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Marketing Channel Efficiency Analysis of Bird's Eye Chili Commodity in Grabag District Magelang Regency

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ABSTRACT

Bird's eye chili (*Capsicum frutescens* L.) is a high-value horticultural commodity with strong economic potential for farmers in Indonesia. Grabag District, located in Magelang Regency, is one of its main production centers. However, inefficiencies in the marketing system—such as long distribution chains and middlemen dominance—often reduce farmers' income. This study aims to analyze the marketing channel patterns of bird's eye chili in Grabag, assess their efficiency using marketing margin, farmer's share, and marketing efficiency, and identify factors influencing marketing efficiency. The research was conducted through surveys from November 2024 to February 2025, involving 150 farmers selected through two-stage cluster sampling and five marketing institutions selected using snowball sampling. Data analysis included descriptive statistics, one-sample t-tests, and multiple linear regression. The results showed two main marketing channels: channel I (involving auction groups and collectors) and channel II (only collectors). Both channels were considered efficient, with efficiency values of 2.37% and 2.44%, respectively. Channel II provided the highest farmer's share at 84%. Furthermore, producer price, marketing cost, channel type, and sales volume had a significant effect on efficiency ($p < 0.05$). This study highlights the importance of improving institutional support and simplifying marketing chains to enhance the bargaining power and welfare of chili farmers. Channel II is recommended as the most efficient option.

Keywords*: bird's eye chili, marketing channels, marketing efficiency*

BACKGROUND

Bird's eye chili is a strategic commodity in Indonesia, playing a crucial role in the agribusiness sector due to its high economic value and increasing demand in households. The consumption of bird's eye chili has been on the rise, with the average weekly consumption in Indonesia increasing from 0.040 kg in 2022 to 0.042 kg in 2023 (Badan Pusat Statistik, 2024b). This growing demand necessitates a corresponding increase in production; however, the marketing of bird's eye chili presents significant challenges. This growing consumption indicates a rising market demand, which directly affects production requirements and highlights the need for more efficient marketing systems.

According to the Badan Pusat Statistik (2023), Central Java is the second-largest producer of bird's eye chili in Indonesia, with Magelang Regency being the highest producer in the province, yielding 54,225 tons. Grabag District, in particular, has been identified as a key production area,

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contributing 8,593 tons in 2022. However, production levels have fluctuated, dropping to 7,836 tons in 2023, which has raised concerns about the stability of supply and the impact on farmers' incomes (Badan Pusat Statistik, 2024a). This decline in production not only raises concerns about supply instability but also affects the pricing strategies within the marketing channels, which may worsen farmers' financial instability. Such instability in production has a direct impact on farmers' incomes and the operational efficiency of the marketing channels. More specifically, fluctuations in production levels influence both the pricing of bird's eye chili and the operational efficiency of its marketing channels.

Flunctuations in production leves influence both the pricing of bird's eye chili and the operational efficiency of it's marketing channels. When production is high and prices decrease, lengthy marketing channels can potentially squeeze farmers' profits. Producers and marketing institutions involved in the marketing flow of bird's eye chili aim to maximize their profits, while consumers seek to obtain products at lower prices. There is a significant price disparity between the prices at the producer level and those at the consumer level (Wijaya & Sekar Tanjung, 2022).

Another issue faced by bird's eye chili farmers in Grabag District is related to marketing. The marketing of bird's eye chili involves multiple marketing institutions, which affects the length of the marketing channels. The involvement of numerous marketing entities can complicate the marketing process. A proposed solution is to strengthen farmer institutions by forming auction groups under cooperatives in Grabag District. These auction groups can serve as an alternative to replace middlemen. The establishment of auction groups, farmers can sell their produce directly, avoid middlemen, secure fair prices, mitigate price fluctuations, and create a streamlined pricing system (Asa et al., 2021).

Based on the above description, it is evident that the marketing system for bird's eye chili in Grabag District faces several challenges, including farmers' dependence on middlemen, lengthy distribution chains, and high marketing costs. Production fluctuations further complicate the marketing process and affect the prices received by farmers. The establishment of auction groups is seen as a potential solution to improve marketing processes and strengthen farmers' bargaining positions in the market. While previous studies have explored aspects of marketing efficiency, there remains a notable research gap concerning a focused and comprehensive assessment of the specific marketing patterns and their efficiency, as well as the intricate impact on farmer profitability, within Grabag District. This research precisely aims to address this identified gap by systematically evaluating the effectiveness of the various marketing channels and their direct implications for farmer economic outcomes.Therefore, it is essential to conduct research analyzing the efficiency of marketing channels in Grabag District to identify the most profitable and efficient options for farmers.

This research aims to analyze the marketing channel patterns of bird's eye chili, evaluate their efficiency, assess the farmer's share associated with each marketing channel, and investigate factors such as producer prices, marketing costs, marketing channel structures, and sales volume on the efficiency of these channels in Grabag District, Magelang Regency. By systematically addressing these objectives, this study seeks to enhance the understanding of the marketing dynamics surrounding bird's eye chili, thereby contributing to the development of more effective strategies for farmers and stakeholders within the agricultural sector.

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RESEARCH METHODS

The research was conducted from November 2024 to February 2025 in Grabag District, Magelang Regency. The selection of the research location was puIDRosive, based on data from the Badan Pusat Statistik Kabupaten Magelang (2024), indicating that Grabag District is a central producer of bird's eye chili in Magelang Regency. The study was carried out in four different locations: Sugihmas Village, Pesidi Village, Ketawang Village, and Lebak Village. These four villages were chosen based on information obtained from the Agricultural Extension Center of Grabag District, which stated that they have the highest production of bird's eye chili in the district.

The research employed a descriptive-quantitative research design, focusing on analyzing the characteristics of marketing channels and their efficiency, while also investigating the causal relationships between various factors and marketing efficiency through statistical modeling. The sample consisted of farmers and marketing institutions. Cluster sampling was chosen to select villages with the highest bird's eye chili production. In the first stage, the population was selected based on the production levels in each village, followed by the selection of four villages with the highest production. The four villages identified as having the highest production of bird's eye chili are Sugihmas, Pesidi, Ketawang, and Lebak.

Table 1. Data of the production volume and number of bird's eye chili farmers in Grabag District for the year 2024

No	Desa	Production Volume(ton)	Nurmber of Farmer(people)
1.	Sugihmas	1875	377
2.	Pesidi	512,4	302
3.	Ketawang	500,2	591
4.	Lebak	466,2	199
5.	Giriwetan	221	153
6.	Salam	183	207
7.	Banaran	176,4	276
Jumlah		3934,2	2105

In the second stage, Proportional Quota Sampling was used to select a representative number of farmers from each village based on the total number of farmers in the area. A sample size of 150 farmers was selected to ensure the reliability of the findings and to achieve a confidence level of 95% with a margin of error of 5%. The sample size was calculated based on the total number of bird's eye chili farmers in the selected villages.

Snowball sampling was then applied to identify key marketing institutions involved in the chili trade. A total of five respondents were selected through this method, consisting of one auction group and four traders. The criteria for selecting traders included those involved in the marketing of bird's eye chili in Grabag District, Magelang Regency. While the sample is representative of the main bird's eye chili-producing villages in Grabag District, the findings may not be fully generalizable to other areas in Magelang Regency or Indonesia due to regional variations in farming practices and marketing systems.

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Table 2. Research Sample of Bird's Eye Chili Farmers in Grabag District

No	Village	Population	Equation	Sample
1.	Sugihmas	377	(377/1469) x 150	38
2.	Pesidi	302	(302/1469) x 150	31
3.	Ketawang	591	(591/1469) x 150	60
4.	Lebak	199	(199/1469) x 150	20
	Jumlah	1469		150

This study utilized both primary and secondary data. Primary data were collected through field observations of ongoing marketing activities and direct interviews with farmers and marketing institutions, covering questions related to the identity of farmers/marketing institutions, business identification, production, marketing, and sales of bird's eye chili. Secondary data were used to complement the primary data obtained from relevant institutions such as the Badan Pusat Statistik (BPS) and local government sources from Sugihmas, Pesidi, Ketawang, and Lebak, as well as various literature sources including theories, research references, and other supporting materials.

Data analysis in this research was conducted using both descriptive and quantitative methods. Descriptive analysis was employed to characterize the marketing institutions involved, allowing for the determination of the number of marketing entities and the various marketing channels present in the study area. This directly addresses the first research objective: to analyze the marketing channel patterns for bird's eye chili. Quantitative analysis was utilized to assess marketing margins, farmer's share, and marketing efficiency.

The collected data were subsequently tabulated and subjected to statistical analysis. A one-sample t-test was specifically employed to evaluate the differences between the observed marketing efficiency values and established efficiency standards (0-33%) , as well as the differences between the farmer's share values and the set minimum threshold for efficiency (≥ 40%). This directly contributed to the second and third research objectives, which involve evaluating the efficiency of these marketing channels and assessing the farmer's share, respectively.

Additionally, multiple linear regression analysis was conducted to examine the factors influencing the marketing efficiency of bird's eye chili in Grabag District, Magelang Regency. This method was chosen to address the fourth research objective, which seeks to investigate the impact of factors such as producer prices, marketing costs, marketing channel structures, and sales volume on marketing efficiency. All calculations for data analysis were performed using Microsoft Excel 2019 for data tabulation and preliminary computations, and IBM SPSS Statistics version 27 for advanced statistical analyses, including the one-sample t-tests and multiple linear regression.

a. Marketing Margins (Mp)

$$Mp = \mathrm{Pr} - Pf$$

MP = Marketing margin (IDR/kg)
Pr = Consumer price (IDR/kg)
Pf = Producer price (IDR/kg)

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b. Farmer's Share (Fs)

$$Fs = \frac{Pr}{Pf} \times 100\%$$

Fs = *Farmer's Share*
Pf = Price at the Farmer Level
Pr = Price at the Final Consumer Level
Decision Rule (Downey & Erikson, 1992):
1. Fs value ≥ 40% = Efficient
2. Fs value < 40% = Inefficient

c. Marketing Efficiency

$$Ep = \frac{Bp}{Np} \times 100\%$$

EP = Marketing Efficiency (%)
BP = Marketing Costs (IDR)
NP = Product Price (IDR)
Decision Rule (Soekartawi, 2002):
1. EP value 0 - 33% = Efficient
2. EP value 34 - 67% = Less Efficient
3. EP value 68 - 100% = Inefficient

The one-sample t-test aims to determine whether there is a difference in the average of the population or previous research compared to the average data in the research sample. This study uses a comparison of the minimum threshold for efficiency values based on marketing efficiency percentages, which is 0 – 33%, and it also uses a comparison of the minimum threshold for farmer's share values based on the percentage of farmer's share, which is ≥ 40%.

Multiple linear regression analysis is used to identify the factors that influence marketing efficiency, with independent variables consisting of producer price, marketing costs, marketing channel patterns, and sales volume. The formula for the multiple linear regression equation to analyze the factors affecting the efficiency of marketing channels is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$$

Description :

Y	= Marketing Channel Efficiency (%)
α	= Constant
$\beta_1 - \beta_4$	= Regression coefficients of independent variables
X_1	= Producer Price(IDR/kg)
X_2	= Marketing Costs (IDR/kg)
X_3	= Marketing Channel Pattern
X_4	= Sales Volume (kg)
e	= Error

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RESULT AND DISCUSSION

Characteristic of Farmer Respondent

Farmers were the primary respondents in this study, as they provided key information regarding the flow of cayenne pepper marketing through various intermediary institutions. The 150 respondents were selected from four main villages: Sugihmas, Pesidi, Ketawang, and Lebak. Respondents were randomly selected based on guidance from agricultural extension officers in each village.

Most farmers had a low level of formal education, with 58% having completed only elementary school. The dominant age group was 45–54 years (43%), followed by 35–44 years (25%), and 55–64 years (17%), indicating that most respondents were within the productive age range for farming. Regarding farming experience, 38% had 10–20 years of experience, 31% had 21–30 years, and 25% had less than 10 years. This experience is crucial as it affects cultivation practices and productivity.

In terms of land ownership, most farmers owned plots between 1,000–2,000 m² (30%), followed by those with less than 1,000 m² (24%). All respondents cultivated their own land without paying rent. Limited capital remains a challenge, often leading farmers to borrow from intermediary traders to fund their farming activities.

Characteristics of Marketing Institutions

The marketing institution respondents in this study consisted of four collector traders and one representative from an auction group. These actors play an essential role in influencing the structure, efficiency, and equity of bird's eye chili distribution channels in Grabag Subdistrict. In terms of age, most collector traders were within the productive age range of 35–44 years (50%), followed by 25–34 years (33%) and 45–54 years (17%). The auction group respondent also belonged to the 35–44 year category. This indicates that the marketing process in the area is dominated by individuals in their prime working years, capable of managing and coordinating market transactions actively.

The education level of the collector traders was relatively low, with equal proportions holding elementary (SD) and junior high school (SMP) qualifications, each at 50%. The auction group respondent also held a junior high school education. These findings suggest that involvement in agricultural marketing is not necessarily dependent on formal education, but rather on field experience and market connectivity.

Regarding trading experience, half of the collector traders had 10–20 years of experience, while the remaining had less than 10 years (33%) and 21–30 years (17%). The auction group respondent also had 10–20 years of experience. This level of experience is vital in navigating market dynamics, pricing strategies, and buyer-seller interactions, contributing to better decision-making. In terms of monthly sales volume, all collector traders and the auction group reported handling 100–1,000 kilograms of bird's eye chili. No respondents reported sales below 100 kilograms per month, suggesting that these actors operate at a moderate scale of trade with consistent market participation.

Analysis of Bird's Eye Chili Price Fluctuations at the Consumer Level in Grabag District

High price fluctuation is a common phenomenon in agricultural commodity marketing. Such volatility often leads to unstable farmer incomes. Price fluctuations in a commodity typically occur

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due to an imbalance between market supply (sales volume) and consumer demand, where insufficient supply drives prices up, and excess supply causes them to fall. In Grabag District, bird's eye chili prices experienced notable fluctuations between November 2024 and March 2025. The lowest price was recorded in November 2024, at Rp 45,000/kg, while the highest prices were observed in January and March 2025, reaching Rp 85,000/kg. This significant price surge during January-March 2025 was primarily attributed to a drastic decrease in production caused by erratic weather patterns (climate change). Deviyanto and Aji (2023) further support that chili price increases are highly dependent on harvest seasons, planting seasons, and climatic influences.

Furthermore, the National Food Agency (Badan Pangan Nasional) has established a benchmark selling price (HAP - Harga Acuan Penjualan Tingkat Konsumen) for red bird's eye chili, ranging from Rp 40.000/kg to Rp 57.000/kg, as per Perbadan 12/2024. The observed prices in Grabag District during January-March 2025 significantly exceeded this HAP threshold. While these high prices were highly profitable for farmers, leading to substantial profit margins , they simultaneously posed a risk of reducing consumer purchasing power. This dynamic underscores a fundamental disequilibrium between market supply and demand. Tubagus *et al.* (2016) suggest that such fluctuating chili prices can also be a consequence of inefficient supply chain management. This highlights the critical need for effective marketing strategies that can mitigate price volatility and ensure a more balanced and equitable market for both producers and consumers.

Analysis of Bird's Eye Chili Marketing Channels

Marketing channels are a key component in the agricultural marketing system as they determine the flow of products from producers to end consumers. According to Putri *et al.* (2018) the number and type of marketing intermediaries involved affect not only transaction costs but also the profit margins and efficiency of the overall supply chain. Based on field observations, there are two main marketing channel patterns for bird's eye chili in Grabag Subdistrict.

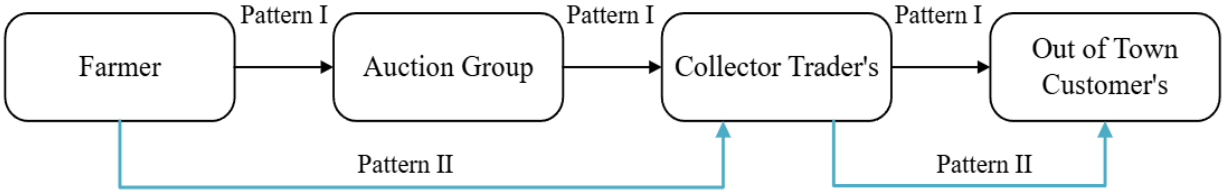

Figure 1. Marketing Channel Patterns of Bird's Eye Chili in Grabag Subdistrict

Description:

→ : Marketing Channel Pattern I
→ : Marketing Channel Pattern II

Marketing Channel I

Marketing Channel I represents the longest channel involving two intermediaries: auction groups and collector traders. In this channel, farmers deliver their harvested chilies to an auction group managed by a farmer cooperative in Lebak Village. The auction group facilitates sales by organizing

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a bidding system among collectors. The average purchase price offered to farmers is IDR 47,000/kg, while the auction group resells the product at IDR 50,000/kg. The collector traders then distribute the chilies to urban markets such as Jakarta, Yogyakarta, and Medan at an average price of IDR 59,000/kg.

This channel involves 20 farmers with a total sales volume of 3,068 kg and a combined landholding area of 74,000 m². Transportation is commonly carried out using motorcycles, with a transport cost of IDR 11,000 per delivery. Although this channel incoIDRorates more structured trading through auctions, it also incurs higher marketing costs due to the added intermediary and logistics to reach distant markets.

Marketing Channel II

Marketing Channel II is the shortest and most widely used channel, involving only one intermediary: the collector trader. In this pattern, farmers directly sell their produce to nearby collector traders without passing through auction groups. This channel includes 130 farmers from Ketawang, Pesidi, and Sugihmas villages, with a total sales volume of 23,405 kg and landholding of 434,950 m².

Farmers typically use motorcycles for delivery, incurring transportation costs of IDR 11,000–12,000. The collector traders purchase the product at IDR 43,000/kg and resell it to consumers in cities such as Batang, Temanggung, Semarang, and Jakarta at an average price of IDR 51,200/kg. This more direct channel reduces the layers of handling, which potentially improves price transmission to farmers and minimizes marketing costs.

Marketing Functions and Channel Implications

Marketing functions are crucial activities that facilitate the movement of agricultural products from producers to consumers. As stated by Kohls (1955) that the marketing function is divided into 3. These include exchange functions (buying and selling), physical functions (transportation, sorting, packaging, and storage), and facilitating functions (financing and market information). The differences in marketing functions performed by each actor directly influence the efficiency and performance of each marketing channel.

Table 3. Marketing Functions Performed by Marketing Institutions in Each Channel

No.	Marketing Function	Farmer	Auction Group	Collector Trader's
1.	Exchange Function			
	Purchasing	-	✓	✓
	Selling	✓	✓	✓
2.	Physical Function			
	Transportation	-	-	✓
	Packaging	-	✓	✓
3.	Faccilitating Function		✓	✓
	Sorting	-	✓	✓
	Marketing Information	-	✓	✓

The marketing function carried out by farmers is limited to the act of selling. After harvesting, farmers immediately sell their bird's eye chili either to the auction group or directly to collector

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traders. The transaction begins with farmers delivering their harvested chilies to the respective buyers. They place the produce at the buyer's location—either the auction facility or the collector trader's collection point—and the product is then weighed and processed for further handling.

The auction group performs several key marketing functions, particularly related to selling and facilitating. It acts as an intermediary where farmers can consign their produce for resale to traders. This is consistent with the opinion of Rusdiyana (2017), who states that auction managers serve to assist farmers in selling their produce through a structured auction system. The group also performs sorting of incoming chilies to ensure quality standards and follows with packaging using 5-kg plastic bags. Once packaging is completed, the group proceeds with online auction sales, allowing collector traders to place price bids. This system introduces price transparency and supports collective farmer marketing.

In contrast, collector traders perform all major marketing functions. They purchase bird's eye chili either directly from farmers or through the auction group. When sourcing directly from farmers, traders conduct weighing, sorting, and packaging. The standard packaging involves placing the chilies in 5-kg plastic bags, which are then grouped into sacks containing six plastic bags, totaling approximately 30 kg. These sacks are transported to market destinations—usually at night to maintain freshness and meet early morning demand.

Analysis of Bird's Eye Chili Marketing Channel Efficiency

Efficiency in marketing channels is achieved when the distribution of products from producers to consumers is carried out at minimal cost while providing fair profit margins to each party involved. According to Shakana *et al*. (2023), an efficient marketing system benefits all stakeholders, including farmers, intermediaries, and end consumers. This study evaluates marketing efficiency based on marketing costs, margin, farmer's share, and marketing efficiency percentage.

Table 4. Marketing Efficiency Indicators for Each Channel

Marketing Channel	Marketing Costs	Marketing Margins	Sales Volumes	Farmer's Share	Marketing Channel Efficiency
	--- IDR/kg ---		--- kg ---	--- % ---	
I	1.397	12.000	1664	79,7	2,37
II	1.251	8.200	11875	84,0	2,44

Marketing Cost

Marketing cost refers to all expenses incurred from the time the product leaves the farmer until it reaches the consumer. These include transportation fees, packaging materials, labor, and other operational activities. In Channel I, the total marketing cost reached IDR 1,397/kg due to the involvement of an additional institution (auction group) and the longer distribution routes that often include inter-regional deliveries. This cost is relatively high because it includes handling, sorting, and repackaging by both the auction group and the collector trader.

On the other hand, Channel II recorded a lower marketing cost of IDR 1,251/kg. This efficiency is attributed to the direct transaction between farmers and collector traders, reducing the number of actors and, consequently, the logistical complexity. With fewer handling stages and localized delivery areas, operational costs are minimized. Therefore, from the standpoint of production-to-market flow,

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Channel II is more cost-efficient. This is in accordance with Shakana *et al*. (2023) that the short marketing channels can affect the amount of marketing costs.

Marketing Margin

Marketing margin is defined as the difference between the price paid by the consumer and the price received by the farmer. According to Faezal *et al.* (2023) the number of marketing institutions involved in the marketing channel can cause differences in margins and profits obtained. In Channel I, the margin reaches IDR 12,000/kg, while in Channel II, the margin is IDR 8,200/kg. The larger margin in Channel I reflects the additional value captured by the auction group and collector traders, which may be necessary to cover the higher costs of a more structured system but also results in less favorable returns to farmers.

Conversely, Channel II offers a smaller marketing margin, indicating that less value is absorbed by intermediaries and a greater portion of the consumer price goes back to the producers. While this may suggest lower profit for traders, it promotes a more equitable distribution of income and potentially enhances farmer welfare. Smaller margins with higher turnover can also remain profitable for traders operating efficiently.

Farmer's Share

Farmer's share is the percentage of the final consumer price that is returned to the producer. A higher farmer's share indicates a more farmer-centric distribution system. According to Puspitasari *et al.* (2020) that farmer's share is one of the indicators to determine the efficiency of a commodity marketing operation. In this study, Channel II recorded a farmer's share of 84%, significantly higher than Channel I at 79.70%. Although both values exceed the 40% efficiency threshold set by (Downey & Erikson, 1992), the results show that Channel II better supports farmers' income.

These findings align with the work of Downey & Erikson (1992), who argue that a higher farmer's share is a direct indicator of marketing system fairness and an equitable distribution of value within the supply chain. The higher farmer's share in Channel II is due to fewer intermediaries and lower marketing costs, allowing farmers to retain a larger portion of the product's final value. This reinforces the argument that direct and short marketing channels not only reduce inefficiencies but also empower farmers economically. Encouraging the adoption of shorter chains can thus serve as a strategic intervention in rural development.

Marketing Efficiency

Marketing efficiency is calculated by comparing total marketing costs to the value added across the supply chain. A lower percentage indicates a more efficient system. In this study, Channel I achieved an efficiency of 2.37%, while Channel II slightly outperformed with 2.44%. Both channels fall well within the efficient category (threshold $\leq 33\%$), showing that bird's eye chili marketing in Grabag Subdistrict is generally effective. Despite the narrow margin between the two channels, the structural differences make Channel II a more attractive option for farmers. The combination of lower costs, smaller marketing margins, and higher farmer's share positions Channel II as a more equitable and economically sustainable distribution method. This is in line with the results of research by

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Wahyudi *et al.* (2021) that the most efficient channel is a marketing channel that has very small marketing costs compared to the selling price.

The high efficiency of Channel II, characterized by its simplified structure, reflects the intermediary reduction theory proposed by Shakana *et al.* (2023) where fewer intermediaries inherently lead to substantial cost savings and subsequently higher returns for producers. Therefore, strengthening institutional support and infrastructure for Channel II can help scale its benefits across more farming communities.

Statistical Data Analysis

One Sample t-test

A one-sample t-test was conducted to statistically verify whether the bird's eye chili marketing channels in Grabag Subdistrict are efficient, based on two important indicators: marketing efficiency percentage and farmer's share. These indicators were compared against established threshold values. For marketing efficiency, a maximum limit of 33% is considered efficient (Soekartawi, 2002), while for farmer's share, a minimum threshold of 40% indicates efficiency (Downey & Erikson, 1992).

The results showed a mean marketing efficiency of 2.41%, with a significance value (p-value) of 0.000, which is below the 5% level. Thus, the null hypothesis is rejected, and it can be concluded that the average marketing efficiency is statistically significantly lower than 33% , indicating that both channels are statistically efficient. This statistical validation reinforces the descriptive finding that the marketing system operates with a high degree of cost-effectiveness, implying minimal resource wastage in transferring the product from farmers to consumers within the specified thresholds. This aligns with the descriptive analysis, where Channel I recorded an efficiency of 2.37% and Channel II 2.44%. These values reflect low marketing cost relative to the final price, demonstrating a streamlined and cost-effective marketing process.

Using the same test formula, the result yielded a mean farmer's share of 81.85%, with a p-value of 0.000. This result allows us to reject the null hypothesis and conclude that the average farmer's share is statistically significantly higher than 40%, confirming efficiency. This robust statistical evidence provides strong support for the conclusion that farmers retain a substantial and equitable portion of the final consumer price, highlighting the fairness and producer-centric nature of the marketing system beyond mere numerical observation. Empirically, Channel I recorded a farmer's share of 79.70%, while Channel II reached 84.00%. These figures demonstrate that farmers retain a high portion of the final consumer price, which is a strong indicator of equity within the marketing system.

Multiple Linear Regression

To analyze the factors that influence the efficiency of bird's eye chili marketing channels in Grabag Subdistrict, a multiple linear regression analysis was applied. The dependent variable in this study is the marketing efficiency (Y), while the independent variables include: producer price (X_1), marketing cost (X_2), marketing channel pattern (X_3), and sales volume (X_4).

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Table 5. Results of Multiple Linear Regression Test

Variable	Coefficient	Sig	Sig (F)	R^2
Constant (a)	0,003	0,000		
Producer Price (X_1)	-.170	0,000		
Marketing Cost (X_2)	.946	0,000	0,001	0,989
Marketing Channel Pattern (X_3)	.065	0,000		
Sales Volume (X_4)	-.028	0,001		

The multiple regression results show the following empirical model:

$$Y = 0{,}003 - 0{,}170X_1 + 0{,}946X_2 - 0{,}065X_3 + 0{,}028X_4$$

a. Coefficient of Determination (R^2)

The coefficient of determination (R^2) obtained in this analysis was 0.989, indicating that 98.9% of the variation in marketing efficiency can be explained by the four independent variables tested. This extremely high R^2 value suggests that the regression model has excellent predictive accuracy and that the chosen variables are highly relevant in explaining efficiency outcomes. The remaining 1.1% is likely influenced by other external or unobserved factors, such as market regulation, quality fluctuations, or weather-related disruptions.

This result aligns with the findings of Bimantara *et al*. (2021), who state that an R^2 value approaching 1 indicates a strong explanatory model. Therefore, the regression model used in this study can be considered statistically robust and suitable for drawing meaningful conclusions regarding efficiency determinants in agricultural marketing.

b. F Test

The simultaneous F-test was conducted to assess whether the independent variables, when considered together, have a statistically significant effect on marketing efficiency. The analysis yielded a significance value of 0.001, which is far below the conventional alpha level of 0.05. This indicates that the null hypothesis can be rejected, confirming that the independent variables jointly exert a significant influence on marketing efficiency.

The implication of this finding is that improvements in marketing performance cannot rely on a single factor alone; rather, a comprehensive approach that considers pricing, cost management, marketing structure, and sales strategy is essential. The result supports the interdependence of marketing components and emphasizes the need for coordinated efforts to optimize overall efficiency.

c. t Test

The partial t-test was applied to examine the individual contribution of each independent variable to marketing efficiency. The variable producer price has a negative regression coefficient of –0.170 and a significance value of 0.000, indicating a statistically significant and inverse relationship with marketing efficiency. This means that as the price received by the farmer increases, the efficiency of the marketing system tends to decrease. While this may appear contradictory since

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higher prices are generally favorable for farmers it may reflect the fact that increasing producer prices can push up consumer prices. In competitive market conditions, this may reduce consumer demand, increase marketing margins, and ultimately decrease the cost-efficiency ratio. This finding is supported by Hia *et al*. (2020), who observed that high farm-gate prices do not always correlate with efficient supply chain performance if market absoIDRtion capacity is limited.

The marketing cost variable has a positive regression coefficient of 0.946, with a significance level of 0.000, making it the most influential factor in the model. This result indicates that an increase in marketing cost contributes positively to marketing efficiency. This finding may seem counterintuitive but is justified within the context of value-added services. Higher marketing costs when allocated to productive activities such as sorting, packaging, branding, or improved logistics can enhance product marketability and consumer satisfaction, thereby justifying their expense in proportion to the increased final value of the product. Efficient cost allocation, rather than cost minimization alone, becomes the key factor for marketing success.

The marketing channel pattern variable, represented as a dummy (1 = Channel I, 2 = Channel II), has a positive coefficient of 0.065 and a significance level of 0.000. This implies that the use of shorter, more direct channels (Channel II) is associated with higher marketing efficiency. The positive relationship confirms that reducing the number of intermediaries in the distribution process can minimize transaction costs, lower marketing margins, and ensure more of the consumer price is returned to the producer. This supports previous findings in agricultural marketing research, which emphasize the benefits of channel disintermediation and producer–consumer proximity in enhancing system performance and equity.

The sales volume variable displays a negative coefficient of –0.028 and a significance level of 0.001, indicating that increases in volume are significantly, but negatively, associated with marketing efficiency. The effect size is relatively small, suggesting that while the impact is statistically significant, it is not dominant. The negative sign may reflect scale-related inefficiencies, such as increased handling complexity, delayed delivery, or mismatch between supply and demand. As the sales volume increases, especially without proportional infrastructure or market expansion, the system may experience diminishing efficiency due to logistical constraints or price volatility. This calls for improved post-harvest management and coordinated volume planning among farmer groups and traders.

CONCLUSION AND SUGGESTION

This study identified two main marketing channels for bird's eye chili in Grabag District: Channel I (through auction groups and collectors) and Channel II (through collectors only). Both channels were found to be efficient, with Channel II having the highest efficiency (2.44%) and farmer's share (84%). Statistical results confirmed that producer price, marketing cost, channel type, and sales volume significantly affect marketing efficiency. Based on the research findings, Marketing Channel II is the recommended marketing channel. This is because Channel II represents the channel with the largest volume absorbed by the market , the highest farmer participation , and offers a high price. The choice of Channel II is also due to collector traders performing every marketing function in creating added value and ensuring a fair distribution of profits among all marketing actors. Farmers

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in Grabag District currently act as price takers; therefore, it is suggested that farmers choose a more efficient channel to obtain higher prices. Farmers should also actively seek market information to secure higher prices.

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