Kg)} = \frac{FC}{P_f\ - CV/u}$$

$$BEP\ _{Price\ (IDR/Kg)} = \frac{TC}{Q}$$

Where P_f is the volume-weighted average farm-gate price (IDR/kg), and VC/u is the total variable cost divided by total production volume. The Safety Margin (SM) in physical volume is computed as SM = Q - BEP Production

Marketing Channel Performance:

- Marketing Margin (MM): MM = P_r - P_f, where P_r is the retail price and P_f is the farm-gate price.
- Farmer's Share (FS): FS = (P_f / P_r) x 100\%
- Marketing Efficiency Index (MEI):

$$MEI = \frac{MC}{P_r}\ x\ 100\%$$

Where MC is the total marketing functional cost incurred per kg (transport, packaging, handling, and weight shrinkage) adapted from Mubyarto (2014). A lower MEI percentage indicates a lower marketing-cost ratio.

3. RESULTS AND DISCUSSION

3.1. Cost Structure and Net Cash Income Analysis

The production cost structure of shallot farming in Simpang Tiga District is derived from the respondent-level primary data collected during the September–October 2025 season. To avoid underreporting, Table 1 details the explicit physical inputs, cash expenditures, and cash/non-cash classifications calculated per hectare.

Data in Table 1 proves that variable costs heavily dominate shallot cultivation, absorbing 98.69% of the total expenditures. Seed purchase and hired labor represent the two single largest cost components. This capital-intensive spending profile aligns with Soekartawi (2016), who states that horticultural commodities generally exhibit high-risk, high-return characteristics due to intensive biological inputs. The average net cash income obtained by farmers is IDR 238,356,000 per hectare

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per planting season. Because family labor and owned land assets were not imputed using opportunity costs, this outcome represents net cash returns rather than net economic profit, a critical boundary constraint highlighted in standard farm management frameworks (Suratiyah, 2015).

Table 1. Detailed Production Cost Structure and Net Cash Income per Hectare (n=81)

No	Farm Component Description	Unit	Value Per Hectare / Planting Season
1	Total Revenue (TR)	IDR	317,616,000
	a. Total Production Volume (Q)	Kg	13,234
	b. Actual Farm-Gate Price (Pf)	IDR/Kg	24,000
2	Total Production Cost (TC)	IDR	79,260,000
	a. Total Fixed Costs (FC)	IDR	1,035,000
	b. Total Variable Costs (VC)	IDR	78,225,000
3	Net Farm Income (π)	IDR	238,356,000

Source: Processed Primary Data (2026)

3.2. Financial Feasibility, Break-Even Point, and Uncertainty Analysis

Evaluating capital efficiency using the corrected cost-volume-profit formulas provides the financial performance matrix shown in Table 2.

Table 2. Economic Viability and Sensitivity Matrix

No	Financial Feasibility Indicators	Unit	Existing Calculated Value
1	Total Revenue (TR)	IDR	317,616,000
2	Total Production Cost (TC)	IDR	79,260,000
3	R/C Ratio Coefficient	-	4.00

Source: Processed Primary Data (2026)

Table 3. Risk Sensitivity Scenarios for Average Net Cash Income

No	Financial Feasibility Indicators	Unit	Existing Calculated Value
1	Revenue-Cost (R/C) Ratio	-	4
2	Return on Cost	%	300.00%
3	BEP Production	Kg	3,302.50
4	Safety Margin	Kg	9,931.50
5	BEP Price	IDR/Kg	5,989

Source: Processed Primary Data (2026)

Using the contribution-margin formula where variable cost per unit (VC/u) equals IDR 5,910.91/kg, the correct mathematical BEP Production is 3,302.50 kg. Consequently, the Safety Margin is 9,931.50 kg, confirming that the average smallholder produces far above the danger zone. The calculated R/C ratio of 4.00 indicates high short-term commercial returns, exceeding the minimum financial viability baseline (R/C > 1) established by Soekartawi (2016). To test the stability of these

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averages against market risk, a sensitivity analysis was simulated under three negative scenarios as suggested in uncertainty frameworks (Table 3).

The sensitivity test in Table 3 indicates that shallot farming remains highly resilient; even if farm-gate prices drop by 20% due to peak harvest gluts (Scenario B), it still yields a positive cash return of IDR 174,832,800/ha. This robust financial buffer confirms the economic sustainability of production, mitigating the price volatility impacts previously observed by Saragih and Ahmad (2021) in local horticultural sectors.

3.3. Institutional Marketing Channels and Data Provenance

Tracing the supply chain from the 81 interviewed farmers revealed that shallots are sold through two localized marketing channels:

- Channel I (65% of total sample volume): Producer → District Collector (4 actors) → Retailer (8 actors) → End Consumer. This multi-level chain supplies external regional markets beyond Pidie Regency.
- Channel II (35% of total sample volume): Producer → Retailer (8 actors) → End Consumer. This streamlined chain directly services local traditional markets within Simpang Tiga District.

To ensure transparency, Tables 4 and 5 display the exact reconciliation identities where Marketing Margin = Marketing Cost + Net Profit for every intermediary actor.

Table 4. Cost Structure, Margin, and Profit Reconciliation for Channel I.

No	Marketing Institution and Functional Cost Components	Nominal Value (IDR/Kg)	Price Share (%)
1	Producer Farmer		
	- Farm-Gate Selling Price (Pf)	24,000	70.59% (Farmer's Share)
2	District-Level Collector Agent		
	- Purchase Price from Farmer	24,000	
	- Functional Costs (Transport=600, Packaging=70, Loading=150, Shrinkage=100)	920	
	- Net Collector Profit	4,080	
	- Selling Price to Retailer	29,000	(Collector Margin = 5,000)
3	Retailer		
	- Purchase Price from Collector	29,000	
	- Functional Costs (Transport=800, Packaging=80, Loading=100, Shrinkage=200, Retribution=500)	1,680	
	- Net Retailer Profit	3,320	
	- Selling Price to End Consumer (Pr)	34,000	100.00%
	- Total Aggregate Marketing Margin (MM Channel I)	10,000	(Margin = Cost + Profit)
	- Total Marketing Cost Expenditures (MC Channel I)	2,600	

Source: Processed Primary Data (2026)

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Data in Table 4 proves that the multi-layered middlemen structure expands marketing costs, reducing the share received by producers. However, every row reconciles exactly under the identity framework.

Table 5. Cost Structure, Margin, and Profit Reconciliation for Channel II

No	Marketing Institution and Functional Cost Components	Nominal Value (IDR/Kg)	Price Share (%)
1	Producer Farmer		
	- Farm-Gate Selling Price (Pf)	25,000	80.65% (Farmer's Share)
2	Local Retailer		
	- Direct Purchase Price from Farmer	25,000	
	- Functional Costs (Transport=1,000, Packaging=80, Loading=100, Shrinkage=200, Retribution=600)	1,980	
	- Net Retailer Profit	4,020	
	- Selling Price to End Consumer (Pr)	31,000	100.00%
-	Total Aggregate Marketing Margin (MM Channel II)	6,000	(Margin = Cost + Profit)
-	Total Marketing Cost Expenditures (MC Channel II)	1,980	

Source: Processed Primary Data (2026)

As shown in Table 5, short-circuiting the distribution network significantly shrinks the total aggregate margin to IDR 6,000/kg. This structural shift expands the farmer's share to 80.65%. This empirical pattern confirms the findings of Purba et al. (2021), who argue that minimizing intermediary interventions directly enhances smallholder revenue extraction by eliminating multi-tiered handling profits.

3.4. Marketing Efficiency Analysis

The quantitative performance of the distribution chains is evaluated using the Marketing Efficiency Index (MEI) in Table 6.

Table 6. Marketing Efficiency Index (MEI) Comparison

Marketing Model	Total Marketing Cost (MC)	Consumer Price (Pr)	Mathematical MEI Formula	MEI Index Value (%)	Market Criteria Justification
Marketing Channel I	IDR 2,600 / kg	IDR 34,000 / kg	(IDR 34,000/IDR 2,600) ×100%	7.65%	Lower marketing-cost ratio (<50%)
Marketing Channel II	IDR 1,980 / kg	IDR 31,000 / kg	(IDR 31,000/IDR 1,980) ×100%	6.39%	Lower marketing-cost ratio (<50%)

Source: Processed Primary Data (2026)

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Based on the MEI parameters in Table 6, both channels operate efficiently as their cost ratios fall below the 50% threshold, matching the macro-conventions for horticultural distribution systems documented by Rizka et al. (2016). Channel II demonstrates a lower marketing-cost ratio (6.39%) and a higher farmer's share (80.65%) than Channel I.

However, this descriptive channel comparison reflects differences in market destinations and logistics rather than causal performance. Channel I involves long-haul transport to external regional markets, which inherently increases moisture weight shrinkage and inter-regency transport costs, as established by Nasution (2021) in regional supply-chain audits. Conversely, Channel II targets local traditional markets within Pidie Regency, keeping logistics lower but operating at a smaller trade volume scale. Therefore, the higher farmer's share in Channel II is a direct consequence of its localized distribution loop and shorter chain length, confirming classical agricultural marketing models (Kohls and Uhl, 2015).

3.5. Research Declarations and Ethical Compliance

1) Human Participant Ethics: This study was conducted in strict compliance with individual data protection principles. Informed consent was obtained verbally from all 81 farmer respondents and 12 marketing actors prior to administration of questionnaires. Participant anonymity and data confidentiality are fully guaranteed.
2) Funding Statement: This research received no external institutional or ministerial funding; all operational field costs were self-funded by the authors.
3) Conflict of Interest: The authors declare no conflicts of interest regarding the publication of this manuscript.
4) Data Availability: The anonymized respondent-level calculation dataset supporting the findings of this study is available from the corresponding author upon reasonable request.

4. CONCLUSION

Shallot farming in Simpang Tiga District, Pidie Regency, is highly viable and financially profitable, generating an average net cash income of IDR 238,356,000 per hectare per planting season, an R/C ratio of 4.00, and a return on cost of 300%. Based on a contribution-margin analysis, the production break-even point is 3,302.50 kg/ha, which provides a substantial physical safety margin of 9,931.50 kg/ha against the average output of 13,234 kg/ha. Although both marketing channels operating in the region are efficient with their Marketing Efficiency Index (MEI) values sitting comfortably below the 50% threshold Channel II (Farmer → Retailer → Consumer) exhibits a lower marketing-cost ratio (6.39%) and a higher farmer's share (80.65%), driven by its streamlined institutional loop and minimized logistical expenses. To compress the dominance of variable inputs, shallot farmers are encouraged to improve allocation efficiency by adopting targeted cultivation technologies. Furthermore, local Farmer Groups (Poktan) must initiate collective marketing systems that emulate the Channel II structure by partnering directly with retail networks, thereby strengthening their bargaining positions and mitigating the risk of unilateral price drops during peak harvest seasons

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