

Economic Factors Affecting Rice Price Fluctuation in North Sumatera

Mariana Eva Yanti¹, Octasella Ainani As'ad², Faiz Ahmad Sibuea³

¹Agribusiness Master Departement, Faculty of Agriculture, Universitas Islam Sumatera Utara, Indonesia

²Agribusiness Departement, Faculty of Economic Management, IPB, Indonesia

Abstract

The research approach method is a qualitative approach. The method of data collection is secondary data, secondary data needed is obtained from relevant agencies, namely from the Central Bureau of Statistics and the Department of Agriculture as well as other literature related to research. The analytical method used is descriptive analysis and analysis of Vector Auto Regression (VAR). The results showed that: 1) The dominant factors affecting rice prices in North Sumatera are 2, the first is 60% production because the higher the production of rice, the price of rice will decline and the lower the production, the price of rice will increase and the second factor is 38% inflation because if the price of rice continues to increase there will be inflation, but it is different from the fact that rice prices fluctuate due to the stability of rice prices. 2) Factors that affect rice prices in North Sumatera in the short term are significant, namely inflation and in the long term there are five significant factors, namely production (prod), harvest area (field), income (inc), consumption (cons)) and inflation (inf). 3) From Impulse Response Function Analysis, it can be seen that the factors that influence rice prices in North Sumatera can be seen as stability, namely the production variable (Prod) reaches stability in the 25th period, the penen variable (Field) reaches stability in the period 28, the consumption variable (Cons) reaches stability in the 25th period, the income (Inc) variable reaches stability in the 20th period, the inflation variable reaches stability in the 27th period. namely inflation and in the long term there are five significant factors, namely production (prod), harvest area (field), income (inc), consumption (cons) and inflation (inf).

Keywords

rice production and rice price; consumption; harvest area; inflation



I. Introduction

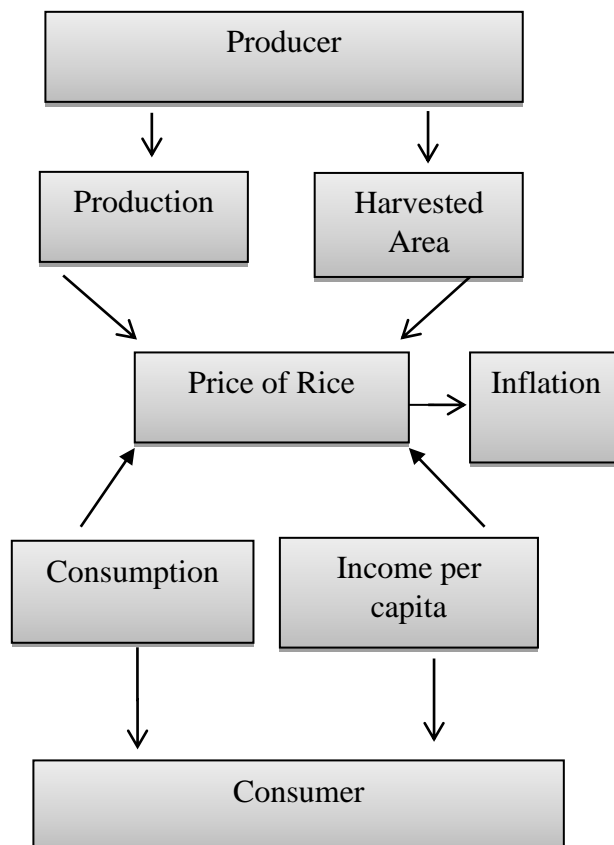
The island of Sumatra is one of the islands that has a high population in Indonesia, especially in the province of North Sumatra, so it requires food security for various existing commodities. Several time periods that occurred in the Province of North Sumatra indicate a scarcity of several commodities that can cause fluctuating price fluctuations. Therefore, the availability of various commodities is very important in maintaining price stability and macroeconomic stability in a region

The retail price of rice experiences price fluctuations, therefore the government must take a policy to stabilize the retail rice price so that consumers and producers do not experience significant losses. Price stability is a government policy which aims to protect rice producers and consumers. If producers are not profitable, it will reduce rice supply, indirectly it will affect the availability of rice for purchase and consumption by consumers. If the price of rice increases continuously due to limited rice availability, it could result in decreased food security in North Sumatra.

The role of the agricultural sector given to the economic development of North Sumatra is very large, so the agricultural sector must continue to be developed by the government, but on the other hand the fact that the agricultural sector has decreased is very unfortunate (Lubis et al, 2020). According to Solow's theory there are a number of things being done to spur economic growth. Increasing the portion of savings will increase capital accumulation and accelerate economic growth. In addition, increasing investment is appropriate in the economy both in physical and non-physical forms. Encouraging technological progress can increase income per workforce so that the opportunity to innovate in the private sector will have a major influence on economic growth (Hasibuan ET AL, 2020).

According to Noer and Agus (2007), agricultural land area and production per hectare are influenced by changes in prices and production per hectare, also influenced by changes in planted area. The conclusion that resulted from his research was that the increase in rice production was the result of an increase in the number of planted areas. The high amount of rice imports can also be seen from the area of harvested land and yields per hectare in North Sumatra in get decreased agricultural harvested area from the previous year resulting in a decrease in rice production in 2014. According to Sawastika et al (2000), one of the causes of fluctuating rice production national is the conversion of agricultural land to housing which continues and results in a decline in rice supply.

Based on microeconomic theory, changes in the price of a commodity are determined by the amount of demand and supply of the commodity. The relationship between the price of a commodity and the quantity demanded follows a basic economic hypothesis which states that the higher the price of a commodity, the lower the quantity of that commodity is demanded, assuming other variables are considered constant (*ceteris paribus*) and vice versa (Lia, 2010).



Based on the picture, changes in the price of a commodity are determined by the amount of demand and supply of the commodity. The relationship between the price of a commodity and the quantity demanded follows a basic economic hypothesis which states that the higher the price of a commodity, the lower the quantity of the commodity demanded, assuming other variables are considered constant (*ceteris paribus*). Meanwhile, the relationship between the price of a commodity and the quantity supplied follows a basic economic hypothesis which states that in general, the higher the price of a commodity, the greater the quantity of commodity and the quantity supplied follows a basic economic hypothesis which states that in general the higher the price of commodity, the greater of quantity commodity supplied by assuming other variable which are considered constant (*ceteris paribus*). The price of commodity is formed by the intersection between of demand and supply curve. So the quantity demanded is the same of the quantity of supply.

II. Research Methods

2.1 Data and Data Collection Methods

The data source in this research is secondary data. The secondary data required is obtained from related agencies, namely from the Central Statistics Agency and the Food Security Service and other literature related to the research. The secondary data required includes the condition of the research area, the amount of production, consumption, harvested area, per capita income and inflation as well as supporting institutions, namely data sources that are relevant to the research objectives in the form of documents and reports from existing relevant agencies in North Sumatra.

2.2 Vector Auto Regression (VAR) Analysis Method

Vector Auto Regression (VAR) analysis is used to project a system with time series variables and to analyze the dynamic impact of the disturbance factors contained in the variable system. Basically VAR analysis is the same as a simultaneous equation model, because in VAR analysis we consider several endogenous variables together in a model. The general VAR equation model can be written as follows (Enders, 2004) as follows:

$$Y_{t-1} = \alpha_{11}Y_t + \beta_{12}X_1 + \beta_{13}X_2$$

The VAR model uses the variables Production, Harvested Area, Consumption, Income per capita and the price of rice and inflation, namely:

P.Rice =

$$\alpha_{11} \text{Prod}_{t-1} + \beta_{12} \text{Field}_{t-1} + \beta_{13} \text{Cons}_{t-1} + \beta_{14} \text{Inc}_{t-1} + \beta_{15} \text{P. Inf}_{t-1} + \beta_{16} \text{P. Rice}_{t-1} + \epsilon$$

Prod =

$$\alpha_{21} \text{Field}_{t-1} + \beta_{22} \text{Cons}_{t-1} + \beta_{23} \text{Inc}_{t-1} + \beta_{24} \text{Inf}_{t-1} + \beta_{25} \text{P. Rice}_{t-1} + \beta_{26} \text{Prod}_{t-1} + \epsilon$$

Field =

$$\alpha_{31} \text{Cons}_{t-1} + \beta_{32} \text{Prod}_{t-1} + \beta_{33} \text{Inc}_{t-1} + \beta_{34} \text{Inf}_{t-1} + \beta_{35} \text{P. Rice}_{t-1} + \beta_{36} \text{Field}_{t-1} + \epsilon$$

$$\begin{aligned} \text{Cons} &= \\ &+++++++ \\ &\alpha_{41}\beta_{41} \text{Inc}_{t-1}\beta_{42}\text{Prodt}_{t-1}\beta_{43}\text{Field}_{t-1}\beta_{44}\text{Inf}_{t-1}\beta_{45} P. \text{Rice}_{t-1}\beta_{46}\text{Cons}_{t-1} + \\ &\epsilon \end{aligned}$$

$$\begin{aligned} \text{Inc} &= \\ &+++++++ \\ &\alpha_{51}\beta_{51} \text{Inf}_{t-1}\beta_{52} P. \text{Rice}_{t-1}\beta_{53}\text{Prodt}_{t-1}\beta_{54}\text{Field}_{t-1}\beta_{55}\text{Cons}_{t-1}\beta_{56}\text{Inc}_{t-1} + \\ &\epsilon \end{aligned}$$

$$\begin{aligned} \text{Inf} &= \\ &+++++++ \\ &\alpha_{61}\beta_{61} P. \text{Rice}_{t-1}\beta_{62}\text{Prodt}_{t-1}\beta_{63}\text{Field}_{t-1}\beta_{64}\text{Cons}_{t-1}\beta_{55}\text{Inc}_{t-1}\beta_{56}\text{Inf}_{t-1} + \\ &\epsilon \end{aligned}$$

Information:

α = Constant

β = Variable constant

$t - 1$ = This year deducted 1

ϵ = Error

There are several stages in carrying out a VAR analysis, namely:

1. Data Stationarity Test

The first step to estimating the VAR model is the data stationarity test. The data stationarity test can be done using the unit root test in the model.

2. Determination of the Optimal Lag

Another important thing in estimating the VAR model is the determination of lag. The optimal lag is needed in order to capture the effect of each variable on the other variables in the VAR system.

3. VAR Model Stability Test

The next step is to test the stability of the VAR. The VAR stability test is done by calculating the roots of the polynomial function or known as the roots of characteristic polynomial.

4. Cointegration Test

The cointegration test aims to determine whether the variables are not stationary and are not cointegrated.

5. Vector Error Correction Model (VECM)

Engle and Granger (1987) in Widarjono (2013) state that time series data are often not stationary at the level or non-stationary level of data, but a linear combination of two or more non-stationary data becomes stationary.

III. Results and Discussion

The stationarity test was carried out to ensure that the research variable did not have a unit root. The criteria used is Augmented Dickey-Fuller (ADF), with a confidence interval of 5%.

Table 1. Stationarity test results at the level level

Variable	ADF statistics	MacKinnon critical value			Information
		1%	5%	10%	
		Price	-1.358967	-3.699871	
Production	-1.379688	-3.679322	-2.967767	-2.622989	Not Stationary
Harvest area	-1.522041	-3.679322	-2.967767	-2.622989	Not Stationary
Consumption	-2.308563	-3.769597	-3.004861	-2.642242	Not Stationary
Income	-1.422639	-3.679322	-2.967767	-2.622989	Not Stationary
Inflation	-5.906736	-3.679322	-2.967767	-2.622989	Not Stationary

Table 2. Stationarity test results at the level *first difference*

Variable	ADF statistics	MacKinnon critical value			Information
		1%	5%	10%	
		Price	-5.438807	-3.699871	
Production	-7.491681	-3.689194	-2.971853	-2.625121	Stationary
Harvest area	-4.973094	-3.689194	-2.971853	-2.625121	Stationary
Consumption	-5.976400	-3.689194	-2.971853	-2.625121	Stationary
Income	-5.800279	-3.689194	-2.971853	-2.625121	Stationary
Inflation	-5.042917	-3.724070	-2.986225	-2.632604	Stationary

3.1 Determination of Optimal Lag

In this study, based on the results of the optimal lag calculation suggested by all the criteria is the 2nd lag, so that the optimal lag is chosen as the 2nd lag.

Table 3. Determination results *lag optimal*

Lag	LogL	LR	FPE	AIC	SC
0	50.9852	NA	1.44e-09	-3.332237	-3.044273 *
1	93,3508	62.7640 *	9.66e-10	-3.803770	-1.788024
2	138.1235	7.89e-10 *	-4.453593 *		-0.710064

Remarks: * recommended optimal lag

3.2 Vector Error Correction Model (VECM) Estimation

Table 4. VECM estimation results

Short-term

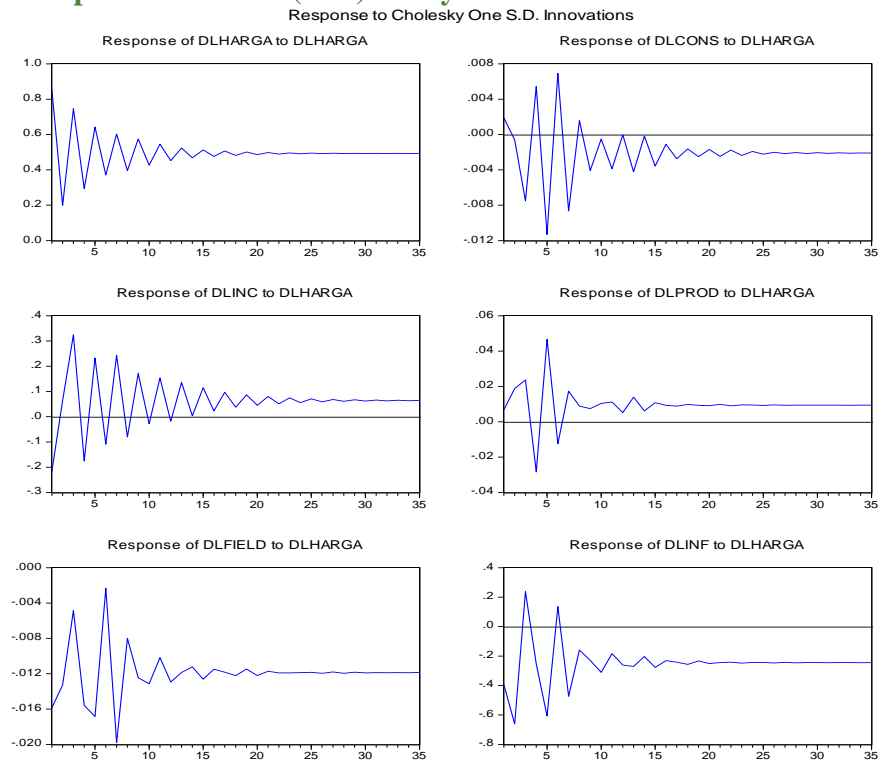
Variable	Coefficient	T-statistics
CoIntEq1	-0.282907	[-1.91120]
D (D Price (-1))	-0.696602	[-4.23238]
D (D Production (-1))	0.858273	[0.70165]
D (D Harvested area (-1))	-3.806207	[-1.07435]
D (D Consumption (-1))	1.453928	[0.52488]
D (D Income (-1))	0.010159	[0.12831]
D (D Inflation (-1))	0.005049	[0.92888] *
C	0.031958	[0.47674]

Long-term

Variable	Coefficient	T-statistics
DHarga (-1)	1,000000	-
D Production (-1)	7.664951	[1.76264] *
D Harvest area (-1)	-30.06845	[-7.60917] *
D Consumption (-1)	20.14268	[6.51096] *
D revenue (-1)	0.345491	[3,44872] *
Inflation (-1)	0.039616	[3,47437] *
C	0.106414	-

Note: * significant at 5% confidence interval

3.3 Impulse Response Function (IRF) Analysis



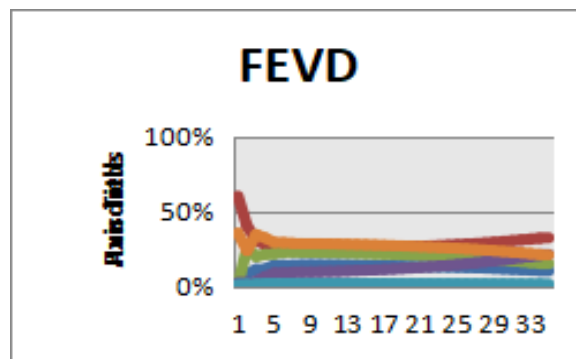
The analysis of the inflation response to price shocks of each food commodity is projected over the next 35 periods of the study period. In general, the results of the IRF analysis state that the price shocks of food commodities in the initial period have not been responded to by inflation in the long run approaching the point of stability. It show that the fluctuation of food commodities doesn't have a permanent impact

In addition, the response of rice prices previous rice prices in the first, second, third, fourth and fifth periods has fluctuated up to the sixth or 30-year period towards the inflection point (point to zero). The effect of rice prices on previous rice prices can be caused by the price of rice in the domestic market and the price of rice in the international market. It can be seen from the law of demand that if rice production increases, the price of rice will decrease and vice versa if rice production decreases, the price of rice will increase. However, all of this is inversely proportional to the fact that when production increases, rice prices experience fluctuations caused by rice imports and government policies.

For the consumption, the response of rice prices to inc (income) in the first, second, third, fourth period fluctuates until the fifth period or at 25 years goes to the inflection point. This is due to increased income but the purchasing power of rice has not increased because it is caused by the needs and tastes of each individual.

3.4 Forecast Error Variance Decomposition (FEVD) Analysis

FEVD analysis results table



Information:	
PRODUCTION 60%	PRICE 15%
INFLATION 38%	CONSUMPTION 21%
HARVEST AREA 25%	INCOME 2%

Based on the results of this analysis, the two most dominant variables in explaining rice prices in North Sumatra Province are production at 60% and inflation at 38% on condition that each variable has a 100% probability. Production is one of the variables that can affect the price of rice because production is the first place to determine the price of rice in accordance with the law of demand, if production increases, the price of rice will decrease and if production decreases, the price of rice will increase. But in reality it is inversely proportional to the existence of policies government to import rice at a much higher price.

After production, inflation is a variable that has the second contribution to affect rice prices in North Sumatra Province. This is because if the price of rice increases continuously it will experience inflation, but in fact the price of rice in North Sumatra has fluctuated due to the price stability policy.

IV. Conclusion

Based on the results of the discussion, it can be concluded in general, that:

1. There are 2 factors that predominantly affect rice prices in North Sumatra, namely the first 60% production because the higher the rice production, the rice price will decrease and the lower the production, the rice price will increase and the second factor is inflation of 38% in because if the price of rice continuously increases, there will be inflation, but it is different from the fact that the price of rice has fluctuated due to the stability of the price of rice.
2. Significant factors affecting rice prices in North Sumatra in the short term are inflation and in the long run there are five significant factors, namely production (prod), harvested area (field), income (inc), consumption (cons) and inflation (inf).
3. From the Impulse Response Function analysis, it can be seen that the factors that influence the price of rice in North Sumatra can be seen from the stability, namely the production variable (Prod) reaches stability in the 25th period, the harvest area variable (Field) reaches stability in the 28th period, the consumption variable (Cons) reaches stability in the 25th period, the income variable (Inc) reaches stability in the 20th period, the inflation variable (Inf) reaches stability in the 27th period.

Suggestions

1. The government is advised to control rice prices, the amount of rice production and rice imports in North Sumatra by making policies to stabilize rice prices. So that people can buy rice at a stable price.
2. For future researchers, it is hoped that they can continue their research and find variables that can affect the price of rice that is more perfect

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