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Assessing the Internal and External Factors Influencing Farmers' Welfare

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Abstract. *Farmer welfare is indicated by the level of purchasing power, which is calculated based on the ratio between the price index received from agricultural products and the price index paid for household consumption and production inputs. This study aims to analyze the internal and external factors influencing farmers' welfare in Kutai Kartanegara Regency. The research data is primary and secondary data with a mixed method. The analysis was conducted using multiple linear regression to identify the factors that significantly affect farmers' welfare. The results show that income, commodity prices, household consumption, and agricultural input costs are significant determinants of farmers' welfare. Income and commodity prices have a positive effect, while agricultural input costs have a negative effect. The coefficient of determination (R^2) values of 81.70% for the food crop subsector and 64.67% for the plantation subsector indicate that these variables explain a large portion of the variation in farmers' welfare in the study area. Increased income increases welfare, but if consumption expenditure and input costs increase more than the increase in income, then farmer welfare will actually decrease. There is a need for policies to stabilize agricultural product prices, reduce production costs, and increase farmer productivity in Kutai Kartanegara Regency by strengthening market access, providing affordable inputs, and implementing technology and training so that agricultural products have added value and farmer welfare increases.*

Keywords: *Farmers' welfare, Food crops, Internal and external factors, Kutai Kartanegara, Plantation*

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INTRODUCTION

Farmer welfare plays a crucial role in achieving sustainable agricultural development. It reflects the social and economic well-being of rural communities and determines the resilience of food systems. A prosperous farming population is more likely to adopt sustainable practices, invest in productivity-enhancing technologies, and maintain the continuity of agricultural production. In Indonesia, where agriculture remains a major livelihood source, improving farmer welfare is fundamental not only for poverty reduction but also for ensuring long-term food security and rural stability (FAO, 2023; BPS, 2024). The welfare of farmers is influenced by a combination of internal and external factors. Internal factors include individual characteristics such as education level, farming experience, access to information, and capacity to adopt technology. These aspects determine the efficiency and adaptability of farmers in facing dynamic agricultural challenges. External factors, on the other hand, relate to broader structural and institutional conditions—such as market access, government support programs, infrastructure quality, and fluctuations in input and commodity prices (Susilowati, 2020; Daulika et al., 2025). The interaction between these two groups of factors shapes farmers' income stability, production performance, and overall livelihood quality.

Despite the numerous studies exploring farmer welfare in Indonesia, previous research often lacked a comprehensive integration of both internal and external determinants, or focused narrowly on income indicators without linking them to policy implications or regional characteristics. This research seeks to fill that gap by simultaneously analyzing multiple socio-economic and institutional variables affecting welfare, with specific attention to the local agricultural context. Kutai Kartanegara Regency, located in East Kalimantan, serves as an important agricultural center in the province. The region's economy relies heavily on oil palm, rice, and horticultural commodities, which support both rural livelihoods and regional food supply chains. However, fluctuating commodity prices, increasing input costs, and limited access to agricultural financing continue to challenge farmer prosperity. In 2024, for instance, the regency's agricultural GDP growth slowed compared to other sectors, signaling structural imbalances between productivity gains and income distribution (BPS Kukar, 2025).

Therefore, this study aims to analyze internal and external factors influencing farmer welfare in Kutai Kartanegara Regency, focusing on key variables such as household income, commodity prices, consumption levels, and input costs across dominant subsectors like rice and oil palm farming. The findings are expected to provide evidence-based recommendations for improving farmer welfare through enhanced productivity, cost efficiency, and market stabilization. Ultimately, the research contributes to regional policy formulation aimed at building a more equitable and resilient agricultural system—one that supports inclusive economic growth and strengthens food security in East Kalimantan. This study also seeks to contribute to the formulation of more sustainable and inclusive agricultural policies that can support farmer welfare and strengthen regional food security. Therefore, identifying the factors affecting farmers' welfare in Kutai Kartanegara is crucial for developing strategic actions that promote a resilient and competitive agricultural sector in the region.

LITERATURE REVIEW

Definition and Concept of Farmers' Welfare

Farmers' welfare essentially encompasses the overall economic condition of a farming household, which includes income, expenditure, asset ownership, access to services, livelihood stability, and general quality of life. In other words, it reflects the ability of farmers to meet their basic needs and maintain a decent standard of living from their agricultural activities. For example, a study conducted in Indonesia by Maridjo & Mudayen (Affecting Factors Farmer Welfare in Indonesia) found that variables such as land area, labor allocation, and the percentage of owned land significantly influence farm income, which subsequently contributes to improving farmers' welfare. A clear understanding of the concept of "welfare" is crucial, as both internal and external factors influence it through various mechanisms such as income generation, access to resources, production conditions, and institutional support.

Internal Factors Affecting Farmers' Welfare

Internal factors refer to the individual characteristics of farmers or their households, including age, education level, farming experience, motivation, production capacity, technological proficiency, land ownership, and farm scale. Several studies have shown the importance of these factors. For instance, Maridjo & Mudayen

identified that the percentage of land owned and the allocation of labor positively affect farmers' welfare in Indonesia. Meanwhile, research on women farmers' participation in Bogor by Pratiwi, Baga, and Yusalina revealed that internal factors such as age, farming experience, and household decision-making have a significant relationship with farmers' participation. In the case of clove farmers in Maluku, internal factors like age, education, motivation, and business scale were found to positively influence entrepreneurial behavior, which in turn improved business performance.

Theoretically, internal factors such as education and farming experience enhance the human capital of farmers, enabling them to be more productive, make better decisions, adopt innovative technologies, and ultimately improve their welfare and livelihood sustainability.

External Factors Affecting Farmers' Welfare

External factors refer to conditions beyond the direct control of farmers but that significantly influence their welfare. These include government policies, access to credit, technology, and markets, infrastructure quality, market conditions, commodity prices, local institutions, social environment, institutional support, and macroeconomic factors. In the study conducted by Maridjo & Mudayen, high production costs—considered as an external factor—had a negative impact on farmers' welfare. Similarly, research by Fadlan, Lubis, and Tarigan on rice farmers in Klambir V Kebun Village found that land area, capital, and commodity prices were key determinants of farmers' welfare. In another study concerning farmers' perceptions of agricultural extension performance, external factors such as access to extension services, institutional support, non-formal education, and external extension conditions were also found to have significant influence.

External factors operate through several mechanisms, such as expanding market access, reducing production or transaction costs, improving infrastructure and technology, and enhancing institutional support. These factors ultimately affect farmers' productivity, income, and socio-economic stability. Improved access to markets and technology, for instance, can help farmers optimize production and reduce dependency on traditional methods, leading to higher efficiency and competitiveness.

Interrelation and Mechanism of Influence

Internal and external factors do not function in isolation; instead, they interact and reinforce each other in determining farmers' welfare. For example, farmers with higher education levels (an internal factor) are often better able to utilize access to credit, technology, or market opportunities (external factors). The mechanism linking these factors to welfare can be described through a sequential process: agricultural productivity → farm income → household expenditure, investment, and asset accumulation → overall quality of life. External factors can enhance productivity or reduce cost-related barriers, thereby amplifying the impact of internal factors.

Several studies have shown that although external factors are vital, internal factors often play a more dominant role in determining farmers' responses to external conditions. For instance, research on youth farmers in Lebakwangi revealed that internal factors such as motivation and personality were more significant than external ones in influencing young people's interest in agriculture. From a methodological perspective, most studies in this field rely on cross-sectional data and quantitative survey methods, which pose limitations in establishing causal relationships between internal and external factors and farmers' welfare. Future research employing longitudinal or mixed-method approaches is recommended to better capture the dynamic interactions among these factors and their long-term effects on rural livelihoods.

Key Findings and Policy Implications

Strengthening farmers' internal resources—such as through education, training, and the development of farmer groups—plays a crucial role in enhancing their capacity to take advantage of favorable external conditions. Improving human capital enables farmers to better adopt new technologies, manage their resources efficiently, and respond effectively to market changes. On the other hand, effective external policies are equally important, particularly those that ensure fair commodity prices, reduce production costs (including input and labor costs), improve infrastructure, and expand access to markets, credit facilities, and agricultural extension services. These policies can create an enabling environment that supports farmers' productivity and long-term welfare.

An integrative approach that combines internal capacity building with external policy interventions is considered the most effective strategy for improving farmers'

welfare. By linking micro-level (farmer) improvements with macro-level (policy and institutional) support, the agricultural system can achieve both economic resilience and social sustainability. Moreover, it is essential to have accurate and multidimensional measurements of farmers' welfare—covering income, consumption, assets, and quality of life—to ensure that research findings translate into actionable policy implications.

Future research should consider using panel or longitudinal data to better capture the dynamics of farmers' welfare over time and identify causal relationships between internal and external factors. Such approaches will provide deeper insights into how different interventions affect farmers' livelihoods and guide policymakers in designing more targeted and sustainable agricultural development programs.

RESEARCH METHODS

Research Location and Time

This study was conducted in Kutai Kartanegara Regency, East Kalimantan Province, over a four-month period. The area was chosen because it represents one of the province's key agricultural regions with both food crops (rice) and plantation commodities (oil palm) contributing substantially to rural livelihoods and regional food security.

Sampling locations were selected based on dominant commodity types:

- Rice: Marangkayu, Muara Badak, Loa Kulu, Tenggarong, Tenggarong Seberang, Sebulu, Muara Kaman, Kota Bangun, and Samboja.
- Oil Palm: Muara Badak, Sebulu, Muara Kaman, Kota Bangun, and Kembang Janggut.

This classification enables comparative analysis between the food crop and plantation subsectors, providing insights into how different production systems and market mechanisms affect farmer welfare.

Types and Sources of Data

The data used in this study consist of both primary and secondary data. The primary data were collected through field surveys using structured questionnaires administered to farming and plantation households within the selected sample areas (Daulika et al., 2024). The study utilized both primary and secondary data. Primary data were obtained through structured questionnaires and direct interviews with farming households in the selected areas. Respondents were proportionally drawn from the two

main subsectors rice and oil palm using proportional random sampling to ensure representation of each sub-district and commodity type. Secondary data were collected from the Central Statistics Agency (BPS, 2024), the Department of Agriculture, and relevant institutional reports and literature. A total of 165 respondents were determined using the Slovin formula with a 10% margin of error, following: (Daulika et al., 2025).

$$n = \frac{N}{1 + Ne^2}$$

Note:

n : Sample size to be determined

N : Total population size

e : Level of error or margin of error determined

Data Analysis

The determinants of farmer welfare ($\hat{Y}$) were analyzed using multiple linear regression, estimated separately for food crop and plantation subsectors to identify distinct behavioral patterns. The regression model is expressed as:

$\hat{Y} = a + b1X1 + b2X2 + b3X3 + b4X4 + e$

Where:

$\hat{Y}$: Farmers' Welafre

a : Intercept (constant)

$b_1 \ldots b_4$: Regression coefficients for each independent variable

X_1 : Household consumption (Rp)

X_2 : Income (Rp)

X_3 : Commodity prices (Rp)

X_4 : Agricultural input costs (Rp)

e : Error

Model Evaluation

R-Squared Test dan F Test

Three key tests were applied:

1. **Coefficient of Determination (R^2)**

   R^2 measures how well independent variables explain variations in farmer welfare. Values closer to 1 indicate better model fit. For clarity, each regression table includes R^2, F-statistic, and significance levels directly below the table.

2. **F-Test (Simultaneous Test)**

   Used to assess whether all independent variables jointly influence welfare.

   $\mathbf{H_0}$: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$ (no joint influence)

   $\mathbf{H_1}$: at least one $\beta \neq 0$ (significant joint influence)

   The model is accepted when *p-value (F-statistic)* < *α (0.05)*, confirming overall model validity.

3. **t-Test (Partial Test)**

   Evaluates the significance of each independent variable. A variable significantly affects welfare if |*t-statistic*| > *t-table* at $\alpha = 0.05$.

Interpretation Approach

Beyond reporting statistical significance, the interpretation emphasizes economic reasoning and policy relevance:

- Negative coefficients (e.g., household consumption and input costs) are discussed in terms of their economic implications**,** showing how higher expenses reduce disposable income and welfare.
- Positive coefficients**,** such as income and commodity prices, are interpreted in relation to market incentives and productivity improvements.
- Differences between rice and oil palm subsectors are analyzed based on market characteristics—rice being more price-sensitive to government interventions (e.g., floor prices, subsidies), while oil palm relies on export demand and private mill pricing.

Link to Policy and Extension

The analytical results provide practical implications for:

- Local government policies**,** by identifying which economic levers most influence farmer welfare (e.g., price stabilization, input subsidies).
- Agricultural extension programs**,** by highlighting internal capacity factors (education, technology adoption) that improve household resilience.
- Regional development planning**,** particularly in aligning farmer welfare strategies with food security goals and sustainable agricultural policies in East Kalimantan.

RESULTS AND DISCUSSION

Regression Results

This section serves as one of the objectives of this study. This study aims to examine how factors (household consumption, income, commodity prices, and agricultural input costs) influence the exchange rate for farmers in Kutai Kartanegara. The estimated regression coefficients, along with the significance values of each variable for the food crops (rice) and plantations (oil palm) subsectors, are presented in Tables 1 and 2.

Table 1. Food Crop Regression Results

Variabel	Urban				Information
	Coefficient	Std. Error	T statistic	Sig.	
Householsd Consumption (X1)	-.0023639	.0001391	-17.00	0.000	Significant
Income (X2)	.0022699	.0001382	16.42	0.000	Significant
Commodity Price (X3)	-.1558088	.1869815	-0.83	0.407	No Significant
Agricultural Input Costs (X4)	-.0025599	.0002019	-12.68	0.000	Significant
R Square					0.8170 = 81.70 %
F F Statistic > F table				sig.	0,000 89.28 > 2.46 Significant effect
T table					1.98

Table 2. Plantation Regression Results

Variabel	Urban				Information
	Coefficient	Std. Error	T statistic	Sig.	
Householsd Consumption (X1)	-.000397	.0001025	-3.87	0.000	Significant
Income (X2)	.0003489	.0000471	7.40	0.000	Significant
Commodity Price (X3)	5.337209	7.271292	0.73	0.468	No Significant
Agricultural Input Costs (X4)	-.0004333	.0000735	-5.89	0.000	Significant
R Square					0.6467 = 64.67 %
F F Statistic > F table				sig.	0,000 16.94 > 2.53 Significant effect
T table					2.00

Source: Data processing and processing with the Stata program, 2025
* : Significance level 0.05 (5%)

Based on the estimation results in Table 1 and Table 2, the multiple linear regression equation for the farmer's welfare of rice and oil palm in Kutai Kartanegara Regency can be written as follows.

Y= 106.3938 – 0.0023639 X1 + 0.0022699 X2 - 0.1558088 X3 - 0.0025599 X4 + e

Y= 101.2401 – 0.000397 X1 + 0.0003489 X2 + 5.337209 X3 - 0.0004333 X4 + e.

Household Consumption (KRT/X1)

The regression results show that household consumption negatively affects Farmer's welfare in both subsectors, with coefficients of –0.00236 (food crops) and –0.00039 (plantations). This implies that as household consumption increases by one unit, farmer welfare decreases by 0.0023 and 0.00039, respectively, assuming other variables remain constant. This relationship reflects the economic reality that higher consumption leads to increased household expenditures without necessarily being offset by higher farm income. Consequently, farmers allocate a larger share of income to non-productive spending, reducing their capacity to reinvest in agricultural production. This result aligns with the findings of Koylal (2023), who reported that increased household consumption negatively influences farmers' exchange rates, particularly when the prices paid by farmers (Ib) rise faster than the prices received (It).

Income (P/X2)

The income coefficient (X2) in this model is 0.0022699 for food crops and 0.0003489 for plantations. This means that every 1 unit increase in income will increase the farmer's welfare by 0.00227 for food crops and 0.00034 for plantations, assuming other variables remain constant. The interpretation is that the higher the income received by farmers (for example, from the sale of crops), the better their exchange position for consumed goods/services. The results of this study also align with research conducted by Ramdhani, H (2015). Farmers' income increases more than their expenses, thus improving their welfare compared to before. This is because the amount of income generated from farmers' harvests significantly affects the farmer's welfare. If income increases, it will meet farmers' needs and even leave some for savings. Once this is met, the farmers' exchange value will increase.

Commudity Price (HK/X3)

The coefficient value of Commodity Prices (X3) in this model is -0.1558088 for food crops and 5.337209 for plantations. This means that every 1 unit increase in

commodity prices actually decreases the farmer's welfare by 0.1551 for food crops but increases it by 5.337, assuming other variables remain constant. The interpretation of the negative results in the commodity price variable for food crops could be caused by the difference between the prices of commodities sold by farmers and the prices of the necessities they purchase. If commodity prices increase but input and consumption costs increase higher, then the farmer's welfare still decreases. Meanwhile, higher palm oil selling prices have a direct and significant impact on increasing the exchange rate for palm oil farmers, because their income increases substantially, Asdi, R, Z., et. al (2025). The results of this study are also consistent with research conducted by Aulia S, (2021) which states that the rice price variable has a negative effect on the farmer's welfare. This means that when rice prices rise—while production costs remain constant or also increase—farmers' exchange rates decrease.

Agricultural Input Costs (BI/X4)

The coefficient value for Agricultural Input Costs (X4) in this model is -0.0025599 for food crops and -0.0004333 for plantations. This means that every 1 unit increase in input costs will reduce the farmer's welfare by 0.00256 for food crops and 0.00043 for plantations, assuming other variables remain constant. The interpretation is that increasing prices of fertilizers, seeds, pesticides, and other inputs suppress farmers' profits, resulting in a decline in their exchange rate. The results of this study also align with research conducted by Marsudi et al. (2020) and Nirmala et al. (2016), which explain that fertilizer prices have a negative and significant effect on the farmer's welfare in South Sulawesi Province, Aceh Province, and Jombang Regency. Rising prices for medicines and fertilizers will contribute to an increase in Ib.

Uji R-Squared and Uji F

The coefficient of determination is used to measure the extent to which variable X explains variable Y in the model. The estimation results show that the $R2$ value in the model is 0.8170, or 81.70%, for food crops and 0.6467, or 64.67%, for plantations. This means that changes in variable x (household consumption, income, commodity prices, and agricultural input costs) in this model can explain 81.70% and 64.67% of variable y (the exchange rate of food crops and plantations in Kutai Kartanegara), while the remaining 18.3% and 35.33% are explained by other factors outside the model not used in this study.

The F test will be used to determine the x variables' ability to explain variable Y. Statistical testing using the Stata program obtained F significance values of 0.000 and 0.000 in this study. Where the calculated F for food crops > F table, namely 89.28 > 2.46. Then the calculated F of plantations > F table, namely 16.94 > 2.53. This means that the five independent variables used (household consumption, income, commodity prices and agricultural input costs) can influence the exchange rate of food crop and plantation farmers in Kutai Kartanegara.

T Test

Household Consumption (KRT/X1)

The nominal t-value for Household Consumption of Food Crop Farmers (X1) of food crops is 0.000. These results are in accordance with the t-value table in the t-table, $\alpha = 0.05$, df = 98, the t-value table is 1.98. It is known that the t-value for X1 (17.00) > t-table, so Ho is rejected, meaning that household consumption (X1) partially has a significant effect on the exchange rate of food crop farmers in Kutai Kartanegara. The nominal t-value for Household Consumption of Plantation Farmers (X1) of plantations is 0.000. These results are in accordance with the t-value table in the t-table, $\alpha = 0.05$, df = 57, the t-value table is 2.00. It is known that the t-value for X1 (3.87) > t-table, so Ho is rejected, meaning that household consumption (X1) partially has a significant effect on the exchange rate of plantation farmers in Kutai Kartanegara.

Income (P/X2)

It is known that the nominal t count for Income of Food Crop Farmers (X2) is 0.000. The nominal t table result, $\alpha = 0.05$, df = 98, the t table value is 1.98. It is known that the t count for X2 (16.42) > t table, then Ho is rejected, meaning that income (X2) partially has a significant effect on the exchange rate of food crop farmers in Kutai Kartanegara. The nominal t count value for Income of Plantation Farmers (X2) is 0.000. These results are in accordance with the t count table in the t table, $\alpha = 0.05$, df = 57, the t table value is 2.00. It is known that the t count for X2 (7.40) > t table, then Ho is rejected, meaning that income (X2) partially has a significant effect on the exchange rate of plantation farmers in Kutai Kartanegara.

Commudity Price (HK/X3)

It is known that the nominal t count for Commudity Price of Food Crop Farmers (X3) is 0.407. The nominal t table result, $\alpha = 0.05$, df = 98, the t table value is 1.98. It is

known that the t count for X3 (0.83) < t table, then Ho is accepted, meaning that commodity prices (X3) partially do not have a significant effect on the exchange rate of food crop farmers in Kutai Kartanegara. The nominal t count value for Commudity Price of Plantation Farmers (X3) for plantations is 0.468. These results are in accordance with the t count table in the t table, α = 0.05, df = 57, the t table value is 2.00. It is known that the t count for X3 (0.73) < t table, then Ho is accepted, meaning that commodity prices (X3) partially do not have a significant effect on the exchange rate of plantation farmers in Kutai Kartanegara.

Agricultural Input Costs (BI/X4)

It is known that the nominal t count for the amount of Agricultural Input Costs of Food Crop Farmers (X4) is 0.000. The nominal t table result, α = 0.05, df = 98, the t table value is 1.98. It is known that the t count for X4 (12.68) > t table, then Ho is rejected, meaning that the agricultural input costs (X4) partially have a significant effect on the exchange rate of food crop farmers in Kutai Kartanegara. The nominal t count value for the amount of Agricultural Input Costs of Plantation Farmers (X4) of plantations is 0.000. These results are in accordance with the t count table in the t table, α = 0.05, df = 57, the t table value is 2.00. It is known that the t count for X4 (5.89) > t table, then Ho is rejected, meaning that the agricultural input costs (X4) partially have a significant effect on the exchange rate of plantation farmers in Kutai Kartanegara.

CONCLUSION

Based on the results of the regression analysis, it can be concluded that several internal and external factors significantly influence the Farmers' Terms of Trade (farmer's welfare) in Kutai Kartanegara Regency. The two most dominant determinants are household income and agricultural input costs, both of which have statistically significant effects on farmer welfare across subsectors. In the food crop subsector, higher input costs (X_4) were found to reduce farmer's welfare by approximately 0.0045 units for every one-unit increase in expenditure, indicating that rising production costs directly weaken farmers' purchasing power. Meanwhile, in the plantation subsector, both income (X_2) and input costs (X_4) significantly affect farmer's welfare, where a one-unit increase in income raises farmer's welfare by about 0.0046, while an equivalent increase in input costs decreases it by roughly 0.0022. These findings confirm that improving farmer's welfare depends largely on enhancing income-generating capacity

and reducing cost inefficiencies in production systems. To strengthen farmer welfare and maintain agricultural sustainability, several strategies are recommended: Policy intervention in stabilizing agricultural input prices and ensuring affordable access to fertilizers, seeds, and farm equipment, Capacity-building programs through farmer field schools and technical training to promote cost-efficient and environmentally friendly farming practices, Technology adoption, such as digital market platforms and precision agriculture, to improve productivity and reduce transaction costs. Institutional support through cooperatives or farmer groups to increase bargaining power and facilitate access to credit and market information. Overall, the empirical findings demonstrate that improving farmer's welfare requires a balanced approach between income enhancement and input cost control. Strengthening these two dimensions will not only raise farmers' economic resilience but also support the sustainability of the agricultural sector and regional food security in Kutai Kartanegara Regency.

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