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# Are the Markets Vertically Integrated?: Evidence on Shallot Marketing Channels in Gorontalo Province, Indonesia

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**ABSTRACT**

The vertical market integration of the shallot market system in Gorontalo Province is a method that can be used to estimate the price movements at each level of marketing (farmers, marketing agents, and consumers), thereby facilitating long-run and short-run equilibrium. Therefore, this study aims to analyze the vertical market integration formed between marketing channels for the shallot market in Gorontalo Province. The Engel-Granger cointegration method was used to analyze long-run equilibrium, while ECM (Error Correction Models) was utilized for short-run equilibrium estimation. The cointegration test results showed that markets at farmer and marketing agent levels, marketing agent and consumer levels, as well as farmer and consumer levels, were cointegrated. This indicated the presence of long-run equilibrium and vertical market integration. The ECM test results revealed that in the short-run equilibrium, markets at farmer and marketing agent levels, marketing agent and consumers levels, as well as farmer and consumer levels were integrated within an estimated adjustment time of one month. Based on these findings, the shallot marketing system in Gorontalo Province was vertically integrated between the marketing agents involved.

**Keywords:** Long-Run Equilibrium; Marketing Agent; Shallot Marketing System; Shallot Price; Vertical Market Integration

## INTRODUCTION

Shallot is one of the strategic horticultural commodities, serving as a fundamental necessity for Indonesian society. Furthermore, its versatility as a spice, cooking seasoning, and a key ingredient in the fried onion processing industry, along with traditional medicinal applications, has led to a constant and growing consumer demand. As the Indonesian population and industrial demand continue to expand, the need for shallot has seen a proportional increase.

Gorontalo Province has an expansive agricultural landscape, a portion of which is dedicated to cultivating shallot (smaller red onion) to meet the consumption needs and demands of society. The province has specifically emphasized the development of shallot cultivation in four districts, namely Boalemo, Gorontalo, Pohuwato, and Bone Bolango Regencies. Despite these efforts, the domestic production volume of the commodity continues to experience annual fluctuation. According to the previous report by the Central Bureau of Statistics Indonesia (BPS Indonesia, 2021), shallot production in Gorontalo Province in 2017 reached 12,818 quintals, which then increased in 2018 to 14,093 quintals. However, the volume experienced a drastic decline in 2019 to 6,286 quintals and continued to decrease to 4,758 quintals in 2020. This constant decrease has led to a situation, where Gorontalo Province requires supplies from external sources to meet its consumption needs. Based on survey results by the Central Bureau of Statistics Indonesia Gorontalo (BPS Gorontalo, 2021) and BPS Indonesia (2020), the supply of the commodity originating from local farmers was only 0.45% and the remaining 56.96%, 40.83%, and 1.35% were from South Sulawesi, West Nusa Tenggara, and East Java Province.

The shallot supply flow, both from farmers and sources outside the region, certainly requires a distribution pattern, involving the role of institutions and other marketing channels, such as distributors, wholesalers, and retailers. Furthermore, the relationship between marketing agencies and prices formed at the farm level can be explained by the concept of market integration. Barrett (2001) stated that vertical market integration was the level of association between a marketing agent and other institutions, where price changes were transmitted to these institutions. This indicates that an increase in price at the consumer level was likely to be transmitted to the farmer level, causing an increase in the selling price.

According to the National Strategic Food Prices Information Center (PIHPS Nasional, 2024), there has been a consistent annual fluctuation in the price of shallot. In 2019, the price in Gorontalo Province increased steadily since the beginning of the year, reaching 45,000 IDR/kg in April and the highest of 50,000 IDR/kg in early May, but gradually decreased in the next month. Consequently, the price of the commodity became increasingly volatile and unpredictable in 2020. Based on value at the agent level, the average price from 2018 to 2021 at the trader level was high, reaching 3,076 IDR/kg and the consumer level reached 39,996 IDR/kg, while the average price at the farm level was only 27,740 IDR/kg. This shows the presence of price disparities at the marketing agent level, indicating the absence of market vertical integration.

Market integration is a crucial indicator of marketing efficiency, especially in terms of price (Fazaria et al., 2016). Furthermore, it can also describe how market information is transmitted to all marketing channels, leading to a response to price changes by market participants. Integrated price information from shallot consumers to farmers ultimately has implications for the efficiency of marketing in Gorontalo Province. According to the findings, there are no studies on the market integration of the shallot marketing system in Gorontalo Province. This indicates that it is necessary to examine whether price

changes at the consumer level affect prices at the farmer level. Therefore, this study aims to analyze the vertical market integration formed between marketing agencies for the shallot in Gorontalo Province. The results are expected to provide information on price disparities between marketing agencies and the differences in vertical distribution channels.

## LITERATURE REVIEW

### Vertical Market Integration

The general definition of market integration is the existence of trade ability or cointegration between markets (Mietra & Wibowo, 2022), which enables the transfer of excess supply from one market to another and suggests a connection or correlation between prices in one market and others. Barrett (2001) distinguished between two definitions of market integration: flow-based and price-based. Integration, according to the flow-based definition, refers to the ability and practice of a product from one market to enter another. Meanwhile, price-based notions are based on the economic concept of equilibrium, which is the Law of One Price (LOP). The LOP states that when two markets trade, the market becomes spatially integrated if the price in the importing market matches the price in the importing market plus transport costs. Previous studies (Ravallion, 1986; Dawson & Dey, 2002; Vavra & Goodwin, 2005) have utilized this concept to gauge the degree of spatial market integration in international trade, and they have further refined techniques to gauge the spatial separation of markets within a country. Nevertheless, the current studies (Rahmawati et al., 2018; BPS Indonesia, 2020; Olviana et al., 2020; Laksono & Yuliawati, 2021) explain the spatial integration of markets among agricultural commodities in Indonesia.

According to Barrett (2001), the price-based definition of market integration has a strong relationship with transmission between prices. Later, Rapsomanikis et al. (2006) explain that the transmission of prices can occur either spatially or vertically. The process of transferring price changes from one stage of a supply chain to another is known as vertical price transmission. This can occur in both directions: from upstream to downstream (retail to wholesale) or from downstream to upstream (wholesale to retail) (Conforti, 2004; Goodwin, 2006; Rapsomanikis et al., 2006). This concept closely relates to vertical market integration. Vertical market integration refers to the extent to which different stages of a supply chain are linked through market forces. Essentially, it gauges the effectiveness of price coordination and transmission among various production and distribution levels. This integration can occur when there are strong market connections between stages, such as when a single company controls multiple stages of production and distribution. Market integration is often tested by analyzing the relationships between prices at different stages of the supply chain to determine if they are closely linked (Asche et al., 2007; Fernández-Polanco & Llorente, 2019).

### Shallot Marketing Channels

Marketing channels refer to a set of associated organizations or middlemen that work together to make the products or services of manufacturers or producers accessible to their final consumers (Krafft et al., 2015; Inasovilizuari & Fontana, 2021). According to Anindita and Baladina (2017), marketing channels are an institutional approach that elucidates the actors involved in agricultural product marketing. The institutional approach itself scrutinizes the conditions and characteristics of diverse intermediary traders and other associated institutions, examining their regulation and organization within marketing channels and systems. Intermediary traders in agricultural product marketing are individuals or companies involved in the movement of agricultural products from farmers to final consumers. The intermediary traders involved include contractor buyers (slashers), grain millers, wholesalers, commission agents, and middlemen.

Extensive studies undertaken in Indonesia (BPS Indonesia, 2020; Lisanty et al., 2020; Yunita et al., 2020; Irmayani et al., 2021; Olabu et al., 2022) reveal that the primary actors in Shallot's marketing channels include farmers, wholesalers, middlemen, and inter-island traders. According to those researchers, marketing channels that have emerged in several regions of Indonesia can either be direct, where farmers sell their shallots directly to consumers or indirect, where farmers require assistance from collecting traders, inter-island traders, or retail traders to distribute their shallots to final consumers. Furthermore, a recent study by Olabu et al. (2022) elaborated on three types of marketing channels specifically formed in Gorontalo Province. Initially, farmers sold shallots to retailers before reselling them to final consumers through the shorthand channel. Alternatively, farmers sold shallots to wholesalers, who then sold them to resellers before they reached consumers. The longest marketing channel involves inter-island traders from Makassar who bring supplies of imported shallots. Retailers then distribute the imported shallot supply to consumers after selling it to wholesalers.

**Hypotheses Development**

Researchers have conducted numerous studies on vertical market integration for agricultural commodities, such as staple food commodities like rice and corn, and horticultural commodities like cayenne peppers and shallots. Khotimah et al. (2016) assessed the performance of vertical market integration in the Indonesian rice market, while Haryani and Mulyaqin (2013) specifically analyzed the vertical integration of the rice market in Banten district. These two studies yield similar outcomes, indicating the formation of only a few marketing channels that demonstrate market integration, while the involvement of provincial traders and grain milling hinders rice market integration. On the other hand, Setiawan et al. (2018) tested the integration of the cayenne pepper market by looking at the long-term and short-term equilibrium. There has been no short-term integration of cayenne pepper in Southeast Sulawesi, but there has been integration over time. However, Bakari et al. (2024) demonstrated that the cayenne pepper market in Gorontalo Province has experienced both short-term and long-term integration across all marketing channels. Moreover, in the shallot market, Kustiari (2017) discovered a long-term cointegration between prices at the farmer level and prices at the consumer level in Indonesia. However, the causality test does not show any causal relationship between producer prices and consumer prices, which shows that the shallot market's linkage and degree of integration in Indonesia are weak. The results of the market integration analysis in West Java show that there is no long-term market integration between the producer and wholesale markets nor between the producer and retail market, but there is short-term market integration. Integration occurs in the long- and short-term between the wholesale market and retail market (Nuraeni et al., 2015). Integration occurs in the long- and short-term between the wholesale market and the retail market. On the other hand, in Brebes, there is some evidence of vertical market integration between farmers and retailers, but it remains relatively weak in both the long and short term (Zain et al., 2022). Based on these previous studies, this research hypothesizes that the shallot market in Gorontalo Province exhibits both short-term and long-term integration.

## RESEARCH METHOD

This study used secondary data, which primarily consisted of time series. Furthermore, the main variable analyzed was the price of shallots in Gorontalo Province at various levels, namely prices at the farm, marketing agent, and consumer levels. Monthly data over four years were analyzed, namely 2017-2020. The data were obtained from the National Food Price Information Center, the Agricultural Data and Information Center, the Central Bureau of Statistics (BPS), the Indonesian Ministry of Trade, and the

Indonesian Ministry of Agriculture. Interviews were also carried out with several informants, namely farmers, retailers, wholesalers, inter-island traders, and consumers.

Data analysis was performed using the time series econometrics method with several analytical stages. In the early stages, the data stationarity test, the Engle and Granger cointegration test, the Granger Causality test, and the Error Correction Model (ECM) test were carried out.

**Stationary Test**

Brooks (2019) explained the reasons that formed the basis for the importance of stationary testing. One of the reasons was that the stationary characteristics of the data greatly impacted the behavior and nature of the data, where non-stationary data regression could cause spurious regressions. The unit root test was originally carried out and introduced by Dickey and Fuller (2012), hence, it was known as the Dickey-Fuller (DF) test. Furthermore, the test could be developed and perfected into the Augmented Dickey-Fuller (ADF) model if there was autocorrelation in the dependent variable (Δyt), which was not previously discussed in the DF model. The ADF model used in this study is presented below:

$$\Delta Pbm_t = \alpha 0 + \beta 1T + \delta Pbm_{t-1} + \varepsilon t \text{ ..... } (1)$$

Description:

| | |
|---|---|
| ΔPbmt | = Pbmt-Pbmt-1 (first difference operator) the price of shallots in Gorontalo province (IDR/Kg) |
| α0 | = constant |
| β1,β2 | = intercept |
| δ | = coefficient |
| $Pbmt_{-1}$ | = price of shallots in the previous period (IDR/Kg) |
| εt | = variable error term |

Using hypothesis:
If $H_0$ : δ= 0, (Non-Stationer)
If $H_1$ : δ<0, (Stationer)

Test Criteria:
If the $ADF_{Statistic} < DF_{Critical\ Value}$ Does Not Reject $H_0$, there is a unit root, the data are not stationary.
If the $ADF_{Statistic} > DF_{Critical\ Value}$ Reject $H_0$, no unit root, the data is stationary.

**Cointegration Test**

Cointegration test was a continuation of the stationarity test, which was initially carried out. After determining that the degree of integration was the same in the unit root test stage, a cointegration test was conducted. According to Engle and Granger (1987), the purpose of the evaluation was to examine whether the residuals generated from the regression model were stationary. Furthermore, to carry out cointegration tests on vertical market integration, the following equation model used was as follows:

$$P_{pt} = \beta_0 + \beta_1 P_{pt} + \beta_2 P_{pt-1} + e_t$$
$$P_{st} = \beta_0 + \beta_1 P_{st} + \beta_2 P_{st-1} + e_t$$
$$P_{kt} = \beta_0 + \beta_1 P_{kt} + \beta_2 P_{kt-1} + e_t$$

Test Criteria:
If the $ADF_{Statistic} < DF_{Critical\ Value}$ Does Not Reject $H_0$, the series in the residual $e_t$ cointegration equation was not stationary, indicating that the inter-market shallot price variable was not integrated.
If the $ADF_{Statistic} < DF_{Critical\ Value}$ Reject $H_0$, this indicated that the inter-market shallot price variable was integrated.

**Error Correction Model (ECM) Test**
According to Engle & Granger (2012), Bakari (2012), and Runtunuwu & Kotib (2021), ECM is a technique for correcting short-run imbalances toward long-run balance and explaining the relationship between the dependent variable and the independent variable at present and past times. In this study, ECM was used to examine the long-run and short-run relationship between prices at different marketing levels, using the equation below:

$$\Delta P_{pt} = \alpha_0 + \alpha_1 \Delta P_{pt} + \alpha_2 \Delta P_{pt-1} + \alpha_2 EC_t + e_1 \text{ ..... (2)}$$
$$\Delta P_{st} = \alpha_0 + \alpha_1 \Delta P_{st} + \alpha_2 \Delta P_{ps-1} + \alpha_2 EC_t + e_1 \text{ ..... (3)}$$
$$\Delta P_{kt} = \alpha_0 + \alpha_1 \Delta P_{kt} + \alpha_2 \Delta P_{pk-1} + \alpha_2 EC_t + e_1 \text{ ..... (4)}$$
$$\text{where: } EC_1 = (\Delta P_{t-1} - \beta_0 - \beta_1 - X_{t-1}) \text{ ..... (5)}$$

If the Error Correction Term (ECT) was statistically significant with a negative sign, the model used in the study was considered valid. The coefficients of the short-run dynamics and the equation of the ECM were represented by the coefficient α1. Furthermore, the results of both the long-run and short-run testing were considered significant if their probabilities were less than 0.05.

## RESULTS

**The Results of the Data Stationarity Test**
The stationary test in this study was carried out in stages, where the initial stage was performed using ADF at level conditions (the condition or initial format of the time series data being tested). If the results obtained indicated that the data was not stationary, then the phase was continued with the first difference. However, if the data series could be stationary without differencing, it was considered to be condition I(0)/level. The occurrence of the data series a first derivative, I(1) often led to its consideration as a first differencing condition or from order 1 (Ariefianto, 2012; Doddy, 2012). Stationary test results at various levels of the price variable used are presented in Table 1.

**Table 1.** Stationary Test Results of Shallot Selling Price at Farmer, Marketing Agent, and Consumer Levels

| Variable | Test Equation (No Trend) | ADF T-Statistic | Critical Value of McKinnon (5%) | Prob. | Description | Status |
|---|---|---|---|---|---|---|
| Farmer (PP) | Level | -2.0058 | -2.9251 | 0.283 | ADF t-statistic > Critical Value 5% | Not Stationery |
| | First difference | -8.8736 | -2.9266 | 0.000 | ADF t-statistic > $DF_{Critical\ Value}$ 5% | Stationery |
| Marketing Agent (PS) | Level | -2.7246 | -2.9251 | 0.077 | ADF t-statistic > $DF_{Critical\ Value}$ 5% | Not Stationery |
| | First difference | -5.9918 | -2.9266 | 0,000 | ADF t-statistic > $DF_{Critical\ Value}$ 5% | Stationery |

| | | | | | | |
|---|---|---|---|---|---|---|
| Consumer (PK) | Level | -2.4574 | -2.9251 | 0.132 | ADF t-statistic > $DF_{Critical\ Value}$ 5% | Not Stationery |
| | First difference | -6.4815 | -2.9266 | 0.000 | ADF t-statistic > $DF_{Critical\ Value}$ 5% | Stationery |

Description:
PP: Shallot selling price variable at farmer level in period tth (IDR/Kg).
PS: Shallot selling price variable at marketing agent level in period tth (IDR/Kg).
PP: Shallot selling price variable at consumer level in period tth (IDR/Kg).

Stationary test results showed that the price of shallots at each level lacked stability, as indicated by the ADF t-statistic value that was greater than the critical value of 5% and the probability value of each variable > greater than α = 5%. Based on the test results at the first difference stage, the ADF t-statistic value was smaller than the critical value of 5% and the probability value of each variable was smaller than α=5%, as shown in Table 1. Therefore, data on shallot prices at the farmer, marketing agent, and consumer levels were stationary at the first level or first difference. This indicated that the data could proceed to the cointegration test.

***Cointegration Test Results of Shallot Selling Prices at Farmer, Marketing Agent, and Consumer Levels***

The cointegration test was intended to determine whether the resulting regression residuals were stationary or non-stationary. To obtain the residual value, a regression between the two variables was carried out first, then a data stationarity test was performed on the residual value. The stationary test results obtained from the cointegration test of the two price variables at different levels are presented in Table 2.

**Table 2.** Cointegration Test Results of Shallot Selling Prices at Farmer, Marketing Agent, and Consumer Levels

| Estimation of the Long-run Cointegration Model of Shallot Prices at Farmer and Marketing Agent Levels<br>$Log(PP_t) = 4.462035 + 0.426686\ (PS_t) + 0.151165\ (PS_{t-1})$ | | | | | |
|---|---|---|---|---|---|
| Variable | Coefficient | T-Statistic | Critical Value McKinnon (5%) | Description | Status |
| Resid01 | -0.277859 | -2.681282 | -1.948140 | ADF t-statistic < $DF_{critical\ value}$ 5% | Cointegrated |
| Estimation of the Long-run Cointegration Model of Shallot Prices at Marketing Agent and Consumer Levels<br>$Log(Ps_t) = -0.442854 + 0.577094\ (PK_t) + 0.438644(PK_{t-1})$ | | | | | |
| Variable | Coefficient | T-Statistic | Critical Value McKinnon (5%) | Description | Status |
| Resid02 | -0.497531 | -3.860195 | -1.948140 | ADF t-statistic < $DF_{critical\ value}$ 5% | Cointegrated |
| Estimation of the Long-run Cointegration Model of Shallot Prices at Farmer and Consumer Levels<br>Log(PPt) = 2.167828+ 0.319399 (PKt) 0.46183 9 ($PK_{t-1}$) | | | | | |
| Variable | Coefficient | T-Statistic | Critical Value McKinnon (5%) | Description | Status |
| Resid03 | -0.345983 | -3.052634 | -1.948140 | ADF t-statistic < $DF_{critical\ value}$ 5% | Cointegrated |

Note. Resid: the residual values obtained from the cointegration test of the two price variables at different levels.

In the cointegration model between prices at the farmer and marketing agent levels, the Resid01 value was obtained, showing that the t-statistic value was less than the McKinnon Critical Value 5% (-2.681282 < -1.948140). This indicated that the residual value was stationary. Based on the results, price changes at the farmer level were cointegrated with price changes at the marketing agent level. The cointegration relationship occurring in this model illustrated the presence of a long-run equilibrium relationship between the market at the farmer and marketing agent levels. Therefore, if there was a price movement at the marketing agent level, it was transmitted and followed by price changes at the farmer level. This pattern explained that the market at the farmer level was integrated with the marketing agent level.

The results of the Resid02 and Resid03 tests also showed stationarity, as indicated by the t-statistic value, which was smaller than the 5% McKinnon Critical Value. Based on the Resid02 test results, there was a cointegration between prices at the marketing agent and consumer levels. This illustrated the existence of a long-run equilibrium relationship, where price movements at the consumer level were transmitted to the marketing agent level in the long run. The finding of the Resid03 test also revealed that there was cointegration between prices at the farmer and consumer levels, indicating the presence of market integration.

When the market had been proven to have a long-run equilibrium relationship, the stage could be continued to the ECM approach to determine how the short-run relationship of shallot prices in all levels was formed.

***ECM Test Results of Shallot Selling Prices at Farmer, Marketing Agent, and Consumer Levels***

ECM, a method for adjusting short-term deviations to achieve long-term equilibrium, might be the underlying mechanism explaining the historical and current connections between the dependent and independent variables (Engle & Granger, 1987; Bakari, 2012; Runtunuwu & Kotib, 2021). Furthermore, ECM analysis was often used to determine the short-run balance relationship between two prices at different market levels (Laksono & Yuliawati, 2021). The ECM test results are presented in Table 3.

**Table 3.** ECM Test Results of Shallot Selling Prices at Farmer, Marketing Agent, and Consumer Levels

| Shallot Price Short-run Relationship Model at the Farmer and Marketing Agent Levels<br>$\Delta PP = 0.001625 + 0.365\ \Delta PSt - 0.126\ \Delta PSt_{-1} - 0.269\ ECt_{-1}$ | | | | | |
|---|---|---|---|---|---|
| Variable | Coefficient | R-Square | Prob. | Description | Status |
| ECT (-1) | -0.269349 | 0.365643 | 0.0067 | The ECT error correlation value (-1) is negative | Cointegrated |
| Shallot Price Short-run Relationship Model at the Marketing Agent and Consumer Levels<br>$\Delta PSt = -0.001609 + 0.576\ \Delta PKt + 0.278\ \Delta PK_{t-1} + 0.496\ ECt_{-1}$ | | | | | |
| Variable | Coefficient | R-Square | Prob. | Description | Status |
| ECT (-1) | -0.497531 | 3.86437 | 0.0005 | The ECT error correlation value (-1) is negative | Cointegrated |
| Shallot Price Short-run Relationship Model at the Farmer and Consumer Levels<br>$\Delta PPt = 0.000975 + 0.244989\ \Delta PKt + 0.0351\ \Delta PK_{t-1} - 0.338 ECt_{-1}$ | | | | | |
| Variable | Coefficient | R-Square | Prob. | Description | Status |

| | | | | | |
|---|---|---|---|---|---|
| ECT (-1) | -0.338232 | 0.230682 | 0.0026 | The ECT error correlation value (-1) is negative | Cointegrated |

Note. ECT-1: error term factor

The short-run relationship that occurred with shallot prices could be explained based on the coefficient values of the ECT and the coefficients of the independent variables. The negative value of the ECT coefficient explained the validity of the model formed and indicated the adjustment lag needed for short-run balance.

The negative value of the ECT coefficient in the three models indicated that the models between prices at the producer and marketing agent level, marketing agent and consumer level, and producer and consumer level were all valid and could be interpreted.

Based on ECM test results, the lag value of this short-run balance model was (t-1). This showed that to achieve short-run balance or market integration, time was required for adjustment, namely at least one year as a process of transmitting price changes from one marketing agent to another. One of the reasons that could be explained was because of the long distances of transportation between marketing agencies. According to survey results by BPS Indonesia (2020), the supply of shallots originating from domestic production was only 0.45%, the supply was dominated by distribution from South Sulawesi (56.96%), West Nusa Tenggara (40.83%), and East Java Province (1.35%). Therefore, time was needed for the process of adjusting supply and demand shocks as well as adjustments to price changes in the short run.

## DISCUSSION

The cointegration test was conducted to analyze the long-run relationships of shallot prices that occurred in the market at the farmer, marketing agent, and consumer levels (Setiawan et al., 2018). Based on the results of these statistical tests, there was market integration and long-run equilibrium in the three cointegration models. In the shallot marketing system of Gorontalo Province, this balance could be due to good communication access between marketing agencies (Rapsomanikis et al., 2006), leading to better transmission of price changes to these institutions. This was supported using communication tools to facilitate the flow of information regarding shallot needs and price changes. Furthermore, Gorontalo Province had several wholesale markets, leading to high access to information by farmers, marketing agencies, and consumers. Information that flowed transparently could serve as an indicator of an integrated market, making it efficient and beneficial to both producers and consumers.

Furthermore, the concept of market integration is not only explained by the concept of long-term equilibrium but should be further discussed by the short-term equilibrium. Long-run and short-run relationships in the concept of market integration have been described by Rapsomanikis et al. (2006). Cointegration implies that these prices move closely together in the long run, although in the short run, they may drift apart, and thus is consistent with the concept of market integration. Based on this explanation, which was implied by the results of this study, it could be explained that there had been an integration of the shallot market in Gorontalo Province at various levels of marketing institutions. Therefore, in the long run, when there was a change in the price of the commodity at the consumer level, it was transmitted, causing an increase in the price at the level of marketing agencies and producers/farmers. The process of price transmission required a process of correction and adjustment in the short run with the fastest estimated adjustment time being one month.

The shallot marketing system in Gorontalo Province consisted of various marketing channels. The shortest system only required one marketing agent to be involved, namely a retailer or wholesaler, who then directly distributed the commodity from farmers to consumers. This condition occurred if the supply marketed was obtained from local farmers, to ensure the price transmission process could occur faster than the estimated time of less than one month. In this case, the farmers could access information on price changes when collectors or wholesalers bought or transported the shallot supplies owned by the farmers. Furthermore, farmers also obtained price change information by observing price movements that occurred in the daily or weekly market in the vicinity. This situation illustrated the occurrence of market integration in the short run with an estimated time of less than one month.

The supply of shallots circulating in the marketing system in Gorontalo Province was mostly fulfilled by supplies from outside the region. According to survey data by BPS Indonesia (2020), the supply of shallots originating from local farmers' production was only 0.45%, while 56.96%, 40.83%, and 1.35% were obtained from South Sulawesi, Nusa Tenggara and West Southeast, as well as East Java Province, respectively. This condition was also observed during an interview with one of the informants, namely a wholesaler in Boalemo Regency. According to the wholesaler, the supply of shallots was obtained from other traders from Makassar, South Sulawesi.

This supply was then re-marketed to retailers who had direct access to the consumers. In this condition, the results showed that market integration still occurred between markets at the level of marketing agencies and consumers or between farmers and consumers. However, the process of price changes that occurred in one marketing agent required a longer time to be transmitted to other marketing institutions. This was because the communication process could not be carried out every day, although there were communication tools that supported the transfer process. Regional wholesalers only contacted traders outside the region to place an order to purchase shallots. Furthermore, consumers or local farmers could not directly access price information from inter-island traders. Longer transportation distances also affected transportation costs, leading to significant changes or increase in prices reaching the final consumer. This indicated that even though there was market integration in the short run, the process of transmitting price changes from one marketing agent to another required time of at least one month to achieve a short-run balance based.

## CONCLUSION

In conclusion, the results showed that the shallot marketing system in Gorontalo Province was vertically integrated between the marketing agencies involved. The cointegration test revealed that the markets at farmer and marketing agent levels, marketing agent and consumer levels, as well as farmer and consumer levels were cointegrated, indicating long-run equilibrium. Meanwhile, based on the ECM test results in the short-run equilibrium, markets at farmer and marketing agent levels, marketing agent and consumer levels, as well as farmer and consumer levels were integrated within an estimated adjustment time of one month. This indicated that price changes at the consumer level were transmitted and followed by changes at the marketing agent level, which also affected farmers. Price variation at the consumer level could be transmitted and followed by changes at the farmer level in both the short- and long-run equilibrium.

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N/A

**DECLARATION OF CONFLICTING INTERESTS**

The authors declared no potential conflicts of interest.

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