



## The relationship of the agricultural sector to the level of poverty in Central Sulawesi Indonesia

Muhardi <sup>1\*</sup>, Mahfudz <sup>1</sup>, Christoporus <sup>2</sup>, Radha Febriani Putri Kanela <sup>2</sup>, Effendy <sup>2</sup>

<sup>1</sup> Department of Agrotechnology, Agriculture Faculty of Tadulako University, Palu, INDONESIA

<sup>2</sup> Department of Agriculture Economics, Agriculture Faculty of Tadulako University, Palu, INDONESIA

\*Corresponding author: [muhardi\\_hasanuddin@yahoo.com](mailto:muhardi_hasanuddin@yahoo.com)

### Abstract

The agricultural sector plays an important role in providing employment in Indonesia, so it had a very important role in the economy of Central Sulawesi Province. The dominant contribution of the agricultural sector, especially in strengthening food security and alleviating poverty. This research determines the causal relationship of the agricultural sector with the level of poverty in Central Sulawesi Province using time series data from 2008 to 2017. The researched uses the Granger causality analysis with a stationary test, cointegration test, and Granger causality test for the data. This study determined that the level of poverty had a causal relationship with the agricultural sector, but on the contrary, the agricultural sector did not have a causal relationship with the level of poverty. The result is that it is possible to suggest that, if one wanted to reduce the level of poverty in Central Sulawesi Province, one could do so namely by: expanding employment in the agricultural sector, expanding agricultural land, utilizing the agro-industry sector, and stabilizing the prices of agricultural products so that the government needed to pay attention to the agricultural sector.

**Keywords:** agriculture, poverty, causality

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## INTRODUCTION

The development process requires high national income and rapid economic growth. In many countries, the main requirement for creating permanent reduction in poverty has been economic growth. Unfortunately, economic growth is not always enough to alleviate poverty – income equity must accompany it (Wongdesmiwati 2009). Gross regional domestic product (GRDP) could reflect the economy of a region. **Table 1** shows GRDP from various employment sectors in Central Sulawesi Province.

**Table 1** shows the agricultural sector contributed a significant portion of employment. The agricultural sector has a very important role in the economy of Central Sulawesi Province, especially considering its dominant contribution, both directly and indirectly, to achieving economy development goals. The dominant contribution of the agricultural sector has persisted, especially in strengthening food security, alleviating poverty, creating employment, and equitable income (Sáez et al. 2015). The agricultural sector is multi-functional, covering aspects of production and preserving the natural environment.

The agricultural sector is a mainstay due to various factors, namely the natural conditions that support it, a vast expanse of nature in the region, and tropical climate (Mwongera et al. 2015, Crost et al. 2015, Senyolo et al.

2018; Villegas, 2016). Additionally, the agricultural sector has a strong resistance to global economic crises (Papageorgiou 2015, Smart et al. 2015, Voskoboinikov 2017), so that its growth maintains and plays role in absorbing labor. These factors also supported the population of Central Sulawesi to farm, although most farmers remain poor.

Poverty levels in the region have a relationship with the agricultural sector. Considering the agricultural sector's significant role and persistent poverty in the region, this research aims to determine the causal relationship between the agricultural sector with the level of poverty.

## MATERIALS AND METHODS

### Types and Data Sources

This study used time series data obtained from relevant agencies and literature from 2008 to 2017.

### Data analysis method

The method used in this research was the causality test using Eviews 8 software. In carrying out the causality test, there were several steps: Unit Root Test.

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**Table 1.** GRDP of Central Sulawesi Province in 2017

No	Employment	On the basis of current price (IDR)	On the basis of constant price (IDR)
1	Agriculture	38,818,219	28,128,526
2	Mining and excavation	17,229,246	14,313,500
3	Processing industry	16,570,871	12,208,800
4	Procurement of Electricity and Gas	44,076	46,933
5	Procurement of Water, Garbage Management, Waste and Recycling	176,594	128,370
6	Construction	16,785,471	10,736,246
7	Procurement of Large and Retail, Repair of Car and Motorcycle	11,998,953	8,617,822
8	Transportation and Warehousing	5,206,624	3,716,839
9	Provision of Accommodation and Eating Drinks	719,143	501,113
10	Information and Communication	4,291,036	3,716,044
11	Financial Services and Insurance	3,160,667	2,217,466
12	Real Estate	2,445,786	1,815,232
13	Company Services	335,075	235,013
14	Government Administration, Defense and Compulsory Social Security	8,290,805	5,532,450
15	Education Services	5,165,475	3,571,126
16	Health Services and Social Activities	1,818,779	1,297,546
17	Other services	1,176,588	768,617

Source: BPS, 2018

Stationarity is one of the important prerequisites in the econometric model for time series data. Stationary data shows the mean, variance and autocovariance (in lag variations) that remain the same at any time when the data is formed or used, meaning that with stationary data the time series model is stable. If the data used in the model is not stationary, then its validity and stability requires reconsideration because the regression results derived from non-stationary data will cause spurious regression. Spurious regression is a phenomenon in which a regression equation that is estimated has a fairly good significance, but in essence it has no meaning (Ajija 2011). One of the formal concepts used to find out stationary data is through the unit root test. David Dickey and Wayne Fuller developed this test originally as the Augmented Dickey-Fuller (ADF) Test. If time series data is not stationary at zero order, I(0), then the stationary data can be searched through the next order so that the stationary level is found in the nth order (first difference or I(1), or second difference or I(2), and so on (Nachrowi and Usman 2006).

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=1}^z \beta_i \Delta Y_{t-i} + et \tag{1}$$

where:

Y = observed variable

$\Delta Y_t = Y_t - Y_{t-1}$

t = time trend

**Cointegration Test**

The Cointegration test is intended to determine the long-term balance relationship between government expenditure and economic growth through the Johansen test method. This method requires two statistical tests, typically with the Trace Test (Trace test,  $\lambda$  trace) to test the null hypothesis, which requires that the number of cointegration directions is  $< p$ .

The cointegration relationship can be seen from the ratio of the value of the Trace statistics and Max-Eigen

statistics with the critical value at  $\alpha = 5\%$ . The equations and hypotheses proposed are:

$$KMS_t = \beta_0 + \beta_1 KMS_{t-1} + \beta_2 PSP_t + et \tag{2}$$

$$PSP_t = \alpha_0 + \alpha_1 KMS_t + \alpha_2 PSP_{t-1} + et \tag{3}$$

where:

KMS<sub>t</sub> = The level of Poverty

PSP<sub>t</sub> = GRDP of Agricultural Sector

H<sub>0</sub> = There is no Long-term relationship (cointegration) between the agricultural sector with the level of poverty in Central Sulawesi Province

H<sub>1</sub> = There is a long term relationship (cointegration) between the agricultural sector with the level of poverty in Central Sulawesi Province.

**Granger Causality Test**

The aim of Granger Causality is to examine whether A precedes B or B precedes A or relationship A and B are reciprocal. This technique is a useful guide to the causality and direction of causality. The Granger causality test is far more meaningful than the test based on ordinary correlation (Kuncoro 2011). The Granger causality equation model and the hypothesis proposed are as follows (Junaidi 2012).

$$KMS_t = \sum_{i=1}^m \alpha_i KMS_{t-i} + \sum_{j=1}^m \beta_j PSP_{t-j} + U_t \tag{4}$$

$$PSP_t = \sum_{i=1}^m \lambda_i PSP_{t-i} + \sum_{j=1}^m \delta_j KMS_{t-j} + V_t \tag{5}$$

Where :

KMS = The level of Poverty

PSP = GRDP of Agricultural Sector

U<sub>t</sub>, V<sub>t</sub> = Disturbing Variables

m = Number of lag

H<sub>0</sub> = There is no causal relationship between the agricultural sector and the level of poverty in Central Sulawesi Province

**Table 2.** The stationarity test results of GRDP of the agriculture sector with index of poverty severity

No	Description	Value of ADF Test Statistics	Critical Value		
			1%	5%	10%
1	GRDP of Agriculture Sector on the basis of constant price	-1.17	-4.42	-3.26	-2.77
2	Index of Poverty Severity	-1.36	-5.52	-4.11	-3.52

$H_1$  = There is a causal relationship between the agricultural sector and the level of poverty in Central Sulawesi Province.

## RESULTS AND DISCUSSION

The Level of Poverty in Central Sulawesi. In measuring poverty, the Central Sulawesi Province Statistics Center used the basic needs approach. The approach saw poverty as an economic inability to fulfill the basic needs of food and non-food measured from the expenditure side. In this vein, poor residents are people who have an average expenditure per capita per month below the poverty line. The average number of poor residents in Central Sulawesi from 2008 to 2017 was 453,000 people; the average percentage of poverty was 15.84%; the average of poverty line was 286,535.03 IDR/Capita/Month; and the average for the depth index and severity of poverty were 2.95 and 0.85, respectively. Judging from the impoverished population, the percentage of depth and severity of poverty were fluctuating data so that it could be said that poverty in Central Sulawesi Province has not been handled properly.

### GRDP of agriculture sector in Central Sulawesi Province

This refers to all goods and services as the result of economic activities operating in the domestic area, regardless of whether the production factors originated from or were owned by the population of the area; these were the domestic products of the region concerned. Income that arose from the existence of these production activities was the domestic income. Regional products were domestic products plus income from production factors received from outside the region/country, and minus income from production factors paid to outside the region/country. Regional products were products resulting from production factors owned by residents. The GRDP of the agricultural sector is the largest employment giver sector in Central Sulawesi Province (**Table 1**). Judging from the average of GRDP according to the employment on the basis of current price and on the basis of the constant price of the agricultural sector in Central Sulawesi Province from 2008 to 2017 was IDR 38,818,219 million rupiahs and IDR 28,128,526 million rupiahs, respectively. The GRDP of the agricultural sector is based on the current price and constant price which increased every year. The agricultural sector was a priority sector considered capable of providing a role in reducing poverty.

### The relationship between the agriculture sector and the level of poverty in Central Sulawesi Province

This refers to the relationship between the agricultural sector and the level of poverty using Granger Causality testing, which is a method to determine whether an endogenous variable could be treated as an exogenous variable. Granger causality was done to know the influence among variables. If there were two variables, X and Y, then the test was to see whether X caused Y or Y caused X or applied both or there was no relationship between the two. The X variable caused the Y variable and determined how much Y value in the current period could be explained by the Y value in the previous period and the X value in the previous period. Granger Causality only tested the relationship between variables and did not estimate the model. The Granger Causality test stages are as follows.

#### Stationarity Test (Unit Root Test)

The researchers conducted the Stationarity test using the Augmented Dickey-Fuller Test (ADF) method, which is based on the null hypothesis that the stochastic variable had a unit root. By using the ADF test model, the null hypothesis and other decision-making bases used in this test were based on the critical value of Mac Kinnon in lieu of the t-test. Furthermore, the t ratio was compared with the critical statistical value of ADF t table to determine whether there were unit roots. If the hypothesis was accepted, it meant that the variable was not stationary, so it was necessary to test the degree of integration. **Table 2** lists the results of the stationarity test of the agricultural sector with the level of poverty in Central Sulawesi Province.

**Table 2** shows the value of each ADF (Augmented Dickey-Fuller) from the GRDP of the agricultural sector and the level of poverty in Central Sulawesi Province, which showed to be non-stationary at a critical point of 1%, 5% and 10%, where the ADF value of GRDP of agricultural sector was  $-1.17 <$  critical point value of 1%, 5%, and 10%. The ADF Value of the level of poverty in Central Sulawesi Province was  $-1.36 <$  critical point value of 1%, 5%, and 10%. Because the ADF value of the agricultural sector and the level of poverty were not stationary, it was estimated that the GRDP of the agricultural sector and the level of poverty in Central Sulawesi Province must be continued in the Cointegration test stage.

#### Cointegration Test (Long Term Relationship)

The Cointegration test combines linear relationships of non-stationary variables, and all these variables must

**Table 3.** Cointegration test results of the GRDP of agriculture sector with index of poverty severity

No	Description	Calculated Value	Critical Value	Prob.
1	Unrestricted Cointegration Rank Test (Trace)	57.34	25.87	0,00
2	Unrestricted Cointegration Rank Test (Maximum Eigenvalue)	51.3	19.39	0,00

**Table 4.** Granger Causality Test Results of GRDP of Agricultural Sector with Index of Poverty Severity

No	Null Hypothesis	F-Count	Prob.
1	Poverty Severity does not Granger Cause GRDP on the basis of constant price	9.97	0.02
2	GRDP on the basis of constant price does not Granger Cause Poverty Severity	0.18	0.69

be integrated at the same order or degree. Integrated variables will show that these variables have the same stochastic trend and direction of movement in the long term. The Cointegration test used the Johansen's Multivariate Cointegration Test method. **Table 3** illustrate the results of the Cointegration Test of the agricultural sector with the level of poverty.

**Table 3** shows the results of the trace test value of  $57.34 > 25.87$  of critical values and had a probability value of  $0.00 < 0.05$ . The maximum eigenvalue value of  $51.30 > 19.39$  of critical value and had a probability value of  $0.00 < 0.05$ . This shows that hypothesis  $H_0$  was rejected, so there was a long-term relationship (cointegration) between the agricultural sector with the level of poverty in Central Sulawesi Province. The agricultural sector and the level of poverty and development in each year were related in the long term (Haghighat et al. 2019). The taken value of the agricultural sector was GRDP according to the employment, so that the agricultural sector could absorb a significant amount of labor, especially for poor residents. The expectation was an increase of income among the poor. The hope was that poor residents could fulfill their needs in terms of fulfilling their food, clothing, and shelter for their lives (Rasouliazar et al. 2011). The government had to pay attention the agricultural sector to reduce the level of poverty owing to the latter's long-term relationship with impoverished workers.

#### Granger Causality Test (Reciprocal Relationship)

The Granger Causality Test was done to see how the reciprocal relationship between two variables. The test allows one to see the reciprocal relationship between the agricultural sector and the level of poverty in Central Sulawesi Province. **Table 4** lists these results.

**Table 4** displays the index of poverty severity and its causal relationship with the GRDP of the agricultural sector with a probability of  $0.02 < 0.05$ , meaning that the

hypothesis  $H_0$  was rejected, so there was a causal relationship between the level of poverty with the GRDP of the agricultural sector. Data here shows that if the government wanted to suppress or reduce poverty in Central Sulawesi Province, it is necessary to focus on expanding employment in the agricultural sector, expanding agricultural land, utilizing the agro-industry sector, and stabilizing the prices of agricultural products (Churchill 2007, Effendy et al. 2019, Hasanabadizadeh et al. 2019). The GRDP on the basis of constant price of the agricultural sector had no causal relationship with the level of poverty with the probability of  $0.69 > 0.05$ , meaning that factors other than the GRDP on the basis of constant price of the agricultural sector determined the level of poverty.

#### CONCLUSION

This study finds that the level of poverty had a causal relationship with the agricultural sector; on the contrary, the agricultural sector did not have a causal relationship with the level of poverty. Reducing poverty in Central Sulawesi is possible by expanding employment in the agricultural sector, expanding agricultural land, utilizing the agro-industry sector, and stabilizing the prices of agricultural products. We also found that it was not only the GRDP on the basis of constant price of the agricultural sector that determined the level of poverty. It is necessary for the government to pay attention to the agricultural sector; it has not developed agricultural land or unused land for the agricultural sector, and this is the most effective way to expand the market share of the agricultural sector.

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