PRODUCTION FACTORS AND COMMODITY PRICES ON FARMERS' EXCHANGE RATE IN INDONESIA: PANEL DATA ANALYSIS 2019–2023

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Abstract

This research seeks to ascertain the components of agricultural production and the price dynamics of commodities that affect the Nominal Producer Price (NTP) in Indonesia, utilizing panel data from 26 provinces over the period from 2019 to 2023. The independent variables examined comprise labor, commodity prices, harvested land area, and farmer productivity. Through a series of model evaluations, the Fixed Effect Model (FEM) emerged as the optimal model, as determined by the outcomes of the Chow and Hausman tests. Collectively, all variables demonstrated a statistically significant impact on the NTP, with a coefficient of determination of 0.9681, signifying that 96.81% of the variability in the NTP can be attributed to these factors. On an individual basis, the labor variable exhibited a negative and significant influence, suggesting that an increase in the workforce has not been matched by corresponding improvements in work efficiency. In contrast, commodity prices displayed a positive and significant relationship, indicating that rising agricultural product prices can enhance farmer welfare. The variables pertaining to harvested area and farmer productivity revealed a positive yet insignificant impact on the NTP, implying that an increase in production alone does not necessarily translate into improved welfare without the backing of efficient distribution and price stability. These results highlight the necessity for policies aimed at price stabilization, enhancement of value addition, and modernization of agricultural practices to bolster farmers' purchasing power and overall welfare.

Keywords: Labor; Commodity Prices; Harvested Area; Farmer Productivity

INTRODUCTION

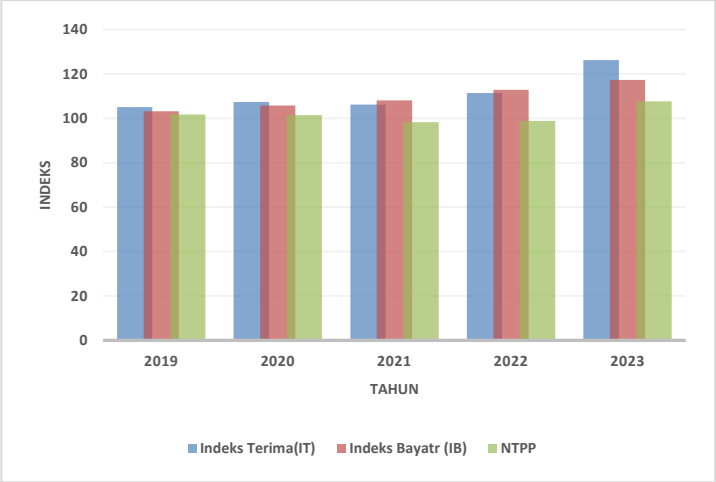
The agricultural sector holds a pivotal and strategic function in promoting the sustainability of both the national economy and society, particularly through its contributions to gross domestic product (GDP), local food supply, and job creation. As long as humanity relies on agricultural commodities for nourishment, and these commodities serve as fundamental raw materials for the industrial sector, the agricultural industry will persist in its evolution (Albetris, 2019). A key metric employed to evaluate the economic status of farmers is the Farmer Exchange Rate (NTP), which indicates farmers' capacity to fulfill their consumption requirements and production expenses. NTP values exceeding 100 signify enhanced well-being, whereas values below 100 indicate a decrease in farmers' purchasing power (Aulia et al., 2021).

This analysis is grounded in the Peasant Welfare Theory posited by Johnson (1950), which asserts that farmers' welfare is shaped by the interplay between the prices they obtain for their agricultural products and the expenses linked to their consumption needs and production inputs. When agricultural output prices escalate more rapidly than input costs, farmers experience a boost in purchasing power and real income, resulting in a rise in the Farmers' Exchange Rate (NTP). Conversely, if the costs of critical production inputs increase, farmers' welfare is likely to deteriorate. This theoretical framework is crucial for comprehending NTP variations in Indonesia and assessing how various economic factors, including commodity prices, labor, harvest areas, and productivity, affect farmers' welfare.

Nevertheless, in Indonesia, the caliber of farmers is inadequate, with a substantial proportion being elderly and less capable of performing labor-intensive tasks. This deficiency in farmer quality directly contributes to the modest earnings of small-scale farmers, as well as the overall revenue generated from the agricultural sector, leading to a relatively low standard of living for these agricultural laborers. The welfare of farmers and the success of agricultural enterprises are influenced by a multitude of internal and external factors. Among the internal factors affecting agricultural operations are the extent of the harvest area and labor productivity, while the external factors that considerably impact farmers include the price levels they receive or the prices established for producers (Jonah, 2019).

Increasing economic pressures threaten farmers' financial stability and pose significant challenges to the sustainability of agricultural enterprises and the welfare of rural communities. Rising food prices, particularly for rice, have led to an escalation in production costs that surpasses the income generated, thereby diminishing farmers' exchange rates. Consequently, prudent, pragmatic, and optimistic strategies are imperative to mitigate long-term risks that could compromise the welfare of farmers and the economic stability of the community.

Figure 1.
Trends in Farmer Exchange Rates (NTP) Based on the Price Index Received and Paid by Farmers in 2019–2023



Source:BPS (2024)

Figure 1 demonstrates that from 2019 to 2023, both the farmer-received price index (IT) and the farmer-paid price index (IB) exhibit a consistent upward trajectory. Notably, IT escalated from 104.97 to 126.27, propelled by increased prices for essential commodities such as rice, corn, and vegetables. Concurrently, IB advanced from 103.2 to 117.31, influenced by soaring production expenses that encompass fertilizers, pesticides, seeds, transportation, and labor. The more rapid rise of IT compared to IB led to an enhancement in the Net Transfer Price (NTP), which increased from 101.72 to 107.63, indicating improved purchasing power and farmer welfare.

In a broader framework, the Net Trade Position (NTP) is influenced by a complex interplay of production factors and interconnected pricing dynamics, including labor, commodity prices, harvest areas, and productivity levels. Labor plays a role in the efficiency of agricultural operations; however, an excess of labor does not inherently elevate the NTP, as the productivity of individual workers often remains inadequate, a notion highlighted by Utomo & Baskoro (2019). In contrast, commodity prices exert the most immediate effect on NTPs, as increased output prices bolster farmers' incomes, reinforcing findings from Faillah (2022) and Tupamahu et al. (2021), which emphasize the critical importance of price stability in enhancing purchasing power. Furthermore, harvested areas indicate production capacity, yet their impact on NTP may be negligible if input costs escalate or if land management practices are poor, as illustrated by Danasari et al. (2023). Additionally, productivity, which serves as an indicator of technical efficiency, does not automatically result in an increase in NTP; the advantages of production growth can be mitigated by price volatility or rising production costs, as noted by Utami & Sitanggang (2024). In conclusion, fluctuations in NTPs are contingent upon price dynamics, labor efficiency, land management, and productivity improvements, which are counterbalanced by cost structures, ultimately reflecting the state of farmers' welfare.

Several empirical studies corroborate the regression findings of this research, despite differences in regional contexts and data characteristics. Concerning labor variables, Aulia et al. (2024) determined that agricultural labor significantly influences the NTP in Lampung Province, while Zaman et al. (2025) also established that labor in the agricultural sector has a substantial effect on the NTP of the national food crop subsector. This conclusion is supported by Rachmadani et al. (2023), whose study verifies that components of labor costs,

such as wages, are critical elements of the price index reported by farmers, thereby affecting fluctuations in NTP. The consistency of these results indicates that labor factors remain a crucial aspect in assessing the welfare conditions of farmers, impacting both productivity and costs.

Numerous scholarly investigations have consistently yielded empirical evidence concerning commodity prices and various production factors. Amri (2023) contends that fertilizer subsidies may result in a reduction of the Net Trade Position (NTP) due to the influence of the subsidy framework on the cost structure of production, whereas Rahman & Octaviani (2021) clarify that external dynamics of commodity prices significantly impact the negotiating power of rice producers. Additionally, Sitorus et al. (2025) discovered that the volatility of rice prices during the pandemic negatively affected the NTP, thereby affirming its susceptibility to fluctuations in output prices. Furthermore, research concerning land area and productivity indicates minimal influential trends, as noted by Afifah & Nalurita (2022), who assert that an expansion of crop area does not inherently enhance NTP without competent management practices. Mulyana et al. (2024) also concluded that productivity and land area did not exert a significant influence on NTP in particular provinces, while Aulia et al. (2024) underscored that macroeconomic factors, including consumer price indices and rice prices, further elucidate variations in NTP related to changes in productivity and farmers' purchasing power. Consequently, this study introduces a novel approach by concurrently investigating the variables of labor, commodity prices, harvest areas, and productivity over the timeframe of 2019—2023, employing panel data from 26 provinces.

This research endeavors to evaluate the effects of diverse agricultural production factors, such as labor, agricultural land area, productivity levels, and commodity price variations, on the Farmers' Exchange Rate (NTP) across 26 provinces in Indonesia from 2019 to 2023. The study offers empirical insights into how the interplay between production inputs and fluctuations in commodity prices influences the purchasing power and overall welfare of farmers, as reflected in the NTP. From an academic standpoint, the outcomes of this investigation are expected to enrich the existing corpus of literature in agricultural economics, particularly concerning the determinants impacting farmer exchange rates (NTPs).

This research aims to provide both empirical and practical contributions to the comprehension of factors influencing the Farmers' Exchange Rate (NTP) in Indonesia, particularly during the period spanning 2019 to 2023, marked by variations in commodity prices and production costs. The structure of the research encompasses an Introduction that outlines the background and significance of the study, a Literature Review presenting pertinent theories and empirical findings related to NTP, Research Methods detailing the panel data models employed, Results and Discussions analyzing empirical findings, and Conclusions and Policy Implications summarizing key insights while offering recommendations aimed at enhancing farmer welfare. Through this methodological framework, the study aspires to deliver a comprehensive understanding of the determinants of NTP and serve as a strategic reference for agricultural policy development in Indonesia.

REVIEW OF LITERATURE

Farmer Welfare Theory

The Peasant Welfare Theory, developed by Johnson (1950), articulates that the prosperity and earnings of farmers are profoundly affected by the interplay between the prices they receive for their agricultural products (outputs) and the costs associated with household inputs and consumption. Johnson (1950) posited that the welfare of farmers is contingent upon the relative shifts in agricultural commodity prices in relation to the variations in input prices they encounter. An increase in commodity prices that outpaces the rise in input prices results in a rise in farmers' real incomes, thereby enhancing their welfare. Conversely, disproportionate increases in input prices diminish the purchasing power of farmers.

Schultz's (1964) Traditional Agricultural Transformation Theory is pertinent as it elucidates how improvements in the quality and efficiency of production factors directly influence farmers' incomes and, consequently, the Net Transfer Price (NTP). This theory asserts that labor should be measured not solely by the number of workers but also by their skills and competencies in managing agricultural enterprises. Schultz contends that the augmentation of labor will not yield favorable outcomes unless it is complemented by enhanced skills or technology; thus, a surplus of labor may lead to stagnant incomes and insufficient increases in NTPs. Additionally, this theory posits that land expansion will effectively boost production only if it is underpinned by adequate capital, technology, and management; otherwise, the addition of land may lead to reduced productivity and fail to enhance farmers' welfare. Productivity is pivotal to Schultz's theory, as advancements in technology, superior seeds, modern equipment, and improved cultivation techniques can elevate output without incurring substantial additional costs, thereby augmenting revenues and increasing NTP.

Simultaneously, commodity prices are intricately linked to farmers' ability to capitalize on heightened production levels. Schultz underscored that productivity influences well-being solely when output prices provide equitable incentives. When commodity prices ascend, the value of output increases, resulting in farmers' income surpassing incurred costs, which subsequently elevates Total Net Income (NTP). Consequently, Schultz's Theory is applicable as it comprehensively elucidates the interrelations among labor, cultivation areas, productivity, and commodity prices in affecting farmers' incomes and fluctuations in NTP.

Hypothesis Development

The hypothesis formulated in this research emerges from the acknowledgment of labor's critical function as a fundamental element in the production process within the agricultural sector. The outcomes derived from the regression analysis indicate that labor has a negative and statistically significant effect on the Farmers' Exchange Rate (NTP). This finding highlights the issue of surplus labor, characterized by a considerable workforce that lacks accompanying technological advancements, efficiency, or quality human capital, consequently failing to yield a measurable enhancement in the actual income of farmers. These findings align with the research conducted by Rahman et al. (2023), which asserts that labor participation in agriculture does not elevate NTP due to persistently inadequate labor productivity. Furthermore, studies by Restiatun et al. (2023) demonstrate that an increase in agricultural labor does not necessarily correlate with improved farmer well-being. Conversely, commodity prices have been shown to positively influence the NTP, as rising

agricultural product prices enhance the price index received by farmers. These findings support the conclusions reached by Ulfah et al. (2022) and Purba et al. (2024), who highlight that the stability and increase in commodity prices are vital for bolstering farmers' purchasing power and overall welfare. In light of this empirical data, a research hypothesis has been formulated.

Additionally, cultivable land and agricultural efficiency emerged as significant determinants in elucidating the variations in the Farmers' Exchange Rate (NTP). The results of the study indicated that the area harvested exerted a positive yet statistically insignificant effect on NTP. These findings imply that an expansion in cultivated areas does not necessarily enhance farmers' purchasing capacity, as the additional crop yields are frequently influenced by price volatility and heightened production costs. This trend aligns with research conducted by Tupamahu et al. (2021), which demonstrated that harvested areas in South Sulawesi did not significantly impact NTP due to ineffective land management practices. In contrast, the analysis of agricultural productivity revealed negative and statistically insignificant coefficients. This suggests that the rise in productivity has not converted into a tangible increase in farmers' real incomes. These findings are consistent with several prior studies, including Bague et al. (2024), which discovered that enhanced productivity in certain commodities does not automatically result in improved farmer welfare. Consequently, these results reinforce the notion that the overall influence of harvested area and productivity on NTP is heavily contingent upon regional conditions, production cost scales, and fluctuations in agricultural product prices.

Hypothesis:

H1: Labor exhibits a negative and statistically significant impact on the Farmers' Exchange Rate

H2: Commodity prices demonstrate a positive and statistically significant influence on the Farmers' Exchange Rate

H3: Harvest Area shows a positive effect on the Farmers' Exchange Rate, although it lacks statistical significance.

H4: Agricultural Productivity presents a negative impact on the Farmers' Exchange Rate, yet it is not statistically significant.

RESEARCH METHOD

Approaches employed in quantitative descriptive research. The data utilized is quantitative, comprising details on the labor force, cultivable land, agricultural yield, and market prices across 26 provinces in Indonesia from 2019 to 2023. The data sources are secondary, acquired from the Central Statistical Agency (BPS) along with agencies pertinent to the research subject.

Table 1.
Variabel Dependen/Independen

Variable	Operational Definition	Unit
Farmer Exchange Rate	The Farmer Exchange Rate functions as a benchmark that evaluates the price index received by farmers against the price index they are obligated to pay. Net Transfer Payments (NTP) illustrate the purchasing power and economic capability of	(%)

	farmers in relation to goods and services, while also indicating their comparative welfare. An NTP exceeding 100 denotes that farmers are experiencing a state of affluence, whereas an NTP below 100 signifies a deterioration in their overall welfare.	
Labor	Labor constitutes the primary factor of production within the agricultural sector, encompassing all individuals engaged in farming activities. The volume of labor influences not only productivity and operational efficiency but also the revenue accrued by farmers.	(%)
Commodity Price	The valuation of agricultural commodities signifies the market pricing of agricultural products at the producer level, acting as a primary indicator of farmers' earnings. Variations in commodity prices will influence the actual income and exchange rates for farmers.	-
Harvested Area	The phrase “harvest area” denotes the complete stretch of land that is harvested within a specified timeframe. From an economic standpoint, the dimensions of the harvest act as a benchmark for assessing the production capacity and scope of agricultural activities. More extensive harvest areas generally associate with enhanced production possibilities and greater revenue for cultivators.	Ha
Farmer Productivity	Agricultural productivity is defined as the quantity of output generated within a specific land area. These indicators act as a representation of farmers' efficiency and their capability to enhance resource utilization in order to attain optimal production levels.	Ku/ha

Estimation Technique

The research investigated the impact of labor, agricultural value addition, cultivated area, farmer efficiency, and pricing indices on agricultural producers. The analysis utilized secondary data presented as panel data, which combines elements of both cross-sectional and time series data. Panel data consists of cross-sectional information collected repeatedly for the same individual unit (object) across various time frames. If the panel data maintains a consistent number of observation periods across each cross-sectional unit, it is categorized as a balanced panel; on the other hand, if the observation periods vary among the sectional units, it is termed an unbalanced panel (Gujarati, 2009). Hsiao (2014) points out that employing panel data in economic research provides numerous advantages over traditional time series or cross-sectional datasets. Primarily, it enables a larger pool of observations, enhances degrees of freedom, demonstrates substantial variability, and mitigates collinearity among explanatory variables, thus fostering more accurate econometric estimations. Furthermore, panel data offers insights that are unreachable through time series or cross-sectional data alone. Lastly, panel data can achieve greater clarity in comprehending dynamic changes when compared to cross-sectional data (Indrasto et al., 2025). The data utilized encompasses labor statistics, agricultural areas, farmer productivity, and price indices obtained from the Central Statistical Agency (BPS). The econometric model is articulated as follows:

$$NTP_{it} = \beta_0 + \beta_1 TK_{it} + \beta_2 HK_{it} + Log\beta_3 LP_{it} + \beta_4 PP_{it} + \varepsilon_{it}$$

The regression analysis conducted in this study employed three methodologies: the Common Effects Model (CEM), the Fixed Effects Model (FEM), and the Random Effects Model (REM). CEM amalgamates cross-sectional and time-series data without considering individual unit characteristics, while FEM accounts for unit discrepancies via fixed interception; conversely, REM views these discrepancies as random fluctuations in error terms (Gujarati, 2009). The optimal model selection process utilized the Chow Test to differentiate between CEM and FEM, alongside the Hausman Test to ascertain the preference between FEM and REM. The outcomes of both tests suggest that FEM is the most suitable model for this analysis.

Following the identification of the optimal model, a sequence of classical assumption tests is executed to confirm the appropriateness of the regression model. These tests include the assessment of normality through the Jarque-Bera test, the evaluation of heteroskedasticity using Spearman Rank Correlation, and the examination of multicollinearity via correlation matrices with a threshold of < 0.8. The findings affirm that the model adheres to all essential assumptions. Moreover, a goodness-of-fit assessment is conducted using the F-Test to evaluate the collective effect of the independent variable, the Coefficient of Determination (R^2) to measure the model's explanatory power regarding the variation of the dependent variable, and the T-test to analyze the individual impact of each variable within a partial context.

RESULTS AND DISCUSSION

The estimation of the panel data regression model was conducted using three distinct methodologies: the Common Effects Model (CEM), the Fixed Effects Model (FEM), and the Random Effects Model (REM). The findings from the panel data estimation are illustrated in Table 1.

Table 1. Panel Estimation

Variable	Coefficient		
	CEM	**FEM**	**REM**
C	52,8411	66,4157	55,0391
TK	-0,20134	-0,34761	-0,21129
HK	0,65399	0,57313	0,64229
Log(LP)	-0,1826	0,72310	-0,16405
PP	-0,04863	-0,08865	-0,05235
R^2	0,931021	0.968197	0,928086
Prob F-stat	0.000000	0.000000	0.000000

1) Chow-test
   Cross-section F (25, 100) = 4,675665; Prob. F = 0,000
2) Hausman-test
   Cross-section random $\chi^2(4)$ = 79,202698; Prob χ^2 = 0,000

Source: Author, 2025

Subsequent to the implementation of CEM, FEM, and REM regression analyses, it is essential to conduct two evaluations to ascertain the most appropriate model for estimating

the panel data. First, the Chow Test was executed to distinguish between the chosen CEM and FEM models. Subsequently, the Hausman Test was carried out to assess the dominance of FEM over REM.

Table 1 demonstrates that the probability of a cross-sectional F = 0.000 < α (0.05). Consequently, H0 was discarded, indicating that FEM is a more precise model in comparison to CEM. Additionally, the results of the Hausman Test reveal a random cross-sectional probability of 2 = 0.000 < α (0.05), resulting in the rejection of H0, which signifies that FEM is applied with greater accuracy than REM, thus establishing FEM as the overall preferred model.

Table 2. FEM Regression Estimation Results

$NTP_{it} = 66{,}415 - 0{,}3476TK_{it} + 0{,}5731HK_{it} + 0{,}7231LogLP_{it} - 0{,}0306PP_{it}$			
(0,020) **	(0,000)**	(0,275)	(0,458)
R^2 = 0,9681; Dw-Stat =1,157; F-Stat = 104,97; Sig. F-Stat = 0,000			

Diagnostic-Test

(1) Multicollinearity (*Correlation Matrix*)

TK-TK = 1; TK-HK = -0,4443; TK-lnLP = 0,0650; TK-PP = 0,4557
HK-HK = 1; HK-lnLP = -0,0819; HK=PP = -0,1498
LnLP-lnLP = 1; lnLP-PP = 0,5359
PP-PP =1;

(2) Normality (*Jarque-Bera*)

$\chi^2(2)$ = 0,132 Sig. $\chi^2(2)$ = 0,9356

(3) Heteroscedasticity (*Spearman Rank Correlation*)

TK = 0,5349; HK = 0,4722; lnLP = 0,8897; PP = 0,7263

*Note: *Significant at α = 0.01; **Significant at α = 0.05*

Results from traditional assumption evaluations indicate that the regression model is statistically viable. The Jarque-Bera test produces a probability of 0.9356 (> 0.05), suggesting that the residuals follow a normal distribution. Additionally, an analysis of heteroskedasticity via the Spearman Rank Correlation demonstrates that all variables exhibit probabilities exceeding 0.05, leading to a model devoid of heteroskedasticity. Moreover, the Correlation Matrix illustrates that the correlations among the independent variables remained below 0.8 (with a peak of 0.5359), thereby confirming the absence of multicollinearity. Given the successful execution of these three assessments, the regression model is deemed suitable for further analysis.

Outcomes from the F-test indicated that the statistical probability of F is 0.000, which is lower than α 0.05, signifying that the independent variables, including labor, commodity prices, crop area, and agricultural productivity, collectively have a substantial impact on farmers' exchange rates across 26 provinces in Indonesia. The coefficient of determination (R^2) of 0.9681 indicates that 96.81% of the variability in farmers' exchange rates is accounted for by fluctuations in labor, commodity prices, crop area, and agricultural productivity, while the remaining 3.19% is attributed to other factors not included in this model. As per Table 2, the coefficients identified as statistically significant are β1 and β2, suggesting that the independent variables that significantly influence farmers' exchange rates are labor and commodity prices. Conversely, the harvest area and agricultural productivity exhibited no significant impact.

Discussion

The results of the research indicate that labor has a detrimental and substantial effect on the Peasant Exchange Rate (NTP), which signals the presence of surplus labor conditions from an economic standpoint. This implies that although the agricultural sector possesses the ability to employ a considerable workforce, the low productivity per individual—attributable to technological limitations, labor efficiency, or the quality of human resources—leads to an insufficient rise in real income in relation to the number of workers added, frequently resulting in a decline in NTP. This finding aligns with the conclusions of Zaman et al. (2025), who assert that labor within the agricultural sector has a significant impact on NTP, thereby emphasizing the necessity of enhancing labor quality and productivity through modernization and training to efficiently harness surplus labor economically. Conversely, Erissanti et al. (2021) discovered that labor engagement in the agricultural sector positively influenced NTP, albeit not to a significant degree during pandemic conditions. They emphasize that merely increasing the labor force is inadequate for enhancing farmer welfare; rather, external elements and labor productivity play a pivotal role in determining their contribution to real incomes. Therefore, initiatives aimed at improving farmer welfare should focus on enhancing labor quality, embracing suitable technologies, and optimizing the management of agricultural enterprises to ensure that surplus labor yields maximum economic benefits.

The results of the research reveal that commodity prices have a positive and significant effect on the Farmers' Exchange Rate (NTP). Economically, this suggests that as agricultural product prices rise, farmers' incomes experience a proportional increase, thereby enhancing their purchasing power since income surpasses production costs. Escalating prices for commodities such as grains, corn, or horticultural products aid in stabilizing the real incomes of farmers. This conclusion is supported by the findings of Failla (2022), who demonstrated that increased grain prices resulted in a rise in NTP, alongside the research by Faridah & Syechalad (2016), which indicated that rice prices positively influenced farmers' terms of trade. Similar findings are echoed by Zaman et al. (2025), who contend that grain prices are instrumental in enhancing farmer welfare.

More broadly, the advantageous effect of commodity prices on NTPs accentuates the significance of output markets in shaping farmers' well-being. Higher output prices motivate farmers to boost production and broaden market access, particularly when input costs remain stable, thereby increasing profit margins. This observation is supported by Maria et al. (2023), who determined that variations in staple food prices considerably impact farmers' terms of trade, as well as by Triwidia et al. (2024), who identified that short-term surges in food prices could elevate NTP. Consequently, the stabilization and enhancement of commodity prices represent a crucial strategy for fostering sustainable progress in farmers' welfare.

CONCLUSION

A study conducted across 26 provinces in Indonesia from 2019 to 2023 indicates that the Farmers' Exchange Rate (NTP) is significantly influenced by various economic factors within the agricultural sector. The optimal Fixed Effect (FEM) model reveals that elements such as labor, commodity prices, cultivation area, and farmer productivity collectively exert a notable influence, achieving a coefficient of determination of 0.9681. Notably, labor has demonstrated considerable negative effects, while commodity prices exhibit a significant

positive correlation; conversely, cultivation area and productivity have shown positive yet statistically insignificant impacts on NTPs. These findings highlight the critical importance of price-setting mechanisms and labor efficiency in enhancing farmer welfare. Consequently, it is essential for policies to focus on price stabilization, enhancing product value, and modernizing production techniques to bolster farmers' competitiveness. Further research is advised to incorporate variables such as inflation, subsidies, and access to financing, as well as to extend the data timeframe to deepen the analysis.

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