

The Effect of Labor Productivity, Exchange Rate and Inflation in Agricultural Sector on the Poverty Rate in the Island of Sulawesi Moderated by the Human Development Index

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Abstract

Poverty has always been a crucial issue where the discussion on it will never end. The percentage of poor people is higher in rural areas than in urban areas. The agricultural sector and poverty have a close relationship. Sulawesi Island has qualified agricultural resources. Therefore, this study aims to look at the agricultural sector which is broken down into agricultural labor productivity, farmer exchange rate, and inflation. And added HDI as moderation to the poverty rate. This research uses panel data regression analysis. The results showed that agricultural labor productivity, farmer exchange rate had a positive and significant effect on the poverty rate while inflation and human development index had a negative and significant effect. The interaction between HDI and labor productivity has a negative and significant effect, HDI and inflation show positive and significant results. Meanwhile, the interaction between HDI and farmer exchange rate has no effect.

Keywords: Labor Productivity, Inflation, Farmer Exchange Rate, Human Development Index.



INTRODUCTION

As a developing country, the agricultural sector in Indonesia has an important role and can affect the welfare of the community. The agricultural sector is the main source of livelihood for most of the population, especially in rural areas (Syahputri et al., 2024). In Indonesia according to data (Badan Pusat Statistik, 2023a; Cantika & Murwiati, 2024) there are 3 sectors that are the sectors with the most employment, namely the industrial sector 13.77%, the trade sector 19.03% and the most is the agricultural sector around 29.96% of the total working population as of 2022.

One of the factors that cause poverty is price (Alfasyah et al., 2024). The percentage of the population living in poverty increases due to price increases. Farmer welfare is an important concern in supporting the development of the agricultural sector. The farmer exchange rate is the ratio of the price index received by farmers (It) to the price index paid by farmers (Ib) (Riyadh, 2015). (Faridah & Syechalad (2016) stated that when the farmer exchange rate decreased, it would negatively affect the real income of farmers. However, if the farmer exchange rate is higher, it will affect the higher purchasing power as well (Aulia et al., 2021).

Agriculture sector provides an indirect influence on economic growth by providing better nutrition for the poor, ensuring food price stability, creating employment opportunities, improving production factors and reducing poverty (Apostolidou et al., 2014; Awokuse & Xie, 2014; Bein & Ciftcioglu, 2017; Moon & Lee, 2013). Based on GDP distribution data, the agricultural sector contributes 11.8%, making it one of the most important sectors (Badan Pusat Statistik, 2023c).

Based on the agricultural data center and information system, the agriculture, forestry and fisheries sector is the sector with the lowest labor productivity of the other 4 sectors during the period 2018 – 2022. The low productivity of the agricultural sector, apart from the education factor, is also influenced by the high number of workers in this sector. So that the agricultural sector bears a considerable burden (Kementarian Pertanian, 2023).

Food commodities are in the spotlight because of their considerable contribution to the inflation rate (Cita & Suwardi, 2024). Inflation is an important indicator of an economy, and to prevent macroeconomic instability that can lead to economic instability. High and unstable inflation indicates economic instability which can lead to a general increase in the price of goods and services and can increase the poverty rate (Yusuf & Ichsan, 2019). The Human Development Index (IPM) is an indicator used to measure the



quality of human resource (Pane et al., 2024) state that the higher the HDI, the lower the poverty rate in a region.

The agricultural sector plays a very important role in the economy of Sulawesi Island, this is indicated by its contribution to GDRP of 21.43% (2023b). (Sihombing & Bangun, 2019) stated that the agricultural sector is the sector that most intersects with poverty. Data from (Badan Pusat Statistik, 2023a) shows that 4 of the 6 provinces on Sulawesi Island are among the 15 poorest regions nationally. The poverty percentage in Gorontalo Province was 15.51%, Central Sulawesi 12.30%, South Sulawesi 11.95%, and Southeast Sulawesi 11.27%. The remaining provinces, namely North Sulawesi and West Sulawesi, are in 17th and 21st positions nationally. Overall, the HDI in Sulawesi Island is in the medium category. The agricultural sector also contributes to the employment of millions of people so that it can reduce poverty levels (Takaredas et al., 2024). The weak exchange rate of farmers can also affect poverty in the agricultural sector (Nasrun et al., 2020). Changes in food prices make the biggest contributor to the inflation rate (Santoso & Basuki, 2011). Based on the background description, this study aims to see how the influence of the agricultural sector, in this case focusing on labor productivity, exchange rates and inflation on the poverty rate on the island of Sulawesi moderated by the human development index.

METHODS

This study employs a quantitative approach, which, according to Sugiyono (2016), is a research methodology based on positivistic, that is data in the form of numbers that will be measured in relation to the problem under study using statistics as a calculation test tool in order to draw a conclusion. In this study, panel data regression analysis was used which according to (Ajija et al., 2010) uses this analysis a type of data consisting of time series and cross section. The analysis model can be written as follows:

$$POV = a + B_1PTKP_{1it} + B_2NTP_{2it} + B_3INF_{it} + B_4PTKP_{IPM} + B_5NTP_{IPM} + B_6INF_{IPM} + \varepsilon$$

Information:

- POV = Poverty Rate (%)
- a = Constanta
- b = Regression Coefficient of Independent Variables
- PTKP = Agricultural Labor Productivity (IDR/Life)
- NTP = Farmers Exchange Rate (%)
- INF = Agricultural Inflation (%)
- IPM = Human Development Index (Ratio)



i = region
t = time
 ε = error

Furthermore, the chow test, hausman test and lagrange multiplier test are performed to determine the best model to use. To avoid cross-section homoskedasticity and cross-section correlation in the research data, the SUR (Seemingly Unrelated Regression) cross-section method is used (Pusakasari, 2015).

RESULT

Panel Data Regression Model Estimation

Before entering the regression test, it is necessary to select the regression estimation model first, which includes the Chow Test, Hausman Test, Lagrange Multiplier Test.

Chow Test

A test to compare the fixed effect model and the common effect model is called the Chow test. In this method, the common effect model is chosen if the probability value is higher than 0.05. In the event that the probability value is less than 0.05, the fixed effect model is the one that is chosen. The following table displays the results of the Chow test

Table 1. Chow Test Result

Redundant Fixed Effects Tests				
Test cross-section fixed effects				
Effects Test	Statistic	d.f.	Prob.	
Cross-section F	266.692104	(5,61)	0.0000	
Cross-section Chi-square	225.316010	5	0.0000	

Source: Output Eviews Secondary Data After Processing 2024

The table above shows the Cross Section F probability value of 0.00 which is smaller than 0.05 and the Cross Section Chi Square probability value of 0.00 which is



smaller than 0.05. Then H_0 is rejected and H_1 is accepted, meaning that the selected model is the Fixed Effect Model.

Hausman Test

If the Cross Section Random probability value is greater than 0.05, the selected model is the Random Effect Model, and if the probability value is less than 0.05, the selected model is the Fixed Effect Model. The following are the results of the Hausman test.

Table 2. Hausman Test Result

Correlated Random Effects - Hausman Test				
Test cross-section random effects				
Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		1333.460520	5	0.0000

Source: Output Eviews Secondary Data After Processing 2024

Based on the table above, it can be seen that the Cross-section random probability value is 0.00 which is smaller than 0.05. Then H_0 is rejected and H_1 is accepted, meaning that the regression model chosen is the Fixed Effect Model compared to the Random Effect Model.

Panel Data Regression Analysis

This regression model is carried out using the moderate regression analysis (MRA). The following is the description.

Table 5. Moderate Regression Analysis Result

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	11.85054	0.053236	222.6047	0.0000
PTKP	0.143275	0.063813	2.245219	0.0285
NTP	0.062779	0.036150	1.736624	0.0877
INF	-0.069291	0.030679	-2.258556	0.0276

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IPM	-0.870533	0.103807	-8.386069	0.0000
IPMPTKP	-0.113608	0.045262	-2.509995	0.0148
IPMNTP	0.014188	0.042351	0.335013	0.7388
IPMINF	0.099982	0.028735	3.479456	0.0010
	Effects Specification			
Cross-section fixed (dummy variables)				
	Weighted Statistics			
R-squared	0.986305	Mean dependent var		13.68658
Adjusted R-squared	0.983519	S.D. dependent var		37.53890
S.E. of regression	1.066672	Sum squared resid		67.12961
F-statistic	354.0927	Durbin-Watson stat		1.745271
Prob(F-statistic)	0.000000			

Source: Output Eviews Secondary Data After Processing 2024

Based on the regression test result, the regression equation model is obtained as follows:

$$Y = 11.85054 + 0.143275PTKPit + 0.62779NTPit + 0.06929INFit + 0.113608IPMPTKP + 0.014188IPMNTP + 0.099IPMINF + e$$

From the results of the panel data regression equation using the moderating variable namely HDI it can be described as follows:

1. The constant coefficient value is 11.85054, so it can be interpreted that if the value of the independent variable is considered constant, then the poverty rate value increases by 11.85054. For more details, the Fixed Effect Cross Section value table is displayed as follows.
2. The coefficient value of agricultural labor productivity is 0.143275, so it can be interpreted that if the agricultural labor productivity variable increases by 1%, the poverty rate variable will increase by 0.143275.
3. The coefficient value of the farmer exchange rate variable is 0.62779, meaning that if the farmer exchange rate increases by 1%, the poverty rate variable will also rise by 0.62779.



4. The coefficient value of the inflation variable is -0.110843, it means that if the inflation variable increases by 1%, the poverty rate variable will decrease by -0.110843.
5. The coefficient value of X1M is -11.3608, meaning that when the interaction between the human development index and agricultural labor productivity increases by 1%, it means that the poverty rate variable will decrease by -11.3608.
6. The X2M coefficient value is 0.014188, meaning that when the interaction between the human development index and the farmer exchange rate increases by 1%, it means that the poverty rate variable will increase by 0.014188.
7. The coefficient value of X3M is 0.099982, meaning that when the interaction between the human development index and agricultural inflation increases by 1%, it means that the poverty rate variable will increase by 0.099982.

Coefficient Determination (R^2)

Based on the results of the regression analysis in table 5, the adjusted R-Square value is 0.983519, which explains that the agricultural labor productivity variable, the farmer exchange rate and inflation and the human development index have an influence on the poverty rate of 98.35, while the remaining 1.64 is influenced by other variables not examined in this study.

Partial Test (T Test)

From the regression test results with fixed effect model in table 5, the partial test result are as follows

1. Labor Productivity

Based on table 5, the labor productivity variable has a positive coefficient value of 0.143275 with a probability value of 0.0285 which is smaller than alpha 0.05, it can be concluded that the agricultural labor productivity variable has a positive and significant impact on the poverty rate.

2. Farmer Exchange Rate

In accordance with the test results listed in Table 5 the farmer exchange rate variable has a coefficient of 0.062779 with a probability value of 0.0877 which is smaller than alpha 0.1, it can be concluded that the farmer exchange rate variable has a positive and significant impact on the poverty rate.



3. Inflation

Based on the regression test results in Table 5, it shows that the coefficient value of the inflation variable has a magnitude of -0.069291 with a probability value of 0.0276 which is smaller than alpha 0.05, it can be concluded that the inflation variable has a negative and significant impact on the poverty rate.

4. Human Development Index

The coefficient value of the human development index variable is -0.8270533 with a probability value of 0.0000 which is smaller than alpha 0.01 so it can be concluded that the human development index has a negative impact on the poverty rate.

5. Labor Productivity Moderated By Human Development Index

Based on Table 5, it can be seen that the coefficient value of agricultural labor productivity moderated by HDI is -0.113608 with a probability value of 0.0148 which is smaller than the alpha value of 0.05 it can be concluded that there is a negative and significant impact of agricultural labor productivity on the poverty rate, which is tempered by the human development index.

6. Farmer Exchange Rate Moderated By Human Development Index

The coefficient value of the farmer exchange rate variable moderated by HDI has a magnitude of 0.014188 with a probability value of 0.7388 which is greater than alpha 0.1, it can be concluded that the farmer exchange rate moderated by HDI does not have any effect on the poverty rate.

7. Inflation Moderated By Human Development Index

The coefficient value of the inflation variable moderated by HDI has a magnitude of 0.099982 with a probability value of 0.0010 which is smaller than alpha 0.01. So it can be concluded that the inflation variable moderated by HDI has a positive and significant effect with a confidence level of 99%. The positive coefficient means that the relationship is unidirectional, so if inflation moderated by the human development index rises, the poverty rate will increase.

Simultaneous Test (F Test)

Table 5 indicates that the probability (F-Statistic) value is 0.000, a value less than alpha 0.01. Therefore, it can be inferred that the poverty rate is influenced by the combination of labor productivity, farmer exchange rate, inflation, and human development index.



DISCUSSION

From the interpretation of the MRA above the following is the explanation

1. Poverty Level in Sulawesi Island

Poverty is a major problem that must be faced by every country. As explained earlier, 4 out of 6 provinces in Sulawesi are included in the 15 poorest regions nationally with Gorontalo Province being the number one poorest region in Sulawesi. Based on Table 6, the regional fixed effect value shows that North Sulawesi Province is the region with the smallest impact of labor productivity, exchange rate and inflation variables on the poverty rate because it has negative units. Meanwhile, Southeast Sulawesi Province is a region that has a great opportunity to reduce its poverty rate and be released from the 15 poorest regions nationally because its regional effect value is at 0.71 While Gorontalo Province is the largest recipient of the impact shown by the regional effect value reaching 4.41 This means that the Gorontalo Provincial government still needs to carry out policies that can reduce poverty levels. Among them are building the independence of farmers, increasing the capacity of extension workers and farmers, and expanding access to agricultural markets. The result research from (Alviyadi, 2024; Mahmud et al., 2020; Ningsih et al., 2023) show that there are several factors that affect the poverty rate on Sulawesi Island, namely economic growth, average years of schooling minimum wage and human development index have a negative effect. While the investment variable and the open unemployment rate have a positive influence.

2. The Effect of Agricultural Labor Productivity on Poverty Level

The results of testing the effect of agricultural labor productivity on poverty levels show influential and significant results and the coefficient value is positive, indicating a unidirectional relationship. This means that if productivity increases so does the poverty rate on Sulawesi Island, but if this result is well understood there is a mistake. This is because under the right conditions, agricultural labor productivity will reduce the poverty rate. However, the regression result of productivity on the poverty rate turns negative after adding the human development index variable as a moderating variable. The negative result shows an opposite relationship where if agricultural labor productivity increases, the poverty rate in the Sulawesi region will decrease. It can be understood that if agriculture in the Sulawesi region has good quality human resources then they will have qualified skills, get a good income and reduce the poverty rate. This means that HDI is able to moderate agricultural labor productivity on the poverty rate by changing the direction of the coefficient.

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The results of this study are supported by a statement from (Izzah & Hendarti, 2021) where the results of the study confirm that the human development index and labor have a positive relationship where the increasing level of education has an impact on people's knowledge and increased community expertise, thereby increasing high work productivity. High productivity will produce labor with good quality and will get more and more production. Production by obtaining more results, the income received will be greater and consumption will also increase. Coupled with the results of research (Rahman & Octaviani, 2021)) that increasing labor productivity can increase agricultural output, so that it can increase the income of agricultural households. An increase in agricultural output can reduce food prices, which can increase the real income of non-farm households. An increase in income from both agricultural and non-agricultural households can reduce the poverty rate in an area.

3. The Effect of Farmer Exchange Rate on Poverty Level

The results of testing the farmer exchange rate on the poverty rate show the difference between before and after interacting with the human development index as a moderating variable. The regression results of NTP on the poverty rate before the existence of HDI have a significant effect and positive coefficient and after interacting with HDI get positive and insignificant results. This means that if the higher the NTP value, the poverty rate will also increase. Similar research was conducted by (Yacoub & Mutiaradina, 2020) where the results of the study found that NTP had a positive and significant relationship. The unidirectional relationship between NTP and poverty in this study is different from the results of research (Udi et al., 2023) which showed a negative effect of the farmer exchange rate and a significant effect on the poverty rate. The study also found that provinces with high NTP had high rural poverty rates, including West Sulawesi, South Sulawesi, Gorontalo and Southeast Sulawesi. The human development index only measures the quality of human resources in general while the farmer exchange rate measures the welfare of farmers based on the difference between the price received by farmers (HT) and the price paid by farmers (HB). According to (Rachmat, 2013)) the farmer exchange rate does not fully reflect welfare measures because it does not consider factors such as productivity, technological progress and production costs. An increase in the price of agricultural products may be due to supply scarcity, not an increase in farmers' welfare. (Salamah et al., 2023) also added that in the context of measuring welfare, the farmer exchange rate should be seen together with



other indicators such as per capita income and access to basic services. This is important to get a more comprehensive picture of farmers' living conditions.

As is known, although NTP has increased, Rural Poverty has also increased, this is due to several factors such as inadequate human resources to farmers who are not familiar with rapidly developing technology. Some farmers who own land but the land is not so extensive which ultimately affects NTP, this is in line with research from (Sholeh & Mublihatin, 2021) saying that farmers who do not have other sources of livelihood other jobs, the income obtained from farming cannot meet their daily needs. Farmers who work 8 hours or more every day but take months to harvest.

4. The Effect of Agricultural Inflation on Poverty Level

The results of the regression analysis of the effect of agricultural inflation on the poverty rate obtained significant results. The results of the inflation variable on the poverty rate before interacting with HDI as a moderating variable get a negative and significant coefficient This means that if agricultural inflation increase, the poverty rate will decrease Agricultural producing areas are more ii rural areas and the poverty rate is also the highest in rural areas, so the results of this study are in line with research (Wina, 2019) which states that rural inflation has a negative and significant effect on poverty rates in rural areas. research conducted by (Leiley et al., 2020) also suggests that the agricultural sector which includes vegetable groups, legume inflation, fruit inflation and spice inflation is a contributor to inflation in Manado City. This means that HDI is able to moderate agricultural inflation on the poverty rate by changing the direction of the coefficient

The regression results of the inflation variable on the poverty rate after being moderated by HDI get a coefficient that is positive and significant. This is due to the interaction between inflation and HDI variables, a high HDI indicates an increase in the quality of human resources through education and skills. This increase in skills can increase production efficiency and reduce production costs per unit, thereby reducing inflationary pressures. Apart from its positive and significant effect which is not in accordance with the theory, this study is not in line with Susanto dan Pangesti (2020) who state that Inflation has no significant effect on Poverty. This can happen because the number of poor people in Manado City increases every year, so if there is inflation the poor will not be affected because they do not have purchasing power. The increase in the poor population also occurs due to urbanization in Manado City.



5. The Effect of Human Development Index on Poverty Level

The panel data regression analysis yielded significant and negative test results regarding the impact of the human development index on the poverty rate. This implies that Sulawesi Island's poverty rate will go down if the island's people resources improve. An improvement in the HDI and a decline in the poverty rate across the Sulawesi area serve as evidence of this. The results of this study are in line with research conducted (Bisai et al., 2016) by The increase in the Human Development Index (HDI) which contributes to a decrease in the poverty rate shows that an increase in HDI can provide a boost to human labor productivity. This is expected to increase their income so that they can meet the needs of a decent life. According to Schultz (Schultz, 1961), the most effective approach in implementing a country's national development lies in increasing the capacity of its people, with education as the main factor. With good education and health, the possibility of earning a high income becomes easier. Conversely, high incomes also allow for greater allocation of funds to health and education, thereby reducing poverty

CONCLUSION

Drawing from the findings of the aforementioned studies, it can be inferred that the poverty rate is heavily influenced by the factors of agricultural labor productivity, farmer exchange rate, and sector inflation. Sulawesi's poverty rate is also influenced by the development index variable.

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