



Analysis of Factors Affecting Farmer Exchange Rate of Food Crop Subsector in Indonesia

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Abstract

This study aims to analyze the factors that can affect the exchange rate of food crop farmers in Indonesia. The data used is sourced from the Central Bureau of Statistics and the Directorate General of Food Crops of Indonesia. Using panel data of 33 provinces in Indonesia during 2016-2021, this study applies the cointegration test to determine the long run of the research variables, and uses fully modified ordinary least square regression to determine the estimation amount of each independent variable in the long run with the Eviews 12 tool. The regression results explain that simultaneously, the research variables used together influence the exchange rate of food crop farmers in the long run. Partially, the variables of rice land area, secondary crop land area, and rice production have a significant positive effect on the exchange rate of food crop farmers in the long run. While the variables of inflation and secondary crop production have a significant negative effect on the exchange rate of food crop farmers in the long term.

Keywords: Farmer, Inflation, Land Area, Production, Ordinary Least Square

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INTRODUCTION

Indonesia is a country with an area of 5,193,250 km². Indonesia has a variety of biological resources due to its large land area of 1,916,906 km². The condition of the Indonesian economy, the majority of which depends on the

agricultural sector for food commodities, horticulture, fisheries, and plantations, shows that Indonesia is also referred to as an agricultural country. The manufacturing industry was the main contributor to GDP in 2021, with the agriculture, forestry, and fisheries

sector coming in second with a share of 13.28%. The agricultural sector is significant in Indonesia's economy due to its ability to absorb the labor of a large portion of the country's population (Raflesia et al., 2021).



Figure 1. Employment Growth in the Agricultural Sector in Indonesia Year 2017- 2022
Source: Central Bureau of Statistics, 2022

Figure 1 shows that in 2022, it is known that the workforce working in the agricultural sector reached 40,635,997 people or around 29.96% of the total workforce in Indonesia. In the last 5 years as a whole from 2017 to 2022, the percentage of labor in the agricultural sector in Indonesia tends to increase. This proves that the agricultural sector has a positive impact on society, but the agricultural sector still cannot answer the problem of poverty in rural areas.

Development in all fields is the direction and goal of Indonesian policy. Thus, the government's development goal has always been to improve the welfare of farmers at every level of agriculture. The government has endeavored to improve farmers' welfare, maintain food supply stability, and increase agricultural productivity through several agricultural development policies and initiatives (Sheikh, 2020). Measuring data on the welfare of the

population, especially among farmers, is necessary to assess the success of development in addition to statistics on economic growth. The farmer exchange rate is one proxy that can be used to measure the level of welfare among farmers.

A comparison between the price index paid by farmers (Ib) and the price index received by farmers (It) yields the farmer exchange rate. It is the average price they pay for goods and services they purchase to meet their daily needs, transportation costs, as well as other costs (farm gate).

On the other hand, Ib is the average retail price of goods and services. (BPS, 2021). NTP is divided into several agricultural subsectors, namely the Food Crops (TP), Plantation Crops (TPR), Horticultural Crops (TH), Livestock (Pt) and Fisheries (Pi) subsectors.

Among other subsectors, the food crop subsector has the largest role. First, after the plantation subsector, the food crop subsector has the second largest contribution to agricultural GDP in 2021. Second, Indonesia is the fourth largest rice producer in the world, producing around 35.4 million metric tons. Finally, commodities from the food crop subsector, namely rice, corn, and others, are also quite important for the food security of the Indonesian people.



Figure 2. Indonesia's Food Crop Farmer Exchange Rate (NTPP) 2016-2021
Source: Central Bureau of Statistics, 2021

Based on Figure 2, in the last five years, Indonesia's food crop exchange rate (NTPP) has decreased in 2021. The average achievement of NTPP in Indonesia is at 100.38. The lowest NTPP occurred in 2021, which was 98.21. The largest NTPP was achieved in 2018 with an NTPP figure of 102.96. In general, over the last five years from 2016 to 2021, NTPP in Indonesia has shown quite good results where the average NTPP achievement is still above 100.

Land area is one of the factors that influence the increase and decrease of NTP. According to Adrian (2018), the level of utilization of production factors, including land area, affects the quantity of output achieved. However, it is widely known that the rate of conversion of paddy fields in Indonesia has increased significantly, reaching an average of 10,000 hectares each year.

In addition, the size of farmland owned by farmers greatly affects the level of production that farmers produce each season. The more extensive the farmland, the higher the production yields that farmers will get. Vice versa, the less farmland owned, the smaller the amount of production and income earned by farmers (Suprayetno and Sofyan, 2003).

Another factor that can affect the rise and fall of NTP is inflation. According to Mankiw (2003), an increase in the price of products and services resulting from a widening gap between supply and demand in the market is known as inflation. In agriculture, inflation can have an impact on farmers' expenditure due to rising prices which generally increase the cost of production.

This can lead to an increase in farmers' spending on inputs such as fertilizers, seeds, and others. If prices rise faster than the income farmers receive from selling agricultural

products, the exchange rate of farmers in terms of purchasing power may decline. The food crop commodities used in this study are rice and secondary crops, which are commodities from the food crop subsector.

Researchers chose food crops on the grounds that food crops are the main commodities that have a major influence on the daily lives of people in Indonesia, where these commodities are always used by the community as staple food. In addition, the reason for choosing food crops is because food crops are one of the subsectors that have an NTP below 100 and have experienced a decline in the farmer exchange rate in 2021, which indicates that food crop farmers have a low level of welfare. Currently, if the welfare of farmers continues to decline, which can mean that the number of poor people is increasing (Dauda, 2019).

RESEARCH METHODS

This research uses quantitative data. Quantitative research is defined as research that focuses on analyzing numerical data (numbers) using statistical methodology. The data used in this research is secondary data in the form of panel data, which is a combination of time series and cross section data (Ghozali, 2011).

Time series data which is data collected from time to time to describe a development or trend of circumstances/events/activities. The time series data used is annual data, namely 2016-2021. Cross section data is data that shows a specific point in time. The cross-section data in this study are 33 provinces in Indonesia.

In testing the effect of independent variables on the dependent variable, this study uses the Fully Modified Ordinary Least Square (FMOLS) analysis method. FMOLS analysis method testing is carried out to explain the

long-term effect of independent variables on the dependent variable. Testing the FMOLS analysis method in this study uses panel data, which combines cross section data and time series data. The cross-section data of this study lies in the use of data for 33 provinces in Indonesia with time series data from 2016 to 2021.

RESULTS AND DISCUSSION

The agricultural sector is one of the sectors that can help to succeed in the economic development of a country. As a measure of the standard of living of food crop farmers, the Food Crop Farmer Exchange Rate (NTPTP) indicator shows an increase in development in the agricultural sector. The welfare of farmers in a location is still classified as low if the farmer exchange rate is less than 100.

The purchasing power of farmers is shown by the development of NTPTP from 2016 to 2021, where most provincial NTPTPs in Indonesia are still below 100. This is due to the value of the price index received by farmers (It) is smaller than the value of the price index paid by farmers (Ib).

The first test carried out in this study is the stationarity test or unit root test. Stationarity testing in this study uses the Levin, Lin, & Chu (LLC) method, to determine the stationarity level of the research variables. The LLC approach is used because it has the advantage of detecting intercept heterogeneity in panel data. Table 1 are the unit root test results of the Levin, Lin, & Chu approach.

If the value of the LLC statistic is less than the significance value $\alpha = 5\%$, then the research data is stationary. Based on Table 1, it is concluded that the variables of food crop farmer exchange rate, inflation, rice land area, secondary crop land area, rice production, and secondary crop production at level 1 (o) degree accept Ho which is shown through the probability value through the Levin, Lin & Chu Test < the real level value $\alpha = 5\%$. Therefore, all variables show stationarity, which indicates that the variance of the data is moderate and tends towards the mean value, making it suitable for further analysis.

The next test conducted is the cointegration test, after knowing that all research variables have been stationary at the level level. In this study, the cointegration test method used is the Kao Test to determine whether there is a long-term relationship in the research variables. Table 2 are the results of the Kao Test.

Through the Kao Test, it can be seen that the research model has a long-term relationship

Table 1. Panel Unit Root Test Results

Variables	Levin, Lin, & Chu W-Stat	
	Individual Intercept	Individual Intercept & Trend
	Level	Level
NTPTP	-11.3059 0.0000**	-19.7319 0.0000**
INF	-15.0493 0.0000**	-26.4909 0.0000**
LPADI	-16.9656 0.0000**	-19.5444 0.0000**
LPALAWIJA	-9.91749 0.0000**	-19.5591 0.0000**
PPADI	-6.59999 0.0000**	-14.4910 0.0000**
PPALAWIJA	-7.45444 0.0000**	-43.4743 0.0000**

Description:

**significance value $\alpha = 5\%$ (0.05)

Source: Eviews output, 2023

with a significance level of $\alpha = 5\%$. So it can be concluded that there is a long-term relationship between the independent variables and the dependent variable in this study, namely between inflation, rice land area, secondary crop land area, rice production, and secondary crop production on the exchange rate of food crop farmers.

Table 2. Cointegration Test Results of Kao Method

ADF	t-Statistic	Prob.
	-5.361516	0.0000**

Description:

** significance value $\alpha = 5\%$ (0.05)

Source: Eviews output, 2023

Kao's approach to cointegration testing can only detect the existence of a long-term relationship in the research model used. However, it has not been able to estimate the magnitude of the long-term relationship in the research model. For this reason, the next step is to test Fully Modify Ordinary Least Square (FMOLS).

Table 3. Functional Form of Logarithms

Model	Dependent Variable	Independent Variable	Interpretation of β_1
Levels	y	x	$\Delta y = \beta_1 \Delta x$
Level-log	y	log(x)	$\Delta y = (\beta_1 / 100)\% \Delta x$
Log-level	log(y)	x	$\% \Delta y = (100\beta_1) \Delta x$
Log-log	log(y)	log(x)	$\% \Delta y = \beta_1 \% \Delta x$

Source: Wooldrige, 2015

In this study, panel data is used to explain how the development of inflation, rice land area,

secondary crop land area, rice production, and secondary crop production on the exchange rate of food crop farmers in Indonesia. In addition, panel data processing is considered to have consistent development. FMOLS test can be conducted after conducting stationarity test and cointegration test.

Wooldrige (2015:39) argues that the way to read the estimation model on data transformed into logarithmic form that can be seen in table 3. The functional form in table 3 can be applied to the estimation model of this study as follows:

$$NTPTP_{it} = \beta_0 + \beta_1 INFit + (\beta_2 / 100)\%LPADI_{it} + (\beta_3 / 100)\%LPALAWIJA_{it} + (\beta_4 / 100)\%PPADI_{it} + (\beta_5 / 100)\%PPALAWIJA_{it} + \epsilon_{it}$$

Based on the description of the estimation model above, the long-term equation of inflation, rice land area, secondary crop land area, rice production, and secondary crop production on the exchange rate of food crop farmers in Indonesia can be written as follows:

$$NTPTP_{it} = -0.7227INFit + 0.000243LPADI_{it} + 0.000081LPALAWIJA_{it} + 0.000452PPADI_{it} - 0.000098PPALAWIJA_{it} + \epsilon_{it}$$

Where NTPTP_{it} is Percentage Value of Farmer Exchange Rate of Food Crops, INFit is Inflation Percentage Value, LPADI_{it} is Rice Land Area Value, LPALAWIJA_{it} is Value of Palawija Land Area, PPADI_{it} is Rice Production Value, PPALAWIJA_{it} is Crop Production Value ϵ_{it} is Error term, *i* is Research cross section data namely 33 provinces in Indonesia, and *t* is Research time series data namely 2016 to 2021.

The regression coefficient on the INF variable is -0.722712, so that in the long run if INF increases by 1%, the NTPTP will decrease by

0.722712 index assuming other variables are constant or *ceteris paribus*. The probability value of 0.0067 indicates that the variable is significant, because the value is less than the real level of 5% (0.05).

Table 5. Statistical Test Results

Variables	Coefficient	t-Statistic	Prob.
INF	-0.72271	-2.75773	0.0067 **
LOG(LPAD I)	2.433883	2.980338	0.0035 **
LOG(LPAL AWIJA)	0.815880	2.274609	0.0246 **
LOG(PPAD I)	4.524533	5.590714	0.0000 **
LOG(PPAL AWIJA)	0-.98105	-2.37593	0.0190 **

Description:

** significance value $\alpha = 5\%$ (0.05)

Source: Eviews output, 2023

Inflation variable: $-2.757737 < 1.972396$ (t-statistic < t-table). The t- statistic value is smaller than the t- table, so H_0 is accepted and H_1 is rejected. So it can be stated that inflation has a negative effect on the NTP of Food Crops from 2016 to 2021.

The regression coefficient on the LPADI variable is 2.433883, so that in the long run if LPADI increases by 1%, the NTPTP will increase by 2.433883 indices assuming other variables are constant or *ceteris paribus*. The probability value of 0.0035 indicates that the variable is significant, because the value is less than the real level of 5% (0.05).

Rice land area variable: $2.980338 > 1.972396$ (t-statistic > t- table). The t-statistic value is greater than the t-table, so H_0 is rejected and H_1 is accepted. So it can be stated that the rice land area has a positive effect on the NTP of Food

Crops from 2016 to 2021. The regression coefficient on the LPALAWIJA variable is 0.815880 so that in the long run if LPALAWIJA increases by 1% then NTPTP will increase by 0.815880 index assuming other variables are constant or *ceteris paribus*.

The probability value of 0.0246 indicates that the variable is significant, because the value is less than the real level of 5% (0.05). Variable area of secondary crops: $2.274609 > 1.972396$ (t-statistic > t- table). The t-statistic value is greater than the t-table, so H_0 is rejected and H_1 is accepted. So it can be stated that the area of secondary crops has a positive effect on the NTP of Food Crops from 2016 to 2021.

The regression coefficient on the PPADI variable is 4.524533 so that in the long run if PPADI increases by 1%, the NTPTP will increase by 4.524533 indices assuming other variables are constant or *ceteris paribus*. The probability value of 0.0000 indicates that the variable is significant, because the value is less than the real level of 5% (0.05).

Rice paddy production variable: $5.590714 > 1.972396$ (t-statistic > t- table). The t-statistic value is greater than the t-table, so H_0 is rejected and H_1 is accepted. So it can be stated that rice production has a positive effect on the NTP of Food Crops from 2016 to 2021.

The regression coefficient on the PPALAWIJA variable is -0.981052, so that in the long run if PPALAWIJA increases by 1% then NTPTP will decrease by 0.981052 index assuming other variables are constant or *ceteris paribus*. The probability value of 0.0190 indicates that the variable is significant, because the value is less than the real level of 5% (0.05).

Crop production variable: $-2.375930 < 1.972396$ (t-statistic < t-table). The t- statistic value is smaller than the t- table, so H_0 is

accepted and H_1 is rejected. So it can be stated that secondary crop production has a negative effect on the NTP of Food Crops from 2016 to 2021.

The first hypothesis (H_1) proposed in this study is that inflation has a positive influence on the exchange rate of Indonesian food crop farmers in the long run. The findings obtained from this study explain that inflation has a negative effect on the exchange rate of Indonesian food crop farmers in the long run. Where the test findings of the inflation variable in table 5 explain the negative coefficient of 0.722712 with a significance probability of 0.0067 < 0.05.

Therefore, it can be said that the first hypothesis is rejected. Farmers are unable to obtain agricultural inputs due to the high inflation rate, as revealed by Jumilah (2021). Some farmers use alternative production facilities, albeit of lower quality, to save money. The result is a decline in production levels, leading to a depreciation of farmers' exchange rates.

The second hypothesis (H_2) proposed in this study is that rice land area has a positive influence on the exchange rate of Indonesian food crop farmers in the long run. The findings obtained from this study explain that the size of rice fields has a positive influence on the exchange rate of Indonesian food crop farmers in the long run. Where the test findings of the rice land area variable in table 5 show a positive coefficient of 0.02433883 with a significance probability of 0.0035 < 0.05. Therefore, it can be said that the second hypothesis is accepted.

According to Kurniawan (2018), one of the programs to increase food security is by increasing the land area and the amount of optimized land area. Rice production is

promoted through efforts to maximize land use, especially through the expansion of rice harvest areas. Production will increase due to a larger harvest area.

As a result, the increase in production will lead to an appreciation of the farmer's exchange rate. This result is in line with the statement in the research by Hoq, et al. (2021) which shows the result that the rice land area has a positive influence on the farmer's exchange rate.

The third hypothesis (H_3) proposed in this study is that the area of secondary crop land has a positive influence on the exchange rate of Indonesian food crop farmers in the long run. The findings obtained from this study explain that the area of secondary crop land has a positive influence on the exchange rate of Indonesian food crop farmers in the long run.

Where the findings of the testing of the crop land area variable in table 5 explain the positive coefficient of 0.0081588 with a significance probability of 0.0246 < 0.05. Therefore, it can be said that the third hypothesis is accepted. The fourth hypothesis (H_4) proposed in this study is that rice production has a positive influence on the exchange rate of Indonesian food crop farmers in the long run.

The findings obtained from this study explain that rice production has a positive influence on the exchange rate of Indonesian food crop farmers in the long run. Where the test findings of the rice production variable in table 5 explain the positive coefficient worth 0.04524533 with a significance probability of 0.0000 < 0.05. So it can be said that the fourth hypothesis is accepted.

The fifth hypothesis (H_5) proposed in this study is that secondary crop production has a positive influence on the exchange rate of

Indonesian food crop farmers in the long run. The findings obtained from this study show that secondary crop production does not have a significant and negative effect on the exchange rate of Indonesian food crop farmers in the long run. Where the test findings of the rice production variable in table 5 explain a negative coefficient of 0.00981052 with a significance probability of $0.0190 < 0.05$. Therefore, it can be said that the fifth hypothesis is rejected.

CONCLUSION

Based on the results of the analysis and discussion that has been done, the following conclusions can be drawn: Partially, the variables of inflation and secondary crop production have a negative and significant effect on the exchange rate of food crop farmers. While the variables of rice land area, secondary crop land area, and rice production have a positive and significant effect on the exchange rate of Indonesian food crop farmers in 2016-2021.

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