JPPIPA 12(3) (2026)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Determination of Food Crop Prices Based on Farmers' Exchange Rates in West Tojo

Yulianti Kalaba[1], Erny[1], Ayu Arini[1], Adinda Elfara Rizki Adam[1], Wira Hatmi[1], Mukhlis[2]

[1] Agribusiness Study Program, Faculty of Agriculture, Tadulako University, Palu, Indonesia
[2] Agribusiness Study Program, Department of Agriculture Business, Politeknik Pertanian Negeri Payakumbuh, Lima Puluh Kota, Indonesia

Received: January 01, 2026
Revised: February 03, 2026
Accepted: March 25, 2026
Published: March 31, 2026

Corresponding Author:
Yulianti Kalaba
yuliantigani610@gmail.com

DOI: 10.29303/jppipa.v12i3.14706

Abstract: The agricultural sector plays a strategic role in regional development, particularly in food security, job creation, and economic growth. In Tojo Una-Una Regency, agriculture, forestry, and fisheries accounted for 38.78% of the regional Gross Domestic Product in 2023; however, this contribution has not yet fully translated into improved farmer welfare. This study aims to determine food crop prices using the Farmer's Price Index in Tojo Barat Subdistrict. A quantitative descriptive approach was employed using primary data from 35 rice farmers selected through proportional random sampling. Data were collected through structured questionnaires, interviews, and field observations. The determination of food crop prices was analyzed by calculating the price index received by farmers (IT), the price index paid by farmers (Ib), and the resulting FPR. The results of the study indicate that production costs increased by 9.04%, household food expenditures by 23.66%, and farmers' income by 10.94%, resulting in income growth of 12.07%. The calculated IT was 112.35, and Ib was 111.84, resulting in an FPR value of 100.46. This indicates a marginal surplus with limited improvements in welfare. The narrow gap between IT and Ib indicates high vulnerability to price fluctuations. Policy interventions focused on input subsidies, price stabilization, and market access are needed to ensure the sustainable well-being of farmers.

Keywords: Commodity; Farmer Exchange Rate; Farmer Welfare; Food Crops; Prices.

Introduction

Economic growth is one of the indicators of a region's development success, as reflected in changes in the Regional Gross Domestic Product (RGDP) (Romhadhoni et al., 2018). In the Indonesian context, the agricultural sector plays a strategic role because it contributes to regional GDP, provides employment, and supports national food security, particularly through food crops such as rice (Aini et al., 2024; Nadila et al., 2025). Therefore, improving the welfare of farmers as the primary actors in agricultural development is a crucial aspect of regional economic development (Kurniawan, 2022). Farmers' economic well-being is significantly influenced by the dynamics of agricultural commodity prices relative to production costs and consumer goods prices. When output prices rise faster than production costs and household consumption expenses, farmers' real income increases and their purchasing power improves (Keumala & Zainuddin, 2018).

One of the indicators commonly used to measure farmers' welfare is the Farmgate Price Index (FPI), in addition to other indicators such as the rural poverty rate and the rural Gini coefficient (Razi & Wahyuni, 2022). The Farmer's Price Ratio is the ratio between the price index received by farmers (It) and the price index paid by farmers (Ib), reflecting the exchange capacity of agricultural products against goods and services consumed by farmers (Riyadh, 2015; Wahyudi, 2025). An FPI value above 100 indicates a surplus or improved

How to Cite:
Kalaba, Y., Erny, Arini, A., Adam, A. E. R., Hatmi, W., & Mukhlis. (2026). Determination of Food Crop Prices Based on Farmers' Exchange Rates in West Tojo. *Jurnal Penelitian Pendidikan IPA*, *12*(3), 449-455. https://doi.org/10.29303/jppipa.v12i3.14706

farmer welfare, while a value below 100 indicates a decline in welfare due to higher production and consumption costs compared to agricultural product prices (Firmansyah et al., 2024; Khoiri & Nuraini, 2022). Changes in the FPR are influenced not only by agricultural commodity prices but also by government policies, distribution systems, input subsidies, and the dynamics of farmers' household consumption prices (Maharani et al., 2023; Soewignyo & Simatupang, 2020; Nirmala et al., 2016).

Empirically, the agriculture, forestry, and fisheries sectors in Tojo Una-Una Regency are the largest contributors to the regional GRDP, accounting for 38.78 percent in 2023 Badan Pusat Statistika Provinsi Sulawesi Tengah (2024). This indicates that farmers' well-being plays a crucial role in the regional economy. Additionally, the food crop sector—particularly rice—dominates agricultural activities in the region, with a total food crop area of 14,581.2 hectares and a rice harvest area of 1,558 hectares. Statistical data show that the price index received by farmers (It) for food crops, at 104.65, has increased; however, at the same time, the price index paid by farmers (Ib) has also risen to 110.42 (Tojo Una-Una Regency Central Statistics Agency, 2024). This situation indicates that an increase in output prices does not necessarily lead to improved farmer welfare, as production and consumption costs are rising even faster.

Various previous studies have shown that the FPR is widely used as an indicator to evaluate farmers' welfare and the impact of agricultural policies. However, most of these studies remain descriptive and macro-level, analyzing FPR trends over time or across regions without directly linking them to mechanisms of commodity price formation at the farm level. Furthermore, research specifically linking changes in food crop prices to FPR dynamics at the micro-regional level—such as the subdistrict level—remains limited. Yet, production cost structures, marketing systems, and local market access significantly influence farmers' ability to set selling prices.

Based on these conditions, the following research gaps can be identified:

1. Previous studies have generally used the FPR solely as an indicator of welfare, rather than as an analytical tool to understand the mechanisms of agricultural commodity price determination.
2. Studies examining the relationship between changes in food crop prices and the FPR at the micro-regional level remain limited, particularly in Tojo Una-Una District.
3. Few studies have integrated analyses of selling prices, production costs, and farmers' purchasing power within the FPR framework to generate operational policy recommendations.
4. The differing dynamics between the increase in the price index received by farmers and the price index paid by farmers in the study area have not been analyzed in depth in the context of food crop farmers' welfare.

Given these research gaps, this study is important for analyzing the impact of prices on the Farmgate Price Index for food crop farmers in Tojo Una-Una District. This study is expected to provide empirical insight into how changes in commodity prices affect farmers' welfare using the FPR indicator.

The novelty of this study lies in:

1. The use of a direct price analysis approach to the farmers' terms of trade for food crops at the micro-regional level.
2. The integration of the price index received by farmers, the price index paid by farmers, and commodity price dynamics within a single framework for analyzing farmer welfare.
3. The provision of region-specific empirical evidence for Tojo Una-Una Regency, which was previously limited in the literature.
4. The development of FPR analysis as a basis for policy recommendations on pricing and regional agricultural development.

Thus, this study is of high urgency because it not only evaluates farmer welfare but also provides an analytical foundation for formulating price policies and agricultural development that are more favorable to food crop farmers in Tojo Una-Una District.

Method

Research Location and Time

This Research was conducted in Tojo Una-Una Regency, specifically in Tojo Barat District, which was determined purposively (Mukhlis et al., 2019; Mukhlis et al., 2024; Asgaf et al., 2025), considering that the location is one of the centers of food crop production in Central Sulawesi. The study was carried out from April to October 2025 and included data collection on production prices, farming costs, and household consumption among farmers.

Figure 1. Research Location Map

Population, and Sample

The population in this study consists of all paddy farmers in Tojo Barat Subdistrict, Tojo Una-Una Regency. The sample comprised 35 respondents selected using proportional random sampling (Sugiyono, 2022). This technique was used because the farming population is spread across several villages with varying numbers of residents; therefore, the sample proportions were adjusted to reflect each village's population size to ensure representativeness.

A sample size of 35 respondents was deemed adequate based on several methodological considerations. First, this study employs a descriptive index analysis approach (It, Ib, and FPR), which does not require a large sample size as in multivariate inferential analysis. Second, according to descriptive statistical principles, a sample size of at least 30 respondents is sufficient to meet the assumption of normality under the Central Limit Theorem. Third, research with homogeneous units of analysis, such as rice farmers in a relatively small region, can use a limited yet still representative sample. Furthermore, previous studies on the Farmer's Price Ratio at the micro-regional level also used sample sizes ranging from 30 to 50 respondents. Thus, a sample size of 35 respondents is deemed sufficient to describe the welfare conditions of rice farmers in the study area.

Data Collection Methods

The data used in this study consists of primary and secondary data. Primary data were obtained through: 1) direct observation of farming activities, 2) structured questionnaires administered to farmers, 3) in-depth interviews, and 4) documentation of activities and supporting data. Secondary data were obtained from relevant agencies, including the Central Statistics Agency, the Department of Agriculture, and local policy documents.

Instrument Validity and Reliability

To ensure data quality, the research instruments were tested for validity and reliability before use. Validity testing was conducted using content validity through consultation with experts in agribusiness and agricultural economics. Additionally, empirical validity was tested using the product-moment correlation between item scores and total scores. An item is considered valid if the correlation coefficient is greater than the table r-value at a 5% significance level. Reliability testing was conducted using Cronbach's Alpha. The instrument is considered reliable if the Cronbach's Alpha value is greater than 0.70. This testing aims to ensure the consistency of respondents' answers to the questions provided.

Data Analysis Method

Farmers' Price Ratio (FPR)

The Farmers' Price Ratio is used to measure farmers' welfare by comparing the price index received by farmers with the price index paid by farmers. The formula for the Farmers' Price Ratio (FPR) is as follows:

$$NTP = \frac{\text{Price index received by farmers (It)}}{\text{Price index paid by farmers (Ib)}} x\ 100 \quad (1)$$

Explanation:
- The Farmer Price Index (It) is a price index that reflects the prices of agricultural products sold by farmers.
- The Farmer Price Index (Ib) is a price index that reflects the costs incurred by farmers, including prices for agricultural inputs (such as fertilizers and seeds), consumer goods, and other costs.

If FPR > 100, it means farmers' welfare has increased (because the price received exceeds the price paid). If FPR < 100, farmers' welfare has decreased.

Calculating the Farmer Received Price Index (It)

It is an index that shows changes in the average prices of agricultural products sold by farmers compared to the base period (base year).

$$It = \frac{\text{Product Prices for the Current Period}}{\text{Product Prices in the Base Period}} \; x \; 100 \qquad (2)$$

Steps:
- Collect agricultural product prices for the current period and the base period (e.g., prices of rice, corn, vegetables, etc.).
- Calculate the ratio between the current product price and the price during the base period.
- Multiply the result of the ratio by 100 to obtain the price index for each product.
- If there are many product types, calculate the weighted average of all products to obtain the total It.

Calculating the Farmer Price Index (Ib)

Ib is an index that shows changes in the average prices of goods and services purchased by farmers (including production inputs and household consumption goods).

$$IB = \frac{\text{Prices of Goods and Services in the Current Period}}{\text{Prices of Goods and Services in the Base Period}} \; x \; 100 \qquad (3)$$

Steps:
- Collect the prices of goods and services purchased by farmers in the current period and the base period (e.g., fertilizer, seeds, fuel, food, clothing, etc.).
- Calculate the ratio between the current price of goods and the price during the base period.
- Multiply the ratio by 100 to obtain the price index for each item.
- Calculate the weighted average of all cost components (both agricultural inputs and consumption needs) to obtain the total Ib.

Result and Discussion

Tojo Barat Subdistrict is one of the areas with significant agricultural potential in Tojo Una-Una Regency, particularly for irrigated rice. With a rice production of 1,643.10 tons in 2023, this area ranks as the second-largest contributor after Tojo Subdistrict. This situation indicates that rice not only serves as the primary source of income for farming households but also as the main driver of the local economy. Therefore, analyzing farmers' welfare through the Farmer's Price Ratio (FPR) approach is crucial for understanding the economic resilience of farming households in the face of commodity price fluctuations and production costs.

The Farmer's Price Ratio (FPR) is an indicator that reflects the comparison between the price index received by farmers (IT) and the price index paid by farmers (IB). An FPR above 100 indicates a surplus, while a value below 100 indicates a deficit. In agricultural economic literature, the FPR is used as an indicator of farmers' purchasing power as well as a measure of the relative well-being of rural households. Previous literature shows that the FPR is significantly influenced by changes in agricultural commodity prices, input costs, and household consumption inflation (Suryana, 2019; Afifah & Nalurita, 2022). Furthermore, fluctuations in the FPR also reflect farmers' economic resilience in the face of market changes and government policies (Putra et al., 2020; Fitriani, 2021). Thus, FPR analysis is not only relevant for assessing farmers' well-being at the micro level but also for understanding the stability of the agricultural sector at the macro level.

Research findings indicate that during the 2024–2025 period, production costs increased by 9.04%, from IDR 7,216,355 to IDR 7,933,120. This increase was primarily driven by rising prices of production inputs, such as fertilizers and labor wages. The high labor wages in Tojo Barat Subdistrict—ranging from IDR 150,000 to 200,000 per day—make the labor component the dominant factor in the farm cost structure. This indicates that labor intensity in rice farming remains quite high, meaning that any wage increase directly impacts production costs. This finding aligns with previous research stating that labor costs constitute the largest component in rice farming, particularly in areas where agricultural mechanization remains limited.

In terms of household consumption, food expenditure increased by 23.66%, from IDR 2,965,255 in 2024 to IDR 3,884,500 in 2025. This increase indicates that food inflation places significant pressure on farming households. Theoretically, this situation can be explained by Keynes's consumption theory, which states that the proportion of spending on basic necessities tends to rise among low-income groups. In other words, farming households are more vulnerable to rising food prices because the majority of their income is allocated to basic needs. This finding is also supported by the research of Ali & Rahman (2020), which shows that farming households tend to increase food expenditures

and reduce non-essential consumption when food inflation occurs.

Interestingly, non-food expenditures decreased by 2.72%. This indicates an adaptation strategy among farming households in coping with economic pressures, namely by cutting back on non-essential expenditures such as transportation, recreation, and other secondary needs. Economically, this phenomenon indicates that farmers' welfare has not improved substantially, as the increase in income has not been accompanied by an improvement in the quality of non-food consumption. Previous research has also shown that improvements in farmers' well-being are typically marked by an increase in the proportion of non-food expenditures, such as education and health care. Therefore, the decline in non-food expenditures observed in this study indicates that farmers' well-being remains at a basic level.

On the revenue side, there was an increase of 10.94%, from IDR 18,980,200 to IDR 21,311,200. This increase was primarily driven by higher selling prices for paddy and stable production levels. Consequently, farmers' net income rose by 12.07%. In nominal terms, this increase indicates an improvement in farmers' economic conditions. However, when compared to the rise in production costs and household consumption expenses, this income increase has not yet led to a significant improvement in welfare. This finding aligns with the research by Darwis (2020), which states that increases in commodity prices often serve merely as compensation for rising production costs, rather than as an improvement in real welfare.

Table 1. Growth Rate of Production Costs, Household Expenditures, Receipts, and Income of Rice Farmers in West Tojo District.

Year	Expenditures (IDR)			Income (IDR)	Income (IDR)
	Cost Production	Food	Non-Food		
2024	7,216,355	2,965,255	2,477,630	18,980,200	11,763,845
2025	7,933,120	3,884,500	2,412,000	21,311,200	13,378,080
Growth (%)	9.04	23.66	-2.72	10.94	12.07

Source: Primary Data After Processing, 2025.

The FPR calculation results show a value of 100.46, with a farmer price index (IT) of 112.35 and a farmer price index (IB) of 111.84. This value indicates that farmers are in a surplus, but the surplus margin is very thin. Analytical, this condition indicates a fragile balance between farmers' income and expenses. The small difference between IT and IB indicates that any small increase in production costs or decrease in grain prices can easily push the FPR below 100. This means that farmers' welfare is highly vulnerable to price fluctuations.

Table 2. Rice Farming Exchange Rate Index for Tojo Barat Subdistrict

Details	Value
Farmer Accepted Index (IT)	112.35
Farmer Payment Index (FPI)	111.84
Farmers' Exchange Rate Index	100.46

Source: Primary data after processing, 2025.

Previous research has also shown that farmers with an FPR value close to 100 are in a vulnerable welfare zone. Under these conditions, economic shocks such as rising fertilizer prices, crop failures, or falling paddy prices can directly reduce farmers' welfare. Therefore, even though farmers are statistically in surplus, they still face considerable economic uncertainty.

The policy implications of these findings are quite significant. First, the government needs to maintain the stability of production input prices, particularly for fertilizers and labor, through subsidy policies or improved distribution efficiency. Second, rice price stabilization policies are necessary to prevent sharp fluctuations in farmers' income. Third, increasing productivity through agricultural mechanization can help mitigate the relatively high cost of labor. Fourth, diversifying farmers' household income should also be encouraged to reduce dependence on a single commodity.

More broadly, the results of this study indicate that the welfare of farmers in Tojo Barat Subdistrict remains in the vulnerable category. Although the FPR is above 100, the very narrow margin suggests that the improvement in welfare has not yet been sustained. The dynamics of input prices and household consumption are the primary factors influencing this situation. Therefore, agricultural development policies should not only focus on increasing production but must also be directed toward controlling production costs, stabilizing prices, and enhancing farmers' purchasing power.

Thus, this study confirms that an increase in the FPR does not always reflect a significant improvement in welfare. The small surplus margin indicates structural vulnerabilities in farmers' household economies. Therefore, adaptive and sustainable policy interventions

are essential to ensure that farmers' welfare can improve tangibly and stably in the long term.

Conclusion

The results of this study indicate that the welfare of rice farmers in West Tojo Subdistrict, as reflected in the Farmer Exchange Rate (NTP), is relatively secure but vulnerable, with income slightly higher than expenditure. This condition indicates that although farmers can still make a profit thanks to favorable grain prices, their welfare improvement remains hampered by increased production costs and limited consumption flexibility. The very small difference between the price index received and the price index paid by farmers reflects vulnerability to fluctuations in input and output markets. Thus, it can be concluded that NTP is indeed a reliable indicator of farmers' purchasing power and welfare, but its sustainability depends heavily on government policy interventions, such as input subsidies, food price stabilization, and policies that strengthen farmers' resilience to external shocks. Future research and policy need to critically highlight this structural vulnerability so that improvements in the NTP can truly contribute to long-term welfare, not just short-term survival.

Acknowledgments

This study reveals that the welfare of lowland rice farmers in Tojo Barat District, as measured by the Farmer Terms of Trade (FPR), is relatively stable but structurally vulnerable. The FPR value of 100.46 indicates that farmers' incomes slightly exceed their expenditures, placing them in a marginal surplus condition. However, the narrow gap between the price index received by farmers and the price index paid by farmers suggests that their welfare remains highly sensitive to fluctuations in input costs and output prices. This fragile balance implies that minor increases in production costs or declines in rice prices could easily push farmers into a deficit condition.

The findings demonstrate that income improvements were primarily driven by higher rice prices, while rising production costs—particularly labor and input expenses—and increasing household food consumption limited real welfare gains. This indicates that improvements in FPR do not necessarily translate into sustainable welfare enhancement, but rather reflect a temporary equilibrium between income and expenditure. Therefore, farmers in the study area remain economically vulnerable despite being above the breakeven threshold.

This study contributes to the literature in three main ways. First, it provides empirical evidence that an FPR value slightly above 100 does not automatically indicate robust farmer welfare, but may instead reflect a fragile economic equilibrium. Second, it highlights the importance of considering both production cost inflation and household consumption dynamics when interpreting farmer welfare indicators. Third, by using a micro-level analysis, this study uncovers structural vulnerabilities that are often masked in aggregated regional or national FPR analyses.

From a policy perspective, the results underscore the need for integrated interventions to strengthen farmer resilience. Stabilization of rice prices, targeted input subsidies, and improved efficiency through agricultural mechanization are essential to reduce production costs. Additionally, strengthening market access and promoting income diversification could enhance household economic stability. Without such policy support, improvements in FPR are likely to remain short-term and insufficient to ensure sustainable farmer welfare.

Future research should expand the spatial scope and incorporate longitudinal data to better capture the dynamics of farmer welfare over time. Integrating productivity, efficiency, and institutional variables would also provide a more comprehensive understanding of the determinants of farmer terms of trade.

Author Contributions

Y.K..: Conceptualization, developing ideas, analyzing, writing, reviewing, responding to reviewers' comments; E.N., A.A., A.E.R.A.: analyzing data, overseeing data collection, reviewing scripts, and writing; W.H., M.K.: reviewing scripts, and writing.

Funding

This research received no external funding

Conflicts of Interest

The authors declare no conflict of interest.

References

Afifah, N., & Nalurita, L. (2022). Analisis Determinan Nilai Tukar Petani Tanaman Pangan Di Indonesia. *NUSANTARA : Jurnal Ilmu Pengetahuan Sosial*, *9*(1), 455–468. https://doi.org/https://doi.org/10.20961/agritexts.v45i2.57364

Aini, A. S., Hindarti, S., & Khoiriyah, N. (2024). Perkembangan Dan Tren Nilai Tukar Petani Padi Di Indonesia Periode 2018-2023. *Seagri : Jurnal Sosial Ekonomi Pertanian Dan Agribisnis*, *12*(7).

Ali, F., & Rahman, S. (2020). "Consumer Preferences in Palm Oil-Based Products: A Sensory Analysis Approach." *Journal of Food Science and Technology*, *57*(3), 502–511.

Asgaf, K., Hifizah, A., Astati, Ananda, S., Jamili, M. A., & Mukhlis. (2025). Application of Fermented Feed Technology to Improve Beef Cattle Business Efficiency and Student Agribusiness Learning. *Jurnal Penelitian Pendidikan IPA*, *11*(5), 604–610. https://doi.org/10.29303/jppipa.v11i5.11135

Badan Pusat Statistika Provinsi Sulawesi Tengah. (2024). *Nilai Tukar Petani Provinsi Sulawesi Tengah 2023/2024*. Badan Pusat Statistika Provinsi Sulawesi

Tengah, 8.

Darwis, K. (2020). Hubungan karakteristik sosial ekonomi petani padi dengan tingkat adopsi inovasi sistem tanam hazton di Desa Malalin Kabupaten Enrekang. *Agrokompleks*, *20*(2), 28–35. https://doi.org/https://doi.org/10.51978/japp.v20i2.217

Firmansyah, Hoesni, F., Farizal, & Ananda, F. D. (2024). Analisis Pengaruh Faktor Inflasi dan Indeks Harga Konsumen Terhadap Nilai Tukar Petani Subsektor Peternakan di Provinsi Jambi Periode Tahun 2014-2022. *Ekonomis: Journal of Economics and Business*, *8*(2), 1462–1468. https://doi.org/10.33087/ekonomis.v8i2.1845

Fitriani, Y. (2021). Online Sebagai Media Untuk Mengelola Atau Memanajemen Keuangan. *Journal of Information System, Applied, Management, Accounting and Research*, *5*(2). https://doi.org/10.52362/jisamar.v5i2

Keumala, C. M., & Zainuddin, Z. (2018). Indikator Kesejahteraan Petani melalui Nilai Tukar Petani (NTP) dan Pembiayaan Syariah sebagai Solusi. *Economica: Jurnal Ekonomi Islam*, *9*(1), 129–149. https://doi.org/https://doi.org/10.21580/economica.2018.9.1.2108

Khoiri, D., & Nuraini, I. (2022). Analisis Pengaruh Impor Beras , Inflasi , Dan Luas Lahan Sawah Terhadap Nilai Tukar Petani di Indonesia Tahun 2003-2017. *ECONOMIE Vol.*, *04*(2), 108–118. https://doi.org/https://doi.org/10.30742/economie.v4i1.2519

Kurniawan, J. (2022). Nilai Tukar Petani sebagai Indikator Kesejahteraan Petani Kedelai di Kecamatan Pulokulon Kabupaten Grobogan. *Journal Of Integrated Agricultural Socio Economics and Entrepreneurial Research*, *1*(1), 15–22. https://doi.org/https://doi.org/10.26714/jiasee.1.1.2022.21-32

Maharani, F., Saryani, L., Nora, A., & Sari, D. (2023). Sosialisasi Nilai Tukar Petani Terhadap Kesejahteraan Masyarakat Di Desa Tahalak Ujung Gading Kecamatan Muara Tais Kabupaten Mandailing Natal. *Jurnal Gembira (Pengabdian Kepada Masyarakat)*, *1*(4), 834–840. https://gembirapkm.my.id/index.php/jurnal/article/view/173/111

Mukhlis, M., Ismawati, I., Sillia, N., Fitrianti, S., Ukrita, I., Wisra, R. F., Raflis, H., Hendriani, R., Hanum, L., Ibrahim, H., Nofianti, S., Marta, A., & Sari, N. (2024). Characteristics of Production Factors and Production of Zero Tillage System Rice Farming. *Jurnal Penelitian Pendidikan IPA*, *10*(8), 6013–6019. https://doi.org/10.29303/jppipa.v10i8.8542

Mukhlis, Noer, M., Nofialdi, & Mahdi. (2019). Analysis of income and feasibility of rice-cattle integration system farming based on enterprises scale. *Journal of Advanced Research in Dynamical and Control Systems*, *11*(7), 544–553. https://www.jardcs.org/abstract.php?id=2678

Nadila, S. P., Puryantoro, & Mayangsari, A. (2025). Nilai Tukar Petani dan Pola Pengeluaran Pangan pada Rumah Tangga Petani Padi di Desa Ramban Wetan. *Mimbar Agribisnis: Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis*, *11*(2), 2490–2497. https://doi.org/https://doi.org/10.25157/ma.v11i2.18315

Nirmala, A. R., Hanani, N., & Muhaimin, A. W. (2016). Analisis Faktor Faktor yang Mempengaruhi Nilai Tukar Petani Tanaman Pangan di Kabupaten Jombang. *JURNAL HABITAT*, *27*(2), 66–71. https://doi.org/10.21776/ub.habitat.2016.027.2.8

Putra, S. I., Gunawan, D. S., & Purnomo, S. D. (2020). Analisis Pendapatan dan Nilai Tambah Industri Pengolahan Kopi : Pendekatan Metode Hayami. *EFFICIENT-Indonesian Journal of Development Economics*, *3*(3), 994–1005. https://doi.org/https://doi.org/10.15294/efficient.v3i3.43518

Razi, F., & Wahyuni, S. (2022). Analisis Faktor-Faktor Yang Mempengaruhi Kesejahteraan Petani Padi Sawah (Oryza sativa , L). *Jurnal AgroNusantara*, *2*(2), 90–96. https://doi.org/https://doi.org/10.32696/jan.v2i2.1498

Riyadh, M. I. (2015). Analysis Of Farmers Term Of Trade Of Crops Commodities In North Sumatra. *Jurnal Ekonomi Dan Kebijakan Publik, 1, 17–32.*, *1*, 17–32.

Romhadhoni, P., Faizah, D. Z., & Afifah, N. (2018). Pengaruh Produk Domestik Regional Bruto (PDRB) Daerah Terhadap Pertumbuhan Ekonomi dan Tingkat Pengangguran Terbuka di Provinsi DKI Jakarta. *Jurnal Matematika Integratif*, *14*(2), 115–121. https://doi.org/10.24198/jmi.v14.n2.2018.115-121

Soewignyo, F., & Simatupang, N. (2020). The Effect Of Changes In Agricultural Commodity Price On The Welfare Of North Sulawesi Farmers. *Klabat Accounting Review*, *1*(1), 14–26.

Sugiyono. (2022). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.

Suryana, A. (2019). *Pengembangan Kewirausahaan untuk Pemberdayaan UKM Daerah. Jakarta: Yayasan Pustaka Obor Indonesia*. Yayasan Pustaka Obor Indonesia.

Wahyudi, A. A. (2025). Kajian Kritis Pengukuran Kesejahteraan Petani Melalui Metode Nilai Tukar Petani Dan Indeks Kesejahteraan Petani. *Jurnal Perencanaan Pembangunan Pertanian*, *2*(1), 44–60.