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# Quantitative Descriptive Study on the Contribution of Oil Palm Farming Income to Farmers' Household Expenditures

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**Abstract:** Indonesia is the world's largest producer of palm oil, a strategic commodity that significantly underpins the national economy and serves as the main source of income for millions of smallholder farmers. While oil palm cultivation is often associated with high and relatively stable financial returns, providing a vital pathway out of poverty, the actual financial dependence of farming households on this single source of income remains a critical subject of inquiry. This study aims to analyze the, contribution of oil palm farming to fulfilling household needs of farmers in Pante Ceureumen Sub-district, West Aceh Regency. The research employed a purposive sampling method with 100 oil palm farmer respondents. Data were analyzed by calculating the ratio between farming income and total household expenditures. The results indicated that the average income from oil palm farming was IDR 74.003.15 per year, while the average household expenditure was IDR 52.269.00 per year. The contribution of oil palm farming to farmers' household expenditures reached 142 %, signifying that the income derived from oil palms not only covered all household necessities but also yielded a surplus of 42%. This finding demonstrates that oil palm farming plays a vital role in enhancing the welfare of farmer households in the study area.

**Keywords:** Contribution; Descriptive; Income; Household expenditures; Oil Palm

## Introduction

Indonesia is the world's largest producer of palm oil (CPO), making it a strategic commodity that plays a vital role in the national economy, particularly in the agricultural sector. Oil palm plantations not only contribute significantly to the country's foreign exchange but also serve as a primary source of income for millions of independent smallholders and households across the region. Since its widespread introduction, oil palm has transformed the rural economic landscape, attracting attention due to its perceived higher and more stable income potential compared to other agricultural commodities (Syamsafitri et al., 2023; Ambarwati et al., 2024). While oil palm promises significant income potential, there is a gap in knowledge regarding the actual contribution of income from this sector to total household expenditures (Chrisendo et al., 2022). Oil palm farming households often rely on more than one source of income; they may also earn income from non-agricultural sectors or other intercropping commodities (Ayompe et al., 2024; Yanita et al., 2021). Furthermore, the highly volatile dynamics of CPO prices in the global market, rising input costs, and fluctuations in crop yields can impact the stability of their income (Theresia et al., 2025; Solaymani, 2022). The

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urgency of this research lies in the need for accurate, descriptive quantitative data to measure these relationships and financial contributions. A thorough understanding of the ratio of palm oil income to household expenditure will provide a clear picture of farmers' economic well-being. This data is crucial for formulating policies aimed at improving farmer welfare, including subsidy policies, price risk management, and business diversification programs.

Household income comprises the financial resources acquired by a family to meet daily living requirements, which may originate from salaries, business ventures, or investment returns (Deschênes et al., 2020; Saucedo-Delgado et al., 2024). This income significantly influences a family's ability to fulfill fundamental needs such as food, clothing, shelter, and other necessities. For farmers, income is generated through agricultural activities, labor, and the sale of farm produce to sustain their livelihoods (Yusriadi & Cahaya, 2022; Ayana et al., 2022). However, revenue from farming alone is not always sufficient to cover all household expenses. Consequently, farmers often seek additional income sources to supplement their earnings and meet their living needs (Haile et al., 2025; Kubitza et al., 2024). The agricultural sector plays a pivotal role in the economy, particularly in enhancing community income (Manono, 2025; Touch et al., 2024). Within this sector, plantations hold a strategic position in the Indonesian economy (Kurniawan et al., 2024; Shadiq & Arlyadesta, 2025).

Oil palm (*Elaeis guineensis* Jacq) is a leading commodity that significantly contributes to national foreign exchange earnings, employment, and rural income (Sibhatu, 2023; Mulyasari et al., 2023). In Pante Ceureumen Sub-district, West Aceh Regency, oil palm serves as the primary income source for most farmer households (Murphy et al., 2021). Nevertheless, price volatility and high production costs frequently impact farmers' net income. Therefore, assessing the extent to which oil palm farming income contributes to household financial requirements is essential. This study was conducted to analyze this contribution and its implications for farmer welfare. This research aims to conduct a quantitative descriptive study to deeply analyze the contribution of income from oil palm farming to total expenditure allocated to farmer household needs.

Specifically, this study will: Document the total income structure of oil palm farmer households; Quantitatively measure the percentage contribution of oil palm income to total household expenditures (e.g., for food, education, health, and non-food needs); and Analyze household expenditure patterns based on the level of oil palm income contribution. The results of this study are expected to provide a scientific basis for stakeholders, such as local governments, non-governmental organizations, and plantation companies, to design targeted intervention programs to support the economic stability and sustainability of oil palm farmer households in Indonesia.

## Method

This research was was conducted in Pante Ceureumen Sub-district, West Aceh Regency, from December 2024 to March 2025. The location was selected purposively based on the predominance of oil palm as the main income source for the local farming community. The study population comprised 2.43 farmers. A sample of 100 respondents was selected using the cluster purposive sampling technique, determined by the Slovin formula with a 10% margin of error. Primary data were collected directly from respondents through observation and structured interviews using questionnaires. The contribution level was categorized: Low: 0–19%, Medium: 20–39%, High: 40–100%. The contribution of oil palm farming income to household expenditures was analyzed by calculating the ratio between the two variables, using the following formula:

$$K = \frac{P}{I} \times 100\% \quad (1)$$

Description:
K = Contribution (%)
P = Net Income from oil palm farming (IDR)
I = Total Household Expenditures (IDR)

*Operational Definition of Variables*

It is important to clearly define how the variables are measured.

*Net Income from Oil Palm Farming (P)*

Net income is the total revenue (the product of Fresh Fruit Bunches/FFB production and the average selling price per month/harvest season) minus the total explicit costs (input costs, labor wages, and equipment depreciation) during the observation period (e.g., one year): Unit: Rupiah (Rp) per period.

*Total Household Expenditure (I)*

Household expenditure includes all consumption (food and non-food) and non-consumption (education, health, recreation, and social obligations) expenses incurred by the respondent's household during the same observation period as the income period: Unit: Rupiah (Rp) per period.

*Contribution (K)*

The percentage ratio of net income from oil palm farming to total household expenditure.

*Research Instruments and Data Quality Testing*

Because you are using structured interviews with questionnaires, it is necessary to explain the validity and reliability of the instrument.

*Research Instruments*

A structured questionnaire is used to collect data on: Respondent Demographic Data (age, education, number of family members, land area); Oil Palm Farming Data (FFB production, selling price, input costs); Household Expenditure Data (food, non-food, investment expenses).

*Validity and Reliability Testing*

Before actual data collection, the questionnaire will be pilot tested on a small number of farmers outside the research sample to ensure: Validity: The questionnaire measures what it is supposed to measure (e.g., using the Product Moment correlation test); Reliability: Respondents' answers are consistent over time (e.g., using the Cronbach's Alpha test).

## Result and Discussion

*Geographical and Demographic Profile of Pante Ceureumen District, West Aceh Regency*

Pante Ceureumen is a district within the West Aceh Regency, Indonesia, encompassing a total area of 487.55 km². This area is administratively divided into 25 villages. The district is geographically bounded by Sungai Mas District to the north, Kaway XVI District to the south, Panton Reu District to the west, and Nagan Raya Regency to the east. Topographically, the region is characterized by a mix of flat plains and river valleys, with 10 villages located on flatlands and 18 situated in valleys or along river basins. The average elevation ranges from 20 to 80 meters above sea level. Land use is predominantly non-agricultural, covering 34.64 hectares. The remaining land area consists of 11.46 hectares of non-paddy field land and 2.91 hectares of paddy fields. Demographically, the population increased from 11.37 in 2015 to 11,486 in 2016, reflecting an annual growth rate of 0.95%. This results in a population density of 21.86 people per km². The population is distributed across 2.08 households and exhibits a sex ratio of 104, with 5.86 males and 5.62 females.

*Characteristics of Respondents*

The majority of respondent farmers were male (58%), belonged to the 30-49 age group (33%), had attained elementary school education (34%), had 1-2 family dependents (63%) and cultivated land areas of 1-2 hectares (56%). Key characteristics of oil palm farming operations include farmer age, education level, engagement in off-farm employment, number of dependents, and land area cultivated. Among these, age is a significant variable because it influences economic decision-making and farmer behavior. The demographic characteristics of the respondents regarding gender are shown in Figure 1.

The data from the study, showing that 58% of the respondents are male and 42% are female, provides a clear indication of gendered participation in the oil palm farming sector under investigation. This disparity primarily points to the persistent dominance of men in this agricultural livelihood, a common pattern in plantation economies often associated with perceived physical demands and socio-cultural norms. Prevalence of Socio-Cultural Norms and Division of Labor: The sector appears to be influenced by traditional gender roles. Men are often ascribed the role of the primary income earner and are associated with tasks considered physically demanding, such as harvesting (cutting fresh fruit bunches) and transporting the yield; While women's participation is significant at 42%, their roles might be more segmented or less visible, potentially involving nursery work, domestic responsibilities, or supporting as unpaid family labor without being designated as the primary farm manager.

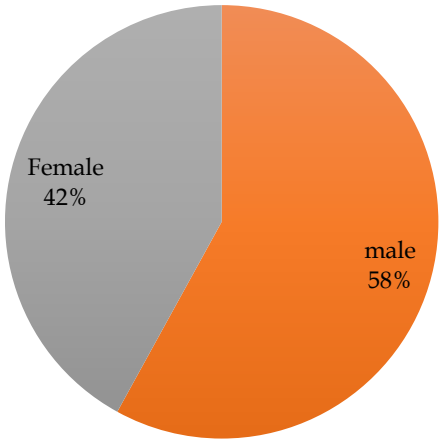


**Figure 1.** Number of farmer respondents by sex

Perception of Labor Intensity: The cultivation of oil palm, particularly the harvesting phase, is generally perceived as labor intensive. This perception often leads to the male head of household being identified as the main farmer or respondent in surveys. A Significant Yet Qualitatively Distinct Female Participation: Crucially, the 42% female participation rate should not be interpreted merely as a minority share. It signifies that womens play a substantial and crucial role in the oil palm production chain. The critical question that arises is not just the level of their participation but the *nature* of it specifically concerning access to resources and decision-making power. Age is a unit of time measuring the period an individual has lived, expressed in years.

Age significantly influences a person's cognitive and physical capacities for decision-making and action. In the context of farming, advanced age is often associated with a decline in physical working ability. Consequently, the aging of farmers can negatively impact agricultural productivity and, by extension, the income derived from their farms. The demographic profile of the respondents in terms of age is detailed in Figure 2.

The data from Figure 2 reveals a significant concentration of farmers in the middle-aged cohort, with a noticeable decline in the older age groups. The majority of respondents (33%) belong to the 30-49 years age range. This indicates that the farming community in this study is predominantly composed of individuals in their prime productive and working years. This age group typically possesses optimal physical capacity for agricultural labor and has accumulated significant practical experience, which is a positive indicator for the sector's current labor capacity and productivity. Conversely, the smallest proportion of farmers (10%) falls within the 60-69 years bracket. This stark contrast with the larger middle-aged group points to a potential "greying" or aging farmer phenomenon. The low representation in this pre-elderly category suggests a critical challenge: a lack of replacement by younger generations.

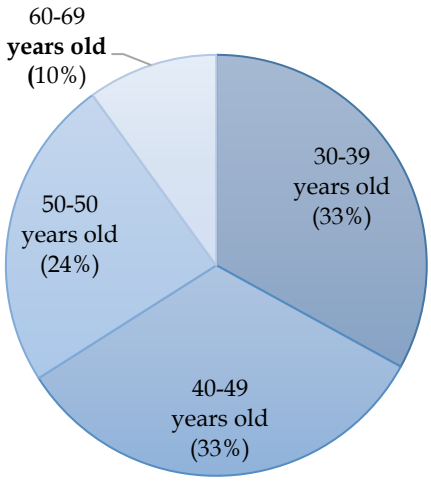


**Figure 2.** Distribution of respondents by age

As these older farmers retire, there may not be a sufficient number of younger farmers to take over, potentially leading to a future labor shortage and the consolidation or abandonment of farmland. While the current age profile indicates a capable and experienced farming population, these data also serve as an early warning of an impending aging crisis that threatens the future of the agricultural sector. Farmer regeneration has, therefore, become a critical issue that must be promptly addressed to ensure the sustainability of food security in the future. Education level, as a key component of human capital, is a fundamental factor in enhancing the capabilities of human resources, thereby leading to higher income generation. The educational level of the respondents in the research area is presented in Figure 3.

The data reveals a significant concentration of farmers within the lower tiers of formal education, with only a minimal proportion having accessed higher education. This indicates a workforce whose capacity for adopting new technologies and managing complex agricultural businesses may be constrained. The largest cohort of respondents (34%) completed only Primary School. When combined with the 21% who completed Junior Secondary School (Middle School), a cumulative 55% of the farming population has only attained a basic education. This high proportion is characteristic of agricultural sectors in many developing regions and reflects a reliance on a labor force with limited formal schooling. Participation in tertiary education is markedly low, with only 12% of respondents holding a Bachelor's degree. This figure is notably lower than the proportion of farmers with no formal education at all (14%). This trend underscores the sector's struggle to attract and retain individuals with advanced academic qualifications, which is critical for driving innovation and managerial sophistication.

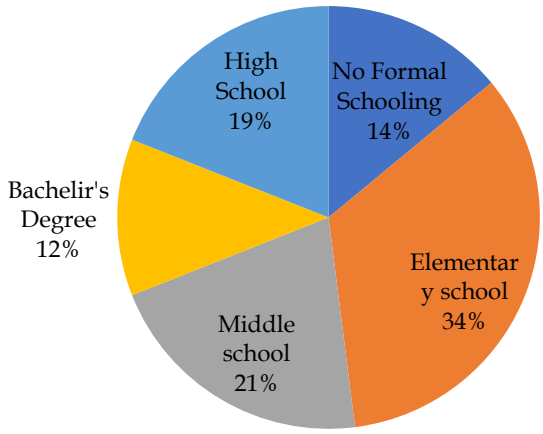


**Figure 3.** Educational characteristics of the farmers

Capacity for Technology Adoption: The ability to comprehend, evaluate, and implement modern agricultural innovations—such as precision farming, integrated pest management, and financial planning—is often linked to foundational literacy and analytical skills developed through formal education. A dominance of basic education can act as a barrier to this process. Productivity and Competitiveness: The low level of

educational attainment can be a limiting factor for enhancing productivity and overall farm competitiveness. Efficient business management, access to market information, and the ability to navigate complex value chains are competencies typically strengthened by higher levels of education. The educational structure of the farming community confirms that the agricultural sector in the study area is predominantly reliant on a labor force with minimal formal qualifications. This finding highlights the critical need for tailored agricultural extension programs that are effective for populations with low literacy and limited formal education. Furthermore, it underscores the importance of policy interventions designed to make the agricultural sector more attractive to better-educated youth, which is essential for long-term sustainability and innovation.

Household labor availability, which is largely determined by the number of family dependents, constitutes a vital resource for farm management and productivity. Figure 4 indicates that the majority of farmer households (63%) have a small family size of 1-2 dependents, while a significant minority (37%) manage a medium size of 3-4 dependents. This distribution of family dependents has direct and critical implications for household economics and agricultural decision-making. The high prevalence (63%) of households with 1-2 dependents suggests a potentially favorable dependency ratio for a substantial portion of the sample. A smaller number of dependents typically implies lower immediate consumption needs, which may allow for a greater proportion of household income to be allocated to productive investments in farming, such as purchasing quality inputs, adopting new technologies, or saving. Conversely, the 37% of households with 3-4 dependents face a different economic reality. A larger family size directly increases the household's consumption requirements for food, education, and healthcare. This creates a higher baseline financial pressure, potentially leaving a smaller surplus from farm income for reinvestment.

These households may be forced to prioritize immediate consumption needs over long-term agricultural investments, which can constrain productivity growth and perpetuate a cycle of subsistence farming (Galanakis et al., 2025; Omay et al., 2025). The interpretation of these figures must also consider the dual role of family members. In an agricultural context, dependents are not merely consumers; they can also function as labor contributors. While the data highlights the burden of consumption, the presence of multiple working-age family members could, in some cases, enhance the household's labor capacity. However, the data on dependency (1-2 vs. 3-4 persons) strongly suggests that the primary impact is on increasing expenditure, thereby exerting downward pressure on discretionary income and savings. The family dependency structure reveals a bifurcation within the farming community. While most households have a demographic profile that could facilitate capital accumulation, a significant share operates under financial strain due to higher consumption demands (Yang et al., 2024; Mason et al., 2022). This dynamic underscores that household composition is a key socioeconomic variable. Policies aimed at improving agricultural productivity and rural welfare must account for these varying dependency burdens, for instance, by facilitating access to credit for larger families to help them overcome capital constraints and by supporting diversified income sources to meet their heightened consumption needs.

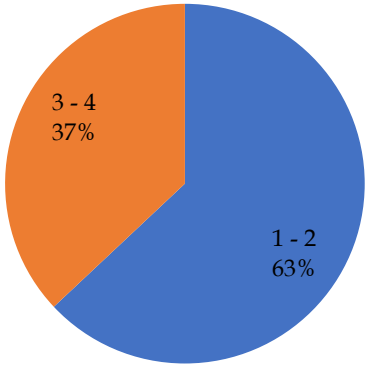


**Figure 4.** Farmers' characteristics by number of family dependents

The size of cultivated land, a key factor of production, directly determines the scale of agricultural output. The data indicates that the majority of farmers (56 %) cultivate oil palm on an average land area of 1–2 hectares, while the remaining 44% manage larger plots of 3–4 hectares. Landholding size significantly influences production volume, as a direct correlation exists between cultivated area and output level: larger land areas generally yield higher production, whereas smaller plots correspond to lower yields. However, it is important to note that higher production does not necessarily ensure household financial sufficiency. The ability to meet daily needs and cover family expenses also depends on other factors, such as the number of dependents and the magnitude of recurring living costs. Thus, even with substantial output, household welfare may remain constrained by high dependency ratios and expenditure burdens.

*Oil Palm Farming Costs*

The production costs analyzed in this study encompass all expenditures incurred by oil palm farmers, calculated based on prevailing local prices in the research location, Pante Ceureumen District. These farming costs are categorized into fixed costs and variable costs. Fixed costs represent average annual expenditures on farm tools and equipment. In this study, these include the costs for hoes, machetes, weeding hooks, harvesting sickles, wheelbarrows and sprayers. Variable costs are expenditures that fluctuate in direct proportion to the level of farming activity and production scale. The variable costs considered in this oil palm farming analysis include expenses for: inter-row weeding (cleaning the trellis), weeding around the palm base (cleaning the disc), fruit transportation from the field (carrying the basket), frond pruning (pruning), and harvesting labor (harvesting costs).

*Income from Oil Palm Farming*

Farming income was calculated as the difference between total revenue and production costs.

**Table 1.** Income from oil palm farming

| Component | Unit | Amount |
|---|---|---|
| Oil palm production | Kg | 4.17 |
| Average price | IDR/Kg | 2.18 |
| Total revenue | IDR/year | 109,296.48 |
| Total production costs | IDR/year | 35,293.32 |
| Net farming income | IDR | 74,003.15 |
| Total household expenditure | IDR | 52,269.00 |

The provided data reveals a profitable and economically viable smallholder oil palm farming operation, with a positive balance between farm income and household expenses (Table 1). The core farming enterprise demonstrates strong financial health. With a Net Farming Income of IDR 74,003.15, the business generates a substantial surplus after accounting for all production costs (IDR 35,293.32). This translates to a high Revenue-Cost Ratio (R/C Ratio) of approximately 3.10 (IDR 109,296.48/IDR 35,293.32). This ratio indicates that for every Rupiah invested in production costs, the farmer gains IDR 3.1 in return, signifying a very efficient and profitable farming operation. The farm's profitability provides a solid foundation for the household's livelihood. The Net Farming Income (IDR 74,003.15) comfortably covers the Total Household Expenditure (IDR 52,269.00). This results in a Household Economic Surplus of IDR 21,734.15 per year. This surplus is a critical buffer, providing financial security for the family. It can be used for savings, investment in farm improvements or other income-generating activities, education, healthcare, and coping with unexpected emergencies, thereby enhancing the household's overall resilience.

The significant positive balance between farm income and living costs suggests a sustainable livelihood. This level of income can contribute to improved standards of living, food security, and the ability to invest in human capital (e.g., children's education). It underscores the importance of oil palm as a primary source of livelihood that can support rural household welfare when managed profitably (Richartz & Abdulai, 2025; Reich & Musshoff, 2025; Mweta et al., 2025). The oil palm farming enterprise is not only profitable on its own but also successfully sustains the household's consumption needs while generating a disposable surplus. This case highlights the potential of smallholder oil palm cultivation to serve as a viable economic foundation for rural families, contingent on maintaining efficient production practices and stable market prices.

*Contribution of Oil Palm Farming*

The contribution was calculated as follows:

$$K = (74{,}003.15 / 52{,}269.00) \times 100\ \% = 142\ \% \quad (2)$$

This result indicates that oil palm farming contributes 142% to farmers' household expenditures. This implies that the net income from oil palm cultivation fully covers all household financial needs and provides a substantial surplus of 42%. This surplus can be allocated towards savings, investments, or enhancing the family's quality of life. The high contribution level is attributed to favorable productivity, stable market prices for Fresh Fruit Bunches (FFB) in the region, and efficient farm management practices.

*Analysis of Factors Supporting High Contribution*

Several factors underpin the high contribution of oil palm farming in Pante Ceureumen Sub-district: Favorable Agro-ecological Conditions: The topography, ranging from lowlands to hills (20-80 masl), coupled with stable annual rainfall (2,000-2,500 mm) and fertile soils, provides an optimal environment for oil palm cultivation; Expansion of Land Area and Production: Data from BPS West Aceh (2024) indicate a consistent increase in both harvested area (from 626 Ha in 2019 to 682 Ha in 2023) and production volume (from 2.75 tons to 13.29 tons over the same period), directly boosting farm revenues; Systematic Farm Maintenance: Most farmers adhere to regular maintenance schedules, including weeding of inter-rows and harvesting circles, fertilization, and timely harvests. The largest variable costs were associated with harvesting labor (IDR 14,297,40/year) and weeding (IDR 9,753,60/year); Reliable Market Access: Farmers receive a relatively stable price for FFB, ranging from IDR 2.00 to IDR 2.60

per kg (average IDR 2.18/kg), ensuring adequate profit margins.

*Impact on Household Welfare*

The significant surplus income (42%) has profoundly impacted household welfare: Enhanced Fulfillment of Basic Needs: Households can comfortably meet expenses for food, clothing, housing, education, and healthcare; Capital Accumulation: The surplus enables savings and capital formation, which can be channeled into business expansion or other productive investments; Reduced Economic Vulnerability: A stable and substantial income source from oil palm increases household resilience against economic fluctuations and shocks related to other commodities; Improved Access to Services: Many households can now afford higher education for their children and access better healthcare services (Cooper & Stewart, 2021).

*Challenges and Constraints*

Despite its positive contribution, oil palm farming in the area faces several challenges: Dependence on Commodity Price Volatility: Fluctuations in global crude palm oil (CPO) prices can significantly affect farm-gate FFB prices and, consequently, farmer income; Rising Input Costs: Increasing prices of fertilizers and labor continually pressure profit margins; Limited Adoption of Technology: The application of modern cultivation technologies for precision fertilization, irrigation, and efficient harvesting remains limited; Environmental Sustainability Concerns: The sector faces scrutiny regarding environmental sustainability and global pressures for adopting more sustainable plantation practices (Feliciano, 2022; (Murphy, 2025).

*Policy Implications*

Based on these findings, the following policy measures are recommended: Strengthening Farmer Institutions: Enhancing the capacity of cooperatives or farmer groups to improve bargaining power within the supply chain; Promoting Farm Diversification: Encouraging diversification of on-farm and off-farm enterprises to reduce reliance on a single commodity and create more resilient income streams; Investing in Infrastructure: Improving rural transportation and post-harvest processing facilities to reduce logistics costs and enhance value addition; Providing Technical Assistance: Implementing programs for technical guidance to improve productivity, cost-efficiency, and the adoption of sustainable practices.

*Very High Financial Contribution and Welfare Surplus*

The results of this quantitative study indicate that oil palm farming contributes significantly to household expenditure, reaching 142%. This figure implies that the net income earned from oil palm cultivation not only covers all household financial needs (100%), but also generates a substantial surplus of 42%. This excess income plays a crucial role in improving welfare, as it can be allocated for savings, productive investments, or improving the family's overall quality of life. This high level of contribution can be attributed to a combination of factors, including profitable productivity, stable Fresh Fruit Bunches (FFB) prices in the local market, and efficient farm management practices by farmers.

*Key Factors Supporting Contribution*

Several key factors synergistically support the high incomes contribution in the Pante Ceureumen Sub-district. First, the highly optimal agro-ecological conditions; This region is blessed with lowland to mild hilly topography (20–80 meters above sea level), stable annual rainfall (2,000–2,500 mm), and fertile soil, which provide an ideal environment for optimal oil palm growth. Second, there is consistent land expansion and production volume increases. Data from the West Aceh Statistics Agency (BPS) (2024) shows a significant increase in harvested area (from 626 hectares in 2019 to 682 hectares in 2023) followed by an increase in production volume (from 2.75 tons to 13.29 tons in the same period), which directly triggers a surge in income. Third, Systematic Plantation Maintenance Practices where the majority of farmers implement a routine maintenance schedule, including weeding, fertilization, and timely harvesting. However, the largest variable costs remain related to harvesting labor (Rp 14,297.40/year) and weeding (Rp 9,753.60/year). Finally, reliable market access, where farmers enjoy relatively stable FFB prices (averaging IDR 2.18/kg), ensures adequate profit margins.

*Positive Impact on Welfare and Constraints*

The 42% income surplus has a profound impact on household welfare. This impact is manifested in better fulfillment of basic needs, capital accumulation through savings and investment, and reduced household economic vulnerability to fluctuations in other commodities (Wanzala & Obokoh, 2024; Wilts et al., 2021). Furthermore, many households are now able to access better services, such as financing higher education for their children and excellent healthcare (Siersbaek et al., 2023). However, despite these positive contributions, the palm oil sector faces challenges (Widyaningsih et al., 2025; Yuslaini et al., 2023; Resdati et al., 2024). Key challenges include dependence on global CPO price volatility, which can affect FFB prices at the farm level; rising input costs (especially fertilizer and labor wages) that continue to pressure profit margins; and limited adoption of modern technologies (such as precision fertilizers). Furthermore,

environmental sustainability issues arise, requiring more responsible plantation practices (Ayompe et al., 2021; Latif et al., 2023; Jena, 2024).

*Policy Implications and Recommendations*

Based on findings demonstrating the economic dominance of palm oil and its vulnerability to external factors, targeted policy measures are needed (Okarda et al., 2024). It is recommended to: Strengthen farmer institutions through cooperatives or farmer groups to increase bargaining power in the supply chain; Promote diversification of on-farm and off-farm businesses to build more resilient income streams; Invest in rural infrastructure and post-harvest facilities to reduce logistics costs and increase sales value; and Provide ongoing technical assistance to increase productivity, cost efficiency, and encourage the adoption of sustainable agricultural practices.

## Conclusion

Oil palm farming in Pante Ceureumen Sub-district makes an exceptionally high contribution (142%) to covering farmers' household expenditures. This confirms its role as a reliable and crucial source of income for improving farmer welfare. This success is underpinned by suitable agro-ecological conditions, expanding cultivation area and production, and consistent farm management. To ensure the long-term sustainability of this livelihood, comprehensive strategies encompassing agricultural diversification, institutional strengthening, and the adoption of sustainable practices are imperative. To sustain these positive outcomes, it is recommended that the substantial profits generated be strategically managed. This includes diversifying income sources, strengthening farmer cooperatives, and consistently implementing sustainable agricultural practices to mitigate environmental and market risks.

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**Author Contributions**

Conceptualization; S, H.; methodology.; A. N.; validation; S.; formal analysis; B.; investigation; Y.; resources; S, H.; data curation; A. N.; writing—original draft preparation; S.; writing—review and editing.; B.; visualization: S. H. All authors have read and agreed to the published version of the manuscript.

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**Conflicts of Interest**

The researchers funded this research independently. No conflicts of interest.

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