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THE IMPACT OF ECONOMIC INDICATORS ON FARMERS' WELFARE IN TWO LEADING COFFEE-PRODUCING PROVINCES

Maria Michelle, Khusnul Khatimah*
Faculty of Economics and Business, Universitas Pembangunan Nasional Veteran Jakarta, Jakarta, Indonesia
*Corresponding author: khusnul@upnvj.ac.id

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ABSTRACT

Indonesia's economy heavily depends on the agricultural sector, especially plantation crops, and the Farmers' Terms of Trade (NTP) are frequently used to gauge the welfare of farmers. South Sumatra and Lampung are the two provinces that produce the most coffee, yet their welfare dynamics do not always match their production dominance, suggesting a possible disconnect between output performance and farmer welfare. Using panel data from 2015 to 2023, this study attempts to investigate how sectoral GRDP, inflation, and coffee production affect Plantation Farmers' Terms of Trade (NTPB). A panel regression approach with high-frequency data is employed to better capture short-term welfare dynamics in leading coffee-producing regions, with the Common Effect Model identified as the most appropriate specification. The findings demonstrate that NTPB is significantly positively impacted by both GRDP and inflation. The beneficial impact of inflation should be read cautiously, too, since it probably represents price rises for agricultural commodities rather than general gains in buying power. Contrarily, coffee productivity has a negative and statistically negligible impact, suggesting that higher output does not always translate into improved farmer welfare. These findings reveal a structural discrepancy between production performance and welfare outcomes, suggesting that price dynamics and overall economic conditions have a greater impact on farmer welfare than productivity alone.

1. INTRODUCTION

Welfare reflects a condition in which human needs are fulfilled in a balanced and high-quality manner, encompassing not only economic aspects but also physical, social, and emotional dimensions (Lecouteux, 2021). In the context of national development, improving public welfare is a key indicator of inclusive and sustainable development, as mandated by Article 28H paragraph (2) of the 1945 Constitution of the Republic of Indonesia. In line with the evolution of development paradigms, scholars emphasize the importance of sustainable and equitable economic growth in enhancing long-term societal welfare. Regional development success is therefore not solely measured by economic growth achievements but also by its capacity to reduce income disparities and strengthen economic structures that support overall welfare (Rosmadayanti et al. (2021) in Sultan et al. (2023).

In rural and agricultural contexts, welfare is closely related to a region's ability to ensure economic security through adequate resource availability, access to income-generating opportunities, and effective utilization of resources (Juliannisa et al., 2025). Therefore, market access and institutional circumstances that allow households to convert economic activity into sustainable living standards are just as important to welfare gains as production capability. As a result, welfare-oriented development, especially for rural populations, needs to show consistent and equitable improvement. As the international framework for sustainable development through 2030, the Sustainable Development Goals (SDGs) represent global commitments that are in line with welfare-oriented development. These frameworks stress that the ability of development to improve living standards, lessen inequality, and bolster economic justice across regions should be taken into consideration in addition to strong economic growth. According to Kementerian PPN/Bappenas (2025), Indonesia's national development policy framework incorporates this global commitment through the National Medium-Term Development Plan (RPJMN) 2025–2029 as the first stage of socio-economic transformation toward sustainable welfare and the National Long-Term Development Plan (RPJPN) 2025–2045, which envisions Indonesia Emas 2045.

In this perspective, the agricultural sector—especially in rural areas—plays a crucial role in advancing welfare. The Farmer Exchange Rate (Nilai Tukar Petani/NTP) is frequently used to gauge the well-being of farmers, who are important players in the agricultural industry. NTP, or the ratio of the price index that farmers receive to the price index that they pay, represents their purchasing power over output expenses and consumption requirements (Pusat Data dan Sistem Informasi Pertanian, 2024). The most significant agricultural subsectors in Indonesia's agricultural economy are plantation crops, which significantly boost GDP and exports. Coffee in particular contributes significantly to rural livelihoods, with over 1.8 million farming households and a substantial export value of USD 1,624.1 million in 2024 (BPS Indonesia, 2025).

The welfare dynamics of farmers in South Sumatra and Lampung do not always match theoretical predictions, notwithstanding their dominance in production. The two primary hubs of the country's coffee production are usually identified as South Sumatra and Lampung Provinces. Geographical and agroclimatic factors that are ideal for robusta coffee production underpin these areas' comparative advantage. While Lampung also demonstrates excellent agroclimatic appropriateness for robusta coffee development (Sarvina et al., 2022), stable rainfall and temperature patterns in South Sumatra facilitate flowering and fruiting processes (Whibowo et al., 2024). These features allow both provinces to reflect more general dynamics of Indonesian coffee farmer wellbeing. Increases in output and sectoral economic growth are predicted to enhance wellbeing from the standpoint of welfare economics by increasing economic agents' income and purchasing power. Empirical findings in these areas, however, seem to indicate otherwise. South Sumatra continuously records the largest coffee production in Indonesia, according to Indonesian Coffee Statistics 2023 released by BPS Indonesia (2024). Its Plantation Farmers' Terms of Trade (NTPB) are still lower and less stable than Lampung's, indicating a disconnect between farmer welfare and production success. This implies that improved farmer welfare is not a direct consequence of higher output and improved regional economic performance.

Numerous macroeconomic and microeconomic economic factors have an impact on farmer welfare and farmer exchange rates, according to prior studies. Welfare and income are impacted by farmer characteristics, output prices, land size, and production efficiency, according to micro-level study (Mailumo et al., 2024; Rahayu et al., 2023; Suratman & Nurbaiti, 2022). Although the direction and importance of these interactions differ by location, macroeconomic and time-series studies reveal that changes in NTP are linked to inflation and agricultural GDP (Indah et al., 2023; Marsudi et al., 2020; Sinaga et al., 2022). However, current research shows contradictions, especially when it comes to how productivity affects farmer welfare. While some research indicates negative or negligible effects, others report that increases in productivity have a beneficial impact on NTP (Purnomo & Savikri, 2021; Triwidia et al., 2024). These discrepancies show that, particularly in

times of price instability and growing production costs, higher production does not always equate to better wellbeing.

A thorough analysis that encompasses both cross-regional and temporal dynamics is also absent because previous research has typically been restricted to single regions, certain time periods, or time-series methodologies. Therefore, there is still a glaring research deficit when it comes to integrating panel data with higher-frequency observations to examine farmer welfare in key coffee-producing regions. Given this background, the study's goal is to investigate how the farmer exchange rate of the plantation subsector in the provinces of South Sumatra and Lampung is impacted by the Gross Regional Domestic Product (GRDP) of the agricultural, forestry, and fishing sectors, inflation, and coffee productivity.

2. RESEARCH METHODS

This study uses panel data and a quantitative methodology to investigate the effects of Gross Regional Domestic Product (GRDP) in the agriculture, forestry, and fisheries sectors, inflation, and coffee productivity on the Plantation Farmers' Terms of Trade (NTPB) in South Sumatra and Lampung Provinces between 2015 and 2023. Panel data allows the methodology to capture both temporal dynamics and cross-regional variance. All variables are transformed to natural logarithms in order to stabilize variance and facilitate the comprehension of elasticity. Panel data regression is used to determine the relationship between the dependent and independent variables (Basuki, 2021). The econometric model formulation is as follows:

$$NTPB_{it} = \beta_0 + \beta_1 PDRB_{it} + \beta_2 INF_{it} + \beta_3 PROD_{it} + \varepsilon_{it} \quad \text{.....(1)}$$

Description :
NTPB : Plantation Farmers' Terms of Trade (Index)
β_0 : Constanta
$\beta_1\beta_2\beta_3$: Coefficient of Independent Variables
PDRB : Gross Regional Domestic Product (GRDP) of the Agricultural, Forestry, and Fisheries Sector (Rupiah)
INF : Inflation (%)
PROD : Coffee Productivity
ε : Error term
i : South Sumatera and Lampung Provinces
t : Time (2015-2023)

The Chow, Hausman, and Lagrange Multiplier (LM) tests are used to determine the optimal panel data specification. These tests are designed to evaluate the presence of individual effects and compare various panel data models based on statistical criteria. To ensure the accuracy of the estimates, several diagnostic tests are performed, including autocorrelation, multicollinearity, and heteroscedasticity tests. These tests are used to assess if the classical regression assumptions are satisfied and to confirm that the calculated coefficients are unbiased and consistent. Overall, the results indicate no serious violations of these assumptions.

3. RESULTS AND DISCUSSION

3.1. RESULTS

To stabilize data volatility, lessen heteroscedasticity, and increase the robustness of the estimate findings, certain variables are converted into natural logarithmic form (ln) prior to model estimation (Basuki, 2021). The Common Effect Model (CEM) is the best specification, according to model selection tests such as the Chow, Hausman, and Lagrange Multiplier tests. This implies that the model may be estimated with homogenous assumptions because cross-sectional heterogeneity between provinces is not statistically significant.

Table 1. Table of Regression Estimation

Variable	Coefficient	t	P>|t|
LN_PDRB	0.3080206	6.18	0.0000
INF	0.0434575	2.16	0.0032
LN_PROD	-0.0025045	-0.53	0.6000
cons	1.966819	4.67	0.0000
F(3,212)			14.22
Prob>F			0.0000
R-squared			0.1675
Adjusted R-squared			0.1557

Source: Processed data (2025)

The results of the simultaneous test (Table 1) show that the regression model is statistically significant at the five percent significance level, with a Prob>F value of 0.0000 < 0.05. This indicates that the GRDP of agriculture, forestry, and fisheries, inflation, and coffee productivity have a substantial impact on the Farmers' Terms of Trade in the plantation subsector (NTPB). However, the model only explains 16.75% of the variation in NTPB, indicating weak explanatory power, according to the R-squared value of 0.1675. This implies that farmer wellbeing is affected by a broader range of factors not covered by the model, such as supply chain dynamics, market access, and governmental regulations. The relatively low explanatory power reflects the difficulty of calculating welfare, particularly when using aggregate macroeconomic parameters. According to Wooldridge, a low R-squared is not always a problem if the coefficients exhibit the expected signals and are statistically significant. According to Ozili (2023), R-squared values between 0.10 and 0.50 may still be considered acceptable when some or most of the independent variables are significant.

3.2. DISCUSSION

The estimation results indicate that GRDP in the agricultural, forestry, and fisheries sectors has a favorable and significant impact on Farmers' Terms of Trade for the plantation subsector in South Sumatra and Lampung Provinces. This indicates that improvements in welfare are not solely driven by increases in total production, even though increases in sectoral output and value added can boost income prospects. However, the effect's magnitude is still limited. Theoretically, this result is consistent with Graaff's welfare economics paradigm, which emphasizes how increases in overall output generate social surplus that enhances purchasing power and societal wellbeing, including the welfare of farmers (Lecouteux, 2021). The increase in agricultural GRDP in both provinces can be empirically attributed to several programs aimed at supporting the coffee plantation subsector. By supplying superior seedlings and production inputs, the Gerakan Sejuta Batang Sambung Pucuk initiative in South Sumatra has helped to revitalize plantations and increase productivity (Liska et al., 2023; Rosiana, 2021). In the meantime, Lampung Province has improved output and value added in the plantation sector through the implementation of agricultural innovations, plantation rejuvenation, and coffee downstream development (Dinas Perkebunan Provinsi Lampung, 2023). Alongside advancements in NTPB, these dynamics have promoted regional economic growth.

The second hypothesis is supported by the fact that inflation significantly and favorably affects NTPB in the provinces of South Sumatra and Lampung. This result implies that farmer welfare is not always decreased by inflation. According to the Marxian viewpoint, producers can capture more surplus value when they operate as sellers of output and output prices rise faster than input costs (Jintar et al., 2023). Regional economic dynamics empirically demonstrate the positive association between inflation and NTPB. Due to increased prices of key plantation commodities brought on by worldwide shocks, especially the crisis between Russia and Ukraine, South Sumatra's inflation spike in 2022 was accompanied by an increase in NTPB (Prasetyo et al., 2024). Higher output prices created windfall advantages for farmers

in this important plantation commodity export region, allowing them to counteract growing production and consumption expenses. Similar trends can be seen in Lampung, where, despite continuous global price volatility, inflation increases during specific periods coincided with increased NTPB after coffee production recovered following the El Nino phenomena.

Contrary to theoretical assumptions and earlier empirical findings, coffee productivity has a negative and minimal impact on NTPB in the provinces of South Sumatra and Lampung. As a result, the third hypothesis (H_3) is not supported by any evidence. This study suggests that more physical productivity does not always translate into greater purchasing power for farmers, particularly when market and structural limitations persist. Due to unfavorable pricing dynamics, pressure from the international market, and structural inefficiencies in the value chain, the transfer of production increases into farmer income was limited in both provinces (Agustin, 2025; Marlina et al., 2021). This outcome contradicts Graaff's welfare economics theory, which maintains that increased aggregate output should result in societal surplus and enhance welfare. Instead, the results are more consistent with the Marxian inequality theory, which argues that producers in primary sectors do not necessarily instantly benefit from increases in output. Value chain controllers and downstream players absorb value generated, but productivity rises without strengthening farmers' negotiating position could lead to price deflation because of excess supply (Pangestuty, 2021). In oligopsonistic coffee markets, where productivity alone is insufficient in the absence of institutional and market assistance, this scenario exemplifies the vulnerable position of smallholder producers. Similar trends are seen by Azrimultiya et al. (2025), who argue that Indonesian agricultural industries frequently operate under oligopsonistic market systems, limiting producers' bargaining power and preventing them from influencing output prices.

Prior to 2025, South Sumatra primarily relied on Lampung as its main export gateway due to insufficient local export infrastructure and logistics capacity (Agustin, 2025). Due to this export reliance, farmers received lower farm-gate prices even as output levels climbed. This resulted in higher handling, shipping, and transaction costs that were absorbed throughout the marketing chain. Rising rural inflation further diminished farmers' purchasing power by causing the price index they paid to increase faster than the price index they received.

Lampung's agricultural area has been steadily declining due to land conversion and increasing competition for non-agricultural uses. When land availability decreases, improvements in production efficiency are often offset by rising input intensity and rising costs per unit of output, which lowers net farmer income. Furthermore, a study carried out in South Lampung Regency by Juliannisa et al. (2022) reveals structural constraints in the agricultural labor market, wherein the current number of farmers and farm laborers could not be accommodated by the amount of available agricultural land, which was made worse by a lack of human resource capacity in land management. Farmers' welfare was thus further compromised despite productivity gains as farmers and agricultural workers found it difficult to find alternative employment and cultivate land effectively.

Beyond price and quality considerations, structural issues further strengthen the negative relationship between productivity and farmer welfare. However, uneven value chain structures, inadequate downstream processing at the farm level, and restricted grading capacities harm farmers' bargaining power in both provinces (Juliannisa et al., 2025). These differences demonstrate that productivity increases by themselves cannot raise farmer welfare in the absence of price stability, enhanced quality, and stronger institutional and value chain support.

Furthermore, the simultaneous significance of GRDP in the agricultural, forestry, and fisheries sectors, inflation, and coffee production indicates that farmer welfare is shaped by a combination of sectoral and macroeconomic factors rather than a single determinant. This finding suggests that the well-being of plantation farmers is not determined by a single economic indicator, but rather by a range of macroeconomic and sectoral factors operating

within the regional economic system. Economically speaking, agricultural GRDP reflects the amount of productive activity and value generated, which might raise farmers' earning potential. Since inflation impacts the stability of consumption and production input costs, it has a direct effect on farmers' purchasing power. Meanwhile, coffee productivity, which reflects agricultural efficiency and capacity, impacts potential output and profitability.

Since NTPB essentially reflects the balance between prices received and prices paid by farmers, their combined effect on NTPB becomes important when these variables interact simultaneously. This result is in line with Graaff's welfare economics paradigm, which highlights that price stability, the distribution of economic gains that result in net social benefits, and production efficiency all influence social welfare (Sen et al., 2020). As a result, policies intended to enhance farmer welfare must to be developed holistically, including the connections between sectoral productivity, price dynamics, and regional economic growth. However, these findings should be interpreted cautiously due to the model's comparatively low explanatory power. A large portion of the variation in NTPB is likely caused by a number of factors, including supply chain design, institutional support, market access, and government laws. Furthermore, endogeneity issues cannot be totally excluded out because some explanatory variables may be determined concurrently with farmer welfare.

4. CONCLUSION

This study indicates that multiple economic factors, rather than a single one, affect the welfare of plantation farmers in South Sumatra and Lampung. Inflation and agricultural GRDP both positively assist farmers' purchasing power, highlighting the importance of macroeconomic conditions in welfare outcomes. However, coffee productivity does not significantly improve wellbeing, indicating a systemic mismatch between farmer income and production performance due to weak bargaining power, rising costs, and inefficiencies in the value chain. This study contributes to the body of knowledge by demonstrating that price dynamics and structural determinants have a higher impact on farmer welfare than productivity alone through the presentation of panel-based data from important coffee-producing regions.

From a policy perspective, improving farmer wellbeing requires strengthening institutional and market systems rather than focusing solely on increasing output. Value chain integration, post-harvest processing, and cooperatives must all be strengthened in order to increase value added and bargaining power. Policies pertaining to land conversion control and price stabilization are necessary for sustainability. This study has limits, though, as the model's relatively low explanatory power suggests the presence of other important factors, such as market access and governmental regulations. Furthermore, because potential endogeneity issues cannot be totally ruled out, the results should be interpreted as associative rather than absolutely causative. This will enable additional factors and other approaches to be included in future research.

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