Article

The Effect of Infrastructure and Labor in Agricultural Sector on Agricultural Economic Growth in Aceh Province

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Abstract: This study focusses on the effect of agricultural infrastructure and agricultural labor on agricultural economic growth rate in Aceh Province. The method used in this study is panel data regression based on districts/cities panel data period 2015-2019. Results of estimation shows that both factors which are agricultural infrastructure and agricultural labor have significant effect toward agricultural economic growth. Agricultural infrastructure found to have a negative effect while agricultural labor has a positive effect on agricultural economic growth. Furthermore, the panel data regression model that has been formed is found to be fit which means that agricultural infrastructure and agricultural labor are considered capable of representing the factors that influence the economic growth rate of agricultural sector in Aceh Province. Based on these findings it is hoped the government will able to formulate a strategic policy that can accelerate the rate of economic growth rate of the agricultural sector in Aceh Province.

Keywords: agricultural economic growth; agricultural infrastructure; agricultural labor; panel data regression

1. Introduction

Development carried out in an area aims to increase prosperity for all levels of society fairly and equitably to create an economy that can be felt by all groups (Schumpeter & Backhaus, 2003). Each country aims to prosper its people in various ways, which can be seen based on all macroeconomic indicators, one of which is an indicator of economic growth (Yuliawan, 2013). High economic growth is one of the goals, including developing countries such as Indonesia (Winardi et al., 2019). Aceh Province is one of the provinces in Indonesia which has a wealth of substantial natural resources. These natural resources can be in the form of renewable or non-renewable resources. This wealth owned by Aceh Province can be used as capital for economic development in Aceh Province. One of the resources that can be continuously

developed is resources in the agricultural sector (Widyawati, 2017). However, the increased distribution in the agricultural sector has not guaranteed that the agricultural sector has grown rapidly in Aceh Province.

Economic growth rate in the agricultural sector in Aceh Province for the period 2010 to 2020 mostly grew positively. The growth was relatively fluctuating, and there was even a tendency to slow down. In 2010, the growth rate of the agricultural sector was 3.75 percent and continued to increase until 2013 to 4.68 percent. However, in 2014 there was a slowdown in growth to 2.45 percent and the slowest growth during that period. Furthermore, there was a fluctuation in growth until in 2015 it became 5.25 percent and became the highest growth during the research period. However, in the next period until 2020, the rate of economic growth in the agricultural sector tends to decline to 3.47 percent (Central Bureau of Statistics, 2020). This is usually due to limited human resources or technological developments that have not significantly impacted the economy.

Agricultural land tends to be in the highway zone to face a higher risk (Bacior & Prus, 2018). In addition, factors that significantly influence the development of the agricultural sector are infrastructure that supports the agricultural sector, such as irrigation and so on. Atmaja & Mahalli (2015) in their research, stated that agricultural infrastructure has a positive influence on economic growth. Hidayati (2021) states that in addition to natural resources and human resources, a factor that greatly influences the economic development of the agricultural sector is the provision of various subsidies that can ease the burden on farmers so that they can spur production growth.

Based on sources from the Central Statistics Agency, the number of workers in the agricultural sector in Aceh Province is 881,357, or about 44.83 percent of the total workforce in Aceh Province. This number decreased to 828,354 in 2019. However, compared to the entire workforce in Aceh Province, employment in the agricultural sector has also decreased to only 36.71 percent. This can be one of the causes of production instability, causing the agricultural sector in Aceh Province to experience fluctuating growth. The total assets owned by Aceh Province for the development of the agricultural sector are relatively large. In 2016, the number of infrastructure development assets such as roads, irrigation, and those supporting the agricultural sector amounted to 29.38 trillion rupiah. This total asset increased every year to reach 47.97 trillion rupiah in 2019. The average growth rate in the value of infrastructure assets that can support economic development in the agricultural sector annually is 12.65 percent. This is certainly an irony where the increase in the value of these assets has not been able to support the pace of economic growth in the agricultural sector in Aceh Province to grow faster.

On the basis of the previous discussion, it is interesting to conduct a study related to the influence given by agricultural infrastructure and agricultural labor on the agricultural economic growth rate in Aceh Province. This research is very important consider that the agricultural sector is a main supporting sector of Aceh Province economy so that by knowing the influence given by each variable, it is able to formulate a policy that can accelerate the rate of economic growth rate of the agricultural sector in Aceh Province.

2. Literature Review

Economic development comes from combining two words, namely development and economy. Singgalen et al. (2019) state that development is the output of building activities, while economics studies the processing of goods from various sectors such as industry, agriculture, and trade. Meanwhile, Schumpeter & Backhaus (2003) states that economic development is a process that aims to increase the real per capita income of the population in an area in the long term. In addition, there is an important aspect in economic development, namely the development of economic development, which can be described through economic growth. According to Erfani (2019), economic growth explains what factors can determine the increase in output per capita in the long term. There is an explanation that can explain the process of economic growth occurring. Arsyad et al. (2021) state that economic growth is a long-term change that slowly increases saving and population.

Economic development cannot be separated from adequate and appropriate infrastructure development. Todaro & Smith (2012) explain that economic growth in developing countries tends to be constrained by poor infrastructure and goods markets. The availability of infrastructure is also the main reason for the increase in the budget that must be spent on the distribution of goods and can lead to low investment received. Furthermore, Labor is one of the macroeconomic indicators that can streamline the economy (Abraham & Sasikumar, 2017). The theory that forms the basis for the use of this variable is the Solow-Swan economic growth theory which states that population growth is one indicator that influences economic growth.

Infrastructure improvements will facilitate the distribution of goods due to the connectivity between regions. This will undoubtedly have an impact on increasing demand for goods and services between areas

to increase productivity. Increased productivity will lead to faster economic growth. Edeme et al. (2020), in their research, found that there was a negative but not significant relationship between infrastructure that supports agricultural performance. However, increasing investment in infrastructure development will potentially increase employment opportunities. The correlation test concluded that there was a close relationship between infrastructure in the form of electricity, transportation, and information and communication technology on agricultural productivity. This finding is supported by research conducted by Qin et al. (2020), where infrastructure, labor migration, and land transfer are the determining factors of rural economic development where marginal effects can be felt in all sectors, including the agricultural and non-agricultural sectors.

Song & van Geenhuizen (2014) state that infrastructure is an investment that positively impacts the economy of the Chinese region. The Shanghai region has the largest impact of the four regions studied, followed by the Tianjin and Guangzhou regions. The region with the lowest impact on infrastructure development is the central region. The results of this study indicate that overall, the weakest relationship formed is the relationship with land transportation infrastructure. This result is also strengthened by Sitorus and Yuliana's (2018) research using multiple linear regression analysis models stating that the road, health, and APBD variables have a positive and significant effect on economic productivity.

Masru'ah (2013) stated that investment variables that represent infrastructure and other capital goods in the agricultural sector have a significant effect on the economic growth of the agricultural sector. Meanwhile, the labor variable in the agricultural sector does not have a statistically significant effect on economic growth in the agricultural sector. This is caused by the effect of the law of diminishing return, where the addition of labor cannot improve the agricultural sector's economy because the combination of capital goods and labor has reached the highest point of productivity so that the addition of labor will reduce productivity. This is supported by Surya et al. (2021), where the agricultural sector still has to bear most of the workforce. Still, the share of GDP tends to be small compared to Indonesia's total GDP.

In addition to infrastructure, an essential factor in increasing economic productivity, including the agricultural sector, is labor. An increase in labor tends to increase production to increase economic growth. Kurniawati (2020) in her research, states that the agricultural sector and labor productivity have a close relationship. In line with this research, Bashir & Susetyo (2018) state that the workforce in the agricultural sector has a positive and significant impact on the Indonesian economy in the agricultural sector. In addition, government expenditure variables also have a positive and significant impact on the Indonesian economy in the agricultural sector. In contrast to these results, La Porta & Shleifer (2014) stated employment has a negative and significant effect on economic growth, and the agricultural sector has not had a statistically significant effect on economic growth. But simultaneously, these two variables have a positive and significant effect on economic growth in North Lampung Regency.

3. Materials and Methods

3.1. Materials

This study aimed to examine the effect of the variable agricultural infrastructure and agricultural labor on the economic growth rate of the agricultural sector in the Aceh Province. Data used in this research is districts/cities panel data period 2015-2019. Type of data is secondary data obtained from Statistics Aceh Province, Indonesia and Ministry of Finance.

3.2. Methods

3.2.1 Panel Data Regression

The method used in this study is a panel data regression. Considering that panel data is a combination of cross section and time-series data (Agusalim et al., 2019), the model is written as

$$\text{AEG}_{it} = \beta_0 + \beta_1 \text{AI}_{it} + \beta_2 \text{AL}_{it} + \varepsilon i \tag{1}$$

Where, AEG_{it} is agricultural economic growth rate; AI_{it} is agricultural infrastructure; AL_{it} is agricultural labor; β_0 is Intercept or constant; $\beta_{1,2,3...n}$ is independent variable regression coefficient and ε_i is error term.

4. Results

4.1 Estimation Results of Panel Data

The first step that must be done in panel data regression is to determine the best model based on research data. Two tests were applied which are Chow and Hausman test. Results from Chow test generate probability value 0.0000 (<0.05) which indicates that between common and fixed effect, fixed effect is the best method. Furthermore, Hausman test generate probability value 0.0191 (<0.05) which indicates that between fixed and random effect, fixed effect is still the best final method for estimating model data.

Table 1 displays the estimation results shows that both selected independent variables which are agricultural infrastructure and agricultural labor have a significant effect toward dependent variable agricultural economic growth. Also, based on the results, the simultaneous effect of independent variables generated probability value 0.000 (<0.05) of the F-statistics which shows that agricultural infrastructure and agricultural labor together have significant effect toward agricultural economic growth. Then, obtained value of R2 is 0.4834 which shows that the variation of agricultural economic growth value explained by agricultural infrastructure and agricultural labor variables is 48.34%.

Table 1. The estimation results of panel data regression.

Variable	Coefficient	Prob.
C	5.264	0.000
Agricultural infrastructure	0.000	0.000
Agricultural labor	0.000	0.000
R-squared		0.483
Adjusted R-squared		0.346
F-statistic		3.509
Prob(F-statistic)		0.000

Dependent variable: Agricultural economic growth

Two classical assumption tests have also been carried out, which are multicollinearity and heteroscedasticity test. Multicollinearity test in Table 2 indicates that there are no variables in the model that influence each other where the test results show that there are no value greater than 0.8.

Table 2. The estimation results of multicollinearity test.

Variables	Agricultural economic growth	Agricultural infrastructure	Agricultural labor
Agricultural economic growth	1.000	-0.027	0.001
Agricultural infrastructure	-0.027	1.000	0.376
Agricultural labor	0.001	0.376	1.000

Heteroscedasticity test in Table 3 also shows that there are no value lower than 0.05 which indicates that the data is free from heteroscedasticity problems or in other words, the data in this study is said to be homoscedasticity.

Table 3. The estimation results of heteroscedasticity test.

Variables	Coefficient	Prob.
Constant	0.910	0.000
Agricultural infrastructure	-5.24E-15	0.966
Agricultural labor	2.28E-06	0.312

5. Discussion

The variable of agricultural infrastructure was found to have negative and significant effect toward agricultural economic growth. The estimated coefficient obtained is -1.72x10-12 which shows that when there is an increase in the agricultural infrastructure by Rp1, it will decrease the agricultural economic

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growth by 1.72x10-12 percent. On the other hand, when there is a decrease in agricultural infrastructure by Rp1, agricultural economic growth will increase by 1.72x10-12 percent. This finding is in line with previous research such as study by Qin et al. (2020), Song & van Geenhuizen (2014), Ibrahim & Mazwan (2020), which also found that agricultural infrastructure had a significant effect on agricultural economic growth.

Then, the variable agricultural labor was also found significant and have a positive effect toward agricultural economic growth. The coefficient of estimation results is 2.40x10-5 which shows that when there is an increase in agricultural labor by 1 people, agricultural economic growth will also increase by 2.40x10-5 percent. Conversely, when there a decrease in agricultural labor by 1 people, agricultural economic growth will also decrease by 2.40x10-5 percent. Previous research is in line with this finding such as study by Kurniawati (2020), Nazir et al. (2020), Bashir & Susetyo (2018) which also found that agricultural economic growth was significantly influenced by agricultural labor.

6. Conclusion

This study focus on the effect of agricultural infrastructure and agricultural labor on agricultural economic growth rate in Aceh Province. It can be concluded that both determinan factors have significant effect toward agricultural economic growth. Agricultural infrastructure found to have a negative effect while agricultural labor have a positive effect on Agricultural Economic Growth. Furthermore, the panel data regression model that has been formed is found to be fit, which means that agricultural infrastructure and agricultural labor are considered capable of representing the factors that influence the economic growth rate of agricultural sector in Aceh Province. Based on these findings it is hoped the government will able to formulate a policy that can accelerate the rate of economic growth rate of the agricultural sector in Aceh Province.

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