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The Effect of Income Diversification and Land Ownership on the Welfare of Simalungun Coffee Farmers

¹Muhammad Arief Tirtana*, ²Sya'ad Afifuddin Sembiring,

²Wahyu Ario Pratomo

¹Master of Economics Study Program, Department of Economics

²Fakultas Ekonomi dan Bisnis, Universitas Sumatera Utara, Medan

*Corresponding Author: tirtanaarief2@gmail.com

ABSTRAK

Tujuan penelitian ini adalah untuk mengetahui pengaruh diversifikasi pendapatan dan penguasaan lahan terhadap kesejahteraan petani kopi Simalungun. Penelitian ini menggunakan pendekatan kuantitatif dengan metode Structural Equation Modeling-Partial Least Squares (SEM-PLS), data dikumpulkan melalui kuesioner dari 100 petani kopi di Kabupaten Simalungun selama 2024.12 - 2025.2. Hasil penelitian menunjukkan bahwa diversifikasi pendapatan berpengaruh positif dan signifikan terhadap pendapatan petani kopi, tetapi tidak terhadap kesejahteraan. Di sisi lain, penguasaan lahan berpengaruh positif dan signifikan terhadap pendapatan dan kesejahteraan. Temuan ini menunjukkan bahwa penguasaan lahan yang lebih besar dan lebih stabil dapat meningkatkan pendapatan petani dan meningkatkan kesejahteraan, sementara diversifikasi pendapatan hanya efektif dalam meningkatkan pendapatan tetapi tidak cukup untuk meningkatkan kesejahteraan secara signifikan.

Kata Kunci : diversifikasi pendapatan, penguasaan lahan, pendapatan, petani kopi, kesejahteraan

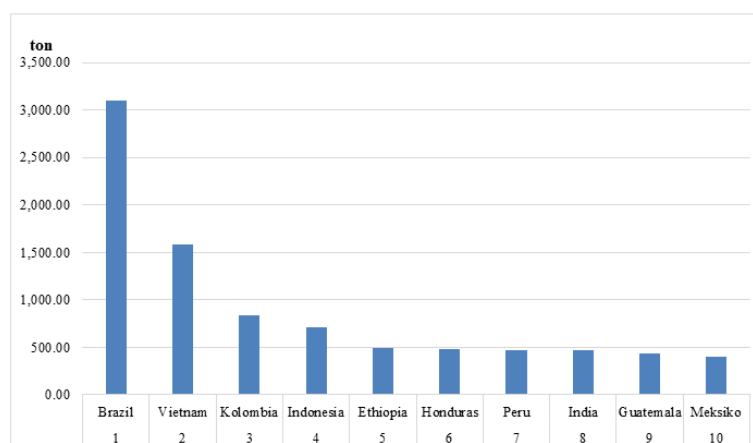
ABSTRACT

The purpose of this study was to determine the effect of income diversification and land tenure on the welfare of Simalungun coffee farmers. This study used a quantitative approach with the Structural Equation Modeling-Partial Least Squares (SEM-PLS) method, data were collected through questionnaires from 100 coffee farmers in Simalungun Regency during 2024.12 - 2025.2. The results showed that income diversification had a positive and significant effect on coffee farmers' income, but not on welfare. On the other hand, land tenure had a positive and significant effect on income and welfare. These findings indicate that larger and more stable land tenure can increase farmers' income and improve welfare, while income diversification is only effective in increasing income but not enough to significantly improve welfare.

Keywords : Income diversification, Land Tenure, Income, Coffee Farmers, Welfare

INTRODUCTION

Indonesia as the fourth largest coffee producer in the world, placing coffee as one of the leading plantation commodities (Ibnu & Rosanti, 2022). Based on data published by FAOSTAT (2022), Indonesia's coffee production is the fourth largest in the world with an average green bean yield of 711.3 tons per year after Brazil (3,103.5 tons per year), Vietnam (1,587.1 tons per year), and Colombia (838.2 tons per year). This number places Indonesia as one of the main coffee producing countries that has a significant contribution in meeting world coffee demand and is in demand by the global market because it meets market requirements and demands (Jamil, 2019).



Source: FAOSTAT (2022) processed.

Figure 1
Graph of World Coffee Producing Countries

In Indonesia, the provinces that produce the most coffee production are on the island of Sumatra, one of which is North Sumatra Province with several districts that are the largest centers of Robusta and Arabica coffee production which contribute to the source of farmers' income, one of which is Simalungun Regency (Martial et al., 2025). Data on coffee production in North Sumatra can be seen in Tables 1 and 2 below.

Table 1
Plantation Area and Production of Robusta Coffee Plantation by Regency/City 2022

Regency/City	Plant Area (Ha)			Total	Production (Ton)
	Non-producing Plant	Producing Plants	Non-producing Plants		
Simalungun		1.732	256	1.988	1.580
Dairi		4.596	3.832	8.428	3.684
Paluta	210	600	42	852	932

Source: Dinas Perkebunan dan Peternakan Province of Sumatera Utara (2022).

Table 2
Plantation Area and Production of Arabica Coffee Plantation by Regency/City 2022

Regency/City	Plant Area (Ha)			Total	Production (Ton)
	Non-Producing Plant	Producing Plants	Non-producing Plants		
Tapanuli Utara	3.267	12.621	623	16.511	16.898
Simalungun	1.240	7.114	108	8.462	11.565
Dairi	1.867	9.316	948	12.131	10.303

Source: Dinas Perkebunan dan Peternakan Province of Sumatera Utara (2022).

The data above shows that Simalungun Regency is a significant coffee producer, indicating that coffee farmers have the potential to increase their income and improve their welfare. However, the high coffee production in Simalungun has not guaranteed the welfare of the community and its farmers. This can be seen from the poverty data presented by the Badan Pusat Statistik Simalungun, (2024) in the period 2013-2023 is as follows:

Table 3
Number of Poor People in Simalungun Regency

Simalungun Regency	Number of Poor People (Thousand)										
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
	87,72	86,25	92,89	92,19	91,35	80,00	76,33	73,64	76,99	72,47	69,21

Sumber: BPS Simalungun Regency (2024).

Meanwhile, the percentage of poor people working in the agricultural sector in Simalungun Regency for the 2018-2024 period is as follows:

Table 4
Percentage of Poor People Working in the Agricultural Sector in Simalungun Regency

Simalungun Regency	Percentage of Poor People Working in the Agriculture Sector						
	2018	2019	2020	2021	2022	2023	2024
	50,08	32,37	34,29	35,29	25,65	29,76	33,41

Source: BPS Simalungun Regency (2024).

The poverty rate in Simalungun Regency has not decreased significantly, indicating that most farmers in the region are still living in poor conditions. Farmer welfare is a national agricultural and land development priority to improve the standard of living of farming families. Although the agricultural sector plays an important role in improving rural welfare, many complex challenges still hinder it. Most farmers live below the national average welfare and if not addressed, the income gap will widen further. This exacerbates social inequality, where high-income groups are increasingly prosperous, while farmers are increasingly left behind (Saputra & Ginting, 2024); (Alfrida & Noor, 2017).

The above phenomenon indicates that although coffee plantations form the backbone of the economy of most farmers in Simalungun, over-reliance on a single commodity and the application of traditional cultivation methods pose serious challenges. Therefore, diversification of farm income is necessary to improve the welfare of coffee farmers. However, the reality in the field shows that farmers in Simalungun still lack diversification, partly due to the suboptimal allocation of labor. This finding is in line with research by Saragih, (2020a) in Bintang Mariah Village, Raya District, Simalungun Regency, which revealed that the utilization of labor on diversified farms is still inefficient, with an optimization value above 1. This figure shows how agricultural diversification efforts have not been fully supported by current labor capabilities.

In addition, farmers need to diversify their income is the increasingly limited agricultural land available, this causes coffee farmers cannot maximize their agricultural production so that income from the farming sector is not optimal and cannot meet their needs (Purba et al., 2023). This shows that agricultural land ownership is an important source in meeting the needs of coffee farmer households. This is in line with research Baso & Anindhita (2018) which states the importance of land tenure in increasing the competitiveness and income of coffee farmers.

Control of natural resources, especially land, also contributes to farmers' income (Budiman et al., 2020). When farmers have full rights to land management, then farmers can be fully creative to increase their farm income (Dananjaya et al., 2021). Theoretically, lands managed by self-owned farmers have stronger rights in their management. As a result, the element of control over land resources can affect income and help farmers become less poor, which in turn can improve farmers' welfare.

Efforts to reduce poverty and improve the welfare of farmers are closely linked to income sources, especially those derived from agriculture. In the case of coffee farmers in Simalungun Regency, strategies to improve welfare can be approached through income diversification and understanding the relationship between land tenure and income levels (Saragih et al., 2019; Hartatri & Neilson, 2021). Land tenure status significantly influences farmers' capacity to expand agricultural production and adopt alternative livelihood strategies (Nainggolan et al., 2020). Overall, diversifying income sources and strengthening land ownership rights among coffee farmers represent vital steps toward sustainable rural welfare (Fitriyah & Sheyoputri, 2025).

METHODS

This study used primary data obtained through questionnaires and direct interviews with coffee farmers in Simalungun Regency, North Sumatra Province. Data collection was conducted from December 2024 to February 2025. The questionnaire was designed using a 1-5 Likert scale to measure respondents' perceptions related to income diversification, land tenure, income, and welfare. The approach used is causality (causal associative) to analyze the effect of income diversification and control of land resources on the welfare of coffee farmers in Simalungun Regency. This type of research

is quantitative with a survey method, which aims to examine the relationship between the independent variables (income diversification and land tenure) and the dependent variable (farmer welfare).

The study population included all coffee farmers in Simalungun Regency with a land area of less than 1 hectare, totaling 29,354 farmers (BPS Simalungun, 2023). Samples were taken using a *multi-stage non-probability sampling* method with a *purposive sampling* technique, which selected farmers who managed land and had diversified income from agricultural resources. The number of samples was determined using the Slovin formula with an error rate of 10%, resulting in 100 respondents. The data analysis method was analyzed using Structural Equation Modeling-Partial Least Squares (SEM-PLS) with the help of SmartPLS 3.0 software. The stages of analysis include:

Pilot Test

Before the main research, a questionnaire was tested on 100 respondents to ensure the validity and reliability of the instrument. The test results showed that the AVE and *Composite Reliability* values met the criteria, so the questionnaire was declared suitable for use.

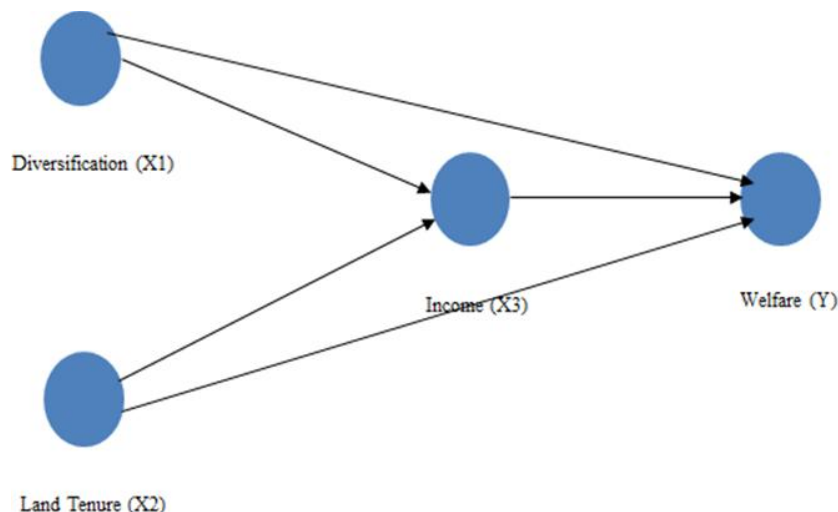
1. Outer Model Evaluation (Measurement Model):

- Convergent Validity Test: Using a loading factor > 0.7 and Average Variance Extracted (AVE) > 0.5 .
- Discriminant Validity Test: Comparing the square root of the AVE with the correlation between variables.
- Reliability Test: Using Cronbach's Alpha and Composite Reliability > 0.7 .

2. Inner Model Evaluation (Structural Model):

- Coefficient of Determination (R^2): To measure the strength of the influence of independent variables on the dependent.
- F-Square: to analyze the level of influence of variable predictions whether weak, moderate, or strong at the structural level.
- Significance Test: Using bootstrapping with the criteria of t-statistic > 1.96 and p-value < 0.05 .

3. Hypothesis Test: Tests the direct and indirect effects between variables.

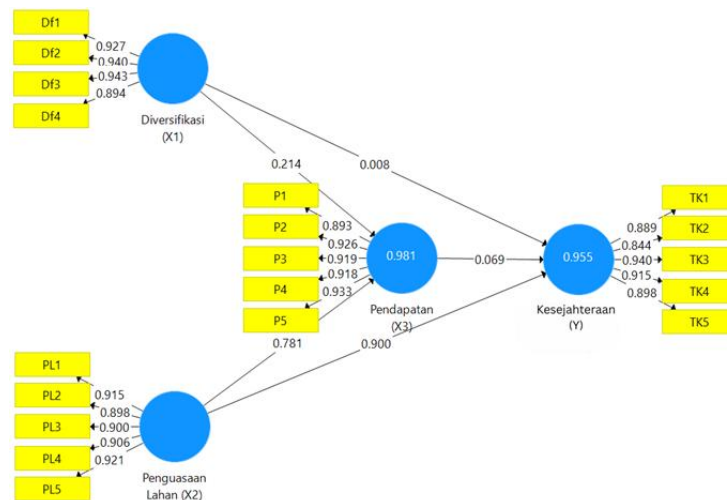


Source: data processed

Figure 2
Conceptual Framework for the Relationship Between Variables

RESULT

In Figure 3, the results of the *outer model* test used to determine the validity of each research variable are shown. This *outer model* test is carried out through two main stages: Validity Test and Reliability Test. Validity Test includes Convergent Validity and Discriminant Validity, while Reliability Test is assessed through Composite Reliability.



Source: data processed

Figure 3
Path Diagram and Loading Factor Value

Convergent validity is assessed by examining the factor loading value, where each indicator must meet the threshold of >0.7 , as well as the Average Variance Extracted (AVE) value which must exceed >0.5 for each variable.

Table 5
Variable Validity Test Results

Variable	Indicator	Loading Factor	Description	Average Variance Extracted (AVE)
Diversification (X1)	Df1	0.927	Valid	0.858
	Df2	0.940	Valid	
	Df3	0.943	Valid	
	Df4	0.894	Valid	
Land Tenure (X2)	PL1	0.915	Valid	0.825
	PL2	0.898	Valid	
	PL3	0.900	Valid	
	PL4	0.906	Valid	
	PL5	0.921	Valid	
Revenue (X3)	P1	0.893	Valid	0.842
	P2	0.926	Valid	
	P3	0.919	Valid	
	P4	0.918	Valid	
	P5	0.933	Valid	
Welfare (Y)	TK1	0.889	Valid	0.806
	TK2	0.844	Valid	
	TK3	0.940	Valid	
	TK4	0.915	Valid	
	TK5	0.898	Valid	

Source: data processed

Based on the results of data processing, it can be concluded that all indicators have met the criteria for convergent validity. This is indicated by the outer loading value for each variable exceeding 0.7, so that all variable indicators in this study are considered valid. This indicates that each questionnaire statement instrument for all variables is in accordance with the situation in the field and in accordance with the thoughts of the respondents.

Discriminant validity is used to prove that the statements on each latent variable are not confused by respondents who answer the questionnaire based on questions on other variables. To test discriminant validity with reflexive indicators, namely by looking at the cross loading value for each variable must be >0.70 .

Table 6
Discriminant Validity Test Results - Fornell-Larcker Criterion

	Diversification (X1)	Income (X3)	Land Tenure (X2)	Welfare (Y)
Diversification (X1)	0,926			
Income (X3)	0,973	0,918		
Land Tenure (X2)	0,971	0,989	0,908	
Welfare (Y)	0,950	0,968	0,977	0,898

Source: data processed

Table 6 shows that the *loading factor* value of each variable is greater than the cross loading value. Therefore, this shows that all indicators of all variables used in this study are declared valid. Based on Table 7, the results of measuring *Composite Reliability* and *Cronbach's Alpha* show that all variables for *Composite Reliability* have a value above 0.70 and all variables for *Cronbach's Alpha* have a value above 0.60. Thus, these results can be declared valid and have a fairly high reliability.

Table 7
AVE Value, Compose Reliability and Cronbach's Alpha

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)	Status
Diversification (X1)	0,945	0,947	0,960	0,858	Valid and Reliabel
Land Tenure (X2)	0,947	0,947	0,959	0,825	Valid and Reliabel
Income (X3)	0,953	0,954	0,964	0,842	Valid and Reliabel
Welfare (Y)	0,939	0,941	0,954	0,806	Valid and Reliabel

Source: data processed

At this stage, the Determinant Coefficient (*R-Square*) test is carried out. *The inner model* can be measured by calculating the *R-square* for the dependent construct, t-test and the significance of the structural path parameter coefficients. There are three categories in grouping the *R-square* and *F-Square* values. If the *R-square* value is 0.75, it is in the strong category; for the *R-square* value of 0.50, it is in the moderate category and 0.25 is in the weak category (Hair et. al, 2013). *F-Square is used to analyze the level of influence of variable predictions whether weak, moderate, or strong at the structural level.* Leeftang dkk., (2017) state that a value of 0.02 indicates the predictor variable has a small influence, a value of 0.15 indicates a medium influence and 0.35 indicates a large influence (Henseler dkk., 2009).

Table 8
R-Square Analysis Results

	R Square	R Square Adjusted
Income (X3)	0,981	0,981
Welfare (Y)	0,955	0,954

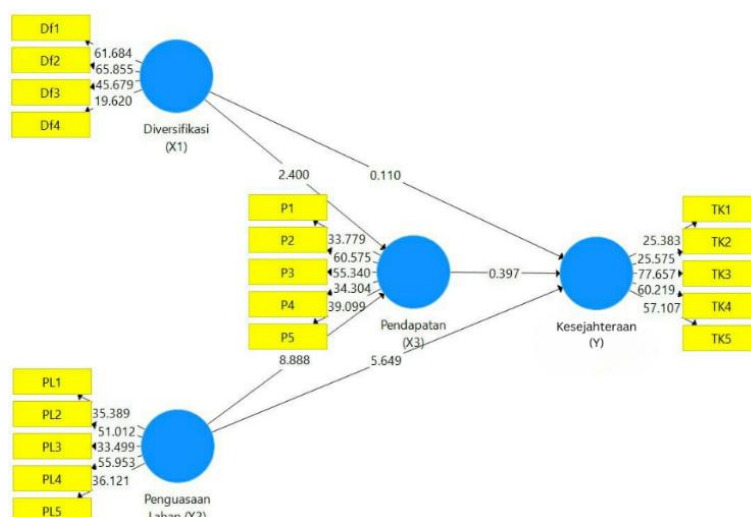
Source: data processed

Table 9
F-Square Test Results

	Diversification (X1)	Income (X3)	Land Tenure (X2)	Welfare (Y)
Diversification (X1)		0,140		0,000
Income (X3)				0,002
Land Tenure (X2)		1,854		0,363
Welfare (Y)				

Source: data processed

The Path Coefficient test shows the direction of the variable relationship, whether the hypothesis is positive or negative. This study uses a *two tail* hypothesis with a *p-value* significance level of 0.05 (5%) and testing with a significance level of 0.05 (5%), has a *t-statistic* value of 1.96. The purpose of this test is to evaluate whether there is a significant influence among the variables involved in this study. The test results are presented in Figure 4 below.



Source: data processed

Figure 4
Test Results with bootstrapping using SmartPLS 3 application

Table 10
Direct Effect Test Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Diversification (X1) -> Income (X3)	0,214	0,211	0,086	2,483	0,013
Diversification (X1) -> Welfare (Y)	0,008	0,005	0,077	0,110	0,913
Land Tenure (X2) -> Income (X3)	0,781	0,784	0,085	9,199	0,000
Land Tenure (X2) -> Welfare (Y)	0,900	0,898	0,154	5,846	0,000
Income (X3) -> Welfare (Y)	0,069	0,075	0,178	0,391	0,696

Source: data processed

Table 11
Indirect Effect Test Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Diversification (X1) -> Income (X3) -> Welfare (Y)	0,015	0,020	0,040	0,369	0,713
Land Tenure (X2) -> Income (X3) -> Welfare (Y)	0,054	0,055	0,141	0,385	0,700

Source: data processed

For hypothesis testing using statistical values, for alpha 5% the *t-statistic* value used is 1.96. So that the criteria for accepting / rejecting the Hypothesis is H_a is accepted and H_0 is rejected when the *t-statistic* > 1.96 . To reject / accept the hypothesis using probability, H_a is accepted if the *p* value is < 0.05 . The estimation results for direct and indirect effects are summarized in Tables 10 and 11, where the interpretation of the results is explained as follows.

The first result, the Diversification variable has a positive and significant effect on Revenue, because the *t-statistic* value is 2.483 which means it is greater than the *t-table* of 1.96. In addition, the resulting *p-value* is 0.013 which means it is smaller than 0.05. The second result, the income diversification variable has a positive and insignificant effect on welfare, because the *t-statistic* value is 0.110, which means it is smaller than the *t-table*, namely 1.96. In addition, the resulting *p-value* is 0.913, which means it is greater than 0.05. The third result, the Land Tenure variable has a positive and significant effect on Income, because the *t-statistic* value is 9.199 which means it is greater than the *t-table* of 1.96. In addition, the resulting *p-value* is 0.000, which means it is smaller than 0.05. The fourth result, the Land Tenure variable has a positive and significant effect on Welfare, because the *t-statistic* value is 5.846, which means it is greater than the *t-table*, namely 1.96. In addition, the resulting *p-value* is 0.000, which means it is smaller than 0.05. The fifth result, the Income variable has a positive and

insignificant effect on Welfare, because the *t-statistic* value is 0.391 which means it is smaller than the *t-table*, namely 1.96. In addition, the resulting *p-value* is 0.696, which means it is greater than 0.05.

Furthermore, for indirect testing, namely the sixth result, the Diversification variable on Welfare through Income shows a positive and insignificant influence because the *t-statistic* value is 0.369, which means it is smaller than the *t-table* of 1.96. In addition, the resulting *p-value* is 0.713, which means it is greater than 0.05. The seventh result, the Land Tenure variable on Welfare through Income, shows a positive and insignificant effect because the *t-statistic* value is 0.385, which is smaller than the *t-table*, namely 1.96. In addition, the resulting *p-value* is 0.700, which means it is greater than 0.05.

Income diversification has an impact on farmers to have various sources of income outside their main business in coffee cultivation or farmers do not only depend on one income from coffee alone, so that farmers' income can increase or increase. This is in line with Ellis (1999) which states that with diversification, the risk of dependence on one source of income can be reduced, so that stability and increased income can be better guaranteed. This result is also in line with the research of Rahman & Mishra, (2019) which shows that income diversification makes a positive contribution to improving the welfare of farmer households in rural areas. By having various sources of income, coffee farmers are better able to deal with fluctuations in coffee prices, weather uncertainty, and other risks that can affect their productivity and income.

Land tenure is a key factor in determining farmers' income. The area of land controlled by farmers affects production capacity and economic efficiency in agricultural activities. This is in line with research Manatar et al., (2017) which shows that land tenure status affects the average income received by farmers. The highest average income was found in farmers with rental land status, significantly different from the income of self-owned and tenant farmers. Furthermore, research Callista et al., (2022) also shows that the area and status of land tenure has a positive and significant effect on the income of paddy rice farming. The larger the land area and the more stable tenure status, the higher the income earned by farmers. Thus, adequate land tenure and clear ownership status can increase farmers' income.

Land tenure plays an important role in determining the economic well-being of farm households. The area of land controlled affects the production capacity and income of farmers, which in turn has an impact on the economy to support the welfare of farmers. This research is in line with Halim & Faisal, (2022) which shows that there is a significant relationship between land tenure and farmers' welfare. The more land controlled, the lower the level of poverty experienced by farmers, which in turn can improve the welfare of farmers. Development economic theory states that access to productive resources, such as land, is an important factor in determining the level of community welfare. Without fair access to land, the poor will find it difficult to increase their productivity and income, so poverty will continue, so it is necessary to control land resources so that farming communities can be helped in their income and ultimately the community can prosper from the land they manage. Land tenure is an important factor in the economic impact of efforts to support farmers' welfare. Land redistribution policies and increasing community access to land can be effective strategies to support farmers' welfare, especially in areas with high land tenure inequality and also adequate and equitable land tenure can be a key factor in welfare efforts in the agricultural sector. Policies that support land redistribution and greater access for smallholders can contribute significantly to their welfare.

CONCLUSION

The SEM model estimation results show that all variables affecting welfare have a positive relationship, but some variables show insignificant results. Income diversification and land ownership show positive and significant results on the income of coffee farmers in Simalungun, and land ownership also shows a positive and significant influence on the welfare of Simalungun coffee farmers. The results of Diversification and Income show a positive but insignificant influence on the welfare of Simalungun coffee farmers. The results of the Indirect Effect, namely Diversification on Welfare through income and land ownership on welfare through income, show equally positive but insignificant results.

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