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ANALYSIS OF MARKET INTEGRATION AND PRICE TRANSMISSION OF GARLIC IN WEST NUSA TENGGARA PROVINCE

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***Abstract*: This study aims to: (1) analyze the market integration of garlic commodities in West Nusa Tenggara Province; and (2) analyze the price transmission of garlic between surplus and deficit regions in the province. The research employed a descriptive method with a quantitative approach. The research areas were selected through purposive sampling based on specific objectives. The unit of analysis in this study is garlic marketing activities. The type of data used is secondary time-series price data. Data were collected from relevant institutions in the form of monthly time-series data on producer and consumer-level garlic prices in West Nusa Tenggara Province from 2021 to 2023.The results show that: (1) Spatial market integration of garlic exists in several regency/city, particularly between East Lombok Regency and North Lombok Regency, Bima Regency and Bima City, as well as Sumbawa Regency and Bima Regency. The strongest integration is observed between Sumbawa Regency and Bima Regency ($r = 0.669$; $R^2 = 0.447$), while moderate integration occurs between Bima Regency and Bima City ($r = 0.524$; $R^2 = 0.274$). (2) Vertical market integration between the garlic market in West Nusa Tenggara Province and East Lombok Regency is not integrated in the short term, as indicated by the IMC value of 223 (>1). However, long-term integration is strong, with the coefficient for current and previous garlic prices (d2) reaching 0.947 (>0.05). Similarly, vertical integration with Bima Regency is weak in the short term (IMC = 33 > 1), but shows strong long-term integration (d2 = 0.948 > 0.05). These findings indicate that overall market efficiency has not yet been achieved, especially in the short term. (3) Price transmission elasticity is elastic and statistically significant in several cases: between East Lombok and North Lombok (ET = 4.045; sig. = 0.012), North Lombok and East Lombok (ET = 1.437; sig. = 0.012), Bima Regency and Bima City (ET = 1.310; sig. = 0.001), Bima City and Bima Regency (ET = 2.776; sig. = 0.001), as well as between Bima and Sumbawa Regencies (ET = 1.149; sig. = 0.000) and vice versa (ET = 1.944; sig. = 0.000). These relationships demonstrate strong market linkages, where price changes in one market significantly affect others. On the other hand, some relationships are categorized as inelastic, such as from East Lombok to the provincial level (ET = 0.629; sig. = 0.226) and from Bima Regency to the provincial level (ET = 0.805; sig. = 0.000). Elasticity values below 1 in these cases indicate that price changes at the producer level are not fully transmitted to the consumer level.**

***Keywords:* Garlic, Market Integration, Price Transmission.**

I. INTRODUCTION

Agriculture is a strategic sector in improving Indonesia's economy. Although its overall contribution to GDP is relatively small, agriculture plays a crucial role in determining the nutritional well-being of the population (Sutrisna & Dewi, 2016). It remains a key driver of economic growth in Indonesia, which is an agrarian country with significant potential for agricultural development, including horticultural products. Horticulture is one of the most important commodity groups and serves as a priority sub-sector in national agricultural development. According to the Directorate General of Horticulture, Ministry of Agriculture (2020), the development of national horticulture is part of a comprehensive effort to enhance competitiveness and strengthen the role of agriculture in the national economy.

One of the key horticultural commodities in Indonesia that has received significant attention in efforts to increase total production is garlic. The development of garlic cultivation areas is being carried out sustainably to revitalize national garlic production centers, enabling them to consistently supply garlic for domestic consumption. The domestic market continues to show strong preference for locally produced garlic due to its superior quality. However, imports still play a major role in meeting national demand, highlighting the need for breakthrough policies to reduce this dependency. Garlic development policies have succeeded in increasing national production and still have room for further improvement, particularly through better seed system management and the optimization of available land resources (Directorate General of Horticulture, Ministry of Agriculture, 2020).

The largest garlic production centers in West Nusa Tenggara (NTB) are East Lombok Regency, followed by Bima Regency. The highest total production is concentrated in East Lombok, particularly in the Sembalun District. This area is recognized as one of the major garlic-producing regions in Indonesia, covering an area of 217.08 km². The production advantage in Sembalun is supported by favorable agro-climatic conditions that meet the growth requirements of garlic: an altitude of 700–1,100 meters above sea level, temperatures ranging from 15°C to 25°C, annual rainfall of 1,200–2,400 mm, and fertile, loose soil (Novrianty, 2020; Titisari et al., 2019). In contrast, other regions in NTB, such as Mataram City, West Lombok, and several areas in Sumbawa Island, do not have significant garlic production. This disparity results in a distribution pattern that depends on the movement of garlic from surplus areas (such as East Lombok and Bima Regency) to deficit regions and creates opportunities for imported garlic to enter the local markets.

Although West Nusa Tenggara (NTB) has garlic-producing areas, in reality, the majority of garlic circulating in traditional and modern markets across the province is still dominated by imported garlic. This condition indicates that NTB remains highly dependent on the distribution and supply of imported garlic to meet consumer demand. This is supported by field observations and data from the Department of Trade, which show that nearly all traditional markets and modern retail outlets in NTB sell imported garlic—most commonly the Bonggol variety from China—while the distribution of locally produced garlic remains limited in both quantity and reach. Such dependency not only affects regional food security but also influences price structures and market stability at the regional level.

According to Asmarantaka (2012), when a market is integrated with another, the marketing activities within that market are considered efficient in terms of price efficiency. Conversely, market disintegration leads to inefficiencies in marketing. Market integration reflects the relationship between prices in two different markets, considering both market levels and the temporal dimension of their interactions. These interactions involve a reference market that influences, and a local market that is influenced, indicating interdependence in the garlic marketing function. This connection is anchored to the central reference market, which acts as the price leader and influences garlic prices in both the short and long term. Therefore, it is crucial to analyze market integration in the garlic marketing system, considering both short- and long-term dynamics, as well as the occurrence of price transmission between surplus and deficit regions. In this context, analyzing garlic market integration and price transmission in West Nusa Tenggara Province becomes essential to support efficiency and market stability for this strategic commodity.

This study aims to: 1) Analyze the market integration of garlic in West Nusa Tenggara Province. 2) Analyze the price transmission of garlic between surplus and deficit areas within the province.

II. METHODS

This study employed a descriptive method with a quantitative approach. The aim of this descriptive research is to obtain a comprehensive overview of both verbal and numerical data related to garlic in West Nusa Tenggara, analyzed quantitatively. The data used in this study are secondary time-series data, specifically monthly garlic price data at the producer and consumer levels. These secondary data were obtained from literature sources and relevant government institutions, such as the West Nusa Tenggara Provincial Trade Office, the Provincial Office of Agriculture and Plantation, the Provincial Food Security Agency, and the Central Statistics Agency (BPS). The unit of analysis in this research is the garlic marketing system in West Nusa Tenggara Province. The study was conducted in West Nusa Tenggara Province, specifically in East Lombok and Bima Regencies (as surplus areas), and in North Lombok, West Lombok, Central Lombok, Bima City, Dompu, Sumbawa, and West Sumbawa Regencies (as deficit areas). The research locations were determined using purposive sampling, based on specific objectives. East Lombok and Bima Regencies were selected based on data indicating that these areas are the primary garlic-producing regions (surplus areas) in the province.

I. Spatial Market Integration Analysis

The degree of market integration can be determined by the value of the correlation coefficient; the higher the coefficient, the stronger the price relationship between the two markets.

$HBP_A = b_0 + b_1 HBP_B$ ..... (1)

Explanation:

HBP_A = The price of garlic at the surplus market (Market A).

HBP_B = The price of garlic at the deficit market (Market B).

b_0 = Intercept (constant term)

b_1 = Regression coefficient

II. Vertical Market Integration Analysis

Market integration can be measured using regression analysis, based on the following equation.

$HBPP_{it} = a_0 + a_1 HBP_{jt} + e_t$ ..... (2)

$HBPP_{it}$ = Garlic price at the *i*-th producer level at time *t*

HBP_{jt} = Garlic price at the *j*-th consumer level at time *t*

a_0 = Intercept (constant term)

a_1 = Parameter (regression coefficient)

e_t = Error term

To measure short-term and long-term market integration, the Timmer's Index of Market Connection (IMC) method is employed. This method assumes that the market structure consists of one primary market and several secondary markets. The primary market governs price formation, while the secondary markets respond to conditions in the primary market (Kustiari et al., 2018).

To calculate the Timmer's Index of Market Connection—commonly referred to as the Index of Market Connection (IMC) the following equation is used:

$H_{BPPt} = d_0 + (1 + d_1) H_{BPPt-1} + d_2 (H_{BPt} - H_{BPt-1}) + (d_3 - d_1) H_{BPt-1}$ ..... (3)

From Equation (2) above, it can be clearly seen that the coefficients **$(1 + d_1)$** and **$(d_3 - d_1)$** respectively reflect the contribution of local market price movements and central market prices to price formation at the farmer level in the local market. This information can then be used to calculate the Index of Market Connection (IMC), which represents the ratio between the local market coefficient and the central market coefficient, using the following equation:

$IMC = \frac{1+d_1}{d_3-d_1}$ ..... (4)

Description:

IMC = Index of Market Connection

H_{BPPt} = Current garlic price at the farmer level (Rp/kg)

$H_{BPP(t-1}$ = Previous garlic price at the farmer level (Rp/kg)

H_{BPt} = Current garlic price at the consumer level (Rp/kg)

$H_{BP(t-1)}$ = Previous garlic price at the consumer level (Rp/kg)

d_1 = Regression coefficient of H_{BPPt-1}

d_2 = Difference between current and previous garlic prices

d_3 = Regression coefficient of H_{BPPt-1}

Table 1. Market Integration Criteria

Description	Short Term	Long Term
Strong Integration	IMC approaches 0 IMC < 1	d_2 approaches 1 (>0,5)
Weak Integration	IMC > 1	d_2 approaches 0 (<0,5)
Not Integrated	High INC	d_2 is very close 0

Source: Kustiari et al., 2018 (as cited in Unggul Priyadi, 2023).

III. Price Transmission Analysis

Price transmission is a crucial mechanism in market analysis as it reflects the interrelationship of prices among actors within the distribution system. Price transmission is generally categorized into two forms: spatial and vertical transmission. Spatial price transmission occurs when price changes in one location are transmitted to another location at the same level of the market. In contrast, vertical price transmission refers to the price response at one level of the marketing chain to changes in price at another level, whether from upstream to downstream or vice versa. This process reflects the effectiveness of price pass-through from producers to wholesalers and consumers, or the other way around (Purwasih, 2016). Mathematically, the price transmission can be expressed by the following formula:

Et = $\frac{\partial Pr/Pr}{\partial Pf/Pf}$ or mathematically:

Et= $\frac{\partial Pr}{\partial Pf} . \frac{Pf}{Pr}$……..(1)

Price exhibits a linear relationship, in which the producer price (Pf) is a function of the retail price (Pr). The mathematical formulation is as follows:

Pf = a + bPr……(2)

From Equation (2), it can be derived that:

$\frac{\partial Pr}{\partial Pf} = \frac{1}{b}$……...…...(3)

Thus, the elasticity of price transmission can be expressed as:

Et =$\frac{1}{b}$ x $\frac{Pf}{Pr}$

Description:

∂Pf = Price of garlic in market A (i-th market) at time t

∂Pr = Price of garlic in market B (j-th market) at time t

Pf = Average garlic price in market A

Pr = Average garlic price in market B

b = Regression coefficient

III. RESULTS AND DISCUSSION

The following is a description of the results of the market integration analysis for garlic across each regency in West Nusa Tenggara Province.

I. Spatial Market Integration Analysis

Table 2. Results of Regression and Correlation Tests of Garlic Prices Across Regencies in West Nusa Tenggara Province.

East Lombok Regency-Nort Lombok Regency	HBP East Lombok	= 17.727 + 0,264 HBP Nort Lombok
	r (Correlation)	= 0,415
	R^2 (D Determination)	= 0,172
East Lombok Regency-West Lombok Regency	HBP East Lombok	= 22.447 + 0,091 HBP West Lombok
	r (Correlation)	= 0,165
	R^2 (Determination)	= 0,027
East Lombok Regency-Central Lombok	HBP East Lombok	= 23.441 + 0,047 HBP Central Lombok
	r (Correlation)	= 0,091
	R^2 (Determination)	= 0,008

Nort Lombok Regency -East Lombok Regency	HBP Nort Lombok = 10.404 + 0,651 HBP East Lombok r (Correlation) = 0,415 R^2 (Determination) = 0,172
West Lombok Regency - East Lombok Regency	HBP West Lombok = 17.670 + 0,302 HBP East Lombok r (Correlation) = 0,165 R^2 (Determination) = 0,207
East Lombok Regency - East Lombok Regency	HBP East Lombok = 22.854 + 0,117 East Lombok r (Correlation) = 0,091 R^2 (Determination) = 0,008

Bima Regency-Sumbawa Regency	HBP Bima Regency = 0,954 + 0,916 HBP Sumbawa Regency r (Correlation) = 0,669 R^2 (Determination) = 0,447
Bima Regency-West Sumbawa Regency	HBP Bima Regency = 15.731 + 0,377 HBP West Sumbawa Regency r (Correlation) = 0,285 R^2 (Determination) = 0,081
Bima Regency-Bima City	HBP Bima Regency = 6.824 + 0,756 HBP Bima City r (Correlation) = 0,524 R^2 (Determination) = 0,274
Bima Regency-Dompu Regency	HBP Bima Regency = 21.157 + 0,210 HBP Dompu Regency r (Correlation) = 0,182 R^2 (Determination) = 0,033

Sumbawa Regency-Bima Regency	HBP Sumbawa Regency = 15.433 + 0,488 HBP Bima Regency r (Correlation) = 0,669 R^2 (Determination) = 0,447
West Sumbawa Regency-Bima Regency	HBP West Sumbawa Regency = 24.754 + 0,216 HBP Bima Regency r (Correlation) = 0,285 R^2 (Determination) = 0,081
Bima city-Bima Regency	HBP Bima City = 17. 170 + 0,363 HBP Bima Regency r (Correlation) = 0,524 R^2 (Determination) = 0,274
Dompu Regency-Bima Regency	HBP Dompu Regency = 24.937 + 0,157 HBP Bima Regency r (Correlation) = 0,182 R^2 (Determination) = 0,033

Based on Table 2, the garlic market integration between East Lombok and North Lombok (KLU) shows a weak relationship, where a price increase of Rp1,000/kg in KLU leads to an increase of only Rp264/kg in East Lombok. The correlation coefficient is 41.5%, with a determination value of 17.2%. The integration with West Lombok is even weaker, with a price transmission of Rp91/kg, a correlation of 16.5%, and an R^2 value of only 2.7%. Meanwhile, the relationship with Central Lombok is the weakest, where a Rp1,000/kg increase in Central Lombok results in only a Rp47/kg increase in East Lombok, with a correlation of 9.1% and an R^2 of 0.8%. These three relationships indicate a low level of market integration between East Lombok and the other regencies on Lombok Island, reflecting limited price transmission and weak market connectivity across these regions.

The market integration between West Lombok and East Lombok indicates a weak relationship, where a price increase of Rp1,000/kg in East Lombok results in a price increase of only Rp302/kg in West Lombok. The correlation coefficient is 0.165 (16.5%), which reflects a weak correlation as it is below 60%, and the coefficient of determination (R^2) is 0.207 (20.7%), indicating a very low level of explanatory power between the two markets. Similarly, the garlic market integration

between Central Lombok and East Lombok also shows a very weak connection. Every Rp1,000/kg increase in East Lombok leads to only a Rp117/kg increase in Central Lombok. The correlation coefficient is 0.091 (9.1%), indicating a very weak correlation, while the R^2 value is only 0.008 (0.8%), which means that the influence of East Lombok's price on Central Lombok's price is extremely limited. Furthermore, the market integration between North Lombok and East Lombok also demonstrates a weak relationship, where a Rp1,000/kg increase in East Lombok corresponds to a price increase of Rp172/kg in North Lombok. The correlation coefficient is 0.415 (41.5%), and the coefficient of determination is 0.172 (17.2%), both of which are below the 60% threshold, indicating low price transmission and weak market integration between these two regions.

Bima Regency exhibits a strong market integration with Sumbawa Regency, as indicated by a correlation coefficient of 0.669 (66.9%) and a coefficient of determination (R^2) of 0.447 (44.7%). This demonstrates a high degree of price interdependence between the two regions. In contrast, Bima's integration with other surrounding areas—namely West Sumbawa (KSB), Bima City, and Dompu—is classified as weak, both in terms of correlation and determination. For instance, the integration between Bima and Dompu shows a correlation of only 0.182 (18.2%) and an R^2 of 0.033 (3.3%), indicating that price changes in Dompu have a minimal impact on garlic prices in Bima. Specifically, a Rp1,000/kg price increase in Dompu translates to only a Rp210/kg increase in Bima, reflecting very weak market integration. From Sumbawa's perspective, the integration with Bima remains similarly strong (r = 66.9%, R^2 = 44.7%), reaffirming the reciprocal nature of price transmission between the two regencies. Furthermore, the market integration between West Sumbawa and Bima City is moderate to strong, with a correlation of 0.602 (60.2%) and R^2 of 0.362 (36.2%). Meanwhile, the relationship between Sumbawa and Dompu is weak, showing a correlation of only 0.148 (14.8%) and a very low R^2 of 0.022 (2.2%). Although Bima, Bima City, and Dompu generally exhibit low inter-market correlation, the largest price transmission effect was found between Dompu and Bima, where a Rp1,000/kg price increase in Dompu results in a Rp511/kg increase in Bima. However, the overall correlation remains moderate at 0.585 (58.5%), which does not meet the threshold for strong integration.

Therefore, it can be concluded that spatial market integration of garlic has occurred between several regencies/cities in West Nusa Tenggara Province, specifically between East Lombok and North Lombok, Bima Regency and Bima City, and Sumbawa and Bima Regencies. Among these, the strongest spatial integration is observed between Sumbawa and Bima, with a correlation coefficient (r) of 0.669 and a coefficient of determination (R^2) of 0.447, indicating a stronger price relationship compared to other regional pairs. In addition, the highest price transmission effect is recorded in the relationship from Bima to Sumbawa, where a Rp1,000/kg increase in garlic prices in Sumbawa leads to a Rp916/kg increase in Bima. This reflects a high degree of price sensitivity between the two regions.

The low level of market integration reflects that price transmission between markets in West Nusa Tenggara (NTB) has not been functioning efficiently. Several factors contribute to this condition, including the high dependence of local markets on imported garlic, which follows its own distinct pricing structure; the limited interregional distribution infrastructure, particularly between Lombok and Sumbawa Islands; and the lack of integrated price information systems across markets. Moreover, asymmetries in market power and the dominance of certain traders in specific regions may also lead to price fragmentation. As a result, although there are indications of integration in several key markets, the overall garlic market in NTB remains suboptimally integrated. To enhance market efficiency and ensure more stable price transmission for this strategic commodity, it is necessary to strengthen the distribution network, improve access to market information, and enforce effective price monitoring and regulation across the provincez.

II. Vertical Market Integration Analysis

Table 3. Regression Analysis Results of Vertical Market Integration between Producer-Level Garlic Prices in East Lombok and Bima Regencies and Consumer-Level Garlic Prices at the Provincial Level (West Nusa Tenggara Province).

Variabel	Correlation (r)	Determination (R^2)	(Constant)	Regression Coefficient	Sig
HBP East Lombok (Rp/kg)	0,207	0,043	6,938	0,082	0,226
HBP Bima Regency (Rp/kg)	0,552	0,305	15,577	0,538	0,000

Source: Processed secondary data 2025.

As shown in Table 3, the regression analysis reveals varying levels of vertical market integration between producer and consumer prices across regions in West Nusa Tenggara (NTB). East Lombok Regency exhibits a low level of integration, with a correlation coefficient of 0.207 and a coefficient of determination (R^2) of only 4.3%. The regression coefficient is 0.082, and the significance value is 0.226 (> 0.05), indicating that the influence of producer prices from East Lombok on consumer-level prices is not statistically significant. This implies that the market relationship between producers and consumers in this area is not well integrated. In contrast, Bima Regency shows a stronger level of vertical integration, with a correlation coefficient of 0.552 (55.2%) and an R^2 of 30.5%. The regression coefficient is 0.538, and the significance level is 0.000 (< 0.05), indicating a statistically significant relationship. However, since the correlation remains below the 60% threshold, this integration is still categorized as moderate to weak. The primary factor contributing to the weak vertical integration of garlic prices in NTB is the region's heavy reliance on imported garlic, particularly from China. According to data from the Directorate General of Horticulture, Ministry of Agriculture (2023), more than 90% of national garlic demand is met through imports, a pattern that is also reflected in NTB. Moreover, the NTB Horticultural Development Action Plan highlights that local garlic production is extremely limited, confined to certain highland areas such as Sembalun (East Lombok Regency), Bima Regency, and surrounding regions. Even in these areas, production occurs only in specific seasons and with limited volume, making the market structure heavily import-dependent and further weakening producer–consumer price linkages.

Table 4. Results of Vertical Market Integration Analysis Using the Index of Market Connection (IMC) Between Producer-Level Garlic Prices in East Lombok (Lotim) and Consumer-Level Garlic Prices at the Provincial Level in West Nusa Tenggara (NTB).

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-.452	1.914		-.236	.815
	price of garlic received by producers in the previous time period. (Rp/Kg)	.226	.152	.089	1.487	.147
	difference between the current and previous consumer prices of garlic, expressed in Rupiah per kilogram (Rp/kg).	.947	.061	.920	15.406	.000
	retail price of garlic at the consumer level in the previous time period.	.001	.001	.062	1.052	.301

a. Dependent Variable: price of garlic received by producers in the previous time period. ((Rp/Kg)

b. Predictors: (Constant), difference between the current and previous consumer prices of garlic, expressed in Rupiah per kilogram (Rp/kg), retail price of garlic at the consumer level in the previous time period.

Source: Processed Secondary Data, 2025.

To analyze the market integration between garlic producers in East Lombok and consumer markets in West Nusa Tenggara Province, both in the short and long term, the Index of Market Connection (IMC) method was employed. Based on the regression results, the IMC equation is as follows:

$$HBPP_t = 0{,}226\ HBPP_{t-1} + 0{,}947\ (HBP_t - HBP_{t-1}) + 0{,}001\ HBP_{t-1}$$

Furthermore, to determine the degree of price integration between producer-level and consumer-level garlic prices, the Index of Market Connection (IMC) was used. The IMC is calculated as follows:

$$IMC = \frac{0{,}226}{0{,}001} = 226$$

The IMC value, which is substantially greater than 1, indicates that in the short term, the market is not efficiently integrated, as changes in consumer-level prices do not proportionally affect producer-level prices. This condition reflects an inefficient market structure, characterized by the dominance of intermediaries, lengthy distribution chains, limited access to price information for farmers, and the prevalence of imported garlic in NTB's consumer markets. The dominance of imports can be attributed to limited local production, lower prices of imported garlic, year-round availability, and consumer preferences

for imported garlic, which is perceived as cleaner and more uniform in appearance. However, the long-term coefficient (d_2) of 0.947, which approaches 1, indicates a strong market integration in the long run, where consumer price changes in NTB significantly influence producer prices in East Lombok. This suggests that, despite short-term barriers—such as weak bargaining power of farmers and intermediary dominance—price information flow and market adjustments become more effective over time. These findings are consistent with studies by Sutisna (2021) and Asmarantaka (2013), which emphasize the importance of improving price transparency and empowering farmers within the supply chain to promote greater efficiency and long-term market integration for garlic in West Nusa Tenggara.

Table 5. Results of Vertical Market Integration Analysis Using the Index of Market Connection (IMC) Between Producer-Level Garlic Prices in Bima and Consumer-Level Garlic Prices at the Provincial Level in West Nusa Tenggara (NTB).

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.944	1.693		.557	.581
	price of garlic received by producers in the previous time period. (Rp/Kg)	.033	.074	.032	.446	.659
	difference between the current and previous consumer prices of garlic, expressed in Rupiah per kilogram (Rp/kg).	.948	.073	.921	13.000	.000
	retail price of garlic at the consumer level in the previous time period.	.001	.001	.051	.829	.413

a. Dependent Variable: price of garlic received by producers in the previous time period. ((Rp/Kg)

b. Predictors: (Constant), difference between the current and previous consumer prices of garlic, expressed in Rupiah per kilogram (Rp/kg), retail price of garlic at the consumer level in the previous time period.

Source: Processed Secondary Data, 2025.

The following IMC equation is derived from the analysis of price integration between producer-level and consumer-level garlic prices:

$$HBPP_t = 0{,}033\ HBPP_{t-1} + 0{,}948\ (HBP_t - HBP_{t-1}) + 0{,}001\ HBP_{t-1}$$

Furthermore, to determine the degree of price integration between producer-level and consumer-level garlic prices, the Index of Market Connection (IMC) was employed:

$$IMC = \frac{0{,}033}{0{,}001} = 33$$

The analysis of the Index of Market Connection (IMC) indicates that the vertical market integration of garlic between Bima and West Nusa Tenggara Province (NTB) remains weak in the short term, as evidenced by an IMC value of 33, which is significantly greater than 1. This implies that consumer market prices are not yet fully transmitted to the producer level, likely due to price transmission delays or a determining effect, as described by Ratya (2013). Price information from consumer markets has not been effectively communicated to farmers, resulting in producer prices that do not reflect actual market conditions, and thereby short-term market efficiency has not yet been achieved. This situation is exacerbated by the dominance of imported garlic in NTB markets, which is typically cheaper and more consistently supplied, thereby undermining the competitiveness of local products. The prevalence of imports also weakens farmers' bargaining power, with price formation largely controlled by intermediary traders rather than through transparent market mechanisms. Nevertheless, the long-term coefficient (d_2) of 0.948 indicates that, over time, the market exhibits a fairly strong degree of integration, with consumer prices in NTB significantly influencing producer prices in Bima. Often, price determination is unilaterally set by middlemen based on base prices rather than through open market dynamics (Wahyuni, 2017; Djulin & Malian, 2017). The imperfect flow of price information throughout the distribution chain continues to hinder optimal vertical integration, as also noted by Yustiningsih (2016) and Asmarantaka (2013). Therefore, in order to achieve comprehensive market efficiency, there is a critical need to improve price transparency and strengthen farmers' roles in the price formation process.

III. Price Transmission

Price transmission analysis is an approach used to assess the extent to which price changes of a commodity in one market can influence the price of the same commodity in another connected market, either vertically (between producers and consumers) or spatially (between regions). An effective price transmission reflects a well-integrated market and an even distribution of price information. Conversely, imperfect price transmission indicates market inefficiencies, which are often driven by information asymmetry, oligopolistic market structures, and dependence on specific distribution channels (Kurniawati, Sayekti, & Kifli, 2024).

Table 6. Price Transmission Elasticity of Garlic in West Nusa Tenggara Province with Respect to Producer Prices in East Lombok Regency and Bima Regency.

No	Regency/city	Regression Equation	Elasticity	Remarks	Correlation	Significance.
1	West Nusa Tenggara-East Lombok Regency	21.385 + 0,525 HBP East Lombok Regency	0,629	Inelastic	0,207	0,226
2	East Lombok Regency - West Nusa Tenggara	6.938 + 0,082 HBP West Nusa Tenggara	16,368	Elastic	0,207	0,226
3	West Nusa Tenggara - Bima Regency	15.577 + 0,538 HBP Bima Regency	0,805	Inelastic	0,552	0,000
4	Bima Regency- West Nusa Tenggara	4.861 + 0,566 HBP West Nusa Tenggara	2,192	elastic	0,552	0,000

Source: Processed secondary data 2025.

Based on Table 6, the regression analysis indicates that the price transmission elasticity of garlic between producers in East Lombok and consumers in West Nusa Tenggara Province (NTB) is weak and statistically insignificant. The regression coefficient is 0.525 with a corresponding price transmission elasticity of 0.629, which is classified as inelastic. This means that a 1% increase in garlic prices at the producer level in East Lombok only results in a 0.629% increase at the consumer level. Moreover, the significance value of 0.226 (> 0.05) and a low correlation coefficient of 0.207 indicate that this relationship is not statistically significant. On the other hand, the reverse relationship—from consumer prices in NTB to producer prices in East Lombok—shows an extremely high elasticity value (16.368). However, this is also accompanied by similarly low correlation and significance levels, suggesting that this is not a reliable or stable economic relationship. These findings reflect the market structure of garlic in NTB, which is still heavily dominated by imported products, particularly from China. As a result, consumer prices are not fully influenced by local producer prices. Other contributing factors include the length of the distribution chain, weak bargaining power of farmers, and the lack of effective farmer institutions, all of which hinder effective price transmission from producers to consumers.

Based on Table 6, the analysis shows that the price transmission elasticity of garlic from producers in Bima to consumers in West Nusa Tenggara (NTB) is only 0.805, which is classified as inelastic. This indicates that a 1% increase in producer prices leads to only a 0.805% increase in consumer prices. Conversely, the transmission from consumers to producers is elastic, with an elasticity value of 2.192, meaning that a 1% increase in consumer market prices triggers a 2.192% increase in producer prices. The correlation coefficient of 55.2% and high significance level (Sig. = 0.000) support the statistical validity of this relationship. Nevertheless, the asymmetry in price transmission reflects persistent structural inefficiencies in the market mechanism, such as the dominance of intermediary traders, a non-competitive market structure, and the strong influence of imported garlic prices in NTB's consumer markets.

Table 7. Price Transmission Elasticity of Garlic Between Markets on Lombok Island, 2021–2023.

No	Regenci/City	Regression Equation	Elastisitacy	Remaks	Correlation	Significance.
1	East Lombok Regency-North Lombok Regency	17.727 + 0,264 HBP North Lombok Regency	4,045	Elastic	0,415	0,012
2	East Lombok Regency - West Lombok Regency	22.477 + 0,091 HBP West Lombok Regency	11,164	Elastic	0,165	0,335
3	East Lombok Regency-Central Lombok Regency	23.441 + 0,047 HBP Central Lombok Regency	23,425	Elastic	0,091	0,251

4	North Lombok Regency-East Lombok Regency	10.404 + 0,651 HBP East Lombok Regency	1,437	Elastic	0,415	0,012
5	West Lombok Regency-East Lombok Regency	17.670 + 0,302 HBP East Lombok Regency	3,254	Elastic	0,165	0,335
6	Central Lombok Regency-East Lombok Regency	22.854 + 0,117 HBP East Lombok Regency	7,752	Elastic	0,091	0,251

Source: Processed secondary data 2025.

Based on Table 7, the price transmission elasticity of garlic between regencies on Lombok Island shows that all inter-market relationships have elasticity values greater than 1, indicating that price changes in one region are more than proportionally responded to by another region. However, the low correlation coefficients and the lack of statistical significance in most of these relationships suggest that prices do not yet fully reflect effective price transmission. Among all observed market pairs, only the relationship between East Lombok and North Lombok demonstrates a statistically significant price linkage, with an elasticity value of 4.045. This implies that a 1% increase in garlic prices in North Lombok leads to a 4.045% increase in East Lombok. Conversely, the reverse relationship—from East Lombok to North Lombok—shows an elasticity value of 1.437, indicating that a 1% price increase in East Lombok results in a 1.437% increase in North Lombok. The correlation coefficient (r) of 0.415 (41.5%) reflects a moderate but statistically significant association between the two markets.

This market condition also reflects the fact that garlic price transmission on Lombok Island has not been operating efficiently, as evidenced by the instability of price movements between markets. This inefficiency is primarily caused by a suboptimal distribution structure, the dominance of intermediary traders, and the weakness of farmer institutions, which reduces farmers' bargaining power (Weldegebriel et al., 2016; Saptana & Ashari, 2007). In addition, limited access to price information and logistical infrastructure leads to information asymmetry, where prices are more influenced by market actors than by ideal market mechanisms (Etienne et al., 2016). The dominance of imported garlic in NTB further weakens the influence of local prices on the overall market price formation (BPS NTB, 2023).

Table 8. Price Transmission Elasticity of Garlic Between Markets on Sumbawa Island, 2021–2023.

No	Regency/City	Regression Equation	Elastisity	Remaks	Correlation	Significance.
1	Bima Regency-Bima City	6.824 + 0,756 HBP Bima City	1,310	Elastic	0,524	0,001
2	Bima Regency-Dompu Regency	16.129 + 0,378 HBP Dompu Regency	2,830	Elastisc	0,274	0,106
3	Bima Regency-Sumbawa Regency	0,954 + 0,916 HBP Sumbawa Regency	1,149	Elastic	0,669	0,000
4	Bima Regency-West Sumbawa Regency	15.731 + 0,377 HBP West SSumbawa Regency	2,976	Elastic	0,285	0,092
5	Bima City-Bima Regency	17.170 + 0,363 HBP Bima Regency	2,776	Elastic	0,524	0,001
6	Dompu Regency-Bima Regency	24.091 + 0,198 HBP Bima Regenci	4,717	Elastic	0,274	0,106
7	Sumbawa Regency-Bima Regency	15.433 + 0,488 HBP Bima Regency	1,944	Elastic	0,669	0,000
8	West Sumbawa Regency-Bima Regency	24.754 + 0,216 HBP Bima Regency	4,120	Elastic	0,285	0,092

Source: Processed secondary data 2025.

Based on Table 8, all inter-market garlic price relationships across districts and cities on Sumbawa Island show price transmission elasticity (PTE) values greater than 1, indicating that all markets are categorized as elastic. This suggests that a 1% increase in price in one market is responded to more than proportionally in other connected markets. For instance, the price transmission from Bima Regency to Bima City yields an elasticity of 1.310, meaning that a 1% increase in prices in Bima City leads to a 1.31% increase in Bima Regency. Conversely, the elasticity from Bima City to Bima Regency is even higher, at 2.776, implying that a 1% increase in Bima Regency prices results in a 2.776% increase in Bima City. This relationship is supported by a moderate correlation coefficient (r = 0.524 or 52.4%) and a high level of statistical significance (p = 0.001), indicating that garlic prices in these two regions move in the same direction and are strongly interconnected.

The price transmission elasticity between Bima and Sumbawa is 1.149, indicating that a 1% increase in garlic prices in Sumbawa results in a 1.149% increase in Bima. Conversely, the elasticity from Sumbawa to Bima is 1.944, meaning that a 1% increase in garlic prices in Bima causes prices in Sumbawa to rise by 1.944%. This relationship is supported by a high correlation coefficient ($r = 0.669$) and a very strong level of significance ($p = 0.000$). These results suggest that price changes in one region have a direct and significant impact on prices in the other, indicating a high degree of market integration between the two regions.

However, in other relationships such as Bima–Dompu (ET = 2.830) and Bima–Sumbawa Barat (KSB) (ET = 2.976), although the elasticity values are relatively high—indicating a strong price response—the correlation coefficients are low ($r = 0.274$ and 0.285, respectively) and statistically insignificant ($p = 0.106$ and 0.092). This implies that despite the apparent responsiveness of prices, the relationships are not stable or consistent over time. Such instability may be attributed to seasonal fluctuations, the influence of imported garlic prices, or irregular supply chains (Meyer & von Cramon-Taubadel, 2004). Additionally, the high elasticity values may reflect markups by intermediaries or elevated distribution costs, especially in regions where logistical infrastructure is underdeveloped (Etienne et al., 2016).

IV. CONCLUSION AND RECOMMENDATION

Conclusion

Based on the results of the study, the following conclusions can be drawn:

1. The garlic market in West Nusa Tenggara Province exhibits spatial integration among several regency/city, including between East Lombok Regency and North Lombok Regency, Bima Regency and Bima City, as well as Sumbawa Regency and Bima Regency. The strongest integration is observed between Sumbawa Regency and Bima Regency ($r = 0.669$; $R^2 = 0.447$). A moderate level of integration is found between Bima Regency and Bima City ($r = 0.524$; $R^2 = 0.274$).
2. Vertical market integration of garlic in West Nusa Tenggara Province, particularly with East Lombok, is considered non-integrated in the short term, indicated by a high IMC value of 223 (>1). However, in the long term, strong integration is evident as shown by the long-run coefficient (d_2) of 0.947 (>0.05). Similarly, the vertical integration between West Nusa Tenggara and Bima is weak in the short term (IMC = 33 > 1), yet displays strong long-run integration with a d_2 value of 0.948. These findings imply that market efficiency has not yet been fully achieved, especially in the short term.
3. Price transmission elasticity that is both elastic and statistically significant was observed in the following pairs: East Lombok–North Lombok (ET = 4.045; sig. = 0.012), North Lombok–East Lombok (ET = 1.437; sig. = 0.012), Bima–Bima City (ET = 1.310; sig. = 0.001), Bima City–Bima (ET = 2.776; sig. = 0.001), and Bima–Sumbawa (ET = 1.149; sig. = 0.000) and vice versa Sumbawa–Bima (ET = 1.944; sig. = 0.000). These relationships indicate strong market linkages, where price changes in one market significantly and more than proportionally affect others. Conversely, some relationships are inelastic, such as East Lombok–NTB (ET = 0.629; sig. = 0.226) and Bima–NTB (ET = 0.805; sig. = 0.000). An elasticity value of less than 1 in these cases indicates that price changes at the producer level have not been fully transmitted to the consumer level.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. The government needs to improve infrastructure development and communication facilities between markets across regencies in West Nusa Tenggara Province to facilitate smoother communication and information flow among markets, which will enhance both spatial and vertical market integration.
2. The government should encourage the enhancement of local production through the provision of high-quality seeds, technical assistance, and incentives for farmers—particularly in key production centers such as Sembalun (East Lombok Regency) and Bima Regency—so that local production can compete with imported products.

REFERENCES

[1] Asmarantaka, I. G. P. (2013). *Market integration and rice market efficiency in Bali Province*. Jurnal Ekonomi Pembangunan, 14(2), 101–112.

[2] Asmarantaka, R. W. (2012). *Agribusiness marketing (agrimarketing)*. Bogor, Indonesia: Department of Agribusiness.

[3] Astuti, E. D. (2020). *Study of cultivation techniques on the growth and yield of garlic (Allium sativum L.) in home gardens at different altitudes* [Undergraduate thesis, Universitas Gadjah Mada].

[4] Badan Pusat Statistik Provinsi NTB. (2023). *Nusa Tenggara Barat in figures*. West Nusa Tenggara Statistics Bureau.

[5] Dessy, V. S. K. (2021). *Market integration analysis of bird's eye chili (Capsicum frutescens L.) in East Java Province* [Undergraduate thesis, Universitas Brawijaya].

[6] Direktorat Jenderal Hortikultura, Kementerian Pertanian. (2020). *Strategic Plan of the Directorate General of Horticulture 2020–2024*.

[7] Djulin, A., & Malian, A. (2017). *Analysis of market integration and rice price transmission in Gorontalo Province*. Jurnal Agriekonomika, 6(1), 10–20.

[8] Djulin, A., & Malian, A. (2017). *Development strategy of horticultural commodity value chains in East Kalimantan*. Jurnal Agribisnis, 11(2), 153–162.

[9] Etienne, X. L., Irwin, S. H., & Garcia, P. (2016). Price transmission in agricultural markets: A meta-analysis. American Journal of Agricultural Economics, 98(3), 597–618.

[10] Fitriani, R. (2019). *Farm business analysis and marketing channels of garlic in Temanggung Regency* [Undergraduate thesis, Universitas Sebelas Maret].

[11] Kustiari, R., Sejati, W. K., & Yulmahera, R. (2018). *Market integration and price formation of red chili in Indonesia*. Jurnal Agro Ekonomi, 36(1), 39.

[12] Meyer, J., & von Cramon-Taubadel, S. (2004). Asymmetric price transmission: A survey. Journal of Agricultural Economics, 55(3), 581–611.

[13] Prativi, M. A. S., & Priyadi, U. (2023). *Market integration and price transmission elasticity of milkfish in Juwana Subdistrict, Pati Regency, Central Java*.

[14] Ratya, A. (2013). *Market integration: Evidence and implications in Indonesian agricultural markets*. Jurnal Ekonomi Pertanian dan Agribisnis, 1(1), 15–24.

[15] Saptana, & Ashari. (2007). *Market integration and price transmission of agricultural products in Indonesia*. Agricultural Socio-Economic and Policy Research Center, Ministry of Agriculture.

[16] Sutisna, A. D. (2021). *Analysis of market integration and price transmission of unhusked rice in Lampung Province*.

[17] Sutrisna, L. K., & Dewi, M. K. (2016). *The influence of production level, price, and consumption on shallot imports in Indonesia*. E-Jurnal Ekonomi.

[18] Wahyuni, S. (2017). *Price transmission analysis and market structure of corn commodity in Lampung Province* [Undergraduate thesis, Universitas Lampung].

[19] Wahyuni, S. (2017). *Price transmission of unhusked rice and rice in Indonesia*. Jurnal Agro Ekonomi, 35(1), 55–70.

[20] Weldegebriel, H. T., Surry, Y. R., & Liu, A. G. (2016). Spatial price transmission and market integration in developing countries: A meta-analysis. Food Policy, 62, 1–10.

[21] Yustiningsih, R. (2016). *Price transmission and market efficiency of agricultural commodities in Indonesia*. Jurnal Ekonomi dan Pembangunan, 16(1), 23–34.

[22] Yustiningsih, S. (2016). *Analysis of price transmission and marketing efficiency of rice in Central Java Province* [Thesis, Universitas Gadjah Mada].