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Contribution of Cocoa Farming to Farmer Income

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ABSTRACT

BACKGROUND AND OBJECTIVES

Belatungan Village, located in Pupuan Sub-district, Tabanan Regency, is known as one of the plantation centers in Bali. Cocoa, as the main commodity, is the main source of livelihood for the local community. Cocoa farming has faced numerous challenges in recent years, including climate change, pest and disease outbreaks, and fluctuations in market prices. This study aims to determine the extent to which cocoa farming contributes to farmers' income and to compare income from cocoa farming with income from farming other than cocoa in Belatungan Village.

METHODS

This research used interviews and a literature study. The data analysis method analyzes the contribution of cocoa farming to farmers' income and compares cocoa farming with other farms using the t-test.

FINDINGS

The results showed that cocoa farming is the main source of income for farmers, with a contribution of IDR 53,912,366 or 63.13% of the total average income per year of IDR 85,402,209, which is in the medium category and close to the high income threshold. Income earned by farmers from coffee farming (24.14%), cloves (7.44%), and non-farm farming (5.30%) is a complementary source of income. The t-test analysis showed a significant difference between cocoa farming income and farming other than cocoa (t-count = 3.71 > t-table = 0.2120). The results showed that cocoa has a big role in the regional economy, so it is necessary to increase cocoa productivity and farm diversification to strengthen the economic resilience of farmers in Belatungan Village.

CONCLUSION

Dependence on income from a single commodity, which is not optimal, can be addressed with several steps. First, the diversification of farming businesses. Second, increasing access to markets and technology. Third, increased government support for cocoa farming sustainability, thereby improving the overall welfare of farmers.

Keywords: Contribution; Cocoa; Income; Diversification; Farming

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INTRODUCTION

Cocoa has great potential and high economic value, and it is a leading commodity in local and international markets. Cocoa's strategic opportunities are used to promote farmer welfare improvement, downstream industry strengthening, and environmental sustainability in its development process. Cocoa can serve as a significant support for production and income in the agricultural sector (1). With its strategic role, cocoa can become a key pillar in supporting the sustainability of agricultural production and income generation for the entire value chain involved. Its great potential makes it one of the leading commodities that can strengthen the economic resilience of the agricultural sector in various regions. The economic advantage of cocoa farmers compared to other farmers in the plantation lies in the higher income potential and significant downstream product opportunities (2). Cocoa farmers often earn better incomes due to the growing global demand for processed cocoa products. Cocoa production in Tabanan Regency has decreased dramatically in the last three years, based on data showing production of 4,530 tons in 2021, and in 2022 it dropped to 1,039 tons, then a slight increase occurred in 2023 to 1,049 tons 2023. The decline in cocoa production in Tabanan is most likely influenced by environmental factors such as climate change and pest attacks, reduced plantation land due to land conversion, changes in farmer cropping patterns that may switch to other more profitable commodities.

Belatungan Village, located in Pupuan Sub-district, Tabanan Regency, is known as a plantation center in Bali, with cocoa as the main commodity. Cocoa farming is one of the main sources of livelihood for the local community, given the geographical and climatic conditions of Belatungan Village that support the growth of this crop. Cocoa plays an important role in the agricultural sector in this area, both as a source of income for farmers and as part of rural economic development. The dynamics of cocoa production in recent years have experienced various challenges, including weather changes, pest attacks, fluctuations in the price of cocoa in the market, resulting in many farmers converting to other land uses. Therefore, it is important to understand the extent to which cocoa farming contributes to farmers' income and how these factors affect their welfare.

The novelty of this study is that it analyzes the contribution of cocoa farming to income, specifically comparing income from cocoa farming with income from farming other than cocoa. Most of the previous studies did not analyze in depth the differences in contribution between types of farming, resulting in information that is less specific and less applicable to farmers and policymakers. Previous studies have generally analyzed the contribution of cocoa farming to the economy and farmers' welfare (3) without elaborating in depth on the differences in income earned from different types of farming, especially between cocoa farming and farming other than cocoa. With more focused information, farmers are expected to be able to make more strategic and data-based business decisions. Cocoa farming can increase household economic resilience and support agricultural development oriented to local potential. The objectives of this study are 1) to identify and measure the contribution of cocoa farming to farmers' income in Belatungan Village, Pupuan Subdistrict, Tabanan Regency, Bali, and 2) to compare the income of cocoa farming with farming other than cocoa in Belatungan Village, Pupuan Subdistrict, Tabanan Regency, Bali.

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RESEARCH METHOD

This research was conducted in Belatungan Village, Pupuan Subdistrict, Tabanan Regency. Research and data collection were conducted from March to May 2025. The selection of the research location was conducted using the purposive method (4). Tabanan Regency is the second-largest producer of cocoa in Bali Province. Belatungan Village is one of the cocoa-producing centers with potential for cocoa farming development, and 2. Research on the contribution of cocoa farming to farmers' income in Belatungan Village, Pupuan Subdistrict, has never been conducted.

The population of this study is the 4 largest farmer groups cultivating cocoa in Belatungan Village, totaling 99 people. The population was obtained from the Village Head in Belatungan Village. The sample selection in this study was chosen purposively to answer the research objectives. According to (4), *the purposive sampling* technique is a sampling technique with certain considerations. From the population of farmer groups, the 4 largest groups, namely the Yeh Sibuh, Manik Sari, Buana Merta Sari, and Pratyaksa farmer groups, were sampled with certain criteria. As for the criteria in the selection of samples, namely 1. Cocoa farmers who have a minimum land area of more than 0.5 hectares, 2. Aged between 30 and 60 years, 3. Have farms other than cocoa and non-agricultural businesses, 4. Have worked as cocoa farmers for at least 5 years 5. Reside in Belatungan Village and actively manage their cocoa land. The criteria determined that a sample of 42 people was obtained.

The data collection methods in this study were interviews and observations (5). This research interview used a pre-prepared questionnaire guide for the interview, so that all important topics could be covered comprehensively. Interviews were conducted by filling out the guide based on information obtained from respondents. The method used in this research is the *library research* method. According to (6), the library study method is a study used to collect information and data with the help of various kinds of materials in the library, such as documents, books, journals, and so on. The literature study method of this research was conducted by collecting, analyzing, and synthesizing various relevant literature to understand the contribution of cocoa farming to farmers' income. This research literature study was conducted by reviewing books, journals, reports, and other literature appropriate to this research. The data analysis methods used in this research are:

Analysis of cocoa farming contribution to farmers' income in Belatungan Village, Pupuan Subdistrict, Tabanan Regency

a) Analysis of Cocoa Farm Income

1. Analysis of Total Cost of Cocoa Farming

The amount of income earned by farmers needs to be calculated based on the total costs incurred during production in one year. These costs include fixed costs and variable costs. The formula for calculating total costs is the sum of fixed costs and variable costs in cocoa farming, as explained by (7) as follows:

$$TC_k = FC_k + VC_k$$

2. Cocoa Farm Revenue Analysis

According to (8), revenue is the value of money received from the sale of agricultural products. Farm revenue is obtained from the sale of output. The formula used according to (7) is as follows:

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$$TR_k = P_k . Q_k$$

3. Cocoa Farm Income Analysis

Cocoa farm income analysis is used to determine how much income farmers get from cocoa farming. Cocoa farm income is analyzed as the difference between total revenue and total costs incurred. The formula used is as follows:

$$I_k = TR_k - TC_k$$

b) Analysis of Income Other Than Cocoa Farming

Sources of farmers' income other than cocoa farming in Belatungan Village, Puputan Subdistrict, Tabanan Regency are coffee and cloves. Data for the calculation of other farm incomes were obtained during interviews with respondents in Belatungan Village. The amount of other farm income is known using quantitative analysis.

c) Analysis of Non-Farm Income

Cocoa non-farm income in Balangan Village, Pupuan Subdistrict, Tabanan Regency can be calculated using the following formula.

$$I_{nu} = I_b + I_n + I_p$$

Total farmer income includes all income earned from cocoa farming activities, other farming activities, and activities outside the agricultural sector. The data analyzed was obtained through interviews. Income can be calculated using the following calculation.

$$I_t = I_k + I_{(u)\,(sk)} + I_{nu}$$

d) Contribution of cocoa farming to farmers' income in Belatungan Village, Pupuan Subdistrict, Tabanan Regency, Bali

Calculation of cocoa farm income contribution can be known by calculating the ratio between cocoa farm income and total income (9). The analysis method used to calculate the contribution of cocoa farming to farmers' income is done using the percentage formulation from the calculation of contribution, which is as follows (10).

$$Z = {}^{Iuk}/_{It} \times 100\%$$

Comparative analysis between cocoa farming income and farming other than cocoa in Belatungan Village, Tabanan Regency

The t-test analysis is used to test and determine whether there is a statistically significant difference between the average income of cocoa farming and farming other than cocoa (11). The basic assumptions of the t-test include normal distribution of variables and that both samples taken have the same variables (12). Comparison of cocoa farming income is compared with the

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average income of other farms using t-test analysis. The calculation of t-test statistics is as follows (13):

$$t = \mathrm{t} = \frac{\mathrm{x}_1 - \mathrm{x}_2}{\sqrt{\frac{\mathrm{S}_1^2}{\mathrm{n}_1^2} + \frac{\mathrm{S}_2^2}{\mathrm{n}_2^2}}}$$

RESULTS AND DISCUSSION

Contribution of Cocoa Farming to Farmer Income in Belatungan Village, Pupuan Subdistrict, Tabanan Regency

a). Analysis of cocoa farming income

Cocoa farm income is the financial result obtained by farmers from cocoa farming activities, calculated as the difference between total revenue (sales proceeds) and total costs (expenses)(14). In 2024, the average production of dry cocoa beans in Belatungan Village on a cultivated area of 1.7 ha is 730 kg, with an average price of IDR 109,077 per kg. The result of the calculation of cocoa farm income in 2024 by the product of dry cocoa beans is IDR 3,344,300,000 with an average of IDR 79,626,190.

Table1: Average Income of Cocoa Farming in Belatungan Village in 2024

Keterangan	Cost Component	Value (IDR/year)	Percentage (%)
A.	**Average Revenue**	79,626,190	
B.	**Fixed Costs**		
	a) Cash Fixed Costs:		
	Land Tax	234,167	0.91
	b) Non-cash Fixed Costs:		
	Depreciation Expenses	336,110	1.31
Subtotal		570,277	2.22
C.	**Variable Costs**		
	a) Cash Variable Cost:		
	TKLK	5,526,964	21.49
	Fertilizer	1,906,667	7.41
	Pesticides	243,048	0.95
	b) Non-cash Variable Costs		
	TKDL	17,466,869	67.93
Subtotal		25,143,546	97.78
D.	**Total Cost (B+C)**	25,713,824	**100.00**
E.	**Cocoa Farm Income (A-D)**	**53,912,366**	

Source: primary data processed (2025)

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Based on the data in Table 1, the average revenue of cocoa farmers in Belatungan Village in 2024 from the sale of dried cocoa beans reached IDR 79,626,190 per year, and the total cost of cocoa farming per year was IDR 25,713,824. Income is obtained from the difference between average revenue and total farming costs, which amounted to IDR 53,912,366 per year, or about 68% of total revenue. Cocoa farming in Belatungan Village is profitable and worthy of further development, especially if farmers can manage costs efficiently and improve the quality and market access of cocoa products.

In a study in Mamullu Village, Pana Subdistrict, Mamasa Regency, the average income from cocoa farming reached IDR 4,936,739 per year, with revenue of IDR 6,402,591 (3). These two studies on cocoa farming, Belatungan Village and Mamullu Village, both highlight the income potential of farmers from cocoa commodities. Both focus on the cocoa commodity, with the main objective to analyze farm income and feasibility. Both Belatungan Village and Mamullu Village showed that cocoa farming is able to contribute positively to farmers' income.

The studies show significant differences in scale and data details. The Belatungan Village study shows a much higher average annual revenue of IDR 79,626,190, with a very detailed analysis of production costs, including fixed costs and variable family labor contributions. The data suggests farming operations may be larger or more intensive. The study in Mamullu village recorded lower annual receipts of IDR 6,402,591 and highlighted farm-gate selling prices as a key indicator of success, although it did not include a breakdown of production costs. These differences reflect variations in farm scale, cultivation practices, or market conditions in each location.

b) Analysis of farm income other than cocoa

Farmers in Belatungan Village not only cultivate cocoa as their main commodity, but also run various other farms. These include coffee and cloves as additional sources of income. Farm diversification is done as a strategy to increase income and fulfill household needs, especially in the midst of uncertainty about the yield of one type of commodity (15).

Coffee farming

Coffee farming is one of the most common forms of agricultural business, combined with cocoa crops through intercropping systems by farmers in Belatungan Village. The results of the analysis of coffee farming income in Belatungan Village in 2024 can be seen in Table 2 below.

Table2: Average Coffee Farm Income in Belatungan Village in 2024

Keterangan	Cost Component	Value (IDR/year)	Percentage (%)
A.	**Average Revenue**	28,959,524	
B.	**Fixed Costs**		
	a) Cash Fixed Costs: Land Tax	133,750	1.60
	b) Non-cash Fixed Costs: Depreciation Expenses	336,110	4.03
Subtotal		469,860	5.63
C.	**Variable Costs**		

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	a) Cash Variable Cost:		
	TKLK	1,689,405	20.25
	Fertilizer	1,531,667	18.36
	Pesticides	187,000	2.24
	b) Non-cash Variable Costs		
	TKDL	4,465,774	53.52
Subtotal		7,873,846	94.37
D.	**Total Cost (B+C)**	**8,343,706**	**100.00**
E.	**Coffee Farm Income (A-D)**	**20,615,818**	

Source: primary data processed (2025)

Table 2 presents the average income of coffee farming in Belatungan Village in 2024, with a gross income of IDR 28,959,524 per year. Total costs amounted to IDR 8,342,706. The net income received by coffee farmers in Belatungan Village is in the medium category. In comparison, Sipirok Sub-district recorded an average revenue of IDR 50,884,542 per farmer, with total costs of IDR 10,396,512, resulting in an income over total costs of IDR 40,488,030 (14). Meanwhile, Bulok sub-district had a total cost of IDR 10,413,614 per hectare, and an income over total cost of DR 7,371,245 per hectare (16).

Research in Belatungan Village shows that coffee is an additional source of income in an intercropping system with cocoa. This indicates that coffee farming is not the main focus, and operations are not as intensive as the monoculture model in Sipirok Sub-district (14) or Bulok Sub-district (16). Farmers in Belatungan Village allocate resources (time, labor, capital) differently. Compared to Kecamatan Bulok, which showed an income over total costs per hectare of IDR 7,371,245, the net income in Belatungan Village (IDR 20,615,818 per year) was higher when measured per farmer. This shows that although categorized as medium compared to Sipirok, coffee farming in Belatungan still makes a substantial economic contribution to farm households.

Clove farming is an alternative farming strategy practiced by some farmers in Belatungan Village, especially as part of a diversification strategy and intercropping with cocoa. Clove crops are chosen because they have a fairly high economic value, although they are seasonal and fluctuating (17). The results of the analysis of clove farming income in Belatungan Village in 2024 can be seen in Table 3 below.

Table3 Average Clove Farm Income in Belatungan Village in 2024

Keterangan	Cost Component	Value (IDR/year)	Percentage (%)
A.	**Average Revenue**	9,931,094	
B.	**Fixed Costs**		
	a) Cash Fixed Costs:		
	Land Tax	62,344	1.74
	b) Non-cash Fixed Costs:		
	Depreciation Expenses	373,700	10.44

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Subtotal		436,044	12.18
C.	**Variable Costs**		
	a) Cash Variable Cost:		
	TKLK	1,350,000	37.71
	Fertilizer	251,364	7.02
	b) Non-cash Variable Costs		
	TKDL	1,621,289	45.29
Subtotal		3,222,653	90.01
D.	**Total Cost (B+C)**	**3,580,145**	**100.00**
E.	**Clove Farming Income (A-D)**	**6,350,948**	

Source: primary data processed (2025)

Table 3 shows the cost structure and average income of clove farming in Belatungan Village in 2024. The average gross income of farmers reached IDR 9,931,094 per year. Total production costs amounted to IDR 3,580,145 per year. Thus, the net income of clove farming is IDR 6,350,945 per year. Research in Talaga Village (18) showed that the average farmer's income from clove farming ranged from IDR 30,297,413 to IDR 35,145,000 per hectare per year. The average total farming costs ranged from IDR 5,258,772 to IDR 6,100,118 per hectare per year, resulting in an average net income of around IDR 25,041,276 to IDR 29,047,881 per hectare per year. Clove farming income in Belatungan Village is substantially lower compared to Talaga Village (Donggala), which recorded an average revenue of IDR 30-35 million/Ha and income of IDR 25-29 million/Ha. Despite the lower income compared to cocoa and coffee, cloves still make a positive contribution as part of a diversification and adaptation strategy to maintain the economic stability of farmer households.

c) Non-farm income analysis

The income earned by farmers does not solely come from farming activities. Farmers also obtain additional income from activities outside the agricultural sector, such as non-farm activities. Non-farm income in Belatungan Village comes from jobs such as driver, construction worker, and trader. The average non-farm income in Belatungan Village in 2024 can be seen in Table 4 below.

Table4: Average Non-Farm Income in Belatungan Village in 2024

No	Occupation	Number (people)	Income	
			IDR	Percentage (%)
1.	Driver	3	10,800,000	18.37
2.	Building Laborer	4	18,000,000	30.61
3.	Trader	6	30,000,000	51.02
Total		13	58,800,000	100.00

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Average Non-Farm Income	**4,523,077**

Source: primary data processed (2025)

Table 4 illustrates the average income of farm households from the non-farm sector in Belatungan Village in 2024, which is obtained from economic activities outside the agricultural sector, especially income diversification. A total of 13 respondents were recorded as having non-farm jobs with a total annual income of IDR 58,800,000. Income from the non-farming sector plays an important role in maintaining household economic stability, especially when agricultural yields are uncertain. This reflects the adaptability of the Belatungan Village community in facing economic challenges through job diversification that supports the sustainability of farmers' livelihoods.

d) Contribution of cocoa farming to farmers' income in Belatungan Village, Pupuan Subdistrict, Tabanan Regency, Bali

Research in Belatungan Village shows that farmers' income sources consist of three categories: (1) income from cocoa farming, (2) income from farming other than cocoa, such as coffee and cloves, (3) non-farm income, such as farm labor, construction labor, and traders. More details can be seen in Table 5 below.

Table5. Contribution of Cocoa Farm Income to Farmer Income in Belatungan Village

No	Source of Income	Average Income (IDR/year)	Contribution (%)
1	Cocoa Farming	53,912,366	63.13
2	Farming other than Cocoa		
	1) Coffee	20,615,818	24.14
	2) Cloves	6,350,948	7.44
3	Non-farm	4,523,077	5.30
Total Income		**85,402,209**	**100.00**

Source: primary data processed (2025)

Table 5 shows that the total average income of farmers in Belatungan Village reached IDR 85,402,209 per year. The main source of income comes from cocoa farming, amounting to IDR 53,912,366 or 63.13%, making it a mainstay commodity and is in the medium contribution category according to classification (19). Other sources of income are: Coffee: IDR 20,615,818 (24.14%), Cloves: IDR 6,350,948 (7.44%), and non-farm income (trader, construction worker, driver): IDR 4,523,077 (5.30%). In line with the research in Belatungan Village, cocoa farming contributes highly to the total income of farmers in Tinete Village at 83.86% (20). The high contribution in Tinete Village is due to the research focus on farm income. Compared to Mamullu Village, which had a low cocoa farming contribution to farmers' income at 21% (3), Belatungan Village had a higher value. Contributions from coffee and cloves are complementary, with coffee having the potential for further development. Income from non-farm sectors falls into the low

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contribution category, reflecting farmers' dependence on the agricultural sector. Overall, these results emphasize the importance of increasing productivity, cocoa sustainability, and the need for farm diversification to strengthen farmers' economic resilience in Belatungan Village.

Comparative Analysis of Cocoa Farming Income with Non-Cocoa Farming in Belatungan Village, Pupuan Sub-district, Tabanan Regency

The analysis used to determine the significance level of the comparison of cocoa farming and farming other than cocoa in Belatungan Village is a t-test analysis. The first step is to calculate the average income of each type of farming. It is known that the average income from cocoa farming (x_1) is IDR 53,912,366, while the average income from farming other than cocoa (x_2) is IDR 26,966,766. The variance of income of each group is calculated, namely the variance of cocoa farming (S_1^2) of IDR 1,633,120,771,432,650 and the variance of farming other than cocoa (S_2^2) of IDR 576,921,012,311,720. The number of respondents from each group is the same, namely 42 people ($n_1 = n_2 = 42$). These values are then substituted into the t-test formula, resulting in a t value of 3.71. Based on the t distribution table with degrees of freedom (df) 84 and a real level of 5% ($\alpha = 0.05$) two-sided test, the t-table value is 0.2120. The calculation then obtained t count (3.71) > t table (0.2120). These results show that the null hypothesis is rejected, and it is known that there is a significant difference between cocoa farming and farming other than cocoa in Belatungan Village.

A study conducted in Lamong Jaya Village that compared income between cocoa and pepper farming, the t-test results also showed a significant difference in income (21). The main difference between these studies lies in the analytical approach and depth of study. The Belatungan study emphasized the comparison of average incomes in general. The research in Lamong Jaya Village calculated income per respondent, analyzing income per hectare. Income in Lamong Jaya Village considers production factors such as fertilizer use, pesticides, land area, and selling price. The research found that cocoa farming has a productivity advantage due to more frequent harvesting, and pepper farming has superior income per hectare due to higher selling prices and relatively lower production costs. Both studies showed significant differences in income. The focus and final results reflect different local conditions, commodity characteristics, and analytical approaches. Assessment of farm viability should consider income, cost efficiency, market potential, and technical aspects of cultivation that can affect the final farming outcome.

CONCLUSION

This study shows that cocoa is a mainstay commodity that plays a dominant role in the income structure of farmers. Other sources of income, such as coffee and cloves, function as complements. Income from non-farm activities, such as laborers, drivers, and traders, only contributes a small portion of total income, thus falling into the low contribution category. This condition shows the dependence of farmers on the agricultural sector, especially cocoa, so that increasing cocoa productivity and diversifying farming are important strategies in strengthening the economic resilience of farmers in Belatungan Village.

RECOMMENDATIONS

Farmers in Belatungan Village are advised to focus on maintaining and increasing the productivity of cocoa farming, considering that this commodity is the main source of income. This can be done through the application of more efficient cultivation techniques, optimal plant

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maintenance, and improved quality of crops to be competitive in the market. Local governments are also advised to prioritize cocoa commodity development through productivity improvement programs and farm sustainability.

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	Contributions	Responsible for the formulation of the main idea and scope of the literature review, collection and analysis of references, and initial preparation of the texts. Apart from that, I also contributed to editing and revising the texts based on input from fellow authors.
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GRAPHICAL ABSTRACT