International Journal of Agriculture, Environment and Bioresearch

Vol. 09, No. 05; 2024

ISSN: 2456-8643

# ANALYSIS OF VERTICAL INTEGRATION OF RICE MARKET IN SOUTH KALIMANTAN PROVINCE

**Marita Rahma Sari*, Sadik Ikhsan and Luthfi Fatah**
Master of Agricultural Economics Study Program, Faculty. Agriculture – Lambung Mangkurat University, Banjarbaru – South Kalimantan
Corresponding Email: sikhsan@ulm.ac.id

https://doi.org/10.35410/IJAEB.2024.5936

## ABSTRACT

Vertical integration is important to know to see whether changes in rice prices in the reference market (consumers) are followed by changes in rice prices in the follower market (producers) which will have an impact on the effectiveness of the Government's policies in stabilizing rice prices. This study aims to determine the price variation and vertical integration of local and superior rice markets in South Kalimantan Province. This study uses local and superior rice price data at the producer (milling) and consumer (retailer) levels from January 2014 to March 2024. The data used was sourced from the Central Statistics Agency and the South Kalimantan Provincial Agriculture and Food Security Office. The Coefficient of Variation is used to see price variations in local and superior rice. VAR/VECM analysis is used to identify vertical integration relationships between local and superior rice markets at the producer and consumer levels. The results of the study show that the highest coefficient of variation in local and superior rice prices occurred in the year of the Covid-19 pandemic. The coefficient of variation in local rice prices of producers was highest in 2020 and 2022 at 10.96% and 15.68%. The coefficient of variation in the price of superior rice for the highest producers in 2022 and 2023 is 16.23% and 12.48%. The results of the study also show that there is a vertical integration of a long-term equilibrium relationship between the consumer and producer of local and superior rice market. In the integration of the long-term equilibrium relationship, when the price of local and superior rice at the consumer level increases, the price of local and superior rice at the producer level also increases. The vertical integration of the short-term equilibrium relationship in the local rice market is full integration because both the consumer and producer markets influence each other but in opposite directions of price transmission. If prices in the consumer market rise, prices in the producer market will fall. The vertical integration of the short-term equilibrium relationship in the superior rice market is not complete because the producer market affects the consumer market but the consumer market does not significantly affect the producer market.

**Keywords:** Rice, Price Variation, Coefficient Of Variation, Vertical Integration, Var/Vecm.

## 1. INTRODUCTION

One of the food commodities that has high strategic value is rice. Rice has a high strategic value because rice is one of the commodities that affects economic movements. Based on the Regulation of the National Food Agency of the Republic of Indonesia Number 7 of 2024, it is stated that for the ceiling price of premium and medium rice in the Kalimantan region of Rp. 14,900.00/kg and Rp.13,100.00/kg, respectively (Regulation of the National Food Agency of the Republic of Indonesia Number 7 of 2023 concerning the Highest Retail Price of Rice, n.d.). This

Vol. 09, No. 05; 2024

ISSN: 2456-8643

shows that the price of local and superior rice in the South Kalimantan region itself is far above the ceiling price recommended according to the regulation.

The price of rice is very important for both farmers and consumers. When the price of rice at the consumer level increases, it is expected that the price of rice at the producer level will also increase. For farmers, high rice prices encourage farmers to increase production in the hope that the price will be reflected in the selling price of rice so that it can provide a decent life for farmers and their families. Meanwhile, on the other hand, consumers hope that the price of rice is not too high so that it can still be affordable for them. If the price of rice is too high, it is feared that it will increase the poverty level in the community.

Price changes will be able to be responded to quickly and appropriately if traders and producers are in the same and even condition (Asmara et al., n.d. 2010). This means that the market has been well integrated. With integrated market conditions, it is hoped that information and policies regarding any change in rice prices, especially when there is an increase in rice prices at the consumer level, can be followed by an increase in rice prices at the producer level so that producers are able to enjoy the increase in rice prices that occur in the consumer market.

VAR/VECM analysis is used to determine the vertical integration of the rice market because the VAR/VECM model is simple, there is no difference between endogenous and exogenous variables in the model, and the model estimation results are better.

The objectives of this study are to (1) find out the variation in local and superior rice prices at the producer and consumer levels in South Kalimantan; (2) analyze the vertical integration of local and superior rice markets in South Kalimantan; (The results of this study are expected to (1) provide information and input to local governments and related agencies in formulating formulation strategies in maintaining local and superior rice prices to remain stable because market integration is a prerequisite for government policy intervention in consumer and producer markets; (2) Reference in conducting further studies for parties who are interested in continuing research by utilizing other analytical tools or reviewing other problems.

## 2. RESEARCH METHODS

### Place and Date of Research

The research was carried out in South Kalimantan Province, starting from the proposal making stage in November 2023 and continuing with data processing until the completion of the research report in June 2024.

### Types and Data Sources

The type of data collected in this study is secondary data, namely the average data of the monthly time series of local rice prices and superior rice at the producer and consumer levels for a period of 123 months, namely the period from January 2014 to March 2024.

Local rice is a typical banjar rice that comes from local varieties of rice in South Kalimantan such as Siam Unus, Siam Mayang, Unus Mutiara, Siam Karang Dukuh, Unus Mayang and others. Superior rice is rice derived from superior varieties of rice such as ciherang, mekongga, inpari, inpara, cibogo, cisokan and other types of superior rice. Local and superior rice price data at the producer level is local and superior rice price data in the form of dry milled grain. Local and superior rice price data at the consumer level is local and superior rice price data at the retailer level. Data was obtained from the Central Statistics Agency of South Kalimantan Province and the Agriculture and Food Security Office of South Kalimantan Province).

### Data Analysis Methods

Vol. 09, No. 05; 2024

ISSN: 2456-8643

The method to analyze the variation in local and superior rice prices in South Kalimantan is to use the amount of the variation coefficient. The coefficient of variation is a measure of value distribution that uses a standard deviation relative to the average value of the data expressed in percentage. The lower the value of the coefficient of variation, the lower the likelihood of price fluctuations so that the more likely the price will be stable.

The value of the coefficient of variation in rice prices based on the Strategic Plan of the Food Security Agency for 2020-2024 has a maximum value of 10%. Suppose the KV value of local and superior rice prices at the producer and consumer levels exceeds the value of 10%. In that case, it can be said that the price of local and superior rice at the producer and consumer levels is highly volatile and unstable. The formula for the Coefficient of Variation is as follows:

$$KV_{it} = \frac{\sigma_{it}}{\bar{x}_{it}} \qquad (1)$$

with:

KV: Coefficient of variation in local/superior rice prices at the producer/consumer level

sit : Standard deviation/standard deviation of local rice/superior producer/consumer level

$\bar{x}_{\text{less}}$ : Average price of local/superior rice at the producer/consumer level

The method to answer the second goal is to analyze VAR/VECM using the Eviews 9.0 application. The steps of VAR/VECM analysis are as follows:

**1. Stationary Test**

Economic data on time series are generally not stationary. Data that is not stationary will produce a pseudo-parameter estimation (*spurious regression*). If this pseudo-regression is interpreted, it will result in an incorrect analysis that results in the wrong policy taken. The stationarity test in this study uses the Augmented Dickey Fuller (ADF) test. The t-statistical results will be compared with the Mackinon Critical Value t-table values. Data is said to be stationary when the t-statistic is greater than the critical value test. The formulation of the ADF test in this study is:

$\Delta P_t = \alpha_0 + \gamma\, P_{t-1} + \beta_i \sum_{j=1}^{m} \Delta\, P_{t-1} + e_t$ (2) by:

$P_t$ : local and superior rice price variables at the producer and consumer levels in the t period (Rp/kg)

$P_{t-1}$ : local and superior rice price variables at the producer and consumer levels in the previous period (Rp/kg)

$\Delta P_t$ : $P_t$ - $P_{t-1}$

$\Delta P_{t-1}$ : $P_{t-1} - P_{t-1-1}$

$m$ : Number of lags

$\alpha_0$ : intersep

$\beta_i, \gamma$ : Coefficient parameter

$e_t$ : error term

**2. Optimal Lag Length Test**

This long lag to find out the length of time changes in local and superior rice prices at the producer level affects changes in local and superior rice prices at the consumer level, and vice versa. The lag value of a variable is necessary because other variables take time to respond to

Vol. 09, No. 05; 2024

ISSN: 2456-8643

changes in other variables. The optimum lag based on the AIC (*Akaike Information Criterion*) value is the minimal. The AIC equation is as follows:

$$AIC = -\frac{2L}{T} + 2K/T \quad (3)$$

With:
L : log likelihood
T : observation size
K : the number of variables in the equation
Stationary data has a Likelihood Test probability value ≤ a critical point

**3. VAR Stability Test**

This stabilization test is used to find out whether the VAR model used is in a stable state or not. The VAR model used in this study is said to be stable if all modulus values are less than 1 and all roots values are in the circle unit. The stabilization test was carried out so that the interpretation of the results of the *Impulse Response Function* (IRF) and *Forecast Error Variance* Decomposition (FEVD) analysis results was not presumptuous. The estimate of the VAR model on the integration of the rice vertical market in South Kalimantan is as follows:

$$\text{Lokprod} = \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta Lokprod_{t-1} + \sum_{i=1}^{k} \delta_{1i} \Delta Lokkons_{t-1} + \varepsilon_t \quad (4a)$$

$$\text{Lokkons} = \alpha_2 + \sum_{i=1}^{k} \beta_{2i} \Delta Lokkons_{t-1} + \sum_{i=1}^{k} \delta_{2i} \Delta Lokprod_{t-1} + \varepsilon_t \quad (4b)$$

$$\text{Ungprod} = \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta Ungprod_{t-1} + \sum_{i=1}^{k} \delta_{1i} \Delta Ungkons_{t-1} + \varepsilon_t \quad (5a)$$

$$\text{Ungkons} = \alpha_2 + \sum_{i=1}^{k} \beta_{2i} \Delta Ungkons_{t-1} + \sum_{i=1}^{k} \delta_{2i} \Delta Ungprod_{t-1} + \varepsilon_t \quad (5b)$$

With:

$\alpha_1$ , $\alpha_2$ : Constant

$\alpha, \beta$ : Parameters to be estimated

Lokprod : local rice price in producer level (Rp/kg)

Lokkons : local rice price in consumer level (Rp/kg)

Ungprod : Superior rice price in producer level (Rp/kg)

Ungkons superior rice prices in consumer (Rp/kg)

t : lag time/period, t = 1,2,3,... k

**4. Cointegration Test**

The cointegration test was carried out to find out whether or not there is vertical integration in the long-term local and superior rice market. The cointegration test was carried out by looking at the statistical trace test value and the maximum *eigen value results*. Trace test statistics:

$$\lambda_{trace}(r) = -T \sum_{t=r=1}^{p} \log(1 - \lambda i) \quad (6)$$

Statistics uji *maximum eigen value*: $\lambda_{max}(r) = -T \log(1 - \lambda_{i+1})$ (7)

Vol. 09, No. 05; 2024

ISSN: 2456-8643

With:

T : Total observation time
L : estimated eigenvalue or *Own value*
Testing criteria with a significance level of 5%
If the calculated value is greater than the critical value or p value < 5%, then there is cointegration and if the calculated value is greater than the critical value or p value > 5%, then there is no cointegration.$\lambda_{trace}$ $\lambda_{max}$ $\lambda_{trace}$ $\lambda_{max}$

**5. Granger Causality Test**

The Granger causality test was conducted to see if the variables in the VAR model had a reciprocal relationship (bidirectional relationship). If the test result has *a probability value* < 0.05, then there is a causality relationship and vice versa.

**6. VECM Estimation (*Vector Error Correction Model)***

The VECM test is carried out when the time series data is not stationary at the same level and the level of differentiation is stationary and there is cointegration. The estimate of the VECM model on the vertical market integration of rice in South Kalimantan is as follows:

$\Delta$Lokprodt $= \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta Lokprod_{t-1} + \sum_{i=1}^{k} \delta_{1i} \Delta Lokkons_{t-1} + \lambda_1 u_{1t} + \varepsilon_{1t}$ (8a)

$\Delta$Locomotive art $= \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta Lokkons_{t-1} + \sum_{i=1}^{k} \delta_{1i} \Delta Lokprod_{t-1} + \lambda_2 u_{2t} + \varepsilon_{2t}$ (8b)

$\Delta$Ungprodt $= \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta Ungprod_{t-1} + \sum_{i=1}^{k} \delta_{1i} \Delta Ungkons_{t-1} + \lambda_3 u_{3t} + \varepsilon_{3t}$ (9a)

$\Delta$Young Art $= \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta Ungkons_{t-1} + \sum_{i=1}^{k} \delta_{1i} \Delta Ungprod_{t-1} + \lambda_4 u_{4t} + \varepsilon_{4t}$ (9b)

With:

Lokprod : local rice price at producer level (Rp/kg)

Lokkons : local rice price at the consumer level (Rp/kg)

Ungprod : Superior rice price at producer level (Rp/kg)

Ungkons : Superior rice price at the consumer level (Rp/kg)

$\alpha_1$, $\alpha_2$ : Intersep
$\beta, \delta$ : coefficient *autoregressive*
$u_{1t}$ : *error correction term* (ECT)
$\varepsilon$ : *white noise*
t : time/period *Lag* t = 1.2,.....k
k : long *Lag* Optimum

**7. Analisis IRF (Impulse Response Function)**

This IRF analysis can see the response of a variable in the next few periods when there is a disturbance/shock from the variable itself and from other variables in the VAR model.

**8. Analisis FEVD (Forecast Error Variance Decomposition)**

Vol. 09, No. 05; 2024

ISSN: 2456-8643

FEVD is used to predict the percentage of variance error contribution of each variable due to changes in certain variables, either this variable itself or other variables. In addition, FEVD also helps show which impulse variables are stronger in explaining variations in response variables throughout the period.

## 3. RESULTS AND DISCUSSION

Prices Variation of Local and Superior Rice

The coefficient of variation in local and superior rice prices in South Kalimantan can be seen in Table 1.

**Table 1. Coefficient of variation in local and superior rice prices in producer and consumer level in south Kalimantan**

| Tahun | KV LOKPROD (%) | KV LOKKONS (%) | KV UNGPROD (%) | KV UNGKONS (%) |
|---|---|---|---|---|
| 2014 | 4.07% | 1.70% | 7.52% | 4.26% |
| 2015 | 2.71% | 3.36% | 8.79% | 3.04% |
| 2016 | 4.41% | 4.42% | 8.50% | 2.35% |
| 2017 | 7.31% | 3.12% | 3.64% | 2.41% |
| 2018 | 6.68% | 3.78% | 4.69% | 4.29% |
| 2019 | 2.92% | 2.96% | 5.05% | 2.74% |
| 2020 | 10.96% | 4.34% | 5.89% | 6.60% |
| 2021 | 7.00% | 3.99% | 6.70% | 6.60% |
| 2022 | 15.68% | 7.53% | 21.23% | 7.44% |
| 2023 | 5.30% | 8.02% | 12.48% | 3.24% |
| 2024 | 0.64% | 7.66% | 0.10% | 1.84% |

The value of the Coefficient of Variation in local rice prices at the producer level fluctuates highly and is unstable based on the criteria of the Food Security Agency's Strategic Plan for 2020-2024, which is a maximum of 10% in 2020 and 2022 of 10.96% and 15.68%, respectively. Meanwhile, the highest Coefficient of Variation in superior rice at the producer level occurred in 2022 and 2023 at 21.23% and 12.48%, respectively.

At the beginning of 2020, Indonesia officially declared an emergency situation for the Covid-19 pandemic so that it had an impact on the agricultural sector. In addition, the high fluctuating local rice prices in 2020 are partly due to a decrease in local rice supply to rice distributors due to a decrease in the amount of local rice production from the Batola Anjir, Gampa Batola, Tala and Aluh-aluh areas. Meanwhile, in 2022, the price of local and superior rice fluctuated high due to the La Nina phenomenon which caused flooding that disrupted rice production. Then El Nino which occurred in 2023 and tungro pest attacks that caused crop failures and local and superior rice prices fluctuated high at the producer level.

The results of the analysis of the vertical integration of the rice market in South Kalimantan using the VAR/VECM method approach are as follows:

Vertical Integration of Local and Superior Rice Markets

### 3.1 Stationary Test

Vol. 09, No. 05; 2024

ISSN: 2456-8643

The results of the stationary test at the level level for the local rice market can be seen in Table 3.

**Table 3. Level stationary test results of local and superior rice in the producer and consumer level**

| Variabel | t-statistic (ADF) | *critical values* | *Probability* |
|---|---|---|---|
| LOKPROD | -0.5855 | -2.8852 | 0.8686 |
| LOKKONS | -0.7285 | -2.8854 | 0.8346 |
| UNGPROD | -1.3809 | -2.8852 | 0.5896 |
| UNGKONS | 0.1288 | -2.8856 | 0.9667 |

Information : *significant at the 5% real test level

Based on the results of the ADF test, it is known that the data on local and superior rice prices at the producer and consumer levels is not stationary at the level because the ADF value is statistically < critical values and probability is less than 0.05. Therefore, a stationery test is needed at the level of first difference.

**Table 4. Results of stationery test at the level of first difference for local and superior rice at the producer and consumer level**

| Variabel | t-statistik (ADF) | *critical values* | *Probability* |
|---|---|---|---|
| Lokprod | -12.387 | -2.8852 | 0.000* |
| Lokkons | -14.55 | -2.8854 | 0.000* |
| Ungprod | -12.371 | -2.8852 | 0.000* |
| Ungkons | -11.853 | -2.8856 | 0.000* |

Information : *significant at the 5% real test level

The results of the first difference level stationarity test in Table 4 show that the price of local and superior rice at the producer and consumer levels has been stationary at the first difference level with ADF statistical values > critical values and probability of less than 0.05.

**2. Optimal Lag Length Test**

Based on the results in Table 5, it shows that the length of lag for the local rice market is lag 1, which means that the two local rice price variables at the producer and consumer levels not only affect each other in the current period but also affect each other in the previous period.

**Table 5. Test results optimal lag lentgh of the local and superior rice in the producer and consumer level**

| Pasar | Kriteria AIC | | | | |
|---|---|---|---|---|---|
| Beras | 1 | 2 | 3 | 4 | 5 |
| Lokal | -5.7* | -5.70 | -5.64 | -5.69 | -5.62 |
| Unggul | -4.85 | -4.82 | -4.8* | -4.81 | -4.75 |

Vol. 09, No. 05; 2024

ISSN: 2456-8643

Information : *significant at the 5% real test level

The optimal lag length for the superior rice market is lag 3 which means that the two variables of superior rice prices at the producer and consumer levels also affect each other in the previous 3 periods.

**3. VAR Stability Test**

The VAR model used is stable if the results of the stability test with the optimal lag length that has been determined in the previous optimal lag length test show a modulus value of < 1 and all roots values are in the circle unit. The results of the VAR stability test can be seen in Table 6.

**Table 6. VAR stability test results on local and superior rice market**

| Pasar Beras | Akar/*Root* | Modulus |
|---|---|---|
| Lokal | 0.9941 | 0.9942 |
| | 0.6736 | 0.6736 |
| Unggul | -0.178677 - 0.516203i | 0.54625 |
| | -0.178677 + 0.516203i | 0.54625 |
| | -0.077672 - 0.232118i | 0.24477 |
| | -0.077672 + 0.232118i | 0.24477 |

Based on the results of the VAR stability test, it is known that all modulus values in the local and superior rice market have a modulus value of < 1 and all roots values are in the circle unit, so it can be said that the VAR model used is stable.

**4. Cointegration Test**

Cointegration is defined as a statistical statement related to the long-term balance linkage between variables (Ikhsan et al., 2024). From Table 7, it can be seen that there is 1 cointegration equation with trace statistical and max-eigen statistical values > critical values and probability < 0.05 so that there is an integration of long-term relationships between the local rice market at the producer and consumer levels.

**Table 7. Results of the cointegration test of the local rice market in producer and consumer level**

| Hipotesis | | *Trace Statistic* | *Critical Value* | *Probability* |
|---|---|---|---|---|
| $H_0$ | $H_1$ | | | |
| r = 0 | r = 1 | 17.87* | 15.494 | 0.02* |
| r = 1 | r = 2 | 0.07 | 3.841 | 0.78 |
| Hipotesis | | *Max-Eigen Statistic* | *Critical Value* | *Probability* |
| $H_0$ | $H_1$ | | | |
| r = 0 | r = 1 | 17.80* | 14.26* | 0.01* |
| r = 1 | r = 2 | 0.071 | 3.841 | 0.78 |

Vol. 09, No. 05; 2024

ISSN: 2456-8643

Information : *significant at the 5% real test level

**Table 8. Cointegration of long-term relationships of local rice markets at producer and consumer level**

| Persamaan Kointegrasi | Variabel Harga Beras Lokal | | |
|---|---|---|---|
| | LOKPROD | LOKKONS | C |
| Kointegrasi 1 | 1 | -0.819685<br>(-0.12543)<br>[-6.33834]* | 0.000525 |

Information: ( ) standard error, [ ] t-statistic, nilai t-table (α 5%) = 1.979764; *significant at a real level of 5%

$LOKPROD_{t-1}$= 0.819685 $LOKKONS_{t-1}$ + 0.000525 (10)

From the cointegration equation above, it can be seen that in the long run, the price of local rice at the consumer level (LOKKONS) significantly affects the price of local rice at the producer level (LOKPROD). If the price of local rice at the consumer level increases by Rp. 1,000.00, then in the long run the price of local rice at the producer level will also increase by Rp. 819,685. So it can be said that between local rice prices at the producer and consumer levels there is a long-term integration relationship with the direction of price transmission in one direction. This means that when the Government implements related policies to increase rice prices, it is hoped that the benefits of the increase in rice prices will be enjoyed by farmers as well, thus encouraging farmers to increase rice production to move towards food self-sufficiency. If the local rice market at the producer and consumer levels is not integrated in a long-term relationship, then the policy of increasing rice prices will not stimulate the growth of rice production and will only increase the poverty level in Indonesia (Ratnaningtyas & Makbul, 2017). The results of the cointegration test in the superior rice market can be seen in Table 9.

**Table 9. Results of the rice market cointegration test of superior rice market in producer and consumer level**

| Hipotesis | | Trace Statistic | Critical Value | Probability |
|---|---|---|---|---|
| Ho | H1 | | | |
| r = 0 | r = 1 | 25.00307 | 15.49471 | *0.0014 |
| Hipotesis | | Max-Eigen Statistic | Critical Value | Probability |
| Ho | H1 | | | |
| r = 0 | r = 1 | 24.78074 | 14.2646 | *0.0008 |

Information: ( ) standard error, [ ] t-statistic, nilai t-table (α 5%) = 1.979764; *significant at a real level of 5%

Vol. 09, No. 05; 2024

ISSN: 2456-8643

**Table 10. Long-term relationship cointegration of superior rice market**

| Persamaan Kointegrasi | Variabel Harga Beras Unggul | | |
|---|---|---|---|
| | UNGPROD | UNGKONS | C |
| Kointegrasi 1 | 1.0000 | -0.71468<br>(-0.11744)<br>[9.12386]* | 1.312651 |

Information: ( ) standard error, [ ] t-statistic, nilai t- table (α 5%) = 1.979764; *significant at a real level of 5%

From the results of the superior rice psar cointegration test, it can be seen that there is 1 cointegration equation with a trace statistic value of 25.003 and a max-eigen statistic of 24.78 > the critical value and probability in the test of 0.0014 and 0.0008 respectively which are smaller than 0.05 so that it can be said that there is a long-term integration of the superior rice market at the producer and consumer levels. The long-term cointegration equation obtained from Table 10 for the superior rice market is as follows:

$$UNGPROD_{t-1} = 0.711468 - 1.312651 UNGKONS_{t-1} \quad (11)$$

**5. Granger Causality Test**

From the results of Granger's causality test in Table 11, it is known that in the local rice market there is a reciprocal causality relationship where the local rice market of producers affects the local rice market of consumers and vice versa. As for the superior rice market, there is a one-way causal relationship where the superior rice market of producers affects the superior rice market of consumers.

**Table 11. Granger causality test results of the local and superior rice in consumer and producer level**

| Ho | Obs | F-Statistic | Probability |
|---|---|---|---|
| LOKKONS does not Granger Cause LOKPROD | 120 | 3.94255 | 0.0075* |
| LOKPROD does not Granger Cause LOKKONS | | 1.63107 | 0.0003* |
| UNGKONS does not Granger Cause UNGPROD | 121 | 2.04479 | 0.1116 |
| UNGPROD does not Granger Cause UNGKONS | | 5.39678 | 0.0017* |

Information : * significant at the real level of 5%

**6. VECM Estimation (Vector Error Correction Model)**

Market integration can be in the form of long-term or short-term integration. The integration of short-term relationships can be known by the VECM test. The results of the VECM test on the local rice market can be seen in Table 12. The results of the VECM test show that the value of correction of imbalance errors that occur in the short term towards the long-term balance (Error

Vol. 09, No. 05; 2024

ISSN: 2456-8643

Correction Term) of ECT in the local rice market producers and consumers is significant at a real level of 5% of 0.749194 and 0.752738 respectively. The meaning of the ECT coefficient is that if there is an imbalance in the short term, it will be corrected by 74.92% in the producer's local rice market and 75.27% in the consumer's local rice market to reach its long-term balance. In the short term, if the price in the local rice market of consumers increases by Rp. 1000.00 in the past 1 month, the price in the local rice market of producers will decrease by Rp. 302.208 at this time. Price changes in the local rice market of consumers are affected by price changes in the local rice market of producers and consumers in the past 1 month. Short-term full integration exists in the local rice market, producers and consumers because in the short term the two markets influence each other. The results of the VECM (Vector Error Correction Model) test on the superior rice market can be seen in Table 13. In the short term, when the change in the price of superior rice at the consumer level is currently influenced by the change in the price of superior rice at the producer level in the last 1 and 2 months. Then in the short term, the current producer level superior rice price is influenced by the producer.

**Table 12. VECM Estimation (Vector Error Correction Model) of the local rice market**

| Error Correction: | LOKPROD | LOKKONS |
|---|---|---|
| ECT 1 | -0.749194 | 0.752738 |
| | -0.10998 | -0.14606 |
| | [-6.81220]* | [ 5.08507]* |
| LOKPROD (-1) | -0.146408 | -0.428275 |
| | -0.0855 | -0.11355 |
| | [-1.71245] | [-3.77175]* |
| LOKKONS (-1) | -0.302208 | -0.30651 |
| | -0.06916 | -0.09185 |
| | [-4.36986]* | [-3.33714]* |
| C | 0.000153 | -0.000959 |
| | -0.00531 | -0.00705 |
| | [ 0.02876] | [-0.13595] |
| R-squared | 0.557508 | 0.651852 |

Information: ( ) standard error, [ ] t-statistic, t-table value (α 5%) = 1.979764; *significant at a real level of 5%.

Vol. 09, No. 05; 2024

ISSN: 2456-8643

**Table 13. VECM estimation (Vector Error Correction Model of the superior rice market**

| Error Correction: | D(UNGKONS,2) | D(UNGPROD,2) |
|---|---|---|
| CointEq1 | -1.650419 | 0.3455 |
| | -0.26495 | -0.37152 |
| | [-6.22915]* | [ 0.92997] |
| D(UNGKONS(-1),2) | 0.271789 | -0.218215 |
| | -0.22128 | -0.31028 |
| | [ 1.22828] | [-0.70329] |
| D(UNGKONS(-2),2) | -0.026369 | -0.177686 |
| | -0.15972 | -0.22396 |
| | [-0.16510] | [-0.79340] |
| D(UNGKONS(-3),2) | -0.026079 | -0.074397 |
| | -0.09429 | -0.13222 |
| | [-0.27658] | [-0.56270] |
| D(UNGPROD(-1),2) | -0.399157 | -0.733952 |
| | -0.09812 | -0.13758 |
| | [-4.06815]* | [-5.33468]* |
| D(UNGPROD(-2),2) | -0.302982 | -0.486125 |
| | -0.09271 | -0.13 |
| | [-3.26816]* | [-3.73956]* |
| D(UNGPROD(-3),2) | -0.123775 | -0.20472 |
| | -0.07015 | -0.09837 |
| | [-1.76442] | [-2.08121]* |
| C | -0.000362 | -0.000151 |
| | -0.00612 | -0.00858 |
| | [-0.05912] | [-0.01762] |
| R-squared | 0.67797 | 0.430789 |
| F-statistic | 33.08331 | 11.89284 |

level superior rice price itself in 1,2 and 3 months ago.

## 7. Analisis IRF (Impulse Response Function)

The results of the IRF analysis Figure 3 show that when there is a price shock in the local rice price at the producer level by 1 standard deviation, the local rice price at the consumer level is faster towards equilibrium than the local rice price at the producer level itself

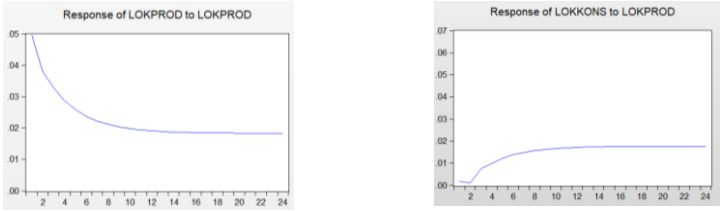


**Figure 3.** Producer and consumer level local rice market response to local rice price shocks at producer level

Vol. 09, No. 05; 2024

ISSN: 2456-8643

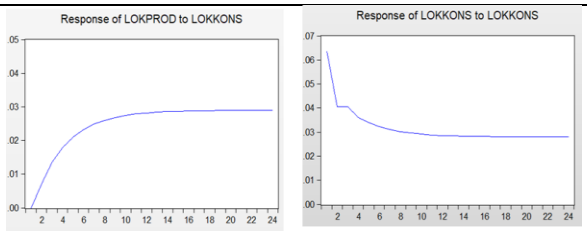


**Figure 4.** Response of the local rice market at the producer and consumer level to the shock of local rice prices at the consumer level

Figure 4 shows that when there is a price shock in local rice at the consumer level by 1 standard deviation, the price of local rice at the consumer level is faster towards price equilibrium compared to the price of local rice at the producer level. Figure 5 shows that if there is a price shock in the price of superior rice at the producer level, then the price of superior rice at the producer level itself will show a significant price increase at the beginning of the shock period until the 12th period and in the 13th period it begins to stabilize towards the equilibrium point, which is 0.35 from the standard deviation. Although the response to superior rice prices at the consumer level itself was responded positively at the beginning of the shock period, the response actually increased as the period progressed until the 10th period and began to reach the point of equilibrium in the 11th period.

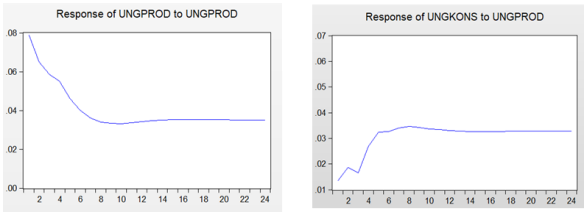


**Figure 5.** Producer and consumer superior rice market response to producer and producer superior rice price shocks

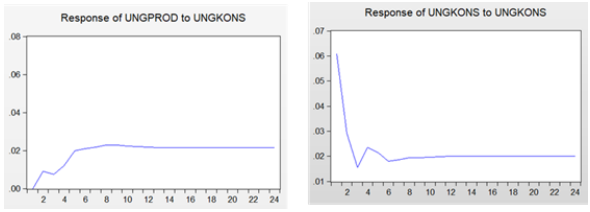


**Figure 6.** Response of the superior rice market at the producer and consumer level to the price shock of superior rice at the consumer level

Figure 6 shows that the response of superior rice prices at the consumer level is faster towards a long-term equilibrium compared to the price of superior rice at the producer level.

## 7. Analisis FEVD (Forecast Error Variance Decomposition)

Vol. 09, No. 05; 2024

ISSN: 2456-8643

Figure 7 shows that the variability of local rice prices at the producer level in the first month is influenced by the local rice price at the producer level itself. However, in the second month to the projection in the 12th month, local rice prices for consumers began to show their influence. So that in the short term, the local rice price at the consumer level has a small effect on the variability of local rice prices at the producer level and the influence begins to increase little by little in the long term.

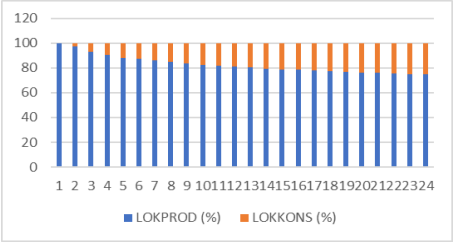


**Figure 7.** Forecast Error Variance Decomposition (FEVD) local rice prices at the producer level

Figure 8 shows that the variation of local rice prices at the consumer level is very small influenced by the local rice price at the producer level. However, in the projection of the 4th to 24th month, the price variability of producers slowly began to show its influence and increased to 29.21% on the price variability of local rice at the consumer level.

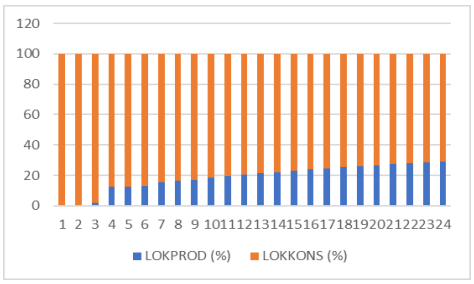


**Figure 8.** Forecast Error Variance Decomposition (FEVD) local rice prices at the consumer level

Figure 9 shows that the source of the variation in the price of superior rice at the producer level comes from the price of superior rice at the producer level itself, which then begins to be influenced by the price of superior rice at the consumer level in the projection of 14.91% in the 24th month.

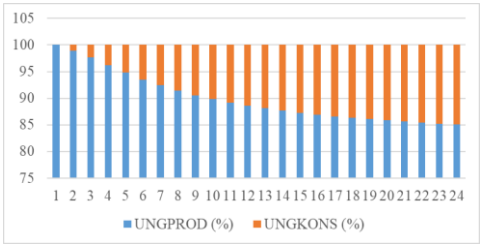


**Figure 9.** Forecast Error Variance Decomposition (FEVD) Superior Rice Prices at the Producer Level

Vol. 09, No. 05; 2024

ISSN: 2456-8643

This means that in the short term, the variation in the price of superior rice at the producer level is also not influenced by the price of superior rice at the consumer level, but in the long term, the influence of superior rice prices at the consumer level begins to be seen in the price of superior rice at the producer level. Figure 10 shows that the source of the variation in the price of superior rice at the consumer level in the first month has been influenced by the price of superior rice at the producer level by 5.14% and even in the projection of the 24th month, the price variability is influenced by 67.79% by the price of superior rice at the producer level.

This means that in the long run, the market for superior rice producers at the producer level is able to influence the price of superior rice at the consumer level. So that this should be well utilized by farmers as superior rice producers in order to determine market prices and enjoy the price increases that occur in the consumer-level market

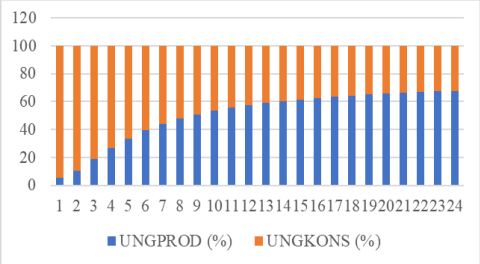


Figure 10. Forecast Error Variance Decomposition (FEVD) superior rice prices at the consumer level

## 4. CONCLUSIONS AND SUGGESTIONS

### Conclusion

Based on the results of the analysis and discussion described earlier, several things can be concluded as follows:

1.The coefficient of variation in local and superior rice prices at the producer level fluctuated highly in 2020, 2022, and 2023. These years were the years when the Covid-19 pandemic occurred.

2. The analysis of vertical integration in the local rice market is that in the local rice market, the producer and consumer levels have the integration of long-term and short-term relationships. In short-term integration, producer and consumer markets influence each other. When there is a price shock in the local rice market at the producer and consumer levels, the local rice price response at the consumer level is faster towards the equilibrium point. The contribution of local rice prices at the consumer level is higher than the contribution of local rice prices at the producer level to each of the local rice price variables at the producer and consumer levels in the projection of the 24th month.

3. Analysis of vertical integration in the superior rice market is In the superior rice market, the producer and consumer levels have a long-term relationship integration. In the short term, the producer level superior rice market affects the producer and consumer level superior rice market. When there is a shock to the price of superior rice at the producer and consumer levels, the

Vol. 09, No. 05; 2024

ISSN: 2456-8643

response to the price of superior rice at the consumer level is faster towards the point of equilibrium. The contribution of superior rice prices at the producer level is higher to each of the price variances of superior rice at the producer and consumer levels in the projection of the 24th month.

**Suggestion**

Several things can be suggested from the findings of this study :

1. In relation to the long-term vertical integration that occurs between the local and superior rice markets, further research can be carried out to measure the government's policy regarding the appropriate increase in rice prices so that producers can increase production and not increase poverty from the consumer side.
2. In relation to if there is a shock to the local rice market and excels at the producer and consumer levels, the Government is expected to focus more on the slower market towards the point of balance, namely the producer market.
3. Regarding price changes in the consumer-level superior rice market, it does not significantly affect the price changes in the producer-level superior rice market, so that the Government can provide even and perfect information to all marketing channels, especially farmers, so that price changes at the consumer level can be enjoyed by farmers in the short term against the consumer-level superior rice market because this market is slower to reach its balance.

**REFERENCES**

Adinda, D. E., Ikhsan, S., & Hamdani. (2023). Market integration analysis of cayenne pepper (Capsicum frutescens L.) in South Kalimantan. International Journal of Biosciences (IJB).

Aryani, D. (2012). Vertical integration of the grain producer market with the rice retail market in Indonesia abstract (Vol. 11).

Asmarantaka, W., Atmakusuma, J., Muflikh, Y. N., Rosiana, N., Ratna, O., Lecturer, ), Agribusiness, D., Economics, F., Institute, M., & Bogor, P. (2017). Agribusiness Marketing Concept: Economic and Management Approach. 5(2), 143–164.

Asmara, R., Ardhiani, R., Social, J., Agriculture, E., Brawijaya, U., & Malang, J. V. (2010). The Market Integration Analysis in Shallot Marketing System.

Asrin, S., Andita Putri, T., & Utami, A. D. (2022). Rice Price Transmission in Indonesia During the Covid-19 Pandemic. 10(1), 159–168.

Ikhsan, S., Santoso, D., Ilmi, Y., & Ananda, D. E. (2024). Analyzing the spatial integration of rice market in South Kalimantan Province, Indonesia: Using Vector Error Correction Model (VECM). Universal Journal of Agricultural Research, 12(2), 262–271.

Muhlis, M., & Nababan, B. O. (2021a). Vertical rice market integration between farmers and wholesalers in Indonesia. Journal of AGRI, 20(2), 227–238.

Ratnaningtyas, S., & Makbul, Y. (2017). Analysis of the integration of rice and paddy prices in Indonesia using a vector error correction model. Jurnal AGRI, 19(1), 142-153.