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Marketing Efficiency of Corn Across Different Supply Chains in East Java

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Abstract

Corn production in East Java Province in the first quarter reached 42.50%, which caused the corn supply to be unstable. The disparity in prices between farmers and consumers results in losses for farmers. The large number of supply chain actors causes profits to decrease. The research focuses on supply chain analysis related to each pattern's product, financial, and information flow. Apart from that, it discusses marketing efficiency analysis. Primary data collection used direct observation and in-depth interviews. The sampling method uses convenience and snowball sampling. The research results show four supply chain patterns with supply chain actors: farmers, collector traders, large traders, and consumers. The payment methods used are direct and temporary payments. Important information needed by supply chain actors is corn prices, corn standardization, corn packaging, delivery schedules, and estimates of the amount of corn sent. Efficient marketing is in the second and fourth supply chain patterns because the profit margin ratio is more than one. The profit margin ratio values for farmers and collector traders in the second pattern are 1.52 and 1.94, which indicate that marketing is efficient. The value of the profit margin ratio for farmers in the fourth pattern is 1.46, so marketing is efficient.

Keywords: Corn, Farmer's share, Marketing efficiency, Supply chain

Efisiensi Pemasaran Jagung Di Berbagai Rantai Pasok Di Jawa Timur

Abstrak

Produksi jagung di Provinsi Jawa Timur pada triwulan pertama mencapai 42,50% yang menyebabkan pasokan jagung tidak stabil. Disparitas harga antara petani dan konsumen mengakibatkan kerugian bagi petani. Banyaknya pelaku rantai pasok menyebabkan keuntungan menurun. Penelitian ini berfokus pada analisis rantai pasok terkait aliran produk, keuangan, dan informasi masing-masing pola. Selain itu, dibahas efisiensi pemasaran. Pengumpulan data primer menggunakan observasi langsung dan *in-depth* interview. Metode pengambilan sampel menggunakan *convenience* dan *snowball sampling*. Hasil penelitian menunjukkan empat pola rantai pasok dengan pelaku rantai pasok: petani, pedagang pengumpul, pedagang besar, dan konsumen. Metode pembayaran yang digunakan adalah pembayaran langsung dan tempo. Informasi penting yang dibutuhkan oleh pelaku rantai pasok adalah harga jagung, standarisasi jagung, pengemasan jagung, jadwal pengiriman, dan estimasi jumlah jagung yang dikirim. Pemasaran yang efisien berada pada pola rantai pasok kedua dan keempat karena nilai *profit margin ratio* lebih dari satu. Nilai *profit margin ratio* di *tier* petani dan pedagang pengumpul pada pola kedua adalah 1,52 dan 1,94 yang menunjukkan bahwa pemasaran efisien. Nilai *profit margin ratio* bagi petani pada pola keempat adalah 1,46 maka pemasaran efisien.

Kata Kunci : *Farmer's share,* Jagung, *Marketing efficiency, Supply chain*

INTRODUCTION

Corn (Zea mays L.) plays a crucial role in the food supply chain, with a consistent market demand. It is among the top three food crops globally (Dabija et al. 2021). The need for chicken feed primarily drives the increasing demand for corn. Its high protein content makes it an excellent choice for chicken feed and food

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ingredients (Zhang et al. 2021). The national corn production for chicken feed is 72.48% (9,786,583 tons). East Java Province leads the corn production in Indonesia, contributing 26.24% (Direktorat Jenderal Tanaman Pangan, 2023). The first quarter saw a 42.50% corn harvest, leading to an unstable supply and subsequent price fluctuations. The El-Nino phenomenon is a critical factor in these supply disruptions.

In 2021, the price of corn at the farmer level in East Java Province fluctuated monthly. Corn prices are low when harvested areas are high. This condition affects the profits of each supply chain actor. The highest corn harvest area is from January to March. The cause of the price disparity between consumers and farmers is that farmers need more substantial bargaining power, and the number of supply chain actors is large. The cause of price fluctuations is the unbalanced supply and demand for corn. There is a significant difference in corn prices between farmers and consumers. Improving supply chain management is essential because product distribution is even, and product prices are stable. Apart from that, supply chain actors get high and even profits. The extensive supply chain network makes management efficient (Laari et al. 2022). Supply chain improvement uses supply chain analysis and marketing efficiency.

Supply chain management (SCM) integrates all components in the material flow. The SCM process involves managing information, financial, and product flows. Product flow starts from raw materials to product delivery. Financial flows start from downstream to upstream. Activities in the financial flow are payments, scheduling, and crediting. Each supply chain actor has a different payment method. Information flows from downstream to upstream and from upstream to downstream. Examples of information needed by supply chain actors are price information, payment mechanisms, and product quantities. Providing information use communication tools and meeting face-to-face. SCM activities for agricultural and non-agricultural products are different. The agricultural supply chain (ASC) is an activity that starts with planting and crop production, processing, testing, packaging, warehousing, transportation, distribution, and marketing (Routroy & Behera 2017). ASC is a supply chain that flows from plant cultivation to product marketing (Routroy & Behera 2017). ASC considers the perishable nature of agricultural products, price fluctuations, climate, and food safety. ASC includes suppliers, companies, customers, and distribution partners. An essential role of ASC is the sustainability of the food supply (Ray, 2021). The main difference is whether humans or animals consume the product (Kamble, 2020). Agricultural products require special handling to maintain product quality. Agricultural products are easily damaged and require ample storage areas.

Efficiency is the minimum use of resources. Marketing efficiency uses minimum costs to achieve optimal results that create consumer satisfaction (Reshetko et al., 2021). Cost suppression can achieve higher profits (Gilmore & Carson 2018). Parameters that influence marketing efficiency are marketing costs, marketing margin, and transportation costs. The function of marketing efficiency is an indicator of economic development (Ilyash et al. 2021). The function of marketing efficiency analysis for each supply chain pattern is to map the efficiency of each pattern (Panda & Sreekumar 2012). Marketing efficiency in agricultural products focuses on moving agricultural products at the lowest cost. Inefficient marketing of agricultural products affects the stability of production and supply. Indicators for measuring marketing efficiency are profit margin ratio, marketing margin, and farmer's share (Gebre et al. 2022). The profit margin ratio calculation

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compares profits and costs (Öztürk & Karabulut 2018). A positive or more than zero profit margin ratio shows efficient marketing. A high ratio value indicates high profit growth (Heikal et al., 2014). The marketing margin calculations recognize the price differences received between supply chain actors (Atinga & Bannor 2022). Marketing margin affects the profits of supply chain actors (Mauki et al. 2023). The marketing margin value can be converted into a percentage (Olugbade et al. 2019). Farmer's share shows the proportion of farmers' profits compared to consumers (Busch & Spiller 2016). A farmer's share value of less than 40% shows that farmers receive low prices (Layade et al. 2017) (Moniruzzaman et al. 2024).

The research aims to conduct a supply chain analysis and marketing efficiency analysis in the corn supply chain in East Java. The supply chain analysis analyzes each pattern's product, information, and financial flow. This analysis describes the actual conditions of the supply chain at each level and each pattern. It also describes the advantages and disadvantages of each supply chain pattern. Marketing efficiency analysis uses marketing margin, farmer's share, and profit margin ratio calculations. These three calculations describe the marketing efficiency conditions for each supply chain pattern. The research uses qualitative and quantitative approaches. The analysis method uses descriptive analysis. This research is essential to provide input to supply chain actors and the government regarding the actual conditions and problems of the corn supply chain in East Java. Marketing efficiency analysis provides an overview of the marketing conditions for each supply chain pattern. This description becomes the basis for creating policies and proposals for supply chain management strategies.

Previous research on marketing efficiency has examined a range of agricultural commodities, including green beans, tomatoes (Sidhu et al. 2011a) (Sidhu et al. 2011b), institutional reforms for agricultural products (Ghosh, 2022), potatoes (Kyomugisha et al. 2018), and shallots (Hidayat & Jaeroni 2022). It is focused on regional or local scales. The novelty of this research is its wider scope, which covers the entire East Java region. Samples were taken from corn production centers in East Java, including Kediri, Jember and Tuban Regencies. In addition, the research emphasizes the calculation of marketing efficiency in each supply chain pattern. This calculation distinguishes this research from other research. By sampling from multiple corn-producing areas and analyzing current conditions, this study aims to fill a significant research gap. Comprehensive research regarding marketing efficiency in each corn supply chain pattern in East Java has not been carried out.

METHODS

The research method is a qualitative and quantitative approach. Qualitative research involves interpreting events and interactions through various sources (Abdala, 2024). It is beneficial for exploring phenomena through detailed descriptions and factual analysis (Aguzzi et al. 2024). This study uses a qualitative approach to analyze supply chain flows, focusing on the patterns, movement of goods, financial transactions, and information exchange within each supply chain pattern. The primary objective is to provide a descriptive account of these elements based on interview data. A quantitative approach, specifically descriptive quantitative analysis, measures marketing efficiency. This method involves a comprehensive exploration and in-depth analysis of numerical data (Dolmatova et al. 2024). Descriptive analysis summarizes and presents the calculation of

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marketing margin, profit margin ratio, and farmer's share in tabular format. The descriptive quantitative method describes the numerical data displayed in a table (Verlicchi et al. 2023). The quantitative approach is well-suited for this analysis due to the numerical nature of the data. Data collection for this research was conducted through in-depth interviews.

Location and Sample

The research was conducted in East Java, particularly in significant corn-producing regions of Kediri, Tuban, and Jember Regencies. These regions were selected based on their importance in the agricultural landscape. Convenience and snowball sampling techniques were employed to select research participants. Convenience sampling is used for farmer samples. Convenience sampling takes samples based on the availability of informants' ability to provide information (Sharma et al. 2022). Convenience sampling focuses on finding data quickly (Winton & Sabol 2022). Convenience sampling is used because it requires farmers to be able to provide complete information. The snowball sampling method uses informants to identify or connect researchers with other informants (Lee & Spratling 2019). This method results in more samples (Leighton et al. 2021). The factor in using the snowball sampling method is that the identification of collectors and large traders needs to be clarified. Snowball sampling in this research provides information about the following supply chain actors: collector traders, large traders, and consumers in each research area. Research using statistical data analysis has a minimum sample size of 30 samples (Bailey, 1994). According to Sekaran (2003), the appropriate sample size in research is between 30 and 500. The number of samples was 98 respondents. Research respondents are presented in Table 1 below.

Tabel 1. Number of research respondents

No.	Respondent	District Name		
		Kediri	Jember	Tuban
1	Farmer	22	22	28
2	Collector trader	7	6	6
3	Large trader	2	2	3
Total		**31**	**30**	**37**

Data Processing

The processing stages use calculations of marketing margin, profit margin ratio, and farmer's share.

Marketing Margin Calculation

Dahl and Hammond (1977) present the marketing margin calculation formula in Equation.

$$\boldsymbol{Mm = P_r - P_f}$$

Mm : Marketing margin (IDR/kg)
Pr : Price at retail level (IDR /kg)
Pf : Price at farm level (IDR /kg)

Farmer's share Calculation

The farmer's share calculation formula, as detailed by Kohls and Uhl (1990), is given in Equation.

$$\boldsymbol{Fs = \frac{Pf}{Pr}\ x\ 100\ \%}$$

Fs : Share margin (price) with farmers (%)
Pr : Price at the consumer level (IDR/kg)
Pf : Price at farm level (IDR/kg)

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Profit Margin Ratio Calculation

The formula for calculating the profit margin ratio is presented in Equation.

$$Pm = \frac{\mu}{C}$$

μ : Profits of marketing agencies
C : Marketing cost

Data Analysis

Supply chain analysis uses qualitative description. The qualitative descriptive analysis technique collects and analyzes descriptive data based on the results of interviews and observations (Klepper et al. 2023). Presentation of data uses pictures and graphs (Wang et al. 2022). This analyst provides information regarding the corn supply chain flow, starting from information, finances, and products in each supply chain pattern. Information flow analysis discusses some of the information needed by each supply chain actor. Financial flow analysis discusses payment methods and payment times. Product flow analysis discusses the movement of products from farmers to the next level. The flow explanation is descriptive and uses pictures to make understanding the corn supply chain pattern easier. Marketing efficiency analysis uses quantitative description. Quantitative descriptive analysis summarizes and organizes data regularly (Shan et al. 2024). The data displayed in the table are the ratio of profit margin, marketing margin, and farmer's share in each supply chain pattern. The results of this analysis show marketing efficiency in each supply chain pattern.

RESULTS AND DISCUSSION

Corn Supply Chain Analysis in East Java

The interview results identified four actors in the corn supply chain: farmers, collector traders, large traders, and consumers. Consumers are the animal feed industry, food industry, and chicken breeders. Supply chain analysis was initiated at the farmer level and progressed to large traders. Figure 1 shows four corn supply chain patterns in East Java. These supply chains involve three primary flows: product, information, and finance. The commodity traded is shelled corn. The flow of products is the flow that flows from upstream to downstream, namely from farmers to final consumers. The first pattern involves four supply chain actors: farmers, collector traders, large traders, and consumers. Collector traders procure corn from farmers and subsequently deliver it to large traders. Large traders, in turn, transport the corn to consumers via trucks, each with a capacity of 8 tons. The primary consumer in this pattern is the animal feed industry. This pattern was discovered across all study areas. A notable weakness of the first supply chain pattern is the involvement of multiple actors, often resulting in diminished farmers' profits. Farmers get the lowest prices in this pattern. The second pattern involves three supply chain actors: farmers, collector traders, and consumers. The consumer, in this case, is the corn flour industry. Collector traders procure corn from farmers and store it in warehouses. Subsequently, the corn is transported to the corn flour industry. This pattern was discovered in the Kediri Regency. A vital advantage of this pattern is that farmers avoid incurring transportation costs. Additionally, collector traders can directly deliver corn to consumers. Consumers in this pattern are the flour industry in the Kediri Regency. Collector traders collaborate with industry to supply corn and get special corn prices. The third pattern involves several supply chain actors: farmers, large traders, and consumers. The consumer,

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in this instance, is the animal feed industry. Farmers deliver corn to large traders, who then transport it to consumers. The third pattern necessitates a consistent supply of corn at the collector trader level, which can be a potential weakness that requires immediate attention. This pattern was observed across all research areas. Some large traders do not provide a minimum target for corn delivery. This condition benefits farmers who have corn with a capacity of less than one ton. Farmers in this pattern incur transportation costs. The fourth pattern involves two supply chain actors: farmers and consumers, specifically chicken farmers. Chicken farmers directly procure corn from farmers. This direct farmer-to consumer model is an advantage of this pattern. Farmers do not bear transportation costs. This pattern was discovered in the Kediri Regency. Transportation costs significantly influence supply chain effectiveness (Baagyere et al. 2023). The disadvantage of this pattern is that the cooperation between farmers and chicken farmers is limited.

Information flow can occur from upstream to downstream or downstream to upstream, which assists supply chain actors in obtaining and providing information. The flow of information can prevent the risk of loss to chain actors' supply. Each supply chain actor provides or receives information before carrying out a buying and selling transaction so that the risk of loss can be prevented or minimized. Information flow management uses end-to-end business processes starting from product requests (Perez et al. 2023). Integration of information flows through suppliers can improve SCM (Madenas et al. 2014). The flow of information from collector traders to farmers and from collector traders to large traders is information on corn prices, estimated picking time, quantity of corn, and corn standardization. Corn standardization involves assessing moisture content. The estimated picking time determines the type of transportation used. Some types of transportation used are trucks and pickup cars. Estimate information picking time is necessary for farmers to ensure the corn is ready for use transported. The capacity of a pickup truck is 3- 4 tons of corn, and for trucks, it is 8 tons. Providing information using a phone or information directly face to face. The information most frequently offered is the price of corn, as corn prices fluctuate weekly. The flow of information between large traders and consumers is information regarding corn prices, corn standardization, corn packaging, delivery schedules, and estimates of the amount of corn sent. Mobile phones serve as a primary communication tool. Additionally, direct communication through meetings facilitates information sharing between farmers and collector traders. Estimate the information consumers, especially industry, need regarding the amount of corn sent to ensure the stock amount is appropriate. Then, information regarding delivery time is required to ensure that corn delivery is on time. Effective communication between suppliers and consumers is crucial for various aspects of supply chain management (Schniederjans & Khalajhedayati 2023). Effective communication is the foundation of business relationships.

Financial flows pertain to the transactions among supply chain actors and are integral to cash movement (Badakhshan & Ball 2023). Both product and financial flows contribute to overall supply chain performance (Bals et al. 2014). This research examines financial flows across all tiers of the corn supply chain. Two primary payment methods were identified: direct and tempo. Direct payment involves immediate cash disbursement upon corn weighing, while tempo payment entails deferred payment with a predetermined deadline. Collector traders predominantly employ direct payment when purchasing corn from farmers. In

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contrast, large traders may utilize both direct and tempo payment methods when dealing with collector traders or farmers. Chicken farmers typically receive tempo payments with a 7- to 10-day deadline. Industrial consumers commonly employ tempo payments with a maximum 30-day deadline. A significant advantage of direct payment is the seller's immediate receipt of funds upon corn weighing.

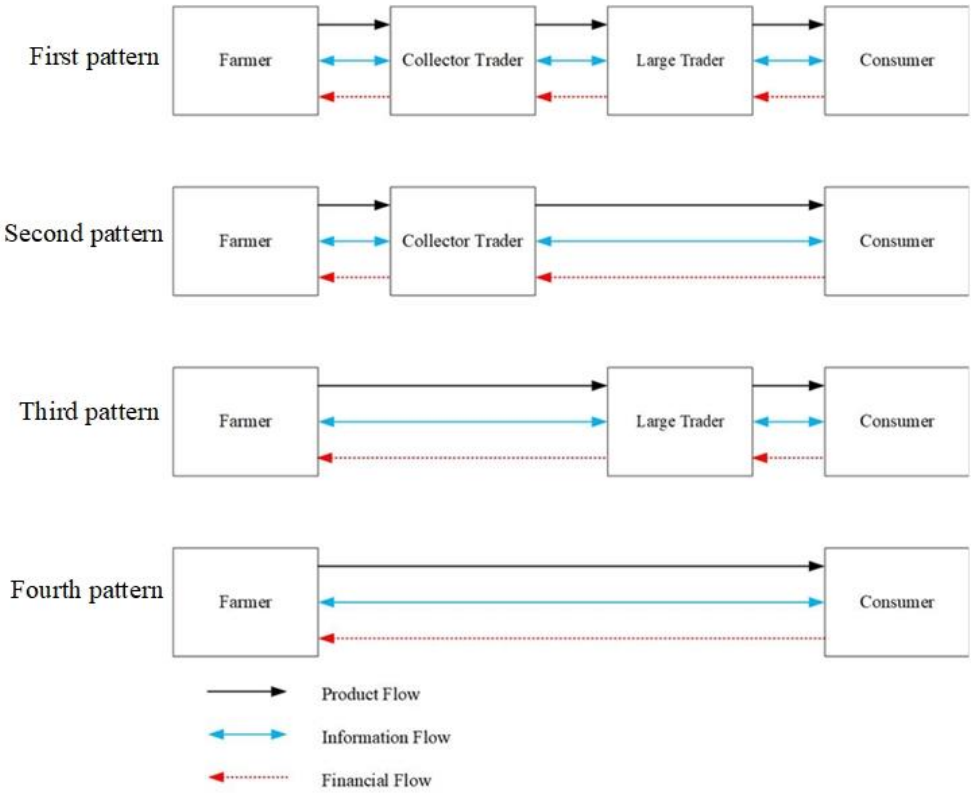

Figure 1. Corn supply chain pattern in East Java (*Primary data, 2024*)

Marketing Efficiency Analysis for each supply chain pattern

Analyze Marketing Efficiency in the First Supply Chain Pattern

The first pattern involves four supply chain actors: farmers, collector traders, large traders, and consumers. Table 2 shows that the marketing margin between farmers and collector traders is IDR. 155.1 per kg or 38.27%. Collector traders and large traders have a marketing margin of IDR. 250.2 per kg or 61.73%. An indicator of marketing efficiency is the low marketing margin between supply chain actors (Smith, 1994). The high margin difference observed in Table 2 suggests inefficiency in the marketing process. Another indicator of marketing efficiency is a profit margin ratio value of more than one. Table 2 shows that the profit margin ratio value for the farmer tier is 1.54. Then, in the collector traders and large traders tier, it is 0.47 and 0.51. The calculation results show that the collector and large traders have a profit margin ratio of less than one, so marketing is inefficient. A high-profit margin ratio makes marketing more efficient (Mkunda et al. 2019). A farmer's share value of more than 50% shows good efficiency (Moniruzzaman et al. 2024). Based on these indicators, marketing in the first pattern is inefficient. Improving the supply chain network can increase the profits of farmers and consumers. The factor that causes marketing to be inefficient in this pattern is the large number of supply chain actors involved. This condition affects the value of the profit margin ratio.

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Table 2. The results of calculating the marketing margin, farmer's share, and profit margin ratio in the first pattern

Tier	(IDR/kg)	Marketing Margin (%)		Margin Distribution (%)	Profit Margin Ratio	Farmer's Share (%)
		IDR	%			
Farmer					1.54	
a. Total Cost	2355.49					
b. Selling Price	5995.2					93.67
c. Profit	3639.71					
Collector Trader		155.1	38.27		0.47	
a. Buying Price	5995.2					
b. Total Cost	105.39			26		
c. Selling Price	6150.3					
d. Profit	49.71			12.27		
Large Trader		250.2	61.73		0.51	
a. Buying Price	6150.3					
b. Total Cost	165.4			40.81		
c. Selling Price	6400.5					
d. Profit	84.8			20.92		
Total		**405.3**	**100 %**	**100**		

Calculation Example :

$Mm = P_r - P_f$ = 6150.3 – 5995.2 = 155.1

$Pm = \frac{\mu}{C}$ = 3639.71 / 2355.49 = 1.54

Analyze Marketing Efficiency in the Second Supply Chain Pattern

The second pattern involves three supply chain actors: farmers, collector traders, and consumers. As shown in Table 3, the marketing margin between farmers and collector traders is IDR 309.95. Increasing product prices does not affect the marketing margin value (Dawe & Maltsoglou 2014). The profit margin ratio value for farmers is 1.52, and for collector traders is 1.94. The profit margin ratio value shows more than one, so marketing is efficient. In conclusion, marketing in the second pattern is efficient.

Table 3. The results of calculating the marketing margin, farmer's share, and profit margin ratio in the second pattern

Tier	(IDR/kg)	Marketing Margin (%)		Margin Distribution (%)	Profit Margin Ratio	Farmer's Share (%)
		IDR	%			
Farmer					1.52	
a. Total Cost	2340.49					
b. Selling Price	5890.35					93.67
c. Profit	3549.86					
Collector Trader		309.95	100		1.94	
a. Buying Price	5890.35					
b. Total Cost	105.39			34.01		
c. Selling Price	6200.3					
d. Profit	204.56			65.99		
Total		**309.95**	**100**	**100**		

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Analyze Marketing Efficiency in the Third Supply Chain Pattern

The third supply chain pattern involves farmers, large traders, and consumers. The marketing margin value between farmers and large traders, according to Table 4, is IDR. 133.78. The profit margin ratio value for farmers is 1.73, and for collector traders is 0.27. Large traders have a profit margin ratio of less than one, indicating marketing inefficiency. The conclusion of marketing efficiency in the third pattern is inefficient. Corn price competition among large traders causes small traders' profits. This competition results from the limited number of corn harvests evenly distributed in the area. The principle of a large trader's business, acquiring a large amount of corn, significantly affects the profit margin ratio**.**

Table 4. The results of calculating marketing margin, farmer's share, and profit margin ratio in the third pattern

Tier	(IDR/kg)	Marketing Margin (%)		Margin Distribution (%)	Profit Margin Ratio	Farmer's Share (%)
		Rp	%			
Farmer					1.73	
a. Total Cost	2360.32					
b. Selling Price	6466.67					97.97 %
c. Profit	4106.35					
Large Trader		133.78	100		0.27	
a. Buying Price	6466.67					
b. Total Cost	105.39			78.77		
c. Selling Price	6600.45					
d. Profit	28.39			21.23		
Total		**133.78**	**100**	**100**		

Analyze Marketing Efficiency in the Fourth Supply Chain Pattern

The fourth pattern involves two supply chain actors, namely farmers and consumers. The results of calculating the farmer's share and profit margin ratio in the fourth pattern are presented in Table 5. The profit margin ratio value for farmers is 1.46, so marketing is efficient. The fourth pattern shows that marketing is more efficient with fewer supply chain actors. Farmers believe marketing efficiency is selling the harvest at the highest price (Akinyemi et al. 2017). Many supply chain actors cause each actor to incur costs and require profits. Corn prices, marketing costs, and the number of supply chain actors influence marketing efficiency.

Table 5. The results of calculating marketing margin, farmer's share, and profit margin ratio in the fourth pattern

Tier	(IDR/kg)	Marketing Margin (%)		Margin Distribution (%)	Profit Margin Ratio	Farmer's Share (%)
		IDR	%			
Farmer					1.46	
a. Total Cost	2335.4					
b. Selling Price	5750					87.11
c. Profit	3414.6					

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CONCLUSION DAN RECOMMENDATIONS

There are four supply chain patterns for corn commodities in East Java. The first pattern involves four supply chain actors: farmers, collector traders, large traders, and consumers. Supply chain actors in the second pattern are farmers, collector traders, and consumers. The third pattern includes farmers, large traders, and consumers. The fourth pattern only involves two supply chain actors, namely farmers and consumers. Patterns two and four are only found in the Kediri Regency area. Patterns number one and number three are found in all research areas. Similarities in the flow of products were found in each supply chain pattern. Important information for all supply chain actors is information on corn prices, estimated picking time, quantity of corn, corn packaging, and corn standardization. Corn payments use two methods, namely direct and tempo payment. Corn payments from collector traders are made directly. Large traders use a combination of payment methods, namely direct and tempo. The industry uses the tempo payment method. The first and third supply chain patterns show that marketing is inefficient. This condition occurs because the profit margin ratio is less than one. The second and fourth supply chain patterns demonstrate efficient marketing, with the profit margin ratio between tiers exceeding one, and the farmer's share value exceeding 40%. Research findings can be a reference when preparing marketing and supply chain strategies. In addition, further research on corn supply chain risk in East Java is essential to mitigate emerging risks. Risk analysts focus on risk analysis in the corn supply chain starting from the farmer tier, collector trader, large trader and consumer. The risks that arise can affect the profits of supply chain actors.

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