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Analyzing The Potato Supply Chain In The Modoinding District, South Minahasa Region.

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Abstract. This study analyzes the structure and marketing performance of the potato supply chain in Modoinding District, North Sulawesi, Indonesia, with emphasis on product, financial, and information flows across dominant marketing channels. Primary data were collected through structured questionnaires, semi-structured interviews, direct observations, and focus group discussions with farmers and key marketing actors. Supply chain mapping was used to identify actors and channel pathways, while marketing performance was evaluated using marketing margins, marketing costs, marketing profits, and farmer share. The mapping results indicate three dominant channels: (1) local marketing to Modoinding and Kotamobagu traditional markets, (2) distribution to Manado traditional markets, and (3) inter-island distribution via port-based traders/offtakers. Farm-gate price was IDR 15,000/kg across channels, while terminal prices increased with channel length: IDR 17,000–17,500/kg (Modoinding local), IDR 18,500/kg (Kotamobagu), IDR 21,000/kg (Manado), and IDR 25,000/kg (inter-island). Consequently, total marketing margins rose from IDR 2,000–2,500/kg in the shortest channel to IDR 10,000/kg in the inter-island channel, and farmer share declined from approximately 85.7–88.2% (local Modoinding) to 60.0% (inter-island). Transport and shipping-related activities were the main cost drivers in longer channels. Overall, improving postharvest handling, logistics coordination, and market information feedback to farmers is critical to reduce losses and enhance upstream value capture.

Keywords: farmer share; inter-island trade; marketing channels; marketing margin; modoinding District; potato; supply chain mapping

INTRODUCTION

Potato is a high value horticultural commodity with a supply chain that spans on farm production, aggregation, grading, storage, transport, and retail. In many producing regions, performance is constrained not only by farm productivity but also by how well the chain coordinates logistics, information, and incentives across actors. Recent evidence shows that potato supply chain improvement increasingly relies on better planning, traceability, and coordination, supported by appropriate technologies and governance arrangements(Allal et al., 2025).

However, fresh produce chains remain highly vulnerable to quality deterioration and product loss, especially when transport and storage conditions are suboptimal. Cold chain logistics, handling practices, and operational visibility strongly shape both economic returns and environmental impacts, yet these capabilities are often unevenly distributed across regions and market channels (Fan et al., 2024). In parallel, postharvest losses can be reduced through practical roadmaps that connect farm operations, packaging, storage, and retail routines, but implementation depends on coordination and investment capacity across the chain (Schudel et al., 2023).

A critical enabler of coordination is information sharing. In agrifood supply chains, data exchange is frequently limited by technological barriers, low interoperability, and lack of trust, which reduces transparency in pricing, demand signals, and quality requirements(Durrant et al., 2021). Empirical studies also highlight that cross chain platforms and structured data sharing mechanisms can create added value, but feasibility depends on governance, incentives, and the willingness of actors to participate(Jonkman et al., 2022). From an operational perspective, interoperability and information sharing are increasingly discussed as prerequisites for circular economy and supply chain resilience, yet adoption remains challenging in fragmented chains(Khan & Abonyi, 2022).

Digital transformation is often proposed as a solution, but the evidence indicates a persistent digital gap. Many agrifood studies focus on concepts and pilots, while empirical adoption in emerging economy contexts is still limited, with recurring issues related to infrastructure, skills, and investment priorities(Yu et al., 2025). At the farm level, behavioral intention to adopt digital platforms is influenced by perceived usefulness, trust, and ecosystem readiness, meaning that technology alone is insufficient without institutional and market support(Cimino et al., 2024). Moreover, digital traceability and market information systems require clear rules on what data are shared, by whom, and for what benefits. Evidence from digital passport style pilots suggests that market actors may support data sharing when value creation and accountability are explicit(Kosior & Młodawska, 2024). Likewise, digital information systems designed for smallholders emphasize that advisory and market services must be practical and accessible, not merely advanced(Mushi et al., 2024).

Beyond technology, sustainability requires measurement frameworks that integrate economic, social, and environmental dimensions. Reviews emphasize that sustainable supply chain management practices are multi dimensional and must be matched to sector context and implementation barriers(Shekarian et al., 2022). In agrifood chains, sustainability assessment has evolved toward integrating socio economic metrics, but consistent application is still developing(Arcese et al., 2023). Studies on sustainability performance measurement also underline trade offs and contextual pressures, implying that indicators and interventions must be tailored to local constraints and actor incentives(León-Bravo & Caniato, 2024). Coordination mechanisms therefore become central, because sustainability improvements often require aligned decisions across multiple actors rather than isolated optimization at one stage(Moreno-Miranda & Dries, 2022).

These challenges are highly relevant for the potato supply chain in Modoinding District, South Minahasa, North Sulawesi, an important highland production area located at about 1,100 to 1,600 meters above sea level. The local chain involves multiple actors, including farmers, village collectors, wholesalers, and retailers, with market linkages that extend to major urban centers and inter island distribution. At the same time, field descriptions indicate constraints related to logistics infrastructure, postharvest handling capacity, and limited feedback of consumer preferences to farmers, which together weaken responsiveness and bargaining position at farm level. In this context, national and regional initiatives such as the Upland program have been positioned as a pathway to improve productivity, infrastructure, farmer organization, and market access, but local supply chain diagnostics remain necessary to target interventions effectively.

Although prior literature provides broad frameworks on sustainability, digitalization, and coordination in agrifood supply chains, there is still limited empirical work that combines poducts, finances, and information with marketing efficiency indicators and context specific sustainability diagnosis for highland potato systems in Eastern Indonesia(Allal et al., 2025; Moreno-Miranda & Dries, 2022). This research also faces the ability of stakeholders to identify where value leakage occurs, which coordination failures matter most, and which interventions are feasible under real infrastructure and institutional conditions.

Recent agri food supply chain research increasingly highlights the importance of transparency and information sharing, often making the case that shared data infrastructures and interoperability are prerequisites for efficiency and sustainability(Jonkman et al., 2022; Khan & Abonyi, 2022). Sustainability evaluation has also moved beyond purely environmental metrics by calling for stronger integration of socio economic indicators to better capture the realities of agri food systems(Arcese et al., 2023). At the same time, persistent bottlenecks remain in practice, especially where supply chains are fragmented and dominated by smallholder actors, since cold chain capability and operational coordination still lag behind what the literature recommends(Mustafa et al., 2024). In addition, recent evidence stresses that postharvest losses require more systematic tracking and decision support tools, yet localized, field based diagnostics that connect losses, governance, and market outcomes are still relatively scarce(Péra et al., 2023). Therefore, a clear research gap remains: only a limited number of empirical studies assess potato supply chains using an integrated perspective that simultaneously maps product, financial, and information flows, evaluates marketing efficiency through margins and farmers share, and interprets the findings with sustainability oriented indicators in a specific local production and distribution context.

To address this gap, the present study contributes a novel integrated assessment of the potato supply chain in Modoinding District by combining structural mapping of actors and governance with flow analysis and marketing efficiency measurement, and then linking the results to contemporary sustainability indicator thinking and digital transformation constraints. Recent work shows that empirical evidence on agri food digital transformation is still limited and context dependent, which strengthens the need for location specific studies that can inform realistic interventions(Yu et al., 2025). Likewise, systematic reviews emphasize that sustainability indicators should be selected in a way that reflects multiple forms of capital and actor specific impacts, rather than relying on narrow measures alone(Amamou et al., 2025). Accordingly, this study is proposed to map the existing supply chain channels and key actors, to identify internal and external factors shaping chain performance, and to assess marketing efficiency and sustainability implications in order to produce actionable recommendations for logistics improvement, information system strengthening, and institutional coordination.

MATERIALS AND METHODS

Study area and research design

This study was conducted in Modoinding District, South Minahasa Regency, North Sulawesi, Indonesia, a highland potato production area with market linkages to (i) local markets (Modoinding and Kotamobagu), (ii) urban wholesale and retail markets (Manado), and (iii) inter-island distribution through port-based traders. The research applied a descriptive case study design that combined (1) quantitative marketing performance measurement and (2) qualitative supply chain diagnostics. A flow-based mapping approach was used to document actors, trading links, and transaction processes before computing performance indicators for each identified marketing channel (MacCarthy et al., 2022).

Data sources and field data collection

Primary data were collected using:

Structured questionnaires to quantify prices, volumes, marketing costs, margins, and payment terms;

Semi-structured interviews to explain coordination, bargaining practices, constraints, and information exchange;

Direct observations to record grading, packing, transport practices, and transaction routines; and

Focus group discussions (FGDs) to validate the chain map and to compile internal and external factors used for strategic interpretation.

Secondary information (regional production context and institutional programs) was used to triangulate and contextualize the findings. Information-flow assessment focused on what data are shared (price, demand, quality), who shares them, how frequently, and whether feedback reaches farmers (Pennekamp et al., 2023).

Sampling strategy and respondents

Sampling followed the logic of tracing the chain from upstream to downstream. Farmers were selected across villages to represent the production base. Market actors were identified by following actual transaction links from farmers to collectors, wholesalers, and retailers across the observed channels. Snowball tracing was used because downstream nodes are most reliably identified through verified trading relationships rather than a complete public sampling frame (Ting et al., 2025). The respondent group covered the main actor types in the chain: farmers, village collectors, sub-district/district traders, port-based or inter-island traders/offtakers, and retailers in traditional markets. Institutional informants (e.g., local agriculture offices or market managers) were included to clarify enabling conditions and operational constraints.

Variables and operational definitions

The study measured three flow dimensions and three sustainability dimensions. Product flow captured physical movement (grading classes, packing, transport mode, lead time, losses). Financial flow captured price formation, marketing costs, margins, and payment mechanisms (cash versus delayed payment). Information flow captured the direction and completeness of market signals (price, demand volume, preferred grades, and quality requirements) and the presence or absence of feedback to farmers. Sustainability diagnosis used an indicator based rapid appraisal across economic, social, and environmental dimensions, guided by recent frameworks that emphasize coordination across chain stages as a sustainability determinant(Moreno-Miranda & Dries, 2022). Table 1 provides an overview of who was interviewed, what instruments were used, and what outputs were produced for each analysis step.

Table 1. Data structure and measurement plan

Data component	Main respondents	Instrument	Key data captured	Output
Chain actor identification	Farmers, collectors, wholesalers, retailers	Interview, observation	Actor roles, transaction links, channel structure	Actor network and channel map
Product flow	All chain actors	Observation, interview	Grading, packing, transport, lead time, losses	Product flow map and bottleneck list
Financial flow	Farmers and all traders	Questionnaire, interview	Purchase and selling prices, costs, profits, payment terms	Margin, profit, farmer share by channel
Information flow	All chain actors	Interview	Price and demand signals, quality specs, feedback patterns	Information flow map and gap diagnosis
Sustainability rapid appraisal	Farmers, traders, institutions	Questionnaire, FGD	Economic, social, environmental indicators	Sustainability score profile and narrative

Table 1 clarifies that the mapping outputs (network, product, finance, information) were developed first, then the quantitative indicators and strategic analysis were performed using the mapped channels and validated actor list.

Marketing performance indicators

Marketing performance was evaluated using marketing margin, marketing cost, marketing profit, and farmer share. Margin was defined as the difference between consumer price and farm gate price, while farmer share was defined as the proportion of the consumer price received by farmers. This approach is widely used in agrifood chain diagnostics to compare efficiency across alternative channels and to identify where value distribution becomes less favorable to producers (Nurunisa et al., 2024). To connect performance interpretation with broader price distribution discussions, farmer share is also reported alongside channel length and intermediary count, consistent with recent policy oriented work on how value is distributed along food chains(Santeramo et al., 2024). Table 2 summarizes the equations so readers can reproduce the calculations channel by channel.

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Table 2. Quantitative computations formulas

Indicator	Formula	Notes
Marketing margin (total)	$MT = P_c - P_f$	P_c consumer price, P_f farm gate price
Margin at actor i	$M_i = P_{sell,i} - P_{buy,i}$	Price spread per intermediary
Marketing cost at actor i	$C_i = \sum c_{ik}$	Transport, packing, fees, labor, storage
Marketing profit at actor i	$\pi_i = M_i - C_i$	Profit after marketing costs
Total marketing cost	$C_T = \sum C_i$	Summed across actors in the channel
Farmer share	$FS(\%) = (P_f/P_c) \times 100$	Higher values imply better farmer participation in final value

Table 2 makes the calculation logic explicit. Prices and costs were standardized to Rupiah per kilogram to ensure comparability across actors and channels, and all channel results were reported as averages over observed transactions during the survey period.

Sustainability diagnosis procedure

Sustainability was assessed as a diagnostic profile rather than a single index. Economic sustainability used margin and farmer share plus qualitative evidence on price stability and market access. Social sustainability used indicators such as payment fairness, inclusion of farmer groups, and perceived bargaining position. Environmental sustainability used indicators such as input intensity (fertilizer and pesticide practices), postharvest loss risk, and handling and transport conditions. This indicator-based approach aligns with recent literature emphasizing that sustainability measurement in food chains requires context specific indicators and recognition of tradeoffs across actors.

Data validation and reliability

Data quality was strengthened through triangulation across instruments (questionnaire, interview, observation, and focus group confirmation) and through consistency checks across actor reported prices and transaction records when available. Where information flow claims differed between actors, the study prioritized cross actor confirmation and documented the mismatch as part of the coordination diagnosis, consistent with recent work highlighting information asymmetry and the need for traceability and price transparency mechanisms in agrifood chains.

RESULT AND DISCUSSION

Supply chain structure and marketing channels

The mapped potato supply chain in Modoinding involves farmers as upstream suppliers, local collectors (who often also act as retailers), district wholesalers, market retailers, and port-based traders/offtakers serving inter-island destinations. Figure 1 summarizes the overall structure and shows how the chain diverges into three dominant distribution routes after farm-gate collection: (i) short local routes to nearby traditional markets, (ii) an urban route to Manado, and (iii) a longer inter-island route that adds port-based handling and shipping functions.

Product flow generally moves smoothly from farms to end markets because collectors and wholesalers actively consolidate volumes from multiple farmers. However, the number of handling points increases with market distance, raising the likelihood of bruising, shrinkage, and quality deterioration. Financial flow is mostly cash-based at shorter routes, while longer routes introduce non-cash settlement and occasional delayed payment between traders. Information flow is strongest for price signals, but information about demand specifications (grade, size, and preferred quality) is not consistently transmitted back to farmers, especially in longer channels where orders originate downstream.

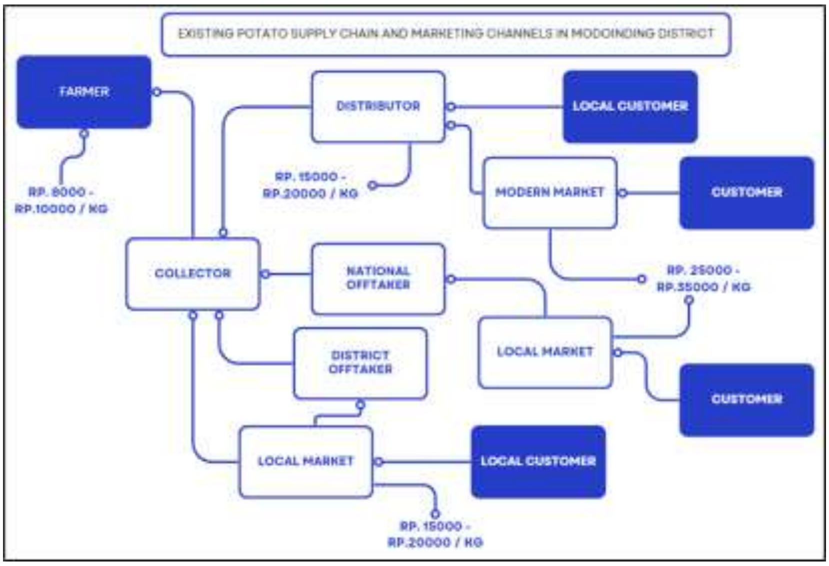

Figure 1. Existing potato supply chain and marketing channels in Modoinding District

Figure 1 illustrates the chain actors and the branching of marketing channels from the farm gate. The shortest route supplies local traditional markets through collectors who also retail, while the Manado and inter-island routes add intermediary functions (packing, transport, wholesale aggregation, and shipping) that increase marketing costs and margins.

Channel 1 (local markets): shortest route with high farmer share

Channel 1 represents a one-level channel, where potatoes move from farmers to local collectors who frequently also function as retailers in traditional markets. As shown in Figure 2, this channel supplies two nearby market destinations: the traditional market in Modoinding and the traditional market in Kotamobagu. Trading volumes are relatively small compared with the longer routes, reflecting the limited carrying capacity of local traders and the day-to-day nature of traditional market demand. In the old paper, typical volumes were around 15 kg per market day for Modoinding and 60–120 kg per market day for Kotamobagu. Transactions are conducted in cash with immediate payment, which improves liquidity for farmers and reduces financial risk for small traders.

Market information in Channel 1 is relatively “complete” in practical terms: traders observe prices directly in the market and communicate farm availability through frequent contact. This supports quick price transmission between market and farm. However, the Kotamobagu variant adds a clear logistics burden due to distance, increasing transport cost and widening the price spread.

Figure 2 shows a direct pathway where the collector-retailer is the only intermediary. The channel’s short length explains why farmer share remains highest, while the Kotamobagu route shows the same structure but higher logistics cost due to travel distance.

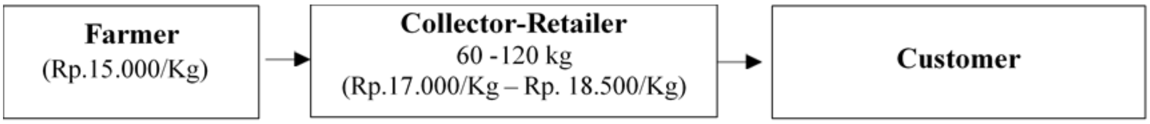

Figure 2. Channel 1 marketing pathway (Modoinding and Kotamobagu traditional markets)

Table 3. Observed Summarizes

Channel	Main actor sequence	Main destination market	Typical transaction volume	Payment practice	Information flow pattern
Channel 1 Modoinding	Farmer to local collector retailer to consumer	Traditional market in Modoinding	Around 15 kg per market day	Cash and immediate	Price and availability information moves relatively well between market and farm
Channel 1 Kotamobagu	Farmer to local collector retailer to consumer	Traditional market in Kotamobagu	Around 60 to 120 kg per market day	Cash and immediate	Price information is available, but logistics cost increases due to distance
Channel 2 Manado	Farmer to collector or district trader to retailer to consumer	Traditional markets in Manado	Around 600 kg per trip for traders and around 20 kg per day for retailers	Mostly cash and immediate	Price and demand information is relatively balanced between upstream and downstream actors
Channel 3 Inter island	Farmer to village collector to district wholesaler to port based trader or offtaker	Inter island domestic markets	Large lot trading up to around 10,000 kg	Transfer or delayed settlement in some links	Demand information mainly follows orders from downstream and is less visible to farmers

Table 3 indicates that Channel 1 is structurally the shortest and tends to rely on direct cash transactions, while Channel 3 is the longest and includes more logistics and coordination steps that raise cost and risk exposure. This pattern is consistent with broader evidence that longer fresh produce chains face higher coordination burdens and are more sensitive to logistics and handling conditions (Mustafa et al., 2024).

Price formation, marketing margin, and farmer share

Marketing performance differs clearly across channels, reflecting both chain length and logistics cost intensity. To ensure comparability, farmer share was interpreted as the farm gate price divided by the final consumer price in each channel, using the reported price points at the farmer and consumer levels. Table 4 consolidates the key price outcomes and efficiency indicators across channels..

Table 4. Price outcomes and efficiency indicators

Channel	Farm gate price	Consumer price	Total marketing margin	Farmer share	Efficiency interpretation
Channel 1 Modoinding	15,000 (IDR per kg)	17,000 to 17,500 (IDR per kg)	2,000 to 2,500 (IDR per kg)	about 85.7 % to 88.2 %	Highest farmer share because the channel is short
Channel 1 Kotamobagu	15,000 (IDR per kg)	18,500 (IDR per kg)	3,500 (IDR per kg)	81.1 %	Still efficient but transport cost reduces farmer share
Channel 2 Manado	15,000 (IDR per kg)	21,000 (IDR per kg)	6,000 (IDR per kg)	71.4 %	Moderate farmer share because of longer chain and higher logistics cost
Channel 3 Inter island	15,000 (IDR per kg)	25,000 (IDR per kg)	10,000 (IDR per kg)	60 %	Lowest farmer share because of high shipping and handling costs

Table 4 shows that farmer share declines when channels extend to distant markets, because more marketing functions are required and the total margin expands. This finding aligns with evidence that perishable crop chains frequently exhibit widening farm retail spreads as distance, handling, and market power effects increase, often creating price transmission asymmetry between chain levels. Channel 1 has the highest farmer share because the channel is short and marketing functions are limited. Farm-gate price is IDR 15,000/kg (≈ IDR 900,000 per 60 kg sack in your old paper), while consumer prices are IDR 17,000–17,500/kg (Modoinding) and IDR 18,500/kg (Kotamobagu). The resulting total margin is relatively small (IDR 2,000–2,500/kg for Modoinding; IDR 3,500/kg for Kotamobagu), indicating that value addition is limited mostly to transport and basic market handling rather than multi-stage trading.

Cost and profit structure in Channel 2

Channel 2 links Modoinding production to traditional markets in Manado and involves collector or district trader functions plus retailing activities, which introduces substantial packing and transport costs compared with local marketing. Table 4 details the marketing cost components and profits recorded for Channel 2.

Table 5. Channel 2 cost components and profits

Actor level	Purchase price (IDR per kg)	Selling price (IDR per kg)	Main marketing costs (IDR per kg)	Profit (IDR per kg)
Farmer	not applicable	15,000	not specified at farm level in the channel table	not specified
Collector or district trader	15,000	18,000	packing 250 and transport 1,500	1,250
Retailer in Manado	18,000	21,000	retail marketing cost 750	2,250
Total across channel			total marketing cost 2,500	total profit 3,500

Table 5 indicates that the largest cost driver in Channel 2 is transport from the highland production area to Manado markets, while retail level costs are lower but still meaningful due to market fees and handling. This supports the interpretation that improving route reliability and reducing handling damage can directly improve efficiency because perishability related losses and quality deterioration are strongly linked to logistics and operational visibility. Cost driver and margin logic (Table 5): Marketing costs increase mainly due to transport from the highland production area to Manado and basic packing. In your data, the collector/district trader incurs packing (IDR 250/kg) and transport (IDR 1,500/kg) and sells at IDR 18,000/kg, generating IDR 1,250/kg profit. Retailers add IDR 750/kg retail marketing cost and sell at IDR 21,000/kg, earning IDR 2,250/kg profit. These added functions explain why Channel 2 has a larger total margin (IDR 6,000/kg) and a lower farmer share (71.4%) than Channel 1 (Table 4), even though the final consumer price is higher.

Cost and profit structure in Channel 3

Channel 3 is the longest route and is designed for inter-island distribution through port-based traders/offtakers. As shown in Figure 4, potatoes flow from farmers to village collectors, then to district wholesalers, and finally to port-based traders who handle shipping to inter-island markets. This channel operates at much larger lot sizes; the old paper reports transactions up to ~10,000 kg, which requires more formal coordination and logistics planning.

Payment practices also differ from shorter channels. While farm-level purchases are generally settled quickly, downstream transactions particularly between district wholesalers and port-based traders, often use bank transfer and may include settlement delays, increasing working-capital pressure and risk for some actors. Information flow tends to be more "order-driven" from downstream: large traders and offtakers respond to inter-island demand signals and then source volume accordingly. As a result, farmers typically receive price signals but have less visibility on downstream specifications and demand timing unless they have strong relationships with collectors or wholesalers.

Figure 4 shows how additional actors and handling stages enter the chain for inter-island distribution. These added stages (field survey, harvest loading, sorting, packing, port handling, and shipping) expand marketing costs and widen margins, reducing the proportion of the final price captured at the farm gate

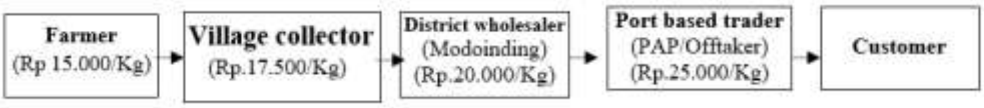

Figure 4. Channel 3 marketing pathway (inter-island distribution via port-based trader/offtaker)

Table 6 confirms that shipping related costs dominate Channel 3 and explain why the total margin becomes the highest among all channels, even though the destination price is also higher. This pattern is consistent with studies showing that postharvest losses and cost escalation often increase with the number of handling nodes and the length of distribution routes, which strengthens the case for better loss tracking and targeted investment in handling and logistics practices. Channel 3 has the highest cost intensity because it includes multiple handling and shipping functions. In your data, village collectors add field survey (IDR 250/kg) and harvest/loading (IDR 1,250/kg); wholesalers add sorting/packing (IDR 750/kg); and port-based traders add transport (IDR 500/kg), unloading (IDR 1,000/kg), and shipping (IDR 2,000/kg). These functions raise the consumer/terminal price to IDR 25,000/kg and widen the total margin to IDR 10,000/kg (Table 4). Consequently, farmer share is lowest (60%) even though the terminal price is highest—because the added logistics and risk-bearing activities capture a larger portion of the value.

Table 6. Channel 3 cost components and profits

Actor level	Purchase price (IDR per kg)	Selling price (IDR per kg)	Main marketing costs (IDR per kg)	Profit (IDR per kg)
Farmer	not applicable	15,000	not specified at farm level in the channel table	not specified
Village collector	15,000	17,500	field survey 250 and harvest loading 1,250	1,000
District wholesaler	17,500	20,000	sorting and packing 750	1,750
Port based trader or offtaker	20,000	25,000	transport 500 unloading 1,000 shipping 2,000	1,500
Total across channel			total marketing cost 5,750	total profit 4,250

Comparative marketing performance across channels

Across channels, a clear pattern emerges: longer channels with greater distance and more handling stages yield higher terminal prices but lower farmer share. Channel 1 provides the highest farmer share because marketing functions are limited and the channel is short. Channel 2 shows moderate farmer share due to long-distance transport and retailer costs. Channel 3 yields the lowest farmer share because shipping and port handling substantially raise marketing costs and margins.

This pattern is consistent with your field evidence on transaction practices: local channels rely on frequent cash trading with relatively transparent price formation, while long channels require consolidation, coordination, and higher-cost logistics that increase the gap between farm-gate and terminal prices.

Coordination issues, risk exposure, and upgrading implications

Your old paper emphasizes that supply continuity is not evenly distributed throughout the year due to seasonal harvest cycles, weather disturbances, and pest/disease pressure. These production-side fluctuations affect price stability and the ability of traders to meet downstream demand consistently. Risk exposure differs across actors: farmers face production and price risk; traders face storage, shrinkage, and transport-damage risk; and inter-island traders face shipping and settlement risk.

A consistent qualitative finding is that coordination is largely trust-based and informal. While this supports flexible transactions, it also limits enforceable quality standards and structured information feedback. Practical upgrading options suggested by your findings include: (1) improving postharvest handling (grading, packing, stacking) to reduce quality loss on longer routes, (2) strengthening information feedback to farmers on preferred grade and quality, and (3) improving logistics coordination and payment clarity in inter-island transactions to reduce disputes and working-capital constraints.

CONCLUSION

This study mapped the potato supply chain in Modoinding District and identified three dominant marketing channels that differ in actor structure, market distance, and marketing functions. The results show that channel length and logistics intensity strongly influence value distribution and marketing efficiency. Channel 1 (local markets) is the shortest route and provides the highest farmer share because marketing functions are limited and transactions are typically cash-based with immediate settlement. Channel 2 (Modoinding–Manado) involves additional consolidation and long-distance transport, resulting in higher marketing costs and margins and a lower farmer share than Channel 1, although coordination is relatively stable due to regular trading frequency and clearer price signals. Channel 3 (inter-island) is the longest route and generates the highest terminal price but also the highest accumulated marketing costs (especially loading, unloading, and shipping), producing the lowest farmer share. This indicates that access to distant markets does not automatically improve farmer welfare unless the chain reduces logistics costs and quality losses and improves upstream participation in value capture.

Overall, the chain operates mainly through informal, trust-based relationships. Price information is generally available, but information on demand specifications and quality requirements is not consistently transmitted to farmers, particularly in longer channels. Improving coordination and governance is therefore essential to strengthen farmer bargaining position and to stabilize supply and quality. Practical upgrading priorities include: (1) improving postharvest handling and packing standards to reduce physical damage and quality decline, (2) strengthening information feedback mechanisms from retailers/offtakers to farmers on grade and quality requirements, and (3) improving logistics planning and settlement clarity in the inter-island channel to reduce transaction risk and working-capital pressure. These actions can increase chain efficiency and support a fairer distribution of value, particularly for smallholder farmers at the upstream level.

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