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Analysis of the Influence of Paddy Prices and Rice Production on the Farmers' Terms of Trade of Food Crops in West Sumatra

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ABSTRACT

The agricultural sector plays a strategic role in improving farmers' welfare, particularly in the food crops subsector where rice remains Indonesia's main staple. The Farmers' Terms of Trade is widely used as an indicator to measure farmers' welfare by reflecting their purchasing power. This study aims to analyze the effect of paddy prices and rice production on the Farmers' Terms of Trade in the food crops subsector in West Sumatra Province. This research uses secondary time series data from 2015 to 2024 obtained from official statistical sources. The analysis applies a multiple linear regression model supported by classical assumption tests to ensure the validity of the results. The findings indicate that paddy prices and rice production simultaneously have a significant effect on Farmers' Terms of Trade. Partially, paddy prices have a positive and significant effect, indicating that increases in paddy prices directly improve farmers' welfare. In contrast, rice production has a positive but not significant effect on Farmers' Terms of Trade, suggesting that higher production does not necessarily improve farmers' welfare due to production instability, declining harvested areas, and increasing production costs. The model explains 61.4% of the variation in Farmers' Terms of Trade. These results imply that improving farmers' welfare requires not only increasing production but also ensuring price stability and enhancing production efficiency. Therefore, policies should focus on stabilizing paddy prices and promoting sustainable agricultural practices.

Keywords: *Farmer term of trade, paddy price, rice production, farmer welfare.*

INTRODUCTION

The agricultural sector holds a strategic position in Indonesia's national development due to its significant contribution to the economy, employment, and food security. According to Statistics Indonesia (Badan Pusat Statistik, 2025a), the agricultural, forestry, and fisheries sector contributed 12.61% to Indonesia gross domestic product (GDP) in 2024, indicating its important role in supporting the national economy and rural livelihoods. In addition, th agricultural sector contributes to improving farmers' welfare and strengthening product competitiveness (Fatimah et al., 2021; Agustian et al., 2021; Pratama & Budhi, 2020). Supported by abundant natural resources, the agricultural sector remains one of the main drivers of sustainable economic development in Indonesia (Hasan et al., 2025).

he food crop subsector plays an important role in the agricultural sector, particularly rice as the main staple food for the Indonesian population. Rice is a strategic commodity due to its high consumption level, its contribution to national food security, and its role as a primary source of income for many farming households (Fitri & Hafidzah, 2023). Therefore, increasing rice production through improved cultivation techniques, pest and disease management, and the adoption of superior varieties is essential to meet growing demand (Silpiyana et al., 2025). As a result, the performance of the food crop subsector has a significant influence on farmers' welfare, highlighting

the importance of supporting farmers as the main actors in agricultural development (Triwidia et al., 2024; Kurniawan, 2022).

A commonly used indicator to evaluate the level of farmers' welfare is the farmer's terms of trade. Farmer's terms of trade is calculated as the ratio between the price index received by farmers and the price index paid by farmers, reflecting farmers' real purchasing power for both household consumption and agricultural production inputs (Andriyani & Ananda, 2023). Farmer's terms of trade above 100 indicates a surplus condition, while a value below 100 indicates a decline in purchasing power and pressure on the welfare of farming households (Tenriawaru et al., 2021). In addition, fluctuations in commodity prices and production costs significantly influence farmer's terms of trade, making it an important indicator for assessing farmers' economic conditions and evaluating agricultural policies (Aulia et al., 2021; Umri & Apriyanti, 2025).

West Sumatra Province is one of the regions with considerable potential in the food crop subsector, particularly in rice production. According to Statistics Indonesia (BPS, 2025), rice production in West Sumatra reached 1,356,467.93 tons of milled dry grain in 2024, equivalent to 785,425.72 tons of rice for food consumption, with South Pesisir and Padang Pariaman Regencies serving as major production centers. These conditions indicate the important role of rice farming in the regional economy and farmers' livelihoods. Therefore, analyzing the farmer's term of trade in the food crop subsector is essential for assessing farmers' welfare. Changes in farmer's term of trade can reflect fluctuations in farmers' purchasing power as well as their responses to changes in rice prices and production costs. The trend of the farmer's terms of trade in the food crop subsector of West Sumatra Province during the last ten years is presented in Figure 1.

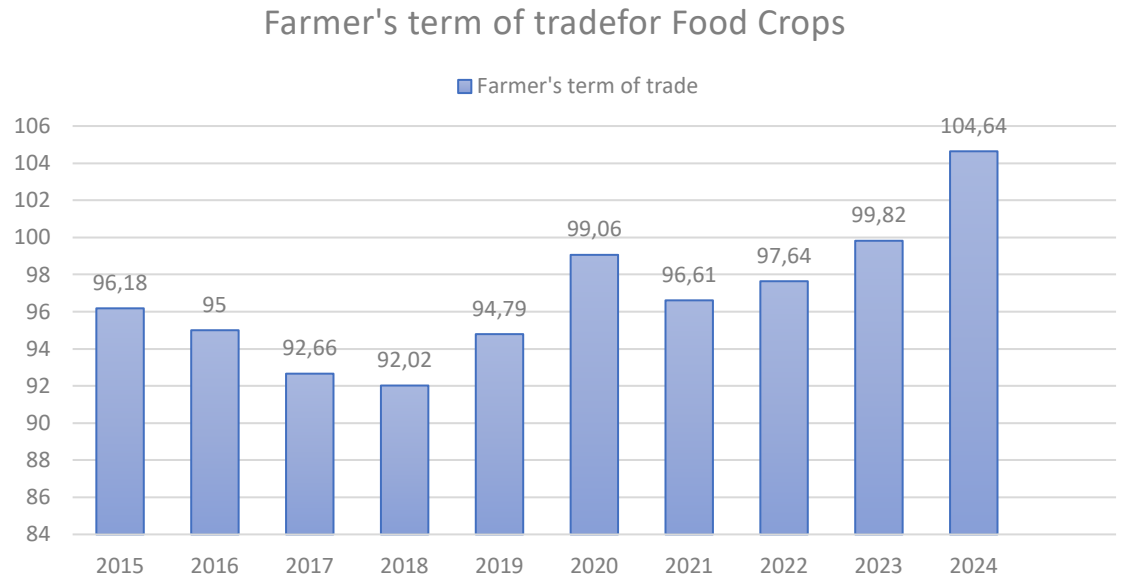

Figure 1. Development of the farmer's terms of trade Subsector of Food Crops in West Sumatra Province 2015-2024
Source: (Badan Pusat Statistik, 2025b)

Based on Figure 1, the condition of the farmer's terms of trade in the West Sumatra Province food crop subsector during the 2015–2024 period shows a fluctuating pattern that reflects the dynamics of farmers' welfare over time. Farmer's terms of trade was recorded at 96.18 in 2015 and gradually decreased until it reached its lowest point of 92.02 in 2018. This situation suggests that, during the observed period, the index of prices paid by farmers exceeded the index of prices received, thereby placing farmers' purchasing power in a disadvantaged position. Next, in the period from 2019 to 2024, the Farmer's term of trade shows a fairly consistent upward trend, from 94.79 in 2019 to 99.06 in 2020, then remaining relatively stable in the range of 96–99 from 2021 to 2023, and reaching 104.64 in 2024. Farmer's term of trade value exceeding 100 in 2024 indicates that farmers are starting to experience a surplus, where the income received is greater than the expenses incurred.

This finding is in line with the research results Bague et al., (2024) which states that farmer's terms of trade fluctuations are influenced by changes in commodity prices and unstable production costs. In addition, research by Ramadhanu et al., (2021) shows that market dynamics and changes in agricultural output prices are the main factors affecting farmers' welfare as reflected in the farmer's terms of trade. More recent research by Triwidia et al., (2024) also emphasized that the increase in the farmer's term of trade in recent periods is not unrelated to the

improvement in agricultural commodity prices, although the influence of production factors is not always significant. Although various studies have examined the factors influencing the farmer's terms of trade, the research findings show discrepancies, particularly regarding the influence of production, which is not always significant on farmers' welfare. In addition, research specifically analyzing the impact of rice prices and production on the farmer's terms of trade in the food crop subsector at the regional level, particularly in West Sumatra Province, is still relatively limited. Accordingly, this research contributes empirically by investigating the impact of rice price fluctuations and production performance on the farmer terms of trade in the regional food crops subsector, using the latest data and a quantitative approach.

This study is grounded in the central question of how paddy prices and production levels influence the farmer's terms of trade within the food crop subsector in West Sumatra Province. Accordingly, the research seeks to examine the extent to which fluctuations in paddy prices and variations in production affect the farmer's terms of trade. In addition, this study is expected to enrich empirical evidence related to farmer welfare, particularly within a regional context.

RESEARCH METHODS

This study was carried out in West Sumatra Province. The research site was selected purposively, taking into account that the region is among the key contributors to the food crop subsector, particularly in rice production. Moreover, the fluctuation patterns of the farmer's terms of trade in this province present an important basis for examining farmer welfare dynamics. The study utilized secondary data in the form of time series covering the period from 2015 to 2024. These data were sourced from Badan Pusat Statistik, particularly from the publication West Sumatra in Figures and other datasets related to the farmer's terms of trade within the food crop subsector. The variables analyzed include the farmer's terms of trade for food crops in West Sumatra, rice production levels, and paddy prices.

The data analysis method in this study was conducted using multiple linear regression to examine the effect of rice paddy prices (X_1) and production (X_2) on the farmer's terms of trade in the food crop subsector (Y). The general form of the estimated model is:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

Keterangan :
Y = Farmer's terms of trade
β0 = Constant
β1, β2 = Regression Coefficient
X1 = Paddy Price
X2 = Production
ε = Error

This method was chosen because it can explain the contribution of each independent variable to the variation of the dependent variable simultaneously (Sinaga et al., 2022). Before estimation is conducted, the model is first tested using classical assumption tests, including normality, multicollinearity, heteroscedasticity, and autocorrelation tests, to ensure that the resulting model is unbiased and efficient (Nugraha, 2022). The normality test is conducted using the Kolmogorov–Smirnov test, while multicollinearity is evaluated thru the Variance Inflation Factor (VIF). Heteroskedasticity is tested using residual pattern analysis and the Glejser test, while autocorrelation is analyzed using the Durbin–Watson statistic. The entire data processing was carried out with the help of statistical software commonly used in the analysis of economic and social time series (Sinaga et al., 2022).

RESULT AND DISCUSSION

Result of Multipe Linear Regression Analysis

Before conducting hypothesis testing, there are several prerequisite tests for analysis, namely classical assumption tests. According to Damodar N Gujarati et al., (2015) The classical assumption test on the multiple linear regression model used is conducted to determine whether the regression model is good or not. The application of classical assumption tests is intended to verify that the estimated regression model is reliable, unbiased, and consistent in its estimations. Prior to performing regression analysis, these diagnostic tests must be conducted to ensure the validity of the model. The key assumptions that need to be satisfied in regression analysis include normality, absence of multicollinearity, homoscedasticity, and absence of autocorrelation.

Table 1. Result of Multiple Regression Analysis

Variabel	Coefficient	t-statistic	Prob.*
Constant	70,766	10,778	0,000
Paddy Price	0,004	4,013	0,005
Production	0,000001087	0,988	0,356
R	0,836		
R-Squared	0,700		
Adjusted R-Squared	0,614		
Prob (F-Statistic)	0,015		

Source: Data processed in SPSS, 2026.

Following a series of statistical analyses performed using the IBM SPSS Statistics software, the results indicate that paddy price and production variables jointly influence the farmer's terms of trade within the food crops subsector. As presented in Table 1, the rice price variable demonstrates a positive and statistically significant effect on the farmer's terms of trade. In contrast, the production variable shows a positive relationship; however, its effect is not statistically significant. Based on the estimation outcomes, the multiple linear regression model can be expressed as follows :

$$\mathbf{Y = 70{,}766 + 0{,}004\ Paddy\ Price + 0{,}000001087\ Production + e}$$

The estimated model indicates that each explanatory variable is positively associated with the farmer's terms of trade. Specifically, the paddy price coefficient (0.004) implies that an increase in paddy prices contributes to an improvement in the Farmer's Terms of Trade. In contrast, the production coefficient (0.000001087) suggests that production exerts only a marginal influence on changes in this indicator.

Furthermore, the adjusted R-squared value of 0.614 demonstrates that approximately 61.4% of the variation in the farmer's terms of trade is accounted for by paddy prices and production levels, while the remaining 38.6% is explained by other factors not included in the model. Overall, this reflects that the model has a reasonably strong explanatory power in capturing the variation of the farmer's terms of trade.

The Influence of Paddy Prices on the Farmer's terms of trade for Food Crop Farmers in West Sumatra Province

The results of the multiple linear regression analysis indicate that the regression coefficient for the paddy price variable is 0.004. The p-value of 0.005 ($p < 0.05$) suggests that this coefficient is positive and statistically significant at the 5% significance level. These findings imply that rice prices have a positive and significant effect on the farmer's terms of trade in the food crops subsector. In practical terms, an increase in paddy prices is associated with an increase in the farmer's terms of trade, and vice versa. Furthermore, the magnitude of the coefficient indicates that a one-unit increase in paddy prices is expected to increase the farmer's terms of trade by 0.004 units, holding other variables constant (ceteris paribus). This relationship is further supported by the t-test results, where the calculated t-statistic of 4.013 exceeds the critical threshold, with a corresponding probability value of 0.005 at $\alpha = 0.05$. Therefore, it can be concluded that paddy prices have a positive and statistically significant effect on the farmer's terms of trade in the food crop subsector of West Sumatra Province.

In the food crop subsector of West Sumatra Province, the price of unhusked rice (paddy) exerts a positive and statistically significant influence on the Farmer's Terms of Trade, as it constitutes a primary determinant of farmers' income. Over the period 2015–2024, paddy prices increased from approximately IDR 5,149 to IDR 7,412. This upward trend contributed to an improvement in farmers' purchasing power, particularly between 2019 and 2024, during which the farmer's terms of trade also experienced a marked increase. These results indicate that rising paddy prices are closely associated with enhanced farmer welfare through increased income levels. In addition, the increase in paddy prices is relatively more consistent compared to production, which tends to be fluctuating, making its impact on the farmer's terms of trade more apparent and significant. Thus, the price of paddy has a more dominant role in influencing the farmer's terms of trade compared to other variables because it directly determines the amount of income received by farmers.

The positive relationship between paddy prices and farmer's terms of trade can be explained through their effect on farmers' net income. An increase in paddy prices directly increases the value of agricultural output and raises the price index received by farmers. When the increase in output prices exceeds the increase in production costs and household expenditures, farmers obtain higher net income and stronger purchasing power, which is reflected in an increase in the farmer's terms of trade. Therefore, higher paddy prices not only increase farmers'

revenues but also contribute to improving their overall welfare.

Government intervention also plays an important role in strengthening this relationship. Through the government purchase price policy, the government seeks to protect farmers' income by establishing a minimum purchase price for paddy and rice while taking into account changes in production and distribution costs. The National Food Agency Regulation Number 4 of 2024 states that the adjustment of the government purchase price is intended to protect farmers' income and accommodate changes in the structure of production and distribution costs. By guaranteeing minimum prices for paddy, the policy helps reduce the adverse effects of market price fluctuations, stabilize farmers' revenues, and improve their purchasing power (Badan Pangan Nasional Republik Indonesia, 2024). Consequently, government intervention through the government purchase price policy contributes to increasing the price index received by farmers and ultimately supports improvements in the farmer's terms of trade and farmer welfare.

The results of this study are consistent with the findings of the research from Faillah (2022) which states that changes in paddy prices can significantly affect the farmer's terms of trade. Price fluctuations still increase the farmer's terms of trade. This is because in 2023 there was a policy change in the government purchase price that was able to increase the farmer's terms of trade. When rice prices increase, the welfare of farmers, as seen from the farmer's terms of trade, also increases. This indicates that an increase in paddy prices will raise the price index received by farmers, thereby increasing the farmer's terms of trade as well. In addition, the results of the research conducted Yulianti et al., (2023) by concluding that the price of unhusked rice significantly affects the farmer's terms of trade. This is because the price of unhusked rice serves as the benchmark price that farmers receive when selling their rice harvest. This price level has a direct impact since the market price of paddy is determined by the price of unhusked rice. If the price of unhusked rice rises, farmers' income will also increase. This can enhance farmers' purchasing power. Conversely, if the price of unhusked rice falls, farmers' income will decrease.

The Influence of Production on the Terms of Trade for Food Crop Farmers in West Sumatra Province

According to the results of the multiple linear regression analysis, the production variable has a regression coefficient of 0.000001087 with a significance value of 0.356, which exceeds the 0.05 threshold. This indicates that, in the food crop subsector of West Sumatra Province, production has a positive but statistically insignificant effect on the farmer's terms of trade. The coefficient suggests that, holding other variables constant (ceteris paribus), a one-unit increase in rice production is associated with an increase of 0.000001087 units in the farmer's terms of trade. However, this relationship is not statistically significant at the 5% level, as indicated by the probability value (0.356) and the corresponding t-statistic (0.988).

One of the reasons why the rice production variable in West Sumatra Province has a positive but insignificant effect on the farmer's terms of trade is the mismatch between production dynamics and changes in harvest area. Based on data from 2015–2024, rice production showed a fluctuating pattern, where production increased to around 2.81 million tons in 2017, but then declined to a range of 1.31–1.48 million tons during the 2019–2023 period. This decline is in line with the decrease in harvested area from approximately 499,157 hectares to around 271,883 hectares in 2022, indicating land limitations due to conversion to non-agricultural sectors. These conditions cause production increases to be inconsistent and relatively small, thus not significantly impacting the improvement of farmers' welfare. In addition, the increase in production is also accompanied by an increase in the use of production inputs such as fertilizers, labor, and other operational costs, so the profits obtained by farmers become relatively limited. Thus, although production has a positive relationship with the farmer's terms of trade, its impact becomes insignificant due to production fluctuations, a decrease in harvested area, and the imbalance between the increase in inputs and the production results obtained.

The findings of this study are consistent with those reported by Ginting (2025) which concluded that rice production does not significantly affect the farmer's terms of trade in Jambi Province. Additionally, research by Kurniawan (2022) also shows that agricultural production or income partially does not significantly affect the farmer's terms of trade. This reinforces the finding that an increase in production does not always improve farmers' welfare, especially if it is not accompanied by price improvements or production cost efficiency. The results of the research conducted by Anggraeni et al., (2025) shows that the rice production variable has an insignificant effect on the farmer's exchange rate. This can occur because when there is an increase in production, farmers require a larger addition of inputs.

CONCLUSION

The results of the multiple linear regression analysis indicate that rice prices and production simultaneously have a significant effect on the farmer's terms of trade in the food crop subsector of West Sumatra Province. Partially, rice prices have a positive and statistically significant effect on farmer's terms of trade,

indicating that higher paddy prices improve farmers' purchasing power and welfare. In contrast, production has a positive but statistically insignificant effect, suggesting that increases in output do not necessarily lead to higher farmer welfare. These findings imply that the farmer's terms of trade in West Sumatra Province is influenced more by price factors than by production quantity.

Based on these findings, efforts to improve farmers' welfare should not only focus on increasing agricultural production but also on maintaining favorable paddy prices and strengthening price stabilization policies. Government intervention through the government purchase price policy and other market stabilization measures can help protect farmers' income from price fluctuations. In addition, improving the efficiency of production input use and supporting sustainable farming practices may enhance farmers' economic welfare and strengthen the farmer's terms of trade.

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