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The Effect of Income of Farmers and Farm Laborers on Agricultural Economic Growth

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Abstract
The agricultural sector plays an essential role in the economy of a country. This critical role cannot be separated from the main component of the farm sector, namely, farmers. To support economic growth and poverty alleviation through the agricultural industry, the welfare of farmers must be a concern. This study aims to analyze the effect of the income of farmers and farm laborers on agricultural economic growth. The method used is ECM with 24 quarterly data observations. The price index received by farmers approximates farmers' incomes, farm laborers' incomes are approximated by the daily real wages of farm laborers, and agricultural economic growth is approximated by the real GRDP of the agricultural sector. The results showed that the income of farmers and farm laborers during the research period had a positive trend. In the long-term and short-term equation, the payment of farmers and farm laborers has a significant positive effect on the economic growth of the agricultural sector. An increase in the income of farmers and farm laborers also followed the increase in agricultural economic development. These results can be used as a reference for the government to make policies to increase the income of farmers and farm laborers.

INTRODUCTION

The agricultural sector plays an essential role in the economy of a country. Agriculture is a sector that can develop countries in economic development and efforts to reduce poverty (Ali & Talukder, 2010; Awan & Alam, 2015). Economic growth, in general, is an essential contributor to poverty reduction, the mixed sector plays a substantially important role, and agricultural incomes are substantial (Cervantes-Godoy & Dewbre, 2010).

The critical role of the agricultural sector in an economy cannot be separated from the main component of the industry, namely, farmers. Therefore, the welfare of farmers and farm workers needs to be given more attention to support economic growth and poverty reduction through the agricultural sector. One approach to measuring farmers' welfare is the Farmer's Exchange Rate (NTP) (BPS, 2021). NTP is obtained from the index of prices received by farmers compared to the index of fees paid by farmers.

Income from farmers and farm workers is related to rural interests and is also related to national social and economic stability (Chen, 2019; Bai, 2003; Tan & Peng, 2018). For farmers and farmworkers, an increase in income

is the most common thing. If farmers' incomes are low, rural purchasing power will not increase, profoundly impacting domestic demand and limited economic development. Farmers cannot become rich and cause the result of a prosperous society as a whole to fail.

Yacoub and Mutiaradina (2020) conducted research related to the welfare of farmers and rural poverty in Indonesia. This study indicates that real wages have a significant adverse effect on rural poverty in Indonesia. However, in Indonesia, the average salary for farm laborers is still relatively low. So that rural poverty is still widely found in various provinces in Indonesia.

A recent study found that farmers' income relates to poverty reduction, one of the economic development goals. Bresciani and Valdes (2007) frame their analysis in three key channels linking agricultural growth to poverty: labor market, farm income, and food prices. They conclude that when both the direct and indirect effects of agricultural growth are considered, such growth is more poverty-reducing than growth in non-agricultural sectors.

Awan (2014) conducted a study on the determinants of agricultural productivity growth. This research uses the time series of data analysis method. The study results indicate that the low agricultural productivity gaps farmers' income.

Analysis related to the income of farmers and farmworkers, which, according to previous research, has an impact on economic growth in the agricultural sector, still needs to be done. This analysis can support the government in producing policies related to the welfare of farmers. Unfortunately, there are still few studies that directly measure farmers' income to the growth of the economic sector in Indonesia.

In addition, previous research did not measure the impact of farm laborers' income. Therefore, this study aims to analyze the effect of the payment of farmers and farm laborers on the agricultural sector in Indonesia. This research is expected to contribute to the government in formulating policies and applying science to the world of education.

RESEARCH METHODS

Data Sources and Research Variables

This study uses a quarterly data series from quartile-1 2014 to quartile-4 2019. The total observations from this study amounted to 24 observations in total. All data are sourced from the Central Bureau of Statistics.

The variable of economic growth in the agricultural sector is approximated by GDP data based on constant prices from the agricultural industry. Meanwhile, farmers' income is approached by one of the indexes that make up the NTP, namely the index received by farmers and the average daily wage of farm laborers.

Table 1. Variables and Operational Definition

Variables	Operational Definition	Unit
AGR (Y)	Indonesia's real GDP with the base year 2010, which is the total added value for agricultural sectors	Billion Rupiah
IT (X1)	A price index that shows the development of producer prices for farmers' products with the base year 2012	Percent
WAGES (X2)	Wages received by farm workers as remuneration for the work done. The wages used are real wages obtained from nominal wages divided by the Consumer Price Index (CPI) for the base year 2012	Rupiah

Method of Analysis

The analysis used in this research is descriptive analysis and time series data analysis, namely Error Correction Mechanism (ECM). The study will focus on the direct effect of the income of farmers and farm laborers on economic growth in Indonesia's agricultural sector. The data used is processed using Microsoft Excel and Eviews 8.

ECM modeling is one way to identify the relationship among some variables that are not stationary at the level. ECM can be done if the group of variables has cointegration. The hallmark of ECM is the Error Correction Term (ECT). ECT is a residual that arises in the ECM method. The ECM model can be valid if the ECT is statistically significant and is less than one.

The first step to performing an ECM analysis is to perform a stationarity test. Data that is not stationary has an inconsistent mean and variance (Ariefianto, 2012). This study used the Phillips-Perron (PP) stationarity test. The stationary test is a development of the Dicky-Fuller (DF) test. The test's null hypothesis is that the data does not have a unit root.

Then the step that must be done is to test the cointegration of the research variables. Cointegration testing is done by testing the stationary of the model equation residuals for all research variables at the level. The stationarity test of the residuals was carried out with the PP test. Here are the equations at the level or commonly referred to as the long-run equation for research:

$$Ln\_AGR_t = \beta_0 + \beta_1 Ln\_IT_t + \beta_2 Ln\_WAGES_t + \varepsilon_t \quad \text{.....(1)}$$

With:

$WAGES$: Farm laborer daily wage in period t
IT_t : Index received by farmers in period t
AGR_t : Economic growth in the agricultural sector in period t
β_1 : Variable coefficient of economic growth
β_0 : Constant
ε_t : Residual

After getting the long-run residuals and testing the cointegration, the next step is to estimate the ECM, also known as the short-run equation. This equation is obtained by estimating the parameters at the first difference and the first lag of the long-run residual equation commonly referred to as ECT. Here is the short-run equation for this study:

$$\Delta Ln_{AGR_t} = \beta_0 + \beta_1 \Delta Ln_{IT_t} + \beta_2 \Delta Ln_{WAGES_t} + \beta_2 ECT_{t-1} + \varepsilon_t \quad (2)$$

The feasibility of the built ECM model needs to be tested with several statistical tests. One of them is by conducting simultaneous testing, namely the F test. The null hypothesis for this test is that none of the independent variables significantly affects the dependent variable ($H_0 = \beta_0, \dots, \beta_2 = 0$). Here are the test statistics for the F test:

$$F = \frac{Mean\ Square\ Regression}{Mean\ Square\ Error} \sim F_{a,k-1;k(n-1)} \quad (3)$$

When the result of the F test rejects the null hypothesis, partial testing needs to be done to find out which independent variables significantly affect the dependent variable. Partial tests generally use the t-test. The null hypothesis of the t-test is that the i-th independent variable has no significant effect ($H_0 = \beta_i = 0$). Here are the t-test statistics:

$$t = \frac{b_i}{Sb_i} \sim t_{\alpha,n-k-1} \quad (4)$$

The coefficient of determination (measures the goodness of the modelR^2). This coefficient measures the contribution of the independent variable to the variation of the dependent variable (Sujana, 2001). The value of this coefficient ranges from 0 to 1; the closer to 1, the better the resulting model. Here is the equation for the coefficient of determination:

$$R^2 = 1 - \frac{(n-k-1){S_y}^2}{(n-1){S_y}^2} \quad (5)$$

ECM is estimated using the Ordinary Least Square (OLS) method. Therefore, ECM needs to meet the classical assumptions so that the parameter estimates carried out-produce the Best Linear Unbiased Estimator. The tests include normality test, non-multicollinearity test, non-autocorrelation test, and homoscedasticity test.

For the normality test, this study uses the Jarque-Bera test statistic, which hypothesizes that the null residual is normally distributed ($H_0 = \varepsilon_i \sim N(\mu, \sigma^2)$) (Gujarati & Porter, 2008). This study uses the Variance Inflation Factor (VIF), which will find multicollinearity if the value for each independent variable is more than 10 (Zain, 1995). This study uses the White test with the null hypothesis for the homoscedasticity test, namely the constant variance ($H_0 = \sigma^2 = \sigma^2$). The non-autocorrelation test was carried out using the Breusch-Godfrey test, and the null hypothesis was that there was no autocorrelation.

RESULT AND DISCUSSION

Movement of Price Index Value Received by Farmers

The price index received by farmers measures the average price change for a package of agricultural products at the producer price level. Thus, this index value aims to determine the price movement of goods produced by farmers. In addition, this value is also used as supporting data in calculating agricultural sector income. Therefore, this index value is appropriate to be used as an approach in measuring farmers' income.

Figure 1. Movement of Price Index Received by Farmers

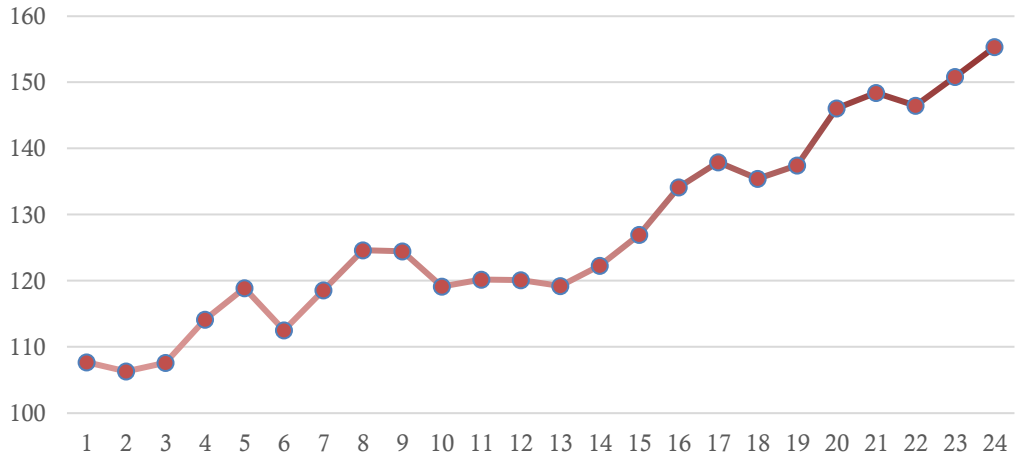

Figure 1 shows that the price index value received by farmers during the study period has a relatively positive trend. For example, with the base year 2012, the index value in 2014 already had an average value of 108,95 which means that the price of agricultural products increased by 8,95 percent compared to the same product in 2012. Thus, the index number has increased relatively drastically and has a value of 150,27 in 2019.

The positive trend is a good result of various government efforts to increase farmers' income. One of the government's efforts that have an impact is to increase the ease of agricultural distribution. In addition, infrastructure development has a positive effect on increasing farmer productivity (Hayati, 2021).

Movement of Daily Wage of Farm Laborers

Farm labor wages measure the income of workers in the agricultural sector. The wages used in this study are real wages resulting from dividing nominal wages with the 2012 Consumer Price Index (CPI). This wage describes the welfare of workers in the agricultural sector, which are farm laborers.

Figure 2. Movement of Daily Wage of Farm Laborers

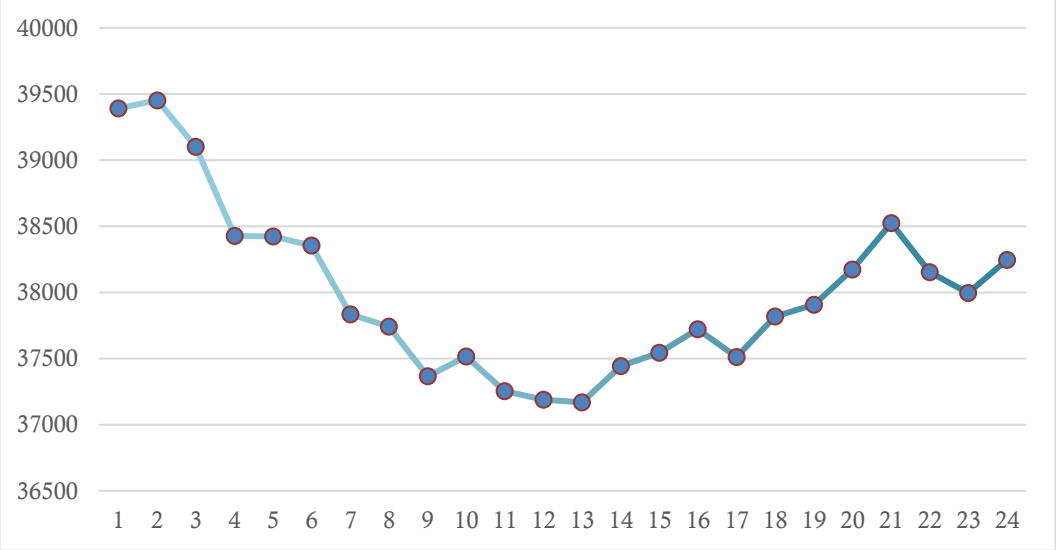

Figure 2 shows that the average daily wage of farm laborers fluctuated relatively during the study period. At the beginning of the research period, namely quartile-1 2014, the value of the average daily salary of farm laborers was relatively high. However, the average value of these wages has decreased in the following two years. Although in 2017 it began to increase again, until the end of the research period, namely quartile-4 2019, the value of the average daily wage of farm laborers was still lower than the initial period of the study.

Stationarity Test

A stationarity test is needed to determine the suitable model in research that uses time-series data analysis. Data that is not stationary will produce a spurious regression if entered into the model. The following are the results of the stationarity test for the data in this study.

Table 2 shows the results of the data stationarity test for the research variables. Using the PP test, the p-value for all variables is more significant than 0,05 in the level test. Therefore, there is not enough evidence to state that all research data is stationary at the level with an alpha error rate of 5 percent. Thus, regression modeling cannot be carried out at a level because it will produce a spurious regression.

Table 2. Result of Data Stationarity Test

Variable	p-value (level)	p-value (1st difference)
LN_IT	0.9948	0.0000
LN_AGR	0.7138	0.0000
LN_WAGES	0.1868	0.0061

However, the test results show that all variables are stationary at the first difference with an alpha error rate of 5 percent. Thus, the appropriate model for this study is regression at the first difference or ECM if all research variables have cointegration.

Long-run equation

Cointegration testing can be done by estimating the regression equation at the level commonly known as the long-run equation. The residuals from these equations will then be tested for cointegration. For example, the following is a long-run equation for the effect of income of farmers and farm workers on economic growth.

Table 3. Estimation Results of the Long-run equation

Dep_Var	Ind_Var	Coefficient	Prob(t)	R^2	Prob(F)
LN_AGR	LN_IT	0.7340	0.0000	0.863	0.0000
	LN_WAGES	0.7134	0.0000		
	C	18.809	0.0008		

Table 3 shows the long-run equation for the effect of farmer income on economic growth. Again, all variables have been transformed into a natural logarithm.

The resulting long-run equation model has an R^2 value of 0,863. These results indicate that the resulting model is relatively good. The value of R^2 can be interpreted that independent variables can explain 86,3 percent of the variation of changes in economic growth.

The probability value of F from the resulting model is less than 0,05. Thus, there is sufficient evidence to conclude that at least one independent variable significantly influences changes in economic growth in the agricultural sector in the long run with an alpha error rate of 5 percent. However, it is necessary to test to determine each independent variable's effect partially.

The probability value of the variable of changes in income of farmers and farm laborers is minor than 0,05. Thus, it can be concluded that in the long run, changes in farmers' income have a significant positive effect on changes in economic growth in the agricultural sector. Therefore, changes in the payment of farmers and farm laborers will increase economic growth in the farming sector.

Cointegration Test

Residuals obtained from the long-run equation were tested for stationarity using the PP test. As a result, cointegration can be found in the residual, which is stationary at the level. The following are the results of the cointegration test of this study.

Table 4. Cointegration Test Results

Variable	p-value (level)
RESID	0.0107

Table 4 shows the results of the cointegration test of the research variables. Based on these results, the residual is stationary at a level with an alpha error rate of 5 percent. That is, the research model will use the ECM model.

Short-run equation

After the cointegration test and the results show cointegration, the next step is to estimate the ECM equation, also known as the short-run equation. The following are the results of the estimation of the short-run equation.

Table 5 shows the estimation results from the short-run equation. The resulting R^2 value is 0,694. This value is relatively large to indicate that 69,4 percent of the variation of the agricultural sector's economic growth in the short run can be explained by independent variables. Thus, the resulting model is relatively good.

Based on Table 5, the probability value for *F* is less than 0,05. This result is similar to the long-run equation estimation results. Therefore, it concludes that at least one independent variable significantly affects the economic growth of the agricultural sector at an alpha error level of 5 percent. Thus, it is necessary to do a partial test.

The partial test results show that the ECT variable has a significant effect on changes in economic growth in the agricultural sector at an alpha error level of 5 percent. ECT is defined as the speed of adjustment. Thus, the value of -0,3863 means that the imbalance in the current quarter will be corrected by 38,63 percent in the next quarter as a short-run impact of changes in farmers' income. Meanwhile, the imbalance corrected in the following quarters will converge towards 0.

The partial test results also show that the changes in the index received by farmers' income significantly affect economic growth in the agricultural sector in the short run at an alpha error level of 5 percent. This result is in line with the long-run equation, which also shows that changes in farmers' income have a significant positive effect on changes in economic growth in the agricultural sector.

Table 5. Estimation Results of the Short-run equation

Dep_Var	Ind_Var	Coef	Prob(t)	R^2	Prob(F)
D(LN_AGR)	D(LN_IT)	0.4512	0.0488	0.694	0.0000
	D(LN_WAGES)	0.2458	0.0071		
	ECT(-1)	-0.3863	0.0085		
	C	0.0197	0.0031		

The average daily wage of farm laborers also has a significant positive effect on agricultural economic growth at an alpha error rate of 5 percent. This result is also in line with the long-term equation. A change of one percent of the average daily wage of farm laborers will increase the shift of economic growth in the agricultural sector by 0,2458 percent.

The significant positive effect of changes in farmer income on changes in economic growth in the agricultural sector shows results in line with previous research conducted by Awan (2014). The higher the level of farmers' income, the better the access of farmers to get better welfare and increase their productivity (Alfrida & Noor, 2017). Awan & Sheikh (2015) estimate the impact of granting land credits on the productivity of low-income farmers.

Farmer productivity is highly dependent on the ability and purchasing power of farmers. Farmers with low income find it difficult to develop their land.

The significant positive effect on the economic growth of the agricultural sector needs special attention from the government. Regulations related to production costs from farmers require to support farmers in obtaining welfare. If production costs are higher than revenues, farmers will experience losses (Lumintang, 2013). Therefore, in the long run, high production costs will impact the agricultural sector, one of the Indonesian economy's supporting sectors.

In addition, the government's efforts to facilitate farmers' access in expanding distribution channels also need to be improved. High production and stock of agricultural commodities will not increase farmers' income if they do not have good distribution and marketing channels. Putri (2013) stated that the size of farmers' income is influenced by marketing.

Classic Assumption Test

Estimating ECM or short-run equations using OLS makes it necessary to test classical assumptions. Assumptions tests carried out in this study were normality, non-autocorrelation, non-multicollinearity, and homoscedastic tests.

Table 6. Assumption Test Results

Test	Probability(test statistic)
Normality	0.5613
Non-autocorrelation	0.6379
Homokedastic	0.3114

Table 6 shows the results of the assumption test for normality, no autocorrelation, and homoscedastic. The results of these tests have a probability value of each test that is more than 0,05. There is not enough evidence to state that the residuals violate the assumptions of normality, no autocorrelation, and homoscedastic at an alpha error level of 5 percent.

Table 7. VIF Value of Research Variables

Variable	VIF
D(LN_IT)	2.263
D(LN_WAGES)	1.019
SISA(-1)	2.236

Table 7 is the result of the non-multicollinearity test. The VIF value obtained from each variable does not exceed 10. Thus, it can be concluded that the non-multicollinearity assumption has been met. The fulfillment of all classical assumptions makes the model estimation carried out a BLUE nature.

CONCLUSION

This study has provided interesting findings from the initial objective of the study, namely to analyze the effect of income of farmers and farm laborers on the economic growth of the agricultural sector. In general, the payment of

farmers and farm laborers has a relatively increasing trend during the study period. In the long and short run, changes in farmer income significantly affect economic growth in the agricultural sector at an alpha error level of 5 percent. The speed of adjustment of the resulting short-run model is -0,3916.

Attention to farmers and farm laborers based on the results of this study becomes important for policymakers. The income of farmers and farm laborers needs to be considered to maintain or increase their productivity. The decline in revenue of farmers and farm laborers can influence the growth of the agricultural economic sector, which is one of the crucial sectors in Indonesia's economic development.

This research is limited to the income of farmers and farm laborers directly without looking at the influence of other sectors. That limit makes the study results not optimal because other factors have not been measured. Future research needs to consider other factors.

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