



Farmers' Terms of Trade: Rice and Oil Palm Households in Kutai Kartanegara

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ABSTRACT

This study analyzes Farmers' Terms of Trade (FTT) among rice and oil palm farmer households in Kutai Kartanegara Regency using a household-level approach. Specifically, it examines the structure and magnitude of the index of prices received by farmers (IT) and the index of prices paid by farmers (IB) as the main components of FTT. A quantitative survey was conducted among 165 farmer households, consisting of 105 rice-farming households and 60 oil palm smallholder households. FTT was calculated as the ratio of IT to IB, while the Laspeyres index was applied to measure changes in price components relative to the base year. The results show that the FTT of rice farmers varied across districts, ranging from 84.15 to 107.98, with an average of 99.33. This indicates that rice farmers generally experienced a near-equilibrium welfare condition, although several households remained vulnerable to production cost increases and output price fluctuations. In contrast, the FTT of oil palm farmers ranged from 82.49 to 115.47, with a higher average of 103.23, reflecting relatively stronger purchasing power despite inter-district disparities. These findings highlight income disparities between farmer groups and emphasize the need for policies that stabilize farm output prices, reduce production cost burdens, and strengthen farmer institutions to improve household welfare.

Keywords: farmers, household, oil palm, rice, welfare

INTRODUCTION

The agricultural sector plays a strategic role in regional development, particularly in food supply, employment, and socio-economic stability in rural communities. In Kutai Kartanegara Regency, the food crops and plantation subsectors are important pillars of the local economic structure. The agriculture, forestry, and fisheries sector continues to contribute substantially to regional gross domestic product, while rice and oil palm remain closely linked to household income, food security, and rural livelihoods (BPS Kabupaten Kutai Kartanegara 2025a; BPS Kabupaten Kutai Kartanegara 2025b). Rice remains the backbone of regional food security, whereas oil palm has expanded as a primary source of cash income for smallholder households and contributes to rural economic activity through cultivation, harvesting, and processing industries. However, the increasing role of these subsectors has not always been followed by proportional improvements in farmer welfare. Many farmers continue to face high production costs, fluctuating crop prices, limited access to production inputs, and weak bargaining positions in local markets (Rachmat 2013; Elizabeth & Darwis 2016).

In the context of measuring farmer welfare, farmers' terms of trade (FTT), commonly referred to in Indonesia as Nilai Tukar Petani (NTP), is widely used to assess farmers' purchasing power. FTT is calculated as the ratio of the index of prices received by farmers (IT) to the index of prices paid by farmers (IB) for household consumption and farm production costs (BPS 2023). An FTT value above 100 indicates a surplus or increased purchasing power, an FTT value equal to 100 indicates a balanced condition, and an FTT value below 100 indicates declining purchasing power. Therefore, FTT reflects not only the economic performance of farming activities but also the broader socioeconomic condition of farming households (Tenriawaru *et al.* 2021; Wahyudi & Agustian 2025).

According to Statistics Indonesia, the agriculture, forestry, and fisheries sector remains one of the important contributors to the economy of Kutai Kartanegara Regency. Nevertheless, agricultural growth is still exposed to structural challenges, including dependence on seasonal production, high input prices, labor constraints, and commodity price volatility. For rice farmers, welfare pressure is commonly associated with limited subsidized fertilizer, rising labor wages, and fluctuations in farm-gate grain prices. For oil palm smallholders, welfare conditions are strongly affected by fresh fruit bunch (FFB) prices, access to mills, transportation costs, fertilizer and herbicide prices, and harvest labor costs (Widi 2021; Mehraban *et al.* 2021).

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An initial study of FTT in seven production center sub-districts in 2024 showed variation in farmers' purchasing power across regions, including several areas with FTT values below 100. This variation indicates that aggregate regional indicators may obscure the actual welfare condition of farmer households at the commodity and sub-district levels. In addition, the rapid growth of smallholder oil palm production in Kutai Kartanegara should be interpreted carefully. The expansion of planted and productive areas, higher FFB prices, stronger market demand, and reporting updates may jointly explain the large increase in recorded production. However, higher production does not automatically indicate improved welfare, because household-level welfare also depends on production costs, household consumption burdens, and price transmission at the farmer level (Euler *et al.* 2017; Chrisendo *et al.* 2022).

To date, Statistics Indonesia has provided FTT as a macro-level indicator based on price and expenditure surveys of farming households. However, this macro approach does not fully capture the heterogeneity of farming households at the sub-district level, including differences in household consumption structures, input prices, market access, and harvest cost components. The novelty of this study lies in its household-level estimation of FTT for rice and oil palm farmers in Kutai Kartanegara Regency. Unlike macro-level FTT data, this study directly compares commodity-based farmer groups and identifies variations in the index of prices received by farmers (IT) and the index of prices paid by farmers (IB) at the household level.

This study employed a repeated cross-sectional survey design in 2024 and 2025 with different household respondents, while the location remained largely unchanged to facilitate temporal and spatial comparison. In addition to measuring FTT for rice and oil palm households, this study identifies the structure and magnitude of IT and IB. The findings are expected to provide a more detailed picture of farmer welfare in Kutai Kartanegara and serve as an empirical basis for more targeted regional policy formulation.

METHODS

Study Area and Research Period

This study was conducted in Kutai Kartanegara Regency, East Kalimantan Province, Indonesia, one of the key production centers for rice and oil palm. Sampling locations were selected purposively based on the concentration of production areas and the availability of comparable household-level data. Rice-producing areas covered Marangkayu, Muara Badak, Loa Kulu, Tenggarong Seberang, Sebulu, Muara Kaman, and Kota Bangun. Oil palm-producing areas covered Muara Badak, Sebulu, Muara Kaman, and Kota Bangun. The research was carried out over six months, from mid-March to mid-August 2025, covering

preparation, field survey, data processing, and final reporting.

Research Rationale, Materials, Equipment, and Data Sources

This study was conducted to address the limitation of macro-level FTT indicators, which do not fully capture household-level variation in farm income, input costs, and consumption expenditure across districts. The materials used in this study consisted of structured household questionnaires and secondary documents obtained from Statistics Indonesia, the Agriculture Office, the Plantation Office, and relevant scientific literature. The equipment included computers for data entry and analysis, spreadsheet and statistical software, stationery, and field documentation tools.

This study used both primary and secondary data. Primary data were collected through field surveys using structured questionnaires administered to rice farmers and oil palm smallholders in selected districts. Secondary data were obtained from Statistics Indonesia, local government agencies, institutional reports, and previous studies. A total of 165 farmer households were selected using the Slovin formula with a 10% margin of error, consisting of 105 rice-farming households and 60 oil palm smallholder households. Respondents were selected using proportional random sampling according to the distribution of farmers by district and commodity.

Data Collection

Field surveys were conducted through direct household interviews to obtain information on socioeconomic characteristics, farm production costs, household consumption structures, input and output prices, harvesting costs, labor costs, and non-production expenditures. A literature review was also conducted to build a conceptual understanding of FTT, including its components and measurement methods. The research procedure consisted of indicator and instrument preparation, enumerator training, questionnaire pre-testing, field data collection, data entry, data cleaning, analysis of IT, IB, and FTT values, and interpretation of findings.

Data Analysis

Farmers' Terms of Trade were calculated using the formula:

$$NTP = \frac{IT}{IB} \times 100$$

Where I is the index of prices received by farmers and IB is the index of prices paid by farmers. An FTT value above 100 indicates that farmers' purchasing power increases, an FTT value equal to 100 indicates a balanced condition, and an FTT value below 100 indicates declining purchasing power.

Changes in farmer welfare between 2024 and 2025 were analyzed using the Laspeyres index, with the

2024 consumption and production structure as fixed weights. The Laspeyres index was calculated as:

$$It = \frac{\sum(p_t \cdot q_0)}{\sum(p_0 \cdot q_0)}; Ib = \frac{\sum(p_t \cdot q_0)}{\sum(p_0 \cdot q_0)}$$

Where p_t is the price in the current year, p_0 is the price in the base year, and q_0 is the fixed quantity in the base year. Analysis was performed for districts surveyed in both years, while districts with incomplete comparison data were interpreted descriptively.

RESULTS AND DISCUSSION

Farmers' Terms of Trade of Rice Farmers

Table 1 presents the farmers' terms of trade (FTT) of rice farmers in seven rice-producing districts of Kutai Kartanegara Regency. The results show that FTT values ranged from 84.15 to 107.98, with an average of 99.33. This average indicates that the welfare condition of rice farmers was close to the break-even point, although considerable variation existed across districts.

The highest FTT value was recorded in Muara Kaman (107.98), followed by Marangkayu (104.78), Kota Bangun (102.45), and Sebulu (101.12). These districts were in surplus conditions, indicating that the index of prices received by farmers was higher than the index of prices paid by farmers. This condition may be associated with more favorable farm-gate grain prices, relatively efficient use of production inputs, better access to local marketing channels, and manageable household expenditure burdens. These findings are consistent with Rachmat (2013) and Tenriawaru *et al.* (2021), who explained that better agricultural infrastructure and competitive market access tend to support higher farmer purchasing power.

Muara Badak recorded the lowest FTT value at 84.15, indicating a decline in rice farmers' purchasing power. The low FTT in this district was mainly driven by a higher IB relative to It, suggesting that increases in production and household consumption costs were not offset by higher rice prices. This condition may reflect high dependence on purchased inputs such as fertilizers, pesticides, and hired labor. Similar findings were reported by Elizabeth and Darwis (2016), who noted that rising input costs without corresponding

increases in revenue can suppress farmers' purchasing power.

Loa Kulu and Tenggarong Seberang recorded FTT values of 96.42 and 98.44, respectively. Although these values were below 100, the gap from the equilibrium point was relatively small. This indicates that rice farmers in these districts were close to a balanced condition but remained vulnerable to minor changes in input prices, labor wages, household consumption needs, or output prices. Small cost increases may therefore quickly reduce purchasing power. Previous studies have also shown that farmers in regions with moderate infrastructure and high dependence on purchased inputs often experience FTT fluctuations around the 95–100 range (Nirmala *et al.* 2016; Pangestika & Prihtanti 2020).

Overall, the rice farmer results demonstrate that welfare conditions were not uniform across districts. The IT–IB relationship shows that districts with higher IT and relatively lower IB achieved FTT values above 100, whereas districts with lower IT or disproportionately high IB tended to record FTT values below 100. This reinforces the importance of controlling production costs, improving market access, and strengthening rice marketing systems to maintain the purchasing power of rice-farming households.

Farmers' Terms of Trade of Oil Palm Smallholders

Table 2 presents the FTT estimates for oil palm smallholders in four districts. Oil palm FTT showed substantial inter-district variation, ranging from 82.49 to 115.47, with an average of 103.23. This suggests that oil palm smallholders generally had stronger purchasing power than rice farmers, although several households remained exposed to price and cost pressures.

Muara Badak recorded the highest oil palm FTT value at 115.47, followed by Kota Bangun at 113.29. These districts indicate surplus welfare conditions, where prices received from FFB sales were able to compensate for household and production expenditures. Higher FTT in these areas may be related to better access to buyers, more favorable FFB prices, relatively efficient harvesting and transportation systems, and stronger market connectivity. Previous studies have shown that proximity to mills and stronger marketing arrangements can improve price reception

Table 1 Farmers' terms of trade (FTT) of rice farmers by district in 2025

District	IT	IB	FTT
Marangkayu	0.351	0.335	104.78
Muara Badak	0.478	0.568	84.15
Loa Kulu	1.078	1.118	96.42
Tenggarong Seberang	1.328	1.349	98.44
Sebulu	2.082	2.059	101.12
Muara Kaman	3.437	3.183	107.98
Kota Bangun	0.544	0.531	102.45
Average			99.33

Note: IT = index of prices received by farmers; IB = index of prices paid by farmers.

Table 2 Farmers' terms of trade (FTT) of oil palm farmers by district in 2025

District	IT	IB	FTT
Muara Badak	6.036	5.227	115.47
Sebulu	2.905	2.857	101.68
Muara Kaman	2.580	3.128	82.49
Kota Bangun	2.022	1.785	113.29
Average			103.23

Note: IT = index of prices received by farmers; IB = index of prices paid by farmers

among oil palm smallholders (Gatto *et al.* 2017; Widi 2021).

Sebulu recorded an FTT value of 101.68, indicating a slightly surplus but relatively fragile condition. Although farmers' purchasing power was above the equilibrium point, the margin was narrow. This means that an increase in fertilizer, herbicide, labor, or transportation costs could quickly reduce FTT. Oil palm smallholders are often exposed to volatility because their income depends on FFB prices, mill grading, transport distance, and the cost of purchased inputs (Jelsma *et al.* 2017a; Mehraban *et al.* 2021).

Muara Kaman recorded the lowest oil palm FTT value at 82.49, indicating that oil palm households in this district faced stronger welfare pressure. The low FTT suggests that the index of prices paid by farmers exceeded the index of prices received. This may be associated with higher input and labor costs, less favorable FFB prices, longer marketing chains, or quality penalties at the buyer level. These results support previous findings that oil palm expansion can increase income opportunities but may also increase exposure to economic risk when farmers depend heavily on external input and market structures (Kubitza *et al.* 2018; Krishna & Kubitza 2021).

Compared with rice, oil palm FTT showed higher variability. This variation reflects the dual character of smallholder oil palm systems: they can improve household income when FFB prices and market access are favorable, but they can also increase household vulnerability when input costs rise or FFB prices decline. Therefore, policies for oil palm smallholders should focus not only on production expansion but also on improving market transparency, strengthening farmer institutions, and reducing cost burdens.

Structure of IT and IB

Across rice and oil palm households, the index of prices received by farmers was mainly influenced by output prices, product quality, timing of sales, and access to marketing channels. For rice farmers, it was closely related to farm-gate grain prices and post-harvest handling. For oil palm smallholders, it was strongly associated with FFB prices, buyer access, fruit quality, and transport distance to mills or collection points. Districts with better market connectivity tended to show higher IT values, confirming that market access is an important factor in farm-gate price formation (Tenriawaru *et al.* 2021; Gatto *et al.* 2017).

The index of prices paid by farmers was mainly driven by fertilizer, pesticides or herbicides, hired labor,

fuel, machinery rental, transport costs, and household consumption expenditures. Household-level IB is particularly important because it captures both production and consumption burdens. Rising non-food consumption expenditures may suppress FTT even when production income remains stable (Elizabeth & Darwis 2016; Keumala & Zainuddin 2018). Therefore, reducing IB requires not only input price stabilization but also broader rural welfare policies that address household expenditure pressures.

Temporal Comparison and Policy Implications

The Laspeyres-based comparison between 2024 and 2025 indicates mixed changes across districts. Some rice-producing districts experienced slight improvements in IT due to higher grain prices after unfavorable seasonal conditions, while IB increased in many districts due to higher food and input prices. Oil palm districts showed greater variability because household income was affected by fluctuating FFB prices, mill access, and harvest-related costs. These patterns indicate that changes in FTT are influenced not only by production prices but also by household consumption inflation and input cost escalation.

The findings provide several policy implications. First, input subsidy distribution and input logistics need to be strengthened, particularly for rice farmers in districts with FTT below 100. Second, rice marketing systems should be improved through post-harvest management, farmer group strengthening, and better access to price information. Third, oil palm smallholders require stronger contractual arrangements, transparent FFB pricing, and support for transportation and quality improvement. Fourth, rural welfare programs should address household consumption burdens because household expenditures contribute significantly to IB. Finally, farmer institutions should be strengthened to improve bargaining power, collective input procurement, and access to market information.

This study has several limitations. The household survey design allows detailed micro-level analysis but does not fully establish causal relationships. Future studies may use panel data, integrate productivity indicators, and include climate variability, land tenure, and institutional performance variables to better explain changes in farmer welfare over time.

CONCLUSION

The average FTT of rice farmers was 99.33, indicating that their welfare level was close to the break-even point. District-level variation remained evident. Muara Kaman, Marangkayu, Kota Bangun, and Sebulu showed surplus conditions, whereas Muara Badak, Loa Kulu, and Tenggarrong Seberang recorded FTT values below 100. This means that rice farmers in several districts remain vulnerable to small increases in input prices, labor costs, or household consumption expenditures.

The average FTT of oil palm farmers was 103.23, indicating a relatively better welfare condition than rice farmers, although inter-district disparities were still observed. Muara Badak, Kota Bangun, and Sebulu recorded FTT values above 100, while Muara Kaman recorded a value below 100. The analysis of IT and IB confirms that farmer welfare is strongly influenced by the balance between output prices, production costs, and household consumption expenditures. Policies that stabilize input prices, improve marketing efficiency, strengthen farmer institutions, and reduce household expenditure burdens are therefore essential to maintain purchasing power and improve farmer welfare in Kutai Kartanegara Regency.

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