

ANALYSIS OF SHALLOT PRICE VARIATION IN SEVERAL TRADITIONAL MARKETS IN KUPANG CITY**(Analisis Variasi Harga Bawang Merah di Beberapa Pasar Tradisional di Kota Kupang)****Meydita Lay¹, Marthen R. Pellokila², Santhy Chamdra³**^{1,2,3}Agribusiness Study Program, Faculty of Agriculture, University of Nusa CendanaE-mail: meyditalay01@gmail.comReceived: 05th June, 2026Accepted: 11th June, 2026**ABSTRACT**

The price of shallots is an important component affecting public welfare because it is directly related to consumers' purchasing power and traders' income. Market dynamics influenced by changes in supply, demand, and distribution cause price fluctuations and price variations across markets. This study aims to determine the level of shallot price fluctuation and to analyze price integration between the two markets in both the short and long term during the 2020–2024 period. The research method used a quantitative approach with secondary data in the form of monthly time-series data obtained from the East Nusa Tenggara Provincial Trade Office and the Central Statistics Agency. Data analysis was conducted using the Vector Autoregression (VAR) method and the coefficient of variation with the assistance of EViews software. The results show that the level of shallot price fluctuation in both markets was relatively high and unstable, with coefficient of variation values of 29% in Inpres Naikoten Market and 28% in Oeba Market. In addition, the market integration analysis shows that shallot prices in the two markets were integrated both in the short and long term, but the relationship was asymmetric or unidirectional, running from Oeba Market to Inpres Naikoten Market. This finding indicates the dominant role of Oeba Market in shallot price formation in Kupang City.

Keywords: shallots, market integration, coefficient of variation, price variation, VAR.**ABSTRAK**

Harga bawang merah merupakan komponen penting yang memengaruhi kesejahteraan masyarakat karena berkaitan langsung dengan daya beli konsumen dan pendapatan pedagang. Dinamika pasar yang dipengaruhi oleh perubahan penawaran, permintaan, dan distribusi menyebabkan fluktuasi serta variasi harga antar-pasar. Penelitian ini bertujuan untuk mengetahui tingkat fluktuasi harga bawang merah dan menganalisis integrasi harga antara kedua pasar tersebut, baik dalam jangka pendek maupun jangka panjang, selama periode 2020–2024. Metode penelitian menggunakan pendekatan kuantitatif dengan data sekunder berupa data deret waktu (*time-series*) bulanan yang diperoleh dari Dinas Perdagangan Provinsi Nusa Tenggara Timur dan Badan Pusat Statistik. Analisis data dilakukan menggunakan metode *Vector Autoregression* (VAR) dan koefisien variasi dengan bantuan perangkat lunak EViews. Hasil penelitian menunjukkan bahwa tingkat fluktuasi harga bawang merah di kedua pasar tersebut relatif tinggi dan tidak stabil, dengan nilai koefisien variasi sebesar 29% di Pasar Inpres Naikoten dan 28% di Pasar Oeba. Selain itu, analisis integrasi pasar menunjukkan bahwa harga bawang merah di kedua pasar tersebut terintegrasi baik dalam jangka pendek maupun jangka panjang, namun hubungannya bersifat asimetris atau searah, yakni dari Pasar Oeba menuju Pasar Inpres Naikoten. Temuan ini mengindikasikan peran dominan Pasar Oeba dalam pembentukan harga bawang merah di Kota Kupang.

Kata kunci: bawang merah, integrasi pasar, koefisien variasi, variasi harga, VAR

INTRODUCTION

Shallot (*Allium ascalonicum* L.) is one of the leading vegetable commodities at the national level, alongside red chili and potatoes. This commodity has a high level of consumption among Indonesian society because it is a basic need in daily life, so demand tends to be large and affects market dynamics. In addition, shallot is a strategic commodity because changes in its price can have a direct impact on inflation. Increases in shallot prices often become one of the triggers of rising inflation. Shallot is also classified as a high-value commodity (Masithoh & Daryono, 2025).

Shallot is also a horticultural commodity with great potential in Indonesia and plays an important role in the agricultural sector. This commodity is included among seven food items with reference prices as regulated in Minister of Trade Regulation Number 63 of 2016, which came into effect on 15 September 2016. After the implementation of the Horticultural Product Import Recommendation policy, shallot price fluctuations increased at both producer and consumer levels. This price instability is influenced by uncertain monthly production, the perishable nature of shallots, and the continuous increase in population, which causes supply limitations in meeting national needs (Tharmizi hakim et al., 2024).

Shallots are perishable, and their price fluctuations also contribute to inflation. This commodity has become an important concern for the government because it has a significant role in inflation formation (Badan Pusat Statistik Provinsi Jawa Timur, 2020). In addition, shallot price fluctuations are often used by traders to manipulate price information at the producer level, resulting in price transmission from consumer markets to producer markets that tends to be asymmetric. This condition shows that price-information distribution has not functioned well and that markets have not been optimally integrated (Febryna et al., 2019).

Demand for shallots tends to change from year to year. The seasonal nature of production causes shallot prices in the market to fluctuate. These price changes are influenced by several factors, including production level, per capita income, and consumer demand (Sofa, 2019). Various studies show that shallots play a significant role in food inflation and household welfare, so this commodity often becomes a main focus in price-stabilization policy (Huda et al., 2023; Rahmawati et al., 2018).

Based on the last five years of data from the Ministry of Agriculture (Pertanian, 2020), during the period 2015 to 2019 shallot productivity in various Indonesian provinces increased in a fluctuating manner each year, with an increase of 3.55 percent in 2019 compared with the previous year. This shows that shallot production has not been stable and therefore has the potential to affect market price stability. This unstable production condition not only affects the national level but is also reflected in price dynamics at the regional level, including in Kupang City as one of the food-distribution centers in eastern Indonesia.

Kupang City, as the capital of East Nusa Tenggara Province, has a strategic role as a center of trade and food distribution. The existence of traditional markets such as Oeba Market and Inpres Naikoten Market serves as the center of community economic activity in meeting daily needs. However, shallot prices in these markets often experience considerable fluctuations and variations. These price differences are influenced by various factors, such as supply sources, distribution costs, and demand and supply conditions in each market.

Theoretically, market integration describes efficient price linkages across regions, where price changes in one market can be transmitted to other markets in certain proportions (Ravallion, 1986; Sekhar, 2012). Distribution efficiency is achieved when price differences solely reflect transportation and transaction costs (Dresdner, 2021).

Shallot prices in Indonesia are known to fluctuate highly, both over time and across regions, reflecting an imbalance between supply and demand and being influenced by various logistical and structural factors in the national food market. Empirical research findings show that price volatility for horticultural commodities such as shallots occurs not only temporally but also differs significantly across regions, especially between production centers and areas less integrated with market infrastructure, thereby creating price disparities across provinces (Bhinadi, 2023).

Price is an important factor in determining income obtained from a business. A business actor will earn greater profit if able to control market prices. Price changes also play a role in adjusting supply to consumer needs. In agricultural commodities, price functions as an instrument for allocating and distributing resources in the production process. Shallot price is one of the important indicators affecting public welfare. The Kupang City Regional Market Company (2024) recorded that the national average shallot price ranged from Rp 25,000 to Rp 40,000 per kilogram. In addition, shallot prices in several traditional markets in Kupang City fluctuated quite significantly during the 2023–2024 period. In Oeba Market, the highest price reached Rp 40,000/kg and the lowest was Rp 15,000/kg. Meanwhile, in Inpres Naikoten Market, prices ranged from Rp 15,000/kg to Rp 45,000/kg.

These price fluctuations and variations across markets indicate that market integration has not operated optimally. Imperfections in price transmission indicate barriers in the flow of market information, resulting in inefficient price differences. Therefore, a deeper analysis is needed regarding the level of price fluctuation and

shallot market integration in Kupang City. Thus, this study aims to analyze the level of shallot price fluctuation across markets and determine whether the two markets were integrated in the short and long term during the 2020–2024 period.

RESEARCH METHODS

This study was conducted in several traditional markets in Kupang City, East Nusa Tenggara Province. The research period was from August to January 2026. This study used secondary data covering monthly shallot commodity prices from the official website of the East Nusa Tenggara Provincial Trade Office and the Central Statistics Agency for the 2020–2024 period.

To answer the first objective, namely determining the level of shallot price fluctuation, the coefficient of variation was used. The coefficient of variation is obtained from the standard deviation of a variable divided by its mean. Mathematically, it is formulated as follows:

$$\text{Coefficient of Variation (CV)} = (\text{standard deviation} / \text{mean}) \times 100\%$$

A high CV value indicates a high level of price fluctuation and price instability. According to the Ministry of Trade, prices are considered stable when the CV is in the range of 5%–9%. A CV value above 9% indicates that prices fluctuate highly (Nendissa et al., 2018).

For the second objective, the analytical steps using Vector Autoregression (VAR) were as follows.

Stationarity Test

The stationarity test is a crucial initial stage in time-series data analysis to ensure that the data do not contain a unit root. According to Widarjono (2007), data are considered stationary if they do not have a unit root, with a constant mean and variance over time. Stationarity testing is important because if the variables used are not stationary, the regression results may be doubtful or called spurious regression. The most commonly used test is the Augmented Dickey-Fuller (ADF) Test.

Optimal Lag Determination

The optimal lag length is needed to observe the influence of each variable on other variables in the VAR model. The lag value of a variable can affect other variables because time is required for one variable to respond to movements in another variable. Optimal lag length can be determined using several criteria, namely Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC), Hannan-Quinn Criteria (HQ), Likelihood Ratio (LR), and Final Prediction Error (FPE). This study used the Akaike Information Criterion (AIC). The decision to select the optimal lag length was based on the smallest or minimum value of these information criteria, particularly by prioritizing the minimum AIC value. The model with the lowest information criterion value was considered the most efficient model.

Cointegration Test

The cointegration test is conducted when the price variables studied are not integrated at level or $I(0)$. Cointegration is a linear combination of non-stationary variables that have the same order of integration and produce stationary residuals. If two or more variables are cointegrated, it means that there is a long-term equilibrium relationship among those variables. The most commonly used test is the Johansen Cointegration Test.

VAR/VECM Model Estimation

The VAR model is a simultaneous-equation model with several endogenous variables at the same time, where each endogenous variable is explained by its own lagged values and the lags of all other endogenous variables in the model. VAR is simple because researchers do not need to distinguish which variables are endogenous and which are exogenous. VECM is a restricted form of VAR used when variables in the system have a cointegration relationship, so it can capture short-term dynamics as well as the correction mechanism toward long-term equilibrium.

VAR Stability Test

According to the results of the study on Causality of Interest Rates, Exchange Rates, and Inflation (2025), the VAR model stability test is conducted based on inverse roots plots, where the model is declared stable if all characteristic polynomial root points are inside the unit circle. The stability test must be conducted before IRF and Variance Decomposition analysis so that the interpretation results can be trusted.

Granger Causality Test

The causality test in VAR modeling aims to examine the influence among variables in both the long and short term. If event x occurs before y, then there is a possibility that x influences y, but not the reverse; this is the basic idea in applying the causality test. In the context of market integration, this test shows which market acts as the price leader and which market acts as the price follower.

Impulse Response Function (IRF)

The dynamic analysis shown by the Impulse Response Function (IRF) provides an overview of how a variable responds to shocks from other variables. IRF strengthens the causality analysis results by showing the direction and duration of influence transmission among variables. In the context of shallot market integration, IRF shows how quickly and how long prices in one market respond to price changes in another market. Variance Decomposition (VD) was also used to examine the contribution of shocks from each market to price variation in the other market.

RESULTS AND DISCUSSION

Description of Shallot Prices in Oeba Market and Inpres Naikoten Market

During the period January 2020 to December 2024, shallot prices in Oeba Market and Inpres Naikoten Market showed that the average shallot price in Inpres Naikoten Market was higher than in Oeba Market. The coefficient of variation of shallot prices in Inpres Naikoten Market was also higher than in Oeba Market, as shown in Table 1.

Table 1. Statistical Description of Shallot Prices in Oeba Market and Inpres Naikoten Market, 2020–2024

Statistical Description	Oeba Market	Inpres Naikoten Market I
Mean (Rp/kg)	25,187.5	25,458.3
Standard deviation	7,174.5	7,443.2
CV (%)	28	29

Source: Secondary data (processed), 2026.

The Ministry of Trade (2010) explained that prices in a province are considered stable if the coefficient of variation (CV) of prices is in the range of 5–9 percent, and if it is greater than 9 percent, prices are considered unstable or highly fluctuating. Table 1 shows that the price coefficient of variation in Oeba Market and Inpres Naikoten Market was greater than 9 percent, so shallot price fluctuations in both markets were highly fluctuating.

Stationarity Test of Shallot Price Data

The test results for price data in Oeba Market showed a t-statistic value of -3.410123. This value was smaller or more negative than the MacKinnon critical value at the 5% significance level of -2.911730. This is supported by a probability value of 0.0145, which is smaller than the significance level of 0.05. This means that shallot price data in Oeba Market were stationary at level or integrated at order zero. In Inpres Naikoten Market, the price data also showed stationarity. The t-statistic value obtained was -3.931041, whose absolute value was much larger or more negative than the critical value at the 1% level (-3.546099) and 5% level (-2.911730). The resulting probability value was highly significant, namely 0.0033 (<0.05). This result confirms that price data in Inpres Naikoten Market also did not contain a unit root and were declared stationary at level. The stationarity test results are shown in Table 2.

Table 2. Stationarity Test Results of Shallot Prices in Oeba Market and Inpres Naikoten Market

Variable	Test Equation	t-statistic	Test Critical Values	MacKinnon Critical Values	Prob.
Oeba Market	Level	-3.410123	1% / 5% / 10%	-3.546099 / -2.911730 / -2.593551	0.0145
Inpres Naikoten Market	Level	-3.931041	1% / 5% / 10%	-3.546099 / -2.911730 / -2.593551	0.0033

Source: Processed secondary data, 2026.

Optimal Lag Determination

The optimal lag test using the AIC criterion, with optimal lag determination based on the smallest value of the information criterion, particularly the Akaike Information Criterion (AIC), showed that lag 1 with a value of 11.91374* was the optimal lag. Therefore, the VAR estimation model used in this study was set using lag length 1. This means that current shallot prices are significantly influenced by prices one month earlier. The optimal lag test results are presented in Table 3.

Table 3. Optimal Lag Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-344.2830	NA	1008.645	12.59211	12.66510	12.62034
1	-321.6278	42.83903*	511.9357*	11.91374*	12.13272*	11.99842*
2	-320.3373	2.346245	565.3916	12.01227	12.37724	12.15340
3	-317.7041	4.596243	595.2534	12.06197	12.57292	12.25956
4	-317.3289	0.627494	681.2727	12.19378	12.85072	12.44782
5	-315.0508	3.644959	728.9241	12.25639	13.05933	12.56689

Source: Secondary data (processed), 2026.

Vector Autoregression (VAR) Model Estimation

The estimation results show that the coefficient of the effect of Oeba Market price (Lag 1) on Inpres Naikoten Market was 0.694935 and significant (t-statistic $3.99 > 1.96$). This means that every increase in shallot price of Rp 1,000/kg in Oeba Market in the previous month would be responded to by an increase of Rp 694/kg in Inpres Naikoten Market in the current month. This proves the existence of fairly strong but imperfect price transmission (coefficient value < 1). The VAR estimation test results are presented in Table 4.

Table 4. Vector Autoregression (VAR) Model Estimation Test Results

	Oeba Market	Inpres Naikoten Market
Oeba Market (-1)	0.924800 (0.16824) [5.49683]	0.694935 (0.17407) [3.99218]
Inpres Naikoten Market (-1)	-0.313419 (0.16255) [-1.92817]	0.022650 (0.16818) [0.13468]
C	9888.507 (2633.51) [3.75488]	7414.769 (2724.79) [2.72123]
R-squared	0.470279	0.473088

Source: Secondary data (processed), 2026.

An integrated market is characterized by the smooth flow of price information. Statistical significance in the VAR test shows that price information from Oeba Market was transmitted effectively to Inpres Naikoten Market. The position of Oeba Market as the price leader is supported by the fact that this market is the main logistics node with the largest transaction volume. The phenomenon of price variation and transmission that does not reach 100% (coefficient value < 1) shows that market imperfection occurs due to information costs and distribution barriers between market locations, causing prices not to be completely uniform.

VAR Stability Test

The VAR stability test results are presented in Figure 1.

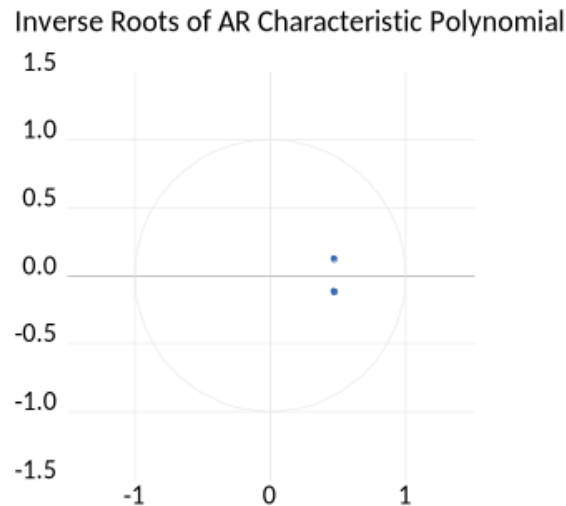


Figure 1. VAR Stability Test

Based on the stability test results displayed in the unit-circle graph, all inverse roots points represented by blue dots were inside the unit circle. None of the points were outside or exactly on the unit-circle line. Therefore, it can be concluded that the VAR model estimated in this study met the stability requirement. This means that the VAR model used was stable and non-explosive, so the results of the Impulse Response Function (IRF) and Variance Decomposition (VD) analyses generated from this model can be declared valid and suitable for further interpretation.

Granger Causality Test

Table 5. Granger Causality Test Results

Null Hypothesis	Obs	F-Stat	Prob.
Inpres Naikoten Market does not Granger cause Oeba Market	59	3.71784	0.0589
Oeba Market does not Granger cause Inpres Naikoten Market	59	15.9375	0.0002

Source: Secondary data (processed), 2026.

A unidirectional causality relationship can be observed. The effect of Inpres Naikoten Market on Oeba Market produced a probability value of $0.0589 > 0.05$. Thus, statistically, the decision was to accept the null hypothesis (H_0). This means that past price fluctuations in Inpres Naikoten Market did not have a statistically significant effect in causing current price changes in Oeba Market. Meanwhile, the effect of Oeba Market on Inpres Naikoten Market showed a probability value of $0.0002 < 0.05$. This probability value was far smaller than the significance level. Therefore, the null hypothesis (H_0) was rejected. This result significantly proves that past price changes in Oeba Market caused current price formation in Inpres Naikoten Market.

Impulse Response Function (IRF) Analysis

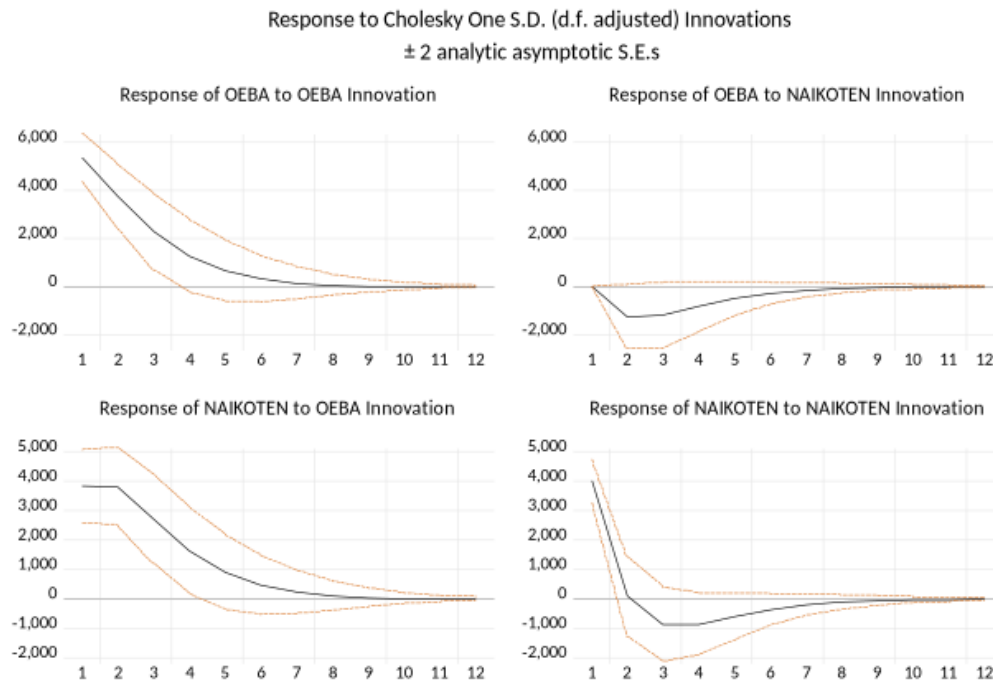


Figure 2. Impulse Response Function (IRF) Analysis Results

The Impulse Response Function (IRF) analysis results in this study show that there was shallot price transmission between Oeba Market and Inpres Naikoten Market, where each price shock occurring in one market was responded to by the other market in the short term and then returned toward equilibrium in the long term. The IRF pattern showing convergence to zero in all panels indicates that the two markets are dynamically integrated, meaning that shallot prices in both markets move together in the long term. This is consistent with the Law of One Price principle, which states that under integrated market conditions, the price of the same commodity in two different locations tends to move together and any price differences that occur are only temporary due to transaction and information costs. Furthermore, the IRF results also reveal that Oeba Market tends to play a more dominant role in price transmission than Inpres Naikoten Market, indicating asymmetry in the shallot market integration process in Kupang City.

Variance Decomposition (VD) Analysis

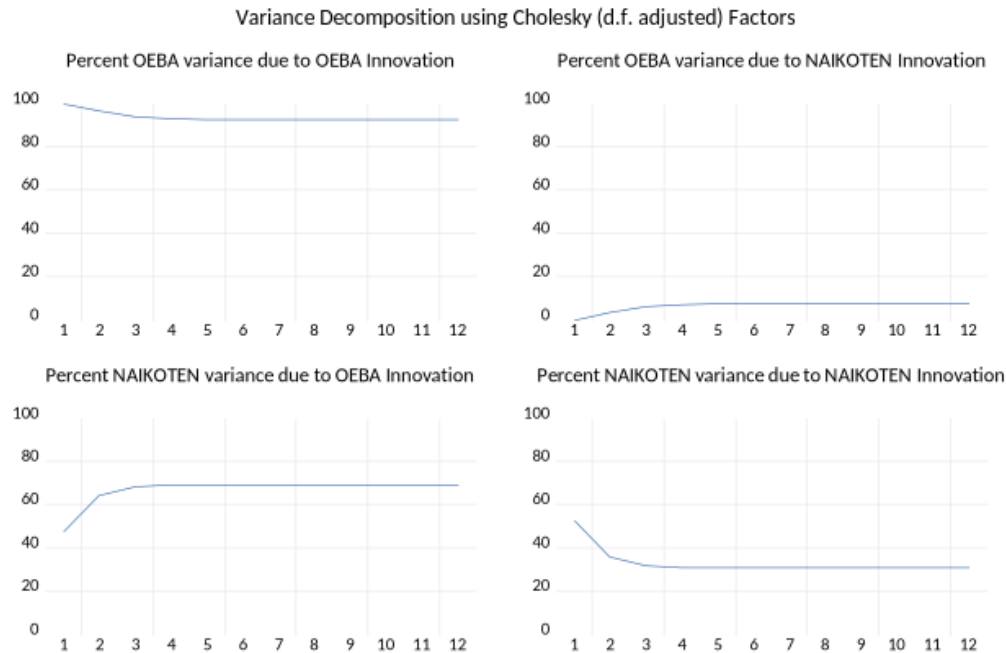


Figure 3. Variance Decomposition (VD) Analysis Results

The Variance Decomposition analysis results provide strong confirmation of the previous IRF findings. Oeba Market was proven to be more dominant in explaining shallot price variation in Inpres Naikoten Market than the reverse, with a contribution that continued to increase throughout the observation period. Conversely, the contribution of Naikoten Market to Oeba Market price variation remained small and insignificant. The combined results of the VAR stability test, IRF, and VD jointly show that: first, the estimated VAR model met the stability requirement so all analysis results can be justified; second, the two markets were dynamically integrated in the long term; third, Oeba Market acted as the price leader and Inpres Naikoten Market as the price follower; and fourth, shallot price information transmission in Kupang City was asymmetric, flowing more dominantly from Oeba Market to Inpres Naikoten Market. This finding has important policy implications, namely that efforts to stabilize shallot prices focused on Oeba Market will have broader and more effective impacts on price formation in Inpres Naikoten Market and on the overall shallot price system in Kupang City.

CLOSING

Conclusion

Based on the research results, it can be concluded that the level of shallot price fluctuation between Oeba Market and Inpres Naikoten Market in Kupang City was high and unstable. This is evidenced by the coefficient of variation (CV) value in Inpres Naikoten Market of 29% and in Oeba Market of 28%. Shallot price market integration between Oeba Market and Inpres Naikoten Market in Kupang City during the 2020–2024 period was integrated both in the short and long term, but the relationship was asymmetric or unidirectional from Oeba Market to Inpres Naikoten Market.

Recommendations

The implications of this study indicate that the local government needs to build or facilitate storage warehouses around Oeba Market. Retail traders should also use communication technology, such as digital groups, to monitor prices in Oeba Market in real time, so that price adjustments can be made quickly without a long-time lag.

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