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Social and Economic Determination of Agroforestry Farmer's Income in Karang Sidemen Village, Rarung Forest Area

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Abstract
Karang Sidemen Village is located in North Batukliang District, Central Lombok Regency. This village is situated in a strategic location, surrounded by productive forests and fertile agricultural land. A deep understanding of the conditions in this village is expected to provide a valuable contribution to the formulation of sustainable development policies and programs while supporting environmental sustainability in the area. Multiple linear regression analysis is used as a calculation tool to analyze this study because in this study, there is one dependent variable, namely the income of agroforestry farmers, and there are five independent variables, namely the level of formal education, agroforestry farming experience, number of family dependents, land area and motivation for agroforestry farming. This research was conducted in Karang Sidemen Village, North Batukliang District, Central Lombok Regency, West Nusa Tenggara Province at the Mitra Farmer Group in the Rarung Forest Area. The research was carried out from April to September 2024. The number of samples taken was 70 respondent farmers. Overall, the regression model used is quite good and significant in explaining the influence of social and economic factors on the income of agroforestry farmers. Farmer motivation plays a vital role in the success of agroforestry efforts. Therefore, programs that increase farmer motivation, such as providing incentives, awards for high-achieving farmers, or intensive mentoring, can be implemented to encourage farmer work enthusiasm and innovation.

Keywords: *Agroforestry Farmers; Income; Social; Economic*

1. Introduction

Forests are one of Indonesia's greatest assets. Land conversion into agricultural land and logging in forest areas have an economic impact on the community. If these activities are not adequately managed, they will cause numerous problems. The function of forests as one of the natural resources and life support systems must continue to be managed sustainably so that they can provide both direct and indirect benefits. One form of forest management that is believed to meet these criteria is forest management through community empowerment, which also makes them partners in the protection and development of forest areas.

Special Purpose Forest Areas (SPFA) are forest areas designated for research and development, education and training, and local religious and cultural interests [1]. Its essential function is not only for environmental aspects such as water management, buffer zones, and carbon reserves, but SPFA is also a place for some people to carry out their activities as farmers, collectors of Non-Timber Forest Products (NTFPs), and other activities because the existence of the community existed before the SPFA location was determined by the government. SPFA Rarung is a Rinjani Geopark Area which administratively falls within the Pemepek Village Government area, Pringgarata District and Karang Sidemen Village, North Batukliang District, Central Lombok Regency, West Nusa Tenggara Province, which has an area based on the minutes of the grammar, it has been determined that the area of SPFA Rarung is approximately 325,868 Ha [2]. Karang Sidemen Village is located in North Batukliang District, Central Lombok

Regency. This village is situated in a strategic location, surrounded by productive forests and fertile agricultural land. This village is renowned for its rich natural resources, encompassing diverse forest ecosystems and a variety of farm products. Located on a plain with good soil fertility, this village is the mainstay of the community, with most residents working as farmers.

As a buffer village for the forest area, Karang Sidemen has a close relationship with the sustainability of the surrounding ecosystem. The forest in this area not only serves as a source of water and soil protection from erosion but also provides various natural resources that are utilized by the community. In practice, village communities often develop an agroforestry system, which is a farming approach that integrates forest plants with crops. This system enables farmers to maintain economic productivity while preserving the forest ecosystem. However, behind this great potential, this village also faces various challenges, such as limited access to modern agricultural technology, low formal education, and economic pressures that affect farmer productivity. Most people depend on limited cultivated land, so efficient management is an essential key to increasing production and income.

Karang Sidemen Village also has complex social and economic dynamics. A large number of family dependents and the diverse motivations of farmers in running agricultural businesses are factors that affect the level of community welfare. On the other hand, forest conservation efforts often clash with daily economic needs, which makes managing this area a challenge that requires serious attention. With all its potential and challenges, Karang Sidemen Village is a relevant location for research that focuses on factors that affect farmer income. An in-depth understanding of the village's conditions is expected to provide a valuable contribution to the formulation of sustainable development policies and programs while supporting environmental sustainability in the area.

2. Materials and Methods

This research was conducted in Karang Sidemen Village, North Batukliang District, Central Lombok Regency, West Nusa Tenggara Province at the Mitra Farmer Group in the Rarung Forest Area. The research was conducted from April to September 2024. The selection of the farmer group was intentional (purposive), as the researcher chose this farmer group considering that it consisted of farmers from Karang Sidemen Village who utilized the Rarung Forest Area. The number of samples was determined using the Slovin formula [3], resulting in 70 respondent farmers.

2.1. Multiple Linear Regression Model

This research employs a descriptive, qualitative approach. A qualitative approach is used in analyzing the social and economic determinants of agroforestry farmers' income. The SPSS version 27 program is used as a data analysis tool in this research. Multiple linear regression analysis is used as a calculation tool to analyze this research because in this study, there is one dependent variable, namely the income of agroforestry farmers, and there are five independent variables, namely the level of formal education, agroforestry farming experience, number of family dependents, land area, and agroforestry farming motivation. According to [4], the formula used is $Y = b_0 + b_1X_1 + b_2X_2 + \ldots + b_nX_n$, which is then translated into the following formula [4]:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

Where:

Y = agroforestry farmer income
b_0 = Constant
b_1-b_5 = Regression coefficient of each variable
X_1 = formal education level
X_2 = agroforestry farming experience
X_3 = number of family dependents

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X_4 = land area
X_5 = agroforestry farming motivation

2.2. Simultaneous Regression Coefficient Test (F Test)

This test is conducted to determine the significance value of the parameters simultaneously from the independent variables, measured against the dependent variable. To determine whether the independent variable can be accepted statistically, we compare the calculated F-value with the F-table value.

2.3. Partial Regression Coefficient Test (t-Test)

This test is conducted to determine the extent to which each independent variable individually influences the dependent variable. This test involves analyzing individual hypothesis tests of the regression coefficient, specifically comparing the statistical value of each regression coefficient with the t-table value according to the level of significance.

3. Results and Discussion

3.1. Social and Economic Determination Equation Model on Agroforestry Farmer's Income

Multiple regression analysis is used in this study to find the magnitude of the influence of changes in an independent variable on the dependent variable in the regression model. The regression model used in this study is presented in Table 1. Based on the results of the theoretical approach and the information obtained, a selection of variables is made that are suspected of affecting the income of agroforestry farmers, including variables such as formal education level, agroforestry farming experience, number of family dependents, land area, and agroforestry farming motivation. The relationship between the dependent variable (Y) and the independent variable (Xi) is transformed into the following form:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

$$Y = 1{,}330 + 0{,}169\,X_1 - 0{,}004\,X_2 - 0{,}010\,X_3 + 1{,}188\,X_4 + 0{,}357\,X_5$$

Table 1. Results of Multiple Linear Regression Analysis of Social and Economic Determination Equation Models on Agroforestry Farmers' Income

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.330	.346		3.840	.000
	X_1	.169	.055	.279	3.080	.003
	X_2	-.004	.007	-.074	-.623	.535
	X_3	-.010	.044	-.022	-.233	.817
	X_4	1.188	.247	.456	4.811	.000
	X_5	.357	.099	.449	3.605	.001

a. Dependent Variable: Y
Source: Processed Primary Data, 2024

The requirements for a good regression model must meet the econometric criteria, which consist of testing the assumptions of the classical linear model, specifically the normality test, heteroscedasticity test, and multicollinearity test. The normality test is used to determine whether the residual variable in the regression model has a normal distribution. The results of the normality test are presented in Table 2.

Table 2. One-Sample Kolmogorov-Smirnov Test of Social and Economic Determination Equation Model on Agroforestry Farmer's Income

		Unstandardized Residual
N		70
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.43621055
Most Extreme Differences	Absolute	.106

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	Positive		.106
	Negative		-.062
Test Statistic			.106
Asymp. Sig. (2-tailed)[c]			.050
Monte Carlo Sig. (2-tailed)[d]	Sig.		.046
	99% Confidence Interval	Lower Bound	.041
		Upper Bound	.052

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. Lilliefors' method is based on 10000 Monte Carlo samples with a starting seed of 2000000.
Source: Processed Primary Data, 2024

Based on the results of the normality test using the Kolmogorov-Smirnov method on the social and economic determinant equation model on the income of agroforestry farmers, the Asymp. Sig. (2-tailed) value was obtained at 0.050. This value is right at the significance limit of 0.05, which indicates that the residual data is usually distributed at a significance level of 5%. In other words, the regression model used meets the assumption of normality. This residual normality distribution is crucial in regression analysis because it is one of the primary requirements for ensuring the inferential validity of the model. By fulfilling the normality assumption, the results of the regression test and model predictions can be interpreted accurately and reliably. This shows that the model used to analyze the influence of social and economic factors on the income of agroforestry farmers in the area is statistically appropriate.

The results of the heteroscedasticity test are presented in Table 3. Based on the results of the heteroscedasticity test using the Glejser method, as shown in the table, it can be seen that the independent variables (X_1 to X_5) have a significance value (Sig.) greater than 0.05. This indicates that there is no significant relationship between the absolute value of the residual (abs_res) and the independent variables, so the assumption of homoscedasticity is met. Since all significance values are greater than 0.05, it can be concluded that there is no heteroscedasticity problem in this regression model. Thus, the regression model used has met one of the critical assumptions in regression analysis, namely the assumption of homoscedasticity, which means that the residual variance is constant throughout the range of independent variable values. These results provide further validation of the regression model, enabling the analysis results to be interpreted more accurately in light of statistical principles.

Table 3. Glejser Test of Social and Economic Determination Equation Model on Agroforestry Farmer's Income

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.538	.184		2.917	.005
	X_1	-.048	.029	-.209	-1.648	.104
	X_2	-.002	.004	-.112	-.672	.504
	X_3	.036	.023	.205	1.557	.124
	X_4	-.130	.131	-.132	-.990	.326
	X_5	-.038	.053	-.127	-.729	.469

a. Dependent Variable: abs_res
Source: Processed Primary Data, 2024

The multicollinearity test is presented in Table 4. Based on the results of the multicollinearity test shown in the table, the test was conducted by examining the Variance Inflation Factor (VIF) and tolerance values for each independent variable. A tolerance value greater than 0.1 and a VIF value less than 10 indicate that there is no multicollinearity in the regression model used.

Table 4. VIF Test of Social and Economic Determination Equation Model on Agroforestry Farmer's Income

Coefficients					
Model		t	Sig.	Collinearity Statistics	
				Tolerance	VIF
1	(Constant)	3.840	.000		
	X_1	3.080	.003	.874	1.144
	X_2	-.623	.535	.506	1.976
	X_3	-.233	.817	.812	1.232
	X_4	4.811	.000	.800	1.251
	X_5	3.605	.001	.462	2.163

a. Dependent Variable: Y
Source: Processed Primary Data, 2024

All tolerance values > 0.1 and VIF < 10 indicate that the relationship between independent variables in this model does not cause serious multicollinearity problems. This is important because high multicollinearity can affect the stability of the regression coefficient estimates and reduce model interpretation. In conclusion, the regression model used in this study meets the assumption of being free from multicollinearity, allowing the results of the analysis to be considered valid in explaining the influence of social and economic variables on the income of agroforestry farmers. In the absence of multicollinearity, each independent variable in the model can be interpreted separately without significantly influencing each other.

In Table 5, the Adjusted R-squared value is 0.505, or 50.5%. This indicates that 50.5% of the variation in Agroforestry Farmers' Income in Karang Sidemen Village, Rarung Forest Area, can be attributed to the five variables used, namely the level of formal education, agroforestry farming experience, number of family dependents, land area, and agroforestry farming motivation. The remaining value of 0.495, or 49.5%, is attributed to other factors not included in this model. This remaining figure is less than 50%, indicating that the independent variables provide sufficient information to predict the variation in the dependent variable. The R-value of 0.735 indicates a reasonably strong correlation between the Agroforestry Farmers' Income and the five variables used. The R-value shows a strong positive correlation between the independent variables (X1, X2, X3, X4, X5) and the dependent variable (agroforestry farmer income). This suggests that the regression model employed has a reasonably strong relationship between these variables. Overall, the results of this summary model indicate that the regression model used is quite good and significant in explaining the influence of social and economic factors on the income of agroforestry farmers. However, there are still other factors outside the model that can affect farmers' income and can be considered in further research. Other factors that can influence these outcomes include capital, labor, seed prices, production costs, and output prices [5], [6], [7], [8].

Table 5. Model Summary of Social and Economic Determination Equation Model on Agroforestry Farmer's Income

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.735[a]	.541	.505	.45293

a. Predictors: (Constant), X_5, X_1, X_3, X_4, X_2
Source: Processed Primary Data, 2024

3.2. The Effect of Independent Variables Simultaneously on Agroforestry Farmer's Income

The F test is a test of the significance of all independent variables (Level of formal education (X_1), agroforestry farming experience (X_2), number of family dependents (X_3), land area (X_4), and agroforestry farming motivation (X_5)) simultaneously on the dependent variable (agroforestry farmers' income (Y). In Table 6, Based on the results of the ANOVA test, the F-statistic value is 15.069 with a significance level (Sig.) of 0.000. This significance value, which is smaller than 0.05, indicates that the overall regression model is significant. In other words, the independent variables (X_1, X_2, X_3, X_4, and X_5) together have a substantial influence on the dependent variable,

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namely the income of agroforestry farmers. Overall, this F-test suggests that the regression model employed in this study is valid and suitable for analyzing the impact of social and economic variables on the income of agroforestry farmers. This provides a strong basis for further interpreting the contribution of each independent variable.

Table 6. ANOVA Model of Social and Economic Determination Equation on Agroforestry Farmer's Income

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.456	5	3.091	15.069	.000[b]
	Residual	13.129	64	.205		
	Total	28.586	69			

a. Dependent Variable: Y
b. Predictors: (Constant), X_5, X_1, X_3, X_4, X_2
Source: Processed Primary Data, 2024

3.3. Partial Influence of Independent Variables on Agroforestry Farmer's Income

The t-test is a test of whether or not there is an influence between the independent variables of formal education level (X_1), agroforestry farming experience (X_2), number of family dependents (X_3), land area (X_4), and agroforestry farming motivation (X_5) on the dependent variable of agroforestry farmers income (Y) partially. As seen in Table 1, the variables of formal education level (X1), land area (X4), and agroforestry farming motivation (X5) have a significant influence on the income of agroforestry farmers. Meanwhile, the variables of farming experience (X2) and the number of family dependents (X3) do not show a significant influence. This indicates that the increase in farmer income is more closely determined by the management ability factor, which is influenced by education, land area, and the farmer's motivation to work more optimally.

The formal education level (X_1) in Table 1 obtained a significance value of 0.003. This value is smaller than 0.05. This indicates that the level of formal education has a significant impact on the income of agroforestry farmers (Y) at a 5% significance level. The coefficient of the variable' level of formal education' is positive, indicating that an increase in the level of formal education will increase the income of agroforestry farmers, assuming other variables remain constant. The variable level of formal education (X_1) has a partial and significant effect on the income of agroforestry farmers (Y). This shows that the higher the level of formal education of farmers, the greater their contribution to increasing revenue. Formal education may provide a better understanding of managing agroforestry businesses. The collective knowledge and experience of farmers enable them to develop their farming businesses more strategically and responsibly, ensuring the long-term sustainability and progress of these businesses [9]. According to research by Kusumawati et al. (2024), the level of education possessed by farmers has a direct impact on the efficiency and results of their farming businesses [10]. Farmers who pursue further education have better abilities in utilizing the latest agricultural technology, which allows them to work more efficiently and make more effective decisions related to farming activities.

The agroforestry farming experience (X_2) in Table 1 yielded a significance value of 0.535. This value is greater than 0.05. This means that agroforestry farming experience does not significantly affect the income of agroforestry farmers (Y) at a 5% significance level. The agroforestry farming experience variable (X_2) does not significantly affect the income of agroforestry farmers (Y) in part. This suggests that fluctuations in agroforestry farming experience do not affect the fluctuations in the income of agroforestry farmers. The agroforestry farming experience variable (X_2) has an insignificant adverse effect on farmer income. This shows that farming experience does not directly affect income. This is likely due to other factors, such as business efficiency or management methods, which are more decisive in determining income. The high level of experience in farming, if not balanced by a high level of farmer adoption of available technology, can result in suboptimal production levels [11].

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The number of family dependents (X_3) in Table 1 obtained a significance value of 0.817. This value is greater than 0.05. This means that the number of family dependents does not significantly affect the income of agroforestry farmers (Y) at a 5% significance level. The variable number of family dependents (X_3) does not significantly affect the income of agroforestry farmers (Y) to a partial extent. This suggests that fluctuations in the number of family dependents do not considerably affect the fluctuations in the income of agroforestry farmers. The variable number of family dependents (X_3) has an insignificant adverse effect on farmer income. This shows that the number of family dependents does not directly affect income. The number of dependents may be more related to family expenses than income. Another factor that does not affect the number of family dependents is that family members are of non-productive age and, therefore, cannot contribute to farming activities as labor [12].

The land area (X_4) in Table 1 obtained a significance value of 0.000. This value is smaller than 0.05. This means that land area has a significant effect on the income of agroforestry farmers (Y). The coefficient of the land area variable has a positive value, indicating that an increase in land area will lead to a rise in the income of agroforestry farmers, assuming other variables remain constant. The land area variable (X_4) has a partial and significant effect on the income of agroforestry farmers (Y). This shows that the wider the land cultivated by farmers, the higher the income generated. Larger land areas allow for increased production and crop diversification. This finding aligns with research by Nopitasari et al. (2019), which suggests that the larger the land area, the greater the number of plant types farmers can cultivate, leading to increased production. This, in turn, leads to increased income, which is followed by increased income [13]. Limited land is a significant challenge for farmers, as managing narrow land tends to be difficult and provides inadequate profits to meet the needs of farmers and their families [6]. On the other hand, the wider the land managed, the greater the opportunity to increase production results.

The motivation for agroforestry farming (X_5) in Table 1 yielded a significance value of 0.001. This value is smaller than 0.05. This means that motivation for agroforestry farming has a significant effect on the income of agroforestry farmers (Y) at $\alpha = 5\%$. The coefficient of the motivation for agroforestry farming variable has a positive value, indicating that an increase in motivation for agroforestry farming will lead to a rise in the income of agroforestry farmers, assuming that other variables remain constant. The motivation for agroforestry farming variable (X_5) has a partial and significant effect on the income of agroforestry farmers (Y). This indicates that high motivation among farmers to engage in agroforestry farming contributes to increased revenue. Good motivation can encourage farmers to be more innovative and productive in their efforts. Income from agriculture is one of the factors that influences farmers' motivation in determining their choice to manage certain commodities [14].

4. Conclusion

The regression model used to analyze the social and economic determinants of agroforestry farmers' income reveals a pretty good relationship between these variables. Overall, the regression model used is quite effective and significant in explaining the influence of social and economic factors on the income of agroforestry farmers. The independent variables (Level of formal education (X_1), agroforestry farming experience (X_2), number of family dependents (X_3), land area (X_4), and agroforestry farming motivation (X_5)) collectively have a significant influence on the dependent variable, namely the income of agroforestry farmers. To some extent, the variables of formal education level (X_1), land area (X_4), and agroforestry farming motivation (X_5) have a significant influence on the income of agroforestry farmers. Meanwhile, the variables of farming experience (X_2) and number of family dependents (X_3) do not show a significant influence. This indicates that the increase in farmers' income is more determined by the management ability factor, which is influenced by education, land area, and farmers' motivation to work more optimally. Farmer motivation plays a significant role in the success of agroforestry efforts. Therefore, programs that increase farmer motivation, such as providing incentives, awards for outstanding farmers, or intensive mentoring, can be implemented to encourage farmer enthusiasm and innovation.

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