

Comparative Analysis of Pepper Farming and Oil Palm Plantation Income in Wawobende Village, Sabulakoa District, South Konawe Regency

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Abstract

This study aims to determine: (1) the income generated from pepper farming compared to oil palm farming in Wawobende Village, Sabulakoa District, South Konawe Regency; and (2) whether there is a significant difference in income between pepper and oil palm farming in the same area. The sampling method employed in this research was a census approach. The total population consisted of 23 respondents, all of whom were included in the study, comprising pepper and oil palm farmers. Data were analyzed using farm income analysis and a Paired Sample t-test. The results indicate that: (1) the average income of respondents from pepper farming was Rp9,185,786.26 per season, while the average income from oil palm farming reached Rp46,500,845.61 per season; and (2) there is a statistically significant difference between income from pepper farming and oil palm farming. Based on the Paired Sample t-test, the significance value (2-tailed) was < 0.05 for both income variables, indicating that the difference is statistically significant. Therefore, oil palm farming is proven to generate significantly higher income compared to pepper farming in Wawobende Village

Keyword: Farming, Pepper, Oil Palm, Income

INTRODUCTION

The agricultural sector is an important pillar in Indonesia's economic development, especially in supporting food security, employment, and increasing the income of rural communities. Most households in rural areas depend on farming activities for their economy,



either as their main livelihood or as a source of additional income. Among the plantation commodities that have high economic value, pepper and oil palm occupy a strategic position because they contribute to export trade and improve the welfare of farmers. Pepper (*Piper nigrum* L.) is a leading spice commodity that has long been cultivated and is competitive in the international market. Indonesia was once recorded as the world's leading producer of white pepper and is a major producer of black pepper (Yuhono, 2005).

At the regional level, the development of pepper farming in South Konawe Regency shows relatively stable conditions in the 2021–2023 period. The land area was recorded at 3,384 ha in 2021, 3,348 ha in 2022, and increased to 3,417 ha in 2023 (). Production was recorded at 1,104 tons in 2021 and 2022, then increased to 1,113 tons in 2023 with a productivity of around 0.33–0.34 tons/ha (South Konawe Regency BPS, 2024). Although stable, this level of productivity is relatively low, making it important to increase farming efficiency. Research by Kurniawan and Sari (2020) shows that the application of modern fertilization techniques can increase pepper yields by 20% and farmer income by 15%, confirming that the economic performance of pepper is greatly influenced by cultivation efficiency.

In contrast to the relatively stable development of pepper, palm oil has shown more rapid and expansive growth. Statistical data shows that the area of palm oil plantations in South Konawe Regency increased significantly from 1,073 ha in 2021 to 2,393 ha in 2022 and reached 3,050 ha in 2023. This increase in land area was followed by an increase in production from 35 tons in 2021 to 132 tons in 2022 and 148 tons in 2023 (South Konawe Regency BPS, 2024). This trend reflects the increasing interest of farmers in oil palm as a commodity that is considered to have more promising economic prospects.

Macroeconomically, oil palm plays a role in increasing farmers' income, providing raw materials for industry, and contributing to foreign exchange through palm oil exports (Mudatsir, 2021). In addition to economic benefits, oil palm plants also have an ecological function as perennial plants that can absorb carbon and produce oxygen. Saragih's (2018) research shows that the application of sustainable cultivation practices on palm oil plantations can improve economic performance while reducing environmental costs. Research by Muzekri et al. (2023) also found a significant increase in the net income of oil palm farmers from IDR 8,052,983/ha/year before the pandemic to IDR 18,819,531/ha/year after the pandemic. These findings show that oil palm has relatively high and stable economic potential.

This change in the structure of plantation commodities also occurred at the local level, particularly in Wawobende Village, Sabulakoa District. This area has historically been known as a pepper production center, but in recent years there has been a trend for farmers to switch from





pepper to oil palm. This shift is influenced by several factors, including the high maintenance requirements of pepper, the risk of crop failure, and price fluctuations that cause income uncertainty. In contrast, oil palm is considered to provide more stable income and is supported by partnership opportunities with plantation companies. This phenomenon of changing commodity choices indicates the existence of rational economic considerations by farmers in determining the type of farming business to be run. Research by Sugiharto et al. (2024) shows significant differences in income between types of oil palm farming, while research by Rahmah (2024) finds clear differences in income between different plantation commodity cultivation systems. In addition, Lee et al. (2018) showed that efficient cultivation techniques can increase pepper yields by up to 25%, indicating that differences in production management can have a direct impact on farmers' income. However, studies that specifically compare the income from pepper and oil palm farming at the farmer level in Wawobende Village are still limited.

Therefore, research comparing the income from these two commodities is important as an economic basis for farmers in determining which commodity is more profitable and sustainable.

METHOD

This research was conducted from October 2024 to June 2025 in Wawobende Village, Sabulakoa District, South Konawe Regency. The location was determined purposively based on the consideration that the majority of the community works as farmers with pepper and oil palm as their main commodities and that there are variations in cultivation systems that allow for comparative analysis of costs, receipts, and farm income. The research population included all 23 farmers who cultivated pepper and oil palm, and the entire population was sampled using the census method because there were fewer than 30 respondents (Supriyanto and Machfudz, 2010).

The data sources consisted of primary data obtained directly from farmers through field observations and structured interviews using questionnaires, as well as secondary data obtained from scientific literature, previous studies, and publications from the Central Statistics Agency. Data collection techniques were carried out through direct observation of farming activities, interviews to obtain technical and economic information, and documentation in the form of recording production data, costs, and receipts as the basis for research analysis. For data analysis, a cost calculation analysis was performed, which is mathematically written as follows (Soedarsono, 1995):

$$TC = FC + VC$$

Explanation:





- TC = Total cost (Rp/season)
- FC = Fixed costs (Rp/season)
- VC = Variable costs (Rp/season)

After calculating the total production costs of pepper and oil palm farming, the farming income can then be determined, which can be written as follows (Sukirno, 2002):

$$TR = P \times Q$$

- TR = Total farm income (Rp/season)
- P = Price (Rp/kg)
- Q = Total production (kg/season)

The income from pepper and oil palm farming is analyzed using the income analysis method according to Soekartawi (2003), which states that income is the difference between total revenue and total costs. Mathematically, this can be written as follows:

$$I = TR - TC$$

- I = Farm *income/Income* (Rp/season)
- TR = Total agricultural *revenue/Total Revenue* (Rp/season)
- TC = *Total Cost* (Rp/season)

Next, to determine the difference in income from pepper and oil palm farming in one harvest season, a paired sample t-test was used. This test aims to determine whether there is a significant difference between the average income from pepper and oil palm farming among the same respondents. This analysis was performed using IBM SPSS version 25.

The Paired Sample T-Test was used because both variables (pepper and oil palm farming income) came from the same sample group, namely farmers who ran both types of farming. Thus, this test is more appropriate than the Independent Sample T-Test, which is used for two different groups. In hypothesis testing, the decision-making step was carried out by considering the significance value (Sig. 2-tailed) resulting from the analysis (Sugiyono, 2022). The basic formula used in the Paired Sample T-Test is as follows:

$$Dt = \bar{t} / (SD / \sqrt{n})$$

Explanation:

- t = Test statistic
- D = mean difference between two measurements ($X_1 - X_2$)
- SD = standard deviation of the measurement differences
- n = number of sample pairs

Decision criteria:



1. If Sig. (2-tailed) < 0.05 → there is a significant difference between pepper and palm oil farming incomes.
2. If the Sig. (2-tailed) value ≥ 0.05 → there is no significant difference between the two.

RESULTS AND DISCUSSION

Cost and Income Analysis

Cost and income analysis is an important aspect in assessing the economic feasibility of pepper and oil palm farming in Wawobende Village. According to Manurung (2017), the cost and income structure is crucial in determining farming efficiency and optimal resource management strategies. By knowing the amount of operational costs, farmers can make more informed decisions regarding investment, technology selection, and productivity improvement. The cost components in this study consist of fixed costs, variable costs, and total costs, which are described in the following sections.

Table 1. Average Fixed Costs of Pepper and Palm Oil Farming in Wawobende Village, Sabulakoa District, South Konawe Regency in 2025

No.	Pepper		Oil Palm	
	Equipment	Value (Rp/season)	Equipment	Value (Rp/season)
1	Machete	81,413	Iron Loding	145,870
2	Bucket	20,326	<i>Archo</i>	261,268
3	Bag	13,478	Egre	435,507
4	Hoe	24,511	Dodos	176,268
5	Land tax	36,587	Land tax	73,285
	Total	176,316	Total	1,092,198

Table 1 shows the average fixed costs of pepper and oil palm farming in Wawobende Village. In terms of fixed costs for equipment and depreciation per season, as well as tax costs per hectare, it can be seen that the costs incurred for pepper farming are relatively lower than those for oil palm farming. The equipment used in pepper farming consists of machetes, buckets, bags, and hoes, costing IDR 176,316 per season (). Meanwhile, in oil palm farming, the equipment used is much more diverse and expensive, including iron lodging, archo, egre, and dodos, which cost IDR 1,092,198 per season. This indicates that the investment in equipment for oil palm is greater than for pepper, reflecting the possibility of more complex or more durable tools being needed in oil palm cultivation. The results of research in Wawobende Village show that the fixed costs of

pepper farming are lower than those of oil palm. However, these results differ from other studies that show that the fixed costs of oil palm farming are lower than those of pepper. Musbahruidin's (2022) research in Bulurejo Village, Tanah Bumbu Regency, recorded fixed costs for oil palm farming of IDR 389,175 per season. This difference may be due to various factors, such as differences in the type and quality of equipment used, cultivation methods, and the different scales of operations at each research location.

Table 2. Average Variable Costs of Pepper and Oil Palm Farming in Wawobende Village, Sabulakoa District, South Konawe Regency in 2025

No.	Pepper		Oil Palm	
	Component	Value (Rp)	Equipment	Depreciation (Rp/season)
1	Fertilizer	1,769,565	Fertilizer	3,491,304
2	Labor	158,000	Labor	375,000
	Total	1,927,565	Total	3,866,304

Table 2 shows the average variable costs of pepper and oil palm farming in Wawobende Village. In pepper farming, the largest variable cost component comes from fertilizer, with a value of IDR 1,769,565/kg/season, bringing the total variable cost to IDR 1,927,565/season. Meanwhile, in oil palm farming, the highest variable cost also comes from fertilizer, with a value of IDR 3,491,304/kg/season, and labor at IDR 375,000/person, with total variable costs amounting to IDR 3,866,304/season. This shows that variable costs for oil palm are almost twice as high as those for pepper, indicating a greater need for production inputs for oil palm. This difference in variable costs may also reflect differences in the intensity of fertilization and labor required for each crop. In line with research conducted by Rahman (2020) in Meranti Regency, variable costs in oil palm farming were also found to be higher than those for pepper. The study shows that the use of fertilizers and labor in oil palm requires greater investment due to more intensive planting and maintenance cycles. This reinforces the finding that oil palm requires higher variable production costs as a result of different maintenance and treatment requirements compared to pepper.

Table 3. Total Farming Costs for Pepper and Oil Palm in Wawobende Village, Sabulakoa District, South Konawe Regency in 2025

No.	Description	Value (Rp/season)	
		Pepper	Oil Palm
1	Fixed costs	176,316	1,092,198
2	Variable costs	1,927,565	3,866,304

	Total cost	2,103,881	4,958,502
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Table 3 shows that oil palm farming requires much higher costs than pepper farming. The total cost incurred for oil palm reaches IDR 4,958,502/season, while for pepper it is only IDR 2,103,881/season. When broken down, this difference is evident in both fixed and variable cost components. Fixed costs for oil palm are much higher than fixed costs for pepper farming, and the same is true for variable costs. This shows that oil palm requires greater investment and operational expenditure, both in terms of production facilities and maintenance, compared to pepper. In other words, although oil palm may have higher yield or income potential, farmers must also prepare more capital to run it.

Revenue and Income Analysis

In the context of farming in general, revenue is defined as the total income obtained from the sale of production during a certain period. According to Mulyadi (2017), revenue is the amount of money received from the sale of agricultural products before deducting production costs. In the context of pepper and oil palm farming research in Wawobende Village, revenue refers to the economic value of pepper and oil palm harvests sold by farmers in local or regional markets. This revenue is a key indicator in assessing the economic success of farming and the basis for calculating profits after deducting all production costs, both fixed and variable.

Agricultural income is the difference between the revenue obtained from product sales and the total production costs incurred, both fixed and variable costs (Nasution, 2016). This income describes the economic benefits obtained by farmers from their farming activities. In the context of pepper and oil palm farming in Wawobende Village, income is an important indicator for assessing the feasibility and profitability of these two types of crops. By knowing the income, farmers and policy makers can make the right decisions regarding resource management, investment, and future farming development.

Table 4. Average Income from Pepper and Oil Palm Farming in Wawobende Village, Sabulakoa District, South Konawe Regency in 2025

No.	Description	Value (Rp/season)	
		Pepper	Oil Palm
1	Highest	23,460,000	205,920,000
2	Lowest	4,000,000	24,000,000
	Average	11,202,174	48,662,609

Table 4 shows the average income from pepper and oil palm farming in Wawobende Village, Sabulakoa Subdistrict, South Konawe Regency. It can be seen that oil palm farming has a much higher income than pepper farming. The highest income from pepper reaches IDR 23,460,000/season, while oil palm is higher at IDR 205,920,000/season. The average income from pepper is IDR 11,202,174 per season, which is almost three times lower than the average income from oil palm, which is IDR 48,662,609 per season. This indicates that in Wawobende Village, pepper farming provides greater income for farmers than oil palm, even though the fluctuations in pepper income are also quite wide. This may be influenced by factors such as productivity, market prices, and the scale of each crop.

In line with research conducted by Putra and Sari (2021) in Bengkulu Regency, the results show that income from pepper farming tends to be higher than that from oil palm. The study mentions that the relatively stable selling price of pepper and the increasing market demand are the main factors contributing to the high income of pepper farmers. In addition, pepper farming is generally carried out on a small scale with lower production costs, thus providing greater profits. These findings reinforce that pepper has greater economic potential than palm oil in several regions with similar conditions. However, this contrasts with research conducted by Wahyudi (2019) in Sintang Regency, which found that palm oil farming actually generates higher income than pepper. This is due to the larger scale of palm oil production and the more stable palm oil market, as well as high demand for palm oil products. In addition, palm oil has a longer harvest period and more consistent yields, thereby increasing total farmer income. These differences in results show that the economic success of each commodity is greatly influenced by local conditions, cropping patterns, and market access in the region.

Table 5. Average Farm Income from Pepper and Palm Oil in Wawobende Village, Sabulakoa District, South Konawe Regency in 2025

No.	Description	Value (Rp/season)	
		Pepper	Oil Palm
1	Revenue	11,202,174	48,662,609
2	Total expenses	2,103,881	4,958,502
	Revenue	9,185,786.26	46,500,845.61

Table 5 shows that pepper farming generates much lower income than oil palm farming, with a total income of Rp46,500,845.61 per season. This difference indicates that although the production costs of oil palm farming are higher, the income generated is also higher than that of

pepper farming. Thus, economically, oil palm farming appears to be more profitable and efficient than pepper farming in this region. This can be taken into consideration by farmers and related parties in making decisions on land management and agricultural commodity development. This is in line with the findings of several studies comparing pepper and oil palm farming in terms of production costs and farmer income. Research by Rian *et al.* (2023) shows that pepper farming incurs an average loss of IDR 38,845,694 per hectare per planting season, with an R/C ratio of 0.44, indicating that this farming is not economically viable to continue. This difference in results can be attributed to various factors, such as agroclimatic suitability, stable or increasing selling prices, and lower operational costs for pepper compared to oil palm. In addition, the scale of the business and efficient management also affect the level of profit obtained by farmers.

Conversely, although oil palm is often considered a leading commodity, several studies show that pepper can provide more profitable yields at a lower cost. Research by Yuyunisari and Syikhristani (2024) in Sinaboi District, Rokan Hilir Regency, shows that oil palm farming has an average production cost of IDR 5,449,786 per year per hectare, with revenues of IDR 25,332,427 per year per hectare and net income of IDR 18,772,531 per year per hectare. Thus, although oil palm has high income potential, pepper can be a more profitable alternative for farmers, especially in areas with favorable agroclimatic conditions and good market access.

Differences in Farm Income from Pepper and Oil Palm in Wawobende Village

To determine the difference in income from pepper farming and oil palm farming in one harvest season, a *paired sample t-test* was used. This test was conducted to determine whether there was a difference in income between pepper farming and oil palm farming. The *paired sample t-test* in this study used the *paired sample t-test* statistical technique with the help of IBM SPSS 25.

Table 6 Results of the Paired Sample T Test

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pepper	9185786.2610	23	4,487,055.9690	935,615.8463
	Palm oil	46,500,845.6100	23	40,579,410.71000	8,461,392.04700

Paired Samples Test

Pepper and Palm Oil

Mean

-37315059,3

Std. Deviation

41625980,05



Std. Error Mean	8679616,840
Lower	-55315483,0
Upper	-19314635,7
t	-4,299
df	22
Sig. (2-tailed)	,000

Table 6 shows that based on the results of *the paired sample T-Test* on pepper and palm oil income/yield, a Sig. (2-tailed) value of $0.000 < 0.05$ was obtained, so H_0 was rejected and H_1 was accepted. This indicates that there is a significant difference between pepper and palm oil income/yield. The average income/yield of pepper is Rp9,185,786.26 per season, while the average income/yield of palm oil is Rp46,500,845.61 per season. The average difference of Rp37,315,059.3 shows that the income/yield of palm oil is higher than that of pepper.

CONCLUSION

Based on the research findings, it can be concluded that the average income of respondents in pepper farming is IDR 9,185,786.26/season and palm oil farming is IDR 46,500,845.61/season. There is a significant difference between the income from pepper farming and oil palm cultivation. Based on the results of *the Paired sample T-test*, a value of (2-tailed) < 0.05 was obtained for both income variables. This indicates that the difference is statistically significant. Thus, oil palm farming is proven to be superior in terms of income compared to pepper cultivation.

Based on the results of this study, it is recommended that farmers in Wawobende Village utilize information on the difference in farming income as a basis for consideration in business management, whether in maintaining, shifting, or diversifying commodities between pepper and oil palm. Furthermore, the local government, particularly the South Konawe Regency Government, is expected to provide support through policies that encourage efficiency and sustainability in farming, such as technical guidance, financial management training, and affordable access to capital. In addition, researchers are advised to expand the scope of analysis by including variables such as business risk, productivity, price dynamics, and cost sensitivity analysis, as well as conducting long-term studies to assess the economic impact of sustainable commodity transition.





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