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## Improving operational efficiency analysis through marketing performance (*Cymbopogon Nardus* L.)

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**Abstract.** The agricultural sector, particularly citronella oil production, is pivotal to Indonesia's economic growth and export potential. The marketing efficiency of citronella oil in Rokan Hulu Regency, Riau Province was analysed to optimise the contribution of the sector to the economy. A descriptive method alongside qualitative and quantitative approaches, based on statistically analysed primary and secondary data, were used. Five marketing channel strategies were examined, revealing variations in production costs, income generation, and profitability across different channels. The market structure for citronella oil in Rokan Hulu Regency was characterised as oligopsony on both the seller's and buyer's sides, indicating a concentrated market with limited buyers and sellers. Marketing channel I demonstrated the best performance, with the lowest production cost of IDR 477,479.17 per kg, the highest farmer's share of 95.24%, and the best profit-to-cost ratio of 9.35. This channel also had the smallest margin of IDR 8,000 per kg and generated the highest income of IDR 2,400,000 per harvest. In contrast, marketing channel III incurred the highest costs at IDR 1,105,451.26 per kg. Overall, the marketing of citronella oil in Rokan Hulu Regency was found to be efficient, with selling prices remaining relatively profitable for farmers, especially through shorter marketing channels. The efficiency of marketing channels was assessed based on price, with more efficient pricing indicating a better market structure. The study also analysed the marketing functions performed by various institutions, including exchange, physical, and facility functions, which contribute to the overall efficiency of the marketing system. These findings can be utilised by policymakers, agricultural extension services, and farmers to improve marketing strategies and increase the

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efficiency of citronella oil production in the region, ultimately contributing to the development of Indonesia's agricultural export sector and enhancing the economic well-being of citronella farmers in Rokan Hulu Regency

**Keywords:** citronella oil; farmers' profitability; agricultural sector of Indonesia; agromarketing; marketing channel

## INTRODUCTION

The agricultural sector remains a cornerstone of Indonesian economy, supported by the tropical climate, which fosters fertile natural resources. This unique environmental condition enhances agricultural cultivation, making it a more efficient sector. Consequently, the agricultural sector significantly affected Indonesian economic growth, contributing to both domestic food security and export potential. As a mainstay economic sector, Citronella (*Cymbopogon Nardus* L.) is an important essential oil-producing plant with high economic value that can grow well on marginal lands. Indonesia is currently the third largest supplier of citronella oil globally, after China and Taiwan. The average global demand for citronella oil reaches 2,000-2,500 tons per year (Żukowska & Durczyńska, 2024).

The marketing system for citronella in Indonesia faces several challenges, including fluctuating prices, limited market access for farmers, and inefficient supply chains. In the Rokan IV Koto District of Rokan Hulu Regency, citronella has emerged as a significant agricultural commodity, yet farmers often struggle to secure equitable prices and optimise profits due to these inefficiencies. Research by D. Chiarelli *et al.* (2018) and E. Ngoben and M. Muchopa (2023) underscores that the food and plantation sectors in Indonesia are not only meeting domestic demands but also achieving substantial export volumes, motivating farmers to cultivate crops with export potential. The efficiency of marketing agricultural products was analysed in various studies. S. Dimitrijević (2023) highlighted the necessity of enhancing agricultural productivity through improved product quality to achieve higher market prices. Marketing efficiency, as detailed by I. Akite *et al.* (2022), is central in reducing costs and boosting farmers' profits. Nevertheless, traditional agricultural practices and the limited adoption of modern farming technologies frequently obstruct productivity.

Several studies explored marketing performance across diverse agricultural contexts. For instance, Y. Methamontri *et al.* (2022) demonstrated that agricultural marketing efficiency is influenced by socio-economic and institutional dynamics, noting that direct marketing channels, especially for organic rice, can yield higher profits for farmers by bypassing intermediaries. Similarly, F. Wanyoike *et al.* (2023) assessed the sustainability of beef marketing chains, identifying that livestock stock capacity, feed availability, and disease management significantly affect marketing efficiency and farmer income. Despite the breadth of existing research, there is a distinct

lack of studies on citronella marketing performance, particularly in Riau Province and the Rokan IV Koto District. This unique crop, valued for its essential oil properties, should be further analysed in the context of inefficiencies and identification of improvements. M. Mehla *et al.* (2023) argued that aligning product quality with market demands is critical for increasing sales prices and improving farmer income. Additionally, N. Habiyaemye *et al.* (2023) asserted that lowering marketing costs not only enhances profitability but also supports increased sales volumes and overall farmer welfare.

The market potential of citronella is evident, supported by a growing demand for citronella oil, with an annual average demand ranging from 2,000 to 2,500 tonnes (Sarah *et al.*, 2023). To capitalise on this demand, improvement of citronella oil productivity must correlate with market trends. However, as noted by F. Gharsan *et al.* (2022), traditional cultivation practices and the low adoption of advanced agricultural technologies continue to impede productivity. Addressing these challenges necessitates a detailed evaluation of the citronella marketing in Rokan IV Koto District, incorporating insights from other agricultural contexts to develop strategies for enhancing marketing efficiency and farmer profitability.

The study aimed to conduct a thorough analysis of citronella marketing performance in Rokan IV Koto District by examining marketing channels, marketing functions, market structure, and marketing efficiency.

## MATERIALS AND METHODS

This research was conducted during 2023 in Rokan Hulu Regency as one of the citronella cultivation centers in Riau Province. The census method was to collect information from 100 farmers and traders of citronella. The choice of research location was determined by purposive sampling of citronella farmers in Rokan hulu regency as the central area for citronella cultivation which produces citronella oil.

Qualitative and quantitative descriptive analysis was employed in data analysis. Qualitative descriptive analysis was conducted by observation of the characteristics of marketing channels, institutions, functions and structure. Quantitative descriptive method was employed to conduct a farming analysis and determine marketing efficiency based on marketing margin approach, farmer's share, and profit and cost ratios.

It was calculated the total cost of farming using a formula:

$$TC = FC + VC, \quad (1)$$

where  $TC$  – Total Cost;  $FC$  – Fixed Cost;  $VC$  – Variable Cost.

The result of dividing total costs by the number of products produced. The average cost of farming was calculated using a formula:

$$AC = \frac{TC}{Q}, \quad (2)$$

where  $AC$  – Average Cost;  $TC$  – Total Cost;  $Q$  – Quantity.

Analysis of farming revenues was calculated using a formula:

$$TR = P \times Q, \quad (3)$$

where  $TR$  – Total Revenue;  $P$  – Price per unit;  $Q$  – Quantity.

Analysis of farming income was calculated using the formula:

$$\pi = TR - TC, \quad (4)$$

where  $\pi$  – Farming income (benefit of farming system);  $TR$  – Total Revenue;  $TC$  – Total Cost.

Marketing Margin Analysis for the efficiency of citronella oil commodities is therefore as follows:

$$\text{Marketing Margin Ratio} = \frac{\text{Total Marketing Margin}}{\text{Selling Price}}. \quad (5)$$

Farmer's Share analysis is formulated as follows:

$$\text{Farmer's Share} = \frac{\text{Price at Farm Level}}{\text{Final Consumer Price}} \times 100\%. \quad (6)$$

Revenue Cost Ratio is formulated as follows:

$$R/C = \frac{TR}{TC}, \quad (7)$$

where  $R/C$  – Revenue-Cost Ratio;  $TR$  – Total Revenue;  $TC$  – Total Cost.

The following is the formula for the Profit and Cost Ratio (B/C):

$$\text{Profit Ratio} = \frac{\text{Profit}}{\text{Marketing costs}}. \quad (8)$$

This methodological framework was used for a comprehensive analysis of the efficiency of citronella farming and marketing channels, providing actionable insights for improving profitability and sustainability in the agricultural sector.

## RESULTS

The study determined that farmers in channel III of table 1 contain fixed cost Rp. 34,135.47 per kg, variable Rp. 1,071,315.79 per kg and total cost 1,105,451.26 per kg. Therefore, the costs incurred were higher, which is proportional to the oil production obtained in this channel. Variable costs are than fixed, as notable from the table with a percentage level of 90.06-97.74%.

**Table 1.** Average total costs of citronella farmers in Rokan Hulu Regency

| Cost breakdown     | Cost (Rp/Kg) | Percentage (%) |
|--------------------|--------------|----------------|
| <b>Channel I</b>   |              |                |
| Fixed Cost         | 47,479.17    | 9.94           |
| Variable Costs     | 430,000.00   | 90.06          |
| Total              | 477,479.17   | 100            |
| <b>Channel II</b>  |              |                |
| Fixed Cost         | 23,671.01    | 2.26           |
| Variable Costs     | 1,025,000.00 | 97.74          |
| Total              | 1,048,671.01 | 100            |
| <b>Channel III</b> |              |                |
| Fixed Cost         | 34,135.47    | 3.09           |
| Variable Costs     | 1,071,315.79 | 96.91          |
| Total              | 1,105,451.26 | 100            |
| <b>Channel IV</b>  |              |                |
| Fixed Cost         | 40,327.26    | 3.70           |
| Variable Costs     | 1,050,500.00 | 96.30          |
| Total              | 1,090,827.26 | 100            |
| <b>Channel V</b>   |              |                |
| Fixed Cost         | 48,082.96    | 5.19           |
| Variable Costs     | 878,750.00   | 94.81          |
| Total              | 926,832.96   | 100            |

**Source:** compiled by the authors

Based on production and sales prices per unit of production, the average revenue from citronella farming per harvest can be obtained. Farmers' income in the research area varies depending on the amount of

citronella oil produced and the selling price prevailing at that time. The highest cost was from IV channel, amounting to Rp. 3,026,800.00, and the smallest revenue in channel I was IDR. 2,400,000.00 (Table 2).

**Table 2.** Average revenue of citronella farmers in Rokan Hulu Regency

| Marketing channel | Oil Production | Retail Price (Rp/Kg) | Revenue      |
|-------------------|----------------|----------------------|--------------|
| Channel I         | 15.00          | 160,000.00           | 2,400,000.00 |
| Channel II        | 16.20          | 160,000.00           | 2,592,000.00 |
| Channel III       | 16.63          | 160,105.26           | 2,663,473.68 |
| Channel IV        | 18.90          | 160,200.00           | 3,026,800.00 |
| Channel V         | 17.50          | 160,500.00           | 2,809,500.00 |

**Source:** compiled by the authors

The highest average income of citronella farming in the research area is channel IV, amounting to Rp. 1,935,972.74, and the lowest revenue is channel II at Rp. 1,543,328.99 (Table 3). Total revenue is greater than total costs incurred. Therefore, all costs incurred in the production process of citronella farming can be covered by farming income. As such,

citronella farming has economic value for farmers in the research area. The average results obtained from respondents' incomes are high enough to be used to meet living needs and support household income. As such, when commodity prices decline, it greatly affects the welfare of farmer households in the research area.

**Table 3.** Average total income of citronella farmers in Rokan Hulu Regency

| Marketing channel | Revenue (Rp/Kg) | Total Cost (Rp/Kg) | Income (Rp/ Harvest) |
|-------------------|-----------------|--------------------|----------------------|
| Channel I         | 2,400,000.00    | 477,479.17         | 1,922,520.83         |
| Channel II        | 2,592,000.00    | 1,048,671.01       | 1,543,328.99         |
| Channel III       | 2,663,473.68    | 1,105,451.26       | 1,558,022.43         |
| Channel IV        | 3,026,800.00    | 1,090,827.26       | 1,935,972.74         |
| Channel V         | 2,809,500.00    | 926,832.96         | 1,882,667.04         |

**Source:** compiled by the authors

The calculation results obtained values R/C Ratio among them are as follows: channel I is relatively more feasible as the R/C value is the highest – 5.03, hence every Rp. 1. The farming costs incurred resulted

in a profit of Rp. 4.03. Meanwhile, the lowest value is in channel III, namely 2.41, meaning every Rp. 1, spent will get a profit of Rp. 1.41. Based on established criteria (Table 4).

**Table 4.** R/C of citronella farmer in Rokan Hulu Regency

| Marketing channel | Revenue (Rp/Kg) | Total Cost (Rp/Kg) | Revenue Cost Ratio (R/C) |
|-------------------|-----------------|--------------------|--------------------------|
| Channel I         | 2,400,000.00    | 477,479.17         | 5.03                     |
| Channel II        | 2,592,000.00    | 1,048,671.01       | 2.47                     |
| Channel III       | 2,663,473.68    | 1,105,451.26       | 2.41                     |
| Channel IV        | 3,026,800.00    | 1,090,827.26       | 2.77                     |
| Channel V         | 2,809,500.00    | 926,832.96         | 3.03                     |

**Source:** compiled by the authors

The calculation results obtained the highest B/C Ratio value of 4.03. This condition means that every cost incurred is IDR. 1, will get a profit of Rp. 4.03. In channel I and channel III the lowest B/C value is 1.41, meaning the costs incurred are Rp. 1, get a profit of Rp. 1.41.

Thus, it is possible to conclude that citronella farming in Rokan Hulu Regency should be further developed (Table 5). This profit is derived from the farmer's income based on the selling price paid by the farmer and the amount of production produced.

**Table 5.** B/C of citronella farmer in Rokan Hulu Regency

| Marketing channel | Income       | Total Cost (Rp/Kg) | Benefit Cost Ratio (B/C) |
|-------------------|--------------|--------------------|--------------------------|
| Channel I         | 1,922,520.83 | 477,479.17         | 4.03                     |
| Channel II        | 1,543,328.99 | 1,048,671.01       | 1.47                     |
| Channel III       | 1,558,022.43 | 1,105,451.26       | 1.41                     |
| Channel IV        | 1,935,972.74 | 1,090,827.26       | 1.77                     |
| Channel V         | 1,882,667.04 | 926,832.96         | 2.03                     |

**Source:** compiled by the authors

Based on the research results, there are 5 marketing channels for citronella oil in Rokan Hulu Regency and several marketing institutions. Differences in marketing channels, including variations in capital owned as well as differences in transportation access were revealed (Patil & Rastog, 2019). The production of citronella oil was 100 respondents per harvest 752 kg. The marketing pattern for citronella oil that is formed is:

- Channel pattern I: Farmers – Village Gathering Traders (PPD) – Consumer;
- Channel pattern II: Farmers – Village Gathering Traders (PPD) – Wholesalers;
- Channel pattern III: Farmers – District Collector Traders (PPK) – Wholesalers;
- IV channel pattern: Farmers – Agents – Wholesalers;
- V channel pattern: Farmers – Village Gathering Traders (PPD) – District Collector Traders (PPK) – Wholesalers

In general, the marketing functions of citronella oil were classified into 3 categories, namely exchange functions, physical functions and facility functions. Based on the results of observations and interviews, most marketing functions are done by marketing institutions. Marketing institutions perform an exchange function in the form of sales activities, physical functions in the form of transportation and storage activities and facil-

ity functions in the form of sorting and grading activities, market information and risk management.

The implementation of the marketing functions of each marketing institution aims to provide added value and facilitating the distribution of citronella oil from farmers to consumers. Marketing institutions have quality standards and different facilities for marketing functions (Walker & Ruekert, 1987; Satola & Milewska, 2022). This process will later influence the value obtained by each marketing institution which is measured based on the price level obtained. On the other hand, the implementation of marketing functions will influence the costs of each marketing institution in the marketing process of citronella oil.

The structure of the marketing market for citronella oil determines the characteristics of marketing institutions that influence the nature of competition and the price of citronella oil on the market. The market structure was analysed using qualitative methods (Rupp *et al.*, 2021). Market structure includes the number of seller and buyer respondents, the nature or heterogeneity of the product, simplicity of market introduction, the level of market information known by seller and buyer respondents and the form of competition. A demonstration of the market structure faced by citronella marketing institutions in Rokan Hulu Regency is provided in Table 6.

**Table 6.** Market structure faced by marketing institutions in Rokan Hulu Regency

| Characteristics                 |                     |                          |                            |                       |
|---------------------------------|---------------------|--------------------------|----------------------------|-----------------------|
| Seller                          | Farmer              | PPD                      | PPK                        | PB                    |
| Buyer                           | PPD, PPK, and Agent | PPK, PB dan Consumer     | PB                         | advanced institutions |
| Entering and exiting the market | Low                 | Low                      | Low                        | High                  |
| Number of sellers/buyers        | A lot/ Quite a lot  | Quite a lot/ Quite a lot | Little/ Little             | Little / Quite a lot  |
| Product properties              | Homogeneous         | Homogeneous              | Differentiation            | Differentiation       |
| Market information              | Easy                | Easy                     | Easy                       | Easy                  |
| Market Structure                |                     |                          |                            |                       |
| Seller Side                     | Oligopsony          | Oligopsony               | Oligopsony Differentiation | Oligopoly             |
| Buyer Side                      | Oligopsony          | Oligopoly                | Oligopoly Differentiation  | Oligopsony            |

**Source:** compiled by the authors

The marketing margin in this research is calculated based on the five marketing channel schemes for citronella oil. The margin calculation includes the sales price (P<sub>ji</sub>) minus the purchase price (P<sub>bi</sub>). The lowest margin

is in channel I, namely IDR. 8,000 kg and has a large margin difference with the other four channels. Analysis of the costs incurred demonstrated that channel one also incurs the smallest costs in comparison to other



channels. This shows that farmers who sell citronella oil to Village Collecting Traders (PPD) and to consumers directly result in smaller margins (Otto *et al.*, 2020).

The results of the farmer's share analysis in this research show that the largest share obtained by farmers is in channel I. The average farmer's share in channel I is 95.24%. Channel I has fewer marketing institutions involved, therefore share received by farmers is greater. The average share in the smallest channel received by farmers is channel V at 84.47%. If the share obtained by farmers in a marketing channel is higher, the marketing channel can be considered more efficient than other channels.

Analysis of the ratio of benefits and costs in this research determined that marketing channel I is 9.35. This condition illustrates that every Rp. 1, marketing costs incurred will provide a profit of Rp. 9.35. The profit and cost ratio in marketing channel II is 2.58, which

means every Rp. 1, the marketing costs incurred will provide a profit of Rp. 2.58. Furthermore, the profit and cost ratio in marketing channel III is 3.97, which means every Rp. 1, the marketing costs incurred will provide a profit of Rp. 3.97. The profit and cost ratio in marketing channel IV is 2.42, which means every Rp. 1, the marketing costs incurred will provide a profit of Rp. 2.42. Lastly, the profit and cost ratio in marketing channel V is 1.23. This means that every Rp. 1, marketing costs incurred only provide a profit of Rp. 1.23. It is possible to conclude that the results of the profit and cost ratio analysis show that marketing channel I is relatively more efficient. This is determined by the largest profit and cost ratio being 9.35. Meanwhile, marketing channel V has the smallest profit to cost ratio of 1.23. The concept of marketing efficiency refers to the price efficiency approach. This approach illustrates that the more efficient the price, the better the level of market structure.

**Table 7.** Comparison of marketing efficiency values for citronella oil marketing channels in Rokan Hulu Regency

| Marketing channel | Total Marketing Costs (Rp/Kg) | Retail Price (Rp/Kg) | Marketing Efficiency (%) |
|-------------------|-------------------------------|----------------------|--------------------------|
| Channel I         | 1,713.00                      | 168,000.00           | 0.46                     |
| Channel II        | 6,454.00                      | 185,000.00           | 3.78                     |
| Channel III       | 4,601.00                      | 185,000.00           | 2.71                     |
| Channel IV        | 6,681.00                      | 185,000.00           | 3.92                     |
| Channel V         | 13,865.00                     | 190,000.00           | 6.96                     |

**Source:** compiled by the authors

Based on the indicator, an efficient value of <5 percent is efficient. while an efficient value of >5% is defined as inefficient. In Table 4, the most efficient channel is channel I at 0.46%. On the other hand, inefficient marketing channels are channel V at 6.96%. Based on the research results, there are 5 marketing channels for citronella oil in Rokan Hulu Regency. Analysis of the operational efficiency of marketing citronella oil from the five channels is as follows:

In marketing channel I, farmers sell their harvest to PPD (Village Collecting Traders) and then to consumers. The PPD involved in channel I amounted to 3 respondents. The buying and selling process of citronella oil is done at the PPD Warehouse and is based on stock availability according to consumer demand. Consumers contact PPD to buy products. The average amount of citronella oil marketed is only 15/kg or 2%. The sales volume of citronella oil in marketing channel I is small from the total sales. The quantity of citronella oil sales in marketing channel I is dependent on direct consumers. The price received by farmers on this channel is IDR. 160,000/kg, while the price received by consumers is Rp. 168,000/kg.

In marketing channel II, the institutions consist of PPD and Wholesalers (PB). In marketing channel II, the number of PPD consisted of 19 respondents, and PB consisted of 2 respondents. Consumers bought citronella oil on average 162/kg or 21.54% of the total

production of 100 respondents. PPD then sells directly without the intermediary of other marketing institutions to large traders at a price of Rp. 165,000/kg while the price obtained from farmers is Rp. 160,000/kg.

Marketing channel III involves three marketing institutions. Those involved included 41 farmers, 1 sub-district collecting trader (PPK) and 1 large trader. This condition renders marketing channel III the dominant marketing channel in terms of the number of parties involved. The average amount of citronella oil sold on this channel reached 316/kg or 42.02%. The sales volume in marketing channel III is the largest volume in marketing citronella oil in Rokan Hulu Regency. The price received by farmers is IDR 162,000/kg, while the price purchased by wholesalers is IDR 168,000/kg.

In marketing channel IV there are several parties involved, including 26 farmers, 2 agents from the sub-district level and 1 wholesaler in Rokan Hulu district. Prices are determined prices are completely determined by agents and wholesalers. The price obtained by farmers is IDR 160,000/kg. It was recorded that 189 kg or 25.13% were sold by farmers to agents and then resold to wholesalers at a price of IDR 170,000/kg.

Marketing channel V is the channel that mostly involves citronella oil marketing institutions in Rokan Hulu Regency, including farmers, Village Collecting Traders (PPD), District Collecting Traders (PPK), Wholesalers. Farmers sell citronella oil for 9.31% of the total

oil production in Jepara Regency. The price received by farmers from channel V is IDR. 160,000/kg, while the price provided by wholesalers is Rp. 175,000/kg. Berdasarkan efisiensi pemasara biaya operasional, saluran pemasaran I mengeluarkan biaya sebesar Rp 1.333/kg. While marketing channel 2 operational costs were Rp 1,543/kg, marketing channel 3 reaches a cost of 1,543 / kg. Furthermore, marketing costs 4 and 5 are Rp 1,323/kg and Rp 1,143/kg, respectively.

The analysis of citronella oil marketing channels in Ogan Ilir District, Indonesia, identified three marketing channels, which are fewer than the five channels found in this study. However, there are similarities in structure. Their channels involved farmers selling to collecting traders, similar to Channel I where farmers sell to Village Collecting Traders (PPD). The marketing margins in this study (ranging from IDR 8,000 to 15,000/kg) are significantly smaller than in the study by H. Malini *et al.* (2023). Margins range from IDR 30,000 to 250,000/L across three channels. This suggests that the marketing channels in Rokan Hulu Regency is more efficient in terms of price transmission from farmers to consumers.

Regarding the dominance of certain channels, this study found that Channel III, involving sub-district collecting traders (PPK), handled the largest volume (42.02%) of citronella oil. This differs from the findings of Syafruddin *et al.* (2022), T. Rosol *et al.* (2023) who studied citronella oil marketing in Aceh. Authors determined that channels involving district-level traders handled the bulk of the product, suggesting regional variations in marketing structure efficiency. While these findings share some similarities with other studies on essential oil marketing in Indonesia, they also highlight unique aspects of the citronella oil market in Rokan Hulu Regency. The efficiency of shorter channels, the significant role of sub-district level traders, and the relatively stable pricing across channels distinguish this market from those in other regions, emphasising the importance of local context in agricultural marketing studies.

Improving the operational efficiency of marketing in the agricultural sector is a substantial challenge, especially for citronella plants. On the other hand, the marketing potential for the selling price of citronella plants is high once processed into citronella oil. The primary marketing channels used are direct and indirect. Direct marketing channels are used by farmers with substantial production capacities and access to final consumers. This marketing channel has the advantage of high selling prices, resulting in large profits. However, this marketing also suffers from higher marketing costs.

Meanwhile, indirect marketing channels are generally used by farmers who have small capacity and do not have direct access to final consumers. However, this marketing channel has the advantage of lower costs. The weakness that occurs is that farmers cannot gain large profits. The marketing efficiency of citronella oil can be measured using several indicators, such as

marketing margin, farmer's share and profit and cost ratio. The marketing efficiency of agricultural sector commodities was conducted by several experts, including by Kh. Mehrez *et al.* (2023). Research on Saudi coffee commodities was conducted in the Jazan Khawlani area. This research analysed the efficiency of the coffee marketing chain strategy from farmers, producers, traders, retailers, to final consumers. Good presentation of coffee attracts consumer interest, which yields higher profits. However, the longer the marketing chain will reduce the profits received by farmers. The effectiveness of the marketing chain is indirect marketing, but the profits received by farmers are low.

Furthermore, research conducted by Y. Methamontri *et al.* (2022) demonstrated that the marketing efficiency of the agricultural sector is influenced by social, economic and institutional levels. Organic rice can be highly effective in marketing if it is marketed in institutions with direct consumers, institutional members. Farmers will gain higher profits if the marketing chain is consumed directly by consumers. The sustainability of the beef animal marketing chain is influenced by animal stock capacity, the availability of grass as a feed ingredient, and suppressing disease outbreaks. Marketing efficiency occurs when livestock production is high, alongside increased sales. According to F. Wanyoike *et al.* (2023), a high livestock population will increase income, so that production costs can be covered. Based on several studies conducted by experts, the difference in this research lies in the efficiency of the marketing channels used, starting from analysing marketing margins, farmer's share and profit and cost ratios. Therefore, the more efficient the marketing channels used by farmers for citronella oil commodities, the higher the profits they receive.

## CONCLUSIONS

Based on the analysis, the marketing of citronella oil in Rokan Hulu Regency is generally efficient, with five distinct marketing channels identified. Among these, marketing channel I demonstrate the best performance and highest efficiency which involves farmers selling directly to Village Collecting Traders (PPD) or consumers, shows the smallest marketing margin of IDR 8,000/kg, the highest farmer's share at 95.24%, and the best profit-to-cost ratio of 9.35.

These metrics indicate that farmers who utilise shorter, more direct marketing routes obtain optimal profits compared to longer channels involving multiple intermediaries. For the efficiency of the citronella oil market in this region is further evidenced by: relatively stable and high selling prices across channels, particularly in shorter routes. A market structure is characterised as oligopsony on both seller's and buyer's sides, indicating a concentrated market with limited buyers and sellers. Varied marketing functions performed by different institutions, including exchange, physical,

and facility functions, which contribute to overall system efficiency.

While longer marketing channels (such as channel V) involve more intermediaries and show lower efficiency, the presence of multiple channels provides farmers with options to suit their production capacity and market access. In conclusion, the citronella oil marketing system in Rokan Hulu Regency demonstrates a balance between efficiency and market access, with shorter channels offering the best returns for farmers. Nonetheless, there remains significant potential for enhancing

the efficiency of longer marketing channels to improve overall market performance and increase farmer profitability. These results provide a foundation for informing policy interventions and strategic initiatives aimed at optimising the citronella oil value chain in the region.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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### **Аналіз підвищення операційної ефективності через маркетингову діяльність (*Symbopogon Nardus* L.)**

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**Анотація.** Сільськогосподарський сектор, зокрема виробництво олії цитронели, є важливим для економічного зростання та експортного потенціалу Індонезії. Це дослідження було присвячене аналізу ефективності маркетингу олії цитронели в регіоні Рокан Хулу, провінція Ріау, з метою оптимізації внеску цього сектору в економіку. Дослідження використовувало описовий метод із кількісним та якісним підходами, базуючись на первинних і вторинних даних, що аналізувалися за допомогою описової статистики. Було досліджено п'ять стратегій маркетингових каналів, які продемонстрували різницю у витратах виробництва, прибутках та рентабельності. Ринок олії цитронели в регіоні Рокан Хулу було охарактеризовано як олігопсонію як з боку продавців, так і з боку покупців, що вказує на концентрованість ринку з обмеженою кількістю учасників. Найкращі результати показав маркетинговий канал I, з найнижчими виробничими витратами – 477,479,17 IDR/кг, найвищою часткою фермера – 95,24 % і найкращим співвідношенням прибутку до витрат – 9,35. Цей канал також мав найменшу маржу – 8,000 IDR/кг і забезпечував найбільший дохід – 2,400,000 IDR за врожай. Натомість маркетинговий канал III мав найвищі витрати – 1,105,451,26 IDR/кг. Загалом маркетинг олії цитронели в регіоні Рокан Хулу був визнаний ефективним, оскільки ціни продажу залишалися прибутковими для фермерів, особливо через коротші маркетингові канали. Ефективність маркетингових каналів оцінювалася за цінами, причому ефективніша ціна свідчила про кращу структуру ринку. У дослідженні також було проаналізовано маркетингові функції, що виконуються різними установами, включаючи функції обміну, фізичні та допоміжні функції, які сприяють загальній ефективності маркетингової системи. Отримані результати можуть бути використані політиками, службами аграрного консультування та фермерами для вдосконалення маркетингових стратегій і підвищення ефективності виробництва олії цитронели в регіоні, що зрештою сприятиме розвитку експортного сільськогосподарського сектору Індонезії та покращенню економічного добробуту фермерів, які вирощують цитронелу, в регіоні Рокан Хулу.

**Ключові слова:** олія цитронели; прибутковість фермерів; аграрний сектор Індонезії; агромаркетинг; маркетинговий канал