

Income Analysis of Coffee Farmers and Its Impact on Regional Development (Case Study: Pematang Sidamanik District, Simalungun Regency, Indonesia)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study investigates the influence of government policies, supporting infrastructure, and farmer institutions on the income of coffee farmers in Pematang Sidamanik District, Simalungun Regency. Utilizing survey methods and data analysis, information was gathered from coffee farmers through interviews and questionnaires. The findings reveal that supporting infrastructure and farmer institutions significantly impact coffee farmers' income both collectively and individually. Conversely, government policies did not show a significant effect. Enhancing coffee production can positively contribute to regional development if backed by supportive policies. Recommendations include a committed governmental focus on priority development programs, particularly in agricultural

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infrastructure, strengthening farmer institutions, and increasing farmers' knowledge of technology and information. Implementing these recommendations is expected to facilitate more effective coffee agricultural development in Pematang Sidamanik District, improve farmers' welfare, and positively impact regional development as a whole.

Keywords: coffee; Sidamanik; Rural Area; Economic; Management.

1. Introduction

Simalungun Regency, located in North Sumatra Province, covers approximately 438,660 hectares, accounting for 6.12% of the province's total area. It lies between latitudes 02°36' - 03°18' N and longitudes 98°32' - 99°35' E, with elevations ranging from 20 to 1,400 meters above sea level. The region's topography varies, with higher elevations in the southwest, west, and northwest, while the lowlands are situated in the north, east, and southeast. The regency experiences a moderate climate, with an average highest temperature of 26.9°C and a lowest temperature of 25.8°C, accompanied by an average monthly humidity of 83.7% in 2022.

Economic activities across all sectors consider the income generated from production. Maximizing profit, which is a primary business objective, is achieved through efficient production costs. Factors influencing agricultural income include farm size, production levels, crop choices, intensity of farming activities, and labor efficiency (Hernanto, 2002).

Production factors are resources used in producing goods and services, including land, capital, labor, work ethics, and experience. Proper management of these factors is crucial for optimal productivity, which in turn influences income (M.D. Isyariansyah et al., 2017). Research has shown that land area, the number of plants, manure, NPK fertilizer, and labor significantly affect Arabica coffee production. Among these, labor is the most influential factor in coffee production (M.D. Isyariansyah et al., 2017).

Further studies indicate that land area, seed costs, fertilizer usage, and labor costs are critical variables affecting Robusta coffee production and farmers' income (Haryoko et al., 2018). Efficient management of these inputs leads to significant productivity and income, demonstrating the importance of production factors in agricultural success.

The agricultural sector significantly contributes to the average coffee production increase. Low productivity often results from poor-quality seeds. Enhancing productivity through factors such as land area, capital, labor, work ethics, and experience can substantially increase income (Mahdalena, 2017). High productivity levels correlate with higher income, while low productivity results in lower income. This relationship underscores the importance of productivity in economic outcomes for coffee farmers (Amelia, Ratih). Various studies have explored similar topics, highlighting the socio-economic factors influencing agricultural income:

- **Rangkuti (2014)** analyzed the influence of socio-economic factors on corn farmers' income, revealing significant effects of land area and labor.
- **Asrawati (2017)** examined clove farmers' income, emphasizing the importance of production levels and cost management.
- **Apriado (2015)** investigated the impact of capital, working days, land area, training, and technology on rice farmers' income, showing significant simultaneous effects.
- **Thamrin (2012)** studied the socio-economic factors affecting areca nut farmers' income, identifying substantial influences of capital, labor, experience, education, and age.
- **Olivi (2015)** assessed agroforestry's contribution to farmers' income, demonstrating significant impacts of age, land area, labor, ethnicity, religion, land slope, and credit assistance.
- **Kosmayanti (2017)** explored the effects of capital and land area on palm oil farmers' income, highlighting significant influences.
- **Juliana (2018)** analyzed factors affecting coffee farmers' income, identifying significant positive effects of land area, labor, and production costs.

Building on previous studies, this research aims to analyze the impact of government policies, infrastructure, and farmer institutions on coffee farmers' income in Pematang

Sidamanik District. Additionally, it examines the extent to which coffee farmers' income can drive regional development.

2. Method

This study was conducted in Pematang Sidamanik District, Simalungun Regency, North Sumatra Province, in April 2023. The location was chosen purposively due to its significant potential in coffee farming, which can contribute to regional development in Simalungun Regency.

2.1 Data Collection

The study utilized both primary and secondary data:

1. **Primary Data:** Collected through field surveys and interviews using questionnaires. The data included household characteristics of coffee farmers, land area, production inputs, production costs, labor, production, land productivity, and farmer income. A stratified sampling method was employed, resulting in a sample size of 30 respondents.
2. **Secondary Data:** Obtained from local government offices, agricultural institutions, and relevant literature to support the primary data.

2.2 Variables and Measurement

The study focused on three independent variables and one dependent variable:

1. **Government Policy (Z1):** Measured using a Likert scale (1-5), assessing the impact of regulations and programs aimed at increasing agricultural production.
2. **Supporting Infrastructure (Z2):** Measured using a Likert scale (1-5), evaluating the availability and condition of infrastructure such as roads, irrigation, and agricultural machinery.
3. **Farmer Institutions (Z3):** Measured using a Likert scale (1-5), assessing the role of farmer cooperatives and groups in advancing agricultural practices.

2.3 Dependent Variable

- **Farmer Income (Y):** Measured using a Likert scale (1-5), considering factors such as land area, fertilizers, pesticides, labor, and total production.

2.4 Data Analysis

The data were analyzed using multiple linear regression with the Ordinary Least Square (OLS) approach. The regression model used is as follows:

$$\ln Y = \beta_0 + \beta_1 \ln Z_1 + \beta_2 \ln Z_2 + \beta_3 \ln Z_3 + e$$

Where:

- Y = Coffee farmers' income (Scale 1-5)
- Z₁ = Government policies (Scale 1-5)
- Z₂ = Supporting Infrastructure (Scale 1-5)
- Z₃ = Farmers' Institution (Scale 1-5)
- β₀ = Constant
- β₁, β₂, β₃ = Regression Coefficients
- E = Standard error / disturbance term

Table 1. Research Variables

Variable	Definition	Indicator	Measurement
Government Policy (Z1)	Regulations and programs to enhance agricultural production	Use of fertilizers/pesticides	Likert (1-5)
Supporting Infrastructure (Z2)	Infrastructure supporting optimal production	Road conditions, land area, technology, processing machinery	Likert (1-5)
Farmer Institutions (Z3)	Organizations advancing agricultural practices	Cooperatives, farmer groups	Likert (1-5)
Farmer Income (Y)	Income generated by farmers using available resources	Land area, fertilizers, pesticides, labor, production	Likert (1-5)

The data were processed using SPSS 13 software and presented descriptively. An efficiency test was conducted at the end of the study to ensure the quality of the estimated regression model. This comprehensive data processing aimed to provide a thorough understanding of the factors affecting coffee farmers' income in Pematang Sidamanik District, Simalungun Regency.

3. Result and Discussion

3.1 Demographic Profile of Pematang Sidamanik District

Pematang Sidamanik District, part of Simalungun Regency, covers an area of 13,780 km², situated between 2°48'20" N latitude and 98°49'06" E longitude. As of 2022, the district comprises nine villages and one urban ward, divided into 43 hamlets. Among these, two villages, Sarimattin and Simattin, are predominantly agricultural, with the highest number of hamlets located in Sait Buttu Saribu, which has seven hamlets.

Table 2. Population Distribution by Gender in Pematang Sidamanik District

	Gender Population (people)	Percentage (%)
Male	9,901	50.22
Female	9,815	49.78
Total	19,716	100

Source: *Pematang Sidamanik District in Numbers 2023*

As of mid-2022, the district had a total population of 19,716 people, with a male-to-female ratio of approximately 50.22% to 49.78%. The majority of the population resides in Sait Buttu Saribu village, which has the highest number of residents.

Table 3. Population Distribution by Age in Pematang Sidamanik District

Age (years)	Population (people)	Percentage (%)
0-14	4,698	23.83
15-64	14,025	71.14
>65	1,611	8.17
Total	19,716	100

Source: *Pematang Sidamanik District in Numbers 2023*

The productive age group (15-64 years) constitutes the majority, indicating a potentially high labor force available for agricultural activities.

Characteristics of Respondent Farmers

The study surveyed 30 coffee farmers in Pematang Sidamanik District. Key findings regarding the respondents' characteristics are as follows:

- **Gender:** The majority of respondents (53%) were male.
- **Age:** Most farmers (90%) were between 41 and 60 years old, indicating a predominantly productive age group.
- **Education:** Half of the respondents had completed high school (50%), while the rest had finished middle school (27%) or elementary school (23%).
- **Family Dependents:** Most farmers had an average of four family dependents (43%).
- **Farming Experience:** A significant majority (90%) had over five years of farming experience, indicating a high level of expertise in coffee farming.
- **Land Ownership:** Most farmers (83%) owned their land, reflecting a tradition of inherited farming practices. However, 50% of the farmers had less than 0.5 hectares of land, suggesting limited land availability might be a constraint.

The data indicates that the majority of coffee farmers in Pematang Sidamanik are experienced, with adequate education and productive age, but limited by small landholdings.

3.2 Analysis of Variables Affecting Regional Development

The study analyzed the impact of independent variables (government policy, supporting infrastructure, and farmer institutions) on coffee farmers' income:

1. **Government Policy (Z1):** Most respondents positively perceived the government's policies, particularly from the local district administration. However, some respondents felt that certain policies required improvement.
2. **Supporting Infrastructure (Z2):** Most respondents positively rated the infrastructure, such as irrigation facilities, village roads, and agricultural machinery. Nonetheless, further improvements in infrastructure were suggested.
3. **Farmer Institutions (Z3):** Positive responses from most respondents indicated the success of farmer organizations in advancing agricultural practices and enhancing farmers' knowledge. However, some respondents suggested further attention to improving farmer institutions.

3.3 Statistical Analysis

The regression analysis results are summarized in the tables below.

Table 4. Regression Results of Government Policy, Infrastructure, and Farmer Institutions on Coffee Farmers' Income

Variable	Coefficient (B)	Standard Error	Beta	t-value	Sig.
(Constant)	-6.636	2.622		-1.515	0.142
Government Policy (Z1)	0.453	0.379	0.148	1.047	0.305
Supporting Infrastructure (Z2)	0.749	0.235	0.497	3.231	0.003
Farmer Institutions (Z3)	0.082	0.841	0.345	2.272	0.032

Source: SPSS Analysis 2023

The regression equation derived is:

$$Y = -6,636 + 0,453Z_1 + 0,749Z_2 + 0,082Z_3$$

- **Government Policy (Z1):** The positive coefficient indicates that favorable government policies positively impact coffee farmers' income, although the effect is not statistically significant.
- **Supporting Infrastructure (Z2):** The positive coefficient shows a significant positive impact on income, emphasizing the importance of infrastructure in enhancing productivity.
- **Farmer Institutions (Z3):** The positive coefficient indicates a significant positive impact, highlighting the role of effective farmer organizations.

Table 5. Determination Coefficient Results

Model R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.708	0.501	0.443
<i>Dependent Variable: Farmer Income (Y)</i>			

The R-square value of 0.501 indicates that 50.10% of the variability in coffee farmers' income can be explained by the independent variables (government policy, infrastructure, and farmer institutions). The remaining 49.90% is influenced by other factors not included in this study.

Table 6. ANOVA Results

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	374	3	969.860	8.701	0.000
Residual	372	26	6.045		
Total	746	29			

The ANOVA results indicate that the independent variables collectively have a significant impact on coffee farmers' income.

Table 7. Partial Test Results

Variable	Coefficient (B)	Standard Error	Beta	t-value	Sig.
(Constant)	-6.636	2.622		-1.515	0.142
Government Policy (Z1)	0.453	0.379	0.148	1.047	0.305
Supporting Infrastructure (Z2)	0.749	0.235	0.497	3.231	0.003
Farmer Institutions (Z3)	0.082	0.841	0.345	2.272	0.032

The partial test results show that infrastructure and farmer institutions significantly impact coffee farmers' income individually, while government policies do not show a significant effect.

3.4 Discussion

The findings highlight the significant role of infrastructure and farmer institutions in enhancing coffee farmers' income in Pematang Sidamanik District. Good infrastructure facilitates better access to markets and resources, while effective farmer organizations provide essential support and knowledge transfer. Although government policies are perceived positively, their direct impact on income appears limited, suggesting a need for more targeted and effective policy interventions.

4. Conclusion and Recommendations

4.1 Conclusion

The study concludes that supporting infrastructure and farmer institutions significantly influence the income of coffee farmers in Pematang Sidamanik District, both collectively and individually. Government policies, while perceived positively, do not show a significant impact on income.

4.2 Recommendations

- Enhance Infrastructure:** Continued investment in infrastructure such as roads, irrigation systems, and agricultural machinery is crucial for improving productivity and income.
- Strengthen Farmer Institutions:** Support and strengthen farmer cooperatives and groups to enhance knowledge transfer and collective bargaining power.
- Refine Government Policies:** Develop and implement more targeted policies that directly address the needs of coffee farmers to maximize their impact.

By implementing these recommendations, it is expected that coffee agricultural development in Pematang Sidamanik District will proceed more effectively, improving farmers' welfare and positively impacting regional development.

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