

Original Article

Increasing the productivity of shallot planting and its impact on the agricultural market, West Java

Aumento da produtividade do plantio de chaleta e seu impacto no mercado agrícola, em West Java

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Abstract

The main objective of this study is to increase the productivity of shallot planting and its impact on the agricultural market. This study analyzes the transmission of shallot prices at the Caringin Main Market (wholesale) level with shallot prices at the farmer (producer) level using quantitative analysis of the Asymmetric Error Correction Model (AECM). The results showed that long-term transmission with positive ECT coefficients and negative ECT showed the same and significant positive values. Positive ECT is 0.286909 and negative ECT is 0.289266, where when there is a price deviation above and below the average balance line of onion prices at the farmer level, it takes three weeks to adjust to the balance of changes in shallot prices. The onion market at the wholesale or parent market occurs asymmetric price transmission from the wholesale price level (Caringin Main Market) to production prices (at the farmer level). A significant t-value of one percent evidences this. Asymmetric price transmission can be caused by abuse of market power.

Keywords: shallot planting, price integration, productivity.

Resumo

O principal objetivo deste estudo consiste em aumentar a produtividade do plantio de chalota e seu impacto no mercado agrícola. Para isto, este estudo analisa a transmissão dos preços da chalota ao nível do Mercado Principal de Caringin (atacado) com os preços da chalota ao nível do agricultor (produtor) utilizando a análise quantitativa do Modelo de Correção de Erros Assimétricos (AECM). Os resultados mostraram que a transmissão de longo prazo com coeficientes de ECT positivos e ECT negativo apresentou valores positivos iguais e significativos. O ECT positivo é 0,286909 e o ECT negativo é 0,289266, e quando há um desvio de preços acima e abaixo da linha de equilíbrio médio dos preços da cebola ao nível do agricultor, são necessárias 3 semanas para se ajustar ao equilíbrio das alterações nos preços da chalota. O comércio de cebola no mercado grossista ou principal ocorre uma transmissão assimétrica de preços desde o nível de preços grossistas (de Caringin) até aos preços de produção (ao nível do agricultor). Um valor "T" significativo de 1% evidencia esse dado. Dessa forma, é possível concluir que a transmissão assimétrica de preços pode ser causada por abuso de poder de mercado.

Palavras-chave: plantio de chalota, integração de preços, produtividade.

1. Introduction

Based on FAO data in 2014–2017, Indonesia became the number three importer country in the ASEAN scope that imported shallots with an average of 89 thousand tons (Eviyati et al., 2023; Asadipour et al., 2005). Shallots are one of the prominent horticultural commodities for Indonesian people that have high economic and strategic value. This can be seen from the highest average vegetable consumption of Indonesian people is shallots at 0.206 per kg/capita in one month with the second highest average expenditure of Rp 636 per kg/capita in one month (Ghaderloo et al., 2023; Aguirre, 2023; Sedigh et al., 2022). In addition, shallots also affect the national economy because they

contribute to the second-highest volatile food group inflation of 0.170 percent (yoy) in 2016 and include the first volatile food group deflation (Najafi & Nasiri, 2019).

Shallots can theoretically be classified as basic needs such as rice, eggs, or meat that are not very sensitive to price changes or are called inelastic goods (Tinaprilla et al., 2022; Nguyen et al., 2023; Nasution & Hanum, 2023). This means that if there is a price increase of one percent, the decrease in demand is lower than one percent. This situation shows that shallot commodities in general are basic goods that are needed by the community, both household consumers and business consumers who

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use onions as their production input. Not only on the demand side but on the supply side it is also inelastic to price changes. Farmers as producers cannot immediately increase their production when prices increase.

High price fluctuations in shallots cause greater marketing margins and lower prices received by farmers (producers). The lack of information received by farmers opens up opportunities for traders to game prices at the farmer level on the grounds of price changes at the consumer level (Khorsandi et al., 2022; Alghalith and Wing-Keung, 2022; Sepúlveda et al., 2023). Therefore, it is substantial to examine the transmission of the producer-level shallot market in Indonesia and the determinants of shallot market transmission. The policies to be implemented are expected to be implemented more effectively and efficiently so that they can achieve the desired goals.

2. Methodology

This experiment was conducted in the 2021 crop year at the West Java research farm located between 5°50' - 7°50'S and 104°48' - 108°48'E. West Java is bordered by the Java Sea and DKI Jakarta (North), Central JaVa Province (East), the Indian Ocean (South) and Banten Province and the Indian Ocean (West). West Java's positioning is strategic and is an advantage for agriculture and especially shallot planting and transportation. In the form of a randomized complete block design with seven treatments and three Repetition was designed and implemented. The plant density for shallot density was also considered to be 10 plants per square meter. The research method used is to use quantitative analysis using secondary data. The secondary data used is in the form of time series data for three years, namely from the 1st week of January 2019 – the 4th week of December 2021 consisting of (Khan et al., 2023; Nursalim, 2021):

1. Price of shallots manufacturer (Rp/Kg)
2. Price of wholesale shallots (Rp/Kg)

The data was sourced from the Caringin Main Market and the Ministry of Agriculture to analyze market integration and transmission of shallot prices. Secondary data that supports research in the form of production data and other data are obtained from the Central Statistics Agency, Ministry of Trade, Bank Indonesia, Trade Map, Food and Agriculture Organization (FAO), and other agencies.

3. Findings and Discussion

Based on Andayani et al. (2022), the consumption of shallot keeps on increasing. The required temperature for

shallot growth is 10 to 13 degrees in autumn cultivation and 15 to 25 degrees in spring cultivation. Shallot can withstand the temperature of -20 degrees Celsius, which makes west java as the most appropriate places. Shallot consumption is expected to reach 921.786 tonnes by 2024. Price transformation is the influence of price changes from one market to another. Price changes, both positive shock (price increase) and negative shock (price decrease) can affect price movements in a market. The shallot market at the wholesale market level or Caringin Main Market is transmitted to the onion market at the producer or farmer level at the distribution. Analysis of changes in shallot prices between prices at the wholesale level (Tightiz & Yoo, 2022; Andayani et al., 2022) and prices at the producer or farmer level in Majalengka Regency was carried out by analyzing the transmission of shallot prices using Asymmetric Error Correction Model (AECM) analysis. Previously, it carried out pre-estimation tests such as data stationarity tests, determination of optimal lag length, and cointegration tests. Next, causality tests, Price Asymmetry Model Estimation, and Wald tests will be carried out.

3.1. Causality-test

Food Supply Chain Networks framework was used for shallot market to links the farmers to consumers (financially and goods). The causality test aims to ascertain the direction of price transmission that occurs. The direction of price transmission can come from the supply side or upstream (producers) or from the demand side or downstream (consumers). The Granger causality test is carried out to determine the price transmission rate, that is, whether the formation of onion prices at the producer level is influenced by prices at the wholesale level of the parent market or vice versa or whether there is a two-way relationship between the price of shallots at the producer level and the price of shallots at the wholesale level (both markets influence each other). Based on Table 1 with a significance of one percent shows that the direction of price transmission occurs in one direction. A one-way relationship occurs in onion prices at the farmer level influenced by prices at the wholesale level or parent market. This asymmetric transmission test is seen from the results of the smallest probability level, namely the relationship of prices at the wholesale level with prices at the farmer level.

The significance of the transmission direction relationship (Table 2) affects the results of price transmission, where the causality relationship of onion prices at the wholesale level at the one percent level is stated to be very strong, Jumintono et al. (2022) Kartiasih

Table 1. Causality Test of Shallot Prices at the producer level with Shallot Prices at the wholesale level.

Interaction	Lag	First Correlation		Second Correlation		Causality
		F-Stat	Prob	F-Stat	Prob	
HP to HG	2	0,00768	0,9303	6,09176	0,0029***	HP to HG
HG to HP	2	16,9808	18,973	12,8890	27,867	HP to HG

Note : *** Significant on a level 1%. HP: Price In; HG: Price Out.

and Setiawan (2020) Stating a causality relationship can capture central markets or price drivers. The relationship between onion prices at the wholesale or parent market level and prices at the producer or farmer level has a value of less than one percent. This indicates that the Caringin Main Market is a reference market for shallot prices for farmers and also has the largest demand for shallots so it often distributes trade. The difference in the direction of price transmission occurs due to the influence of the strength of marketing institutions that have a role in determining the price of shallots and the supply of shallots that changes compared to demand that tends to be stable. Market information and market forces that occur in marketing affect the price transmission that occurs (Shrinivas and Gomez, 2015; Shariati et al., 2013).

3.2. Estimation of asymmetric price transmission

ECM (Error Correction Model) estimation to see the dynamics and speed of price adjustments that occur from the transmission of shallot prices. This model separates price transmission in the short and long run. Price transmission can occur when there are positive and negative shocks. Positive shock occurs when there is a change in price increase in the independent variable, while negative shock indicates that the independent variable has decreased in price. Price asymmetry testing can also be seen from the positive ECT and negative ECT coefficients.

Error Correction Term (ECT) is used to measure the deviation from the long-term equilibrium between the two prices. The ECT coefficient is negative and

statistically significant. This can be interpreted that the ECM model specifications applied are valid. A negative ECT coefficient value serves to correct existing deviations so that equilibrium occurs in the long run. The positive ECT coefficient value states that the direction of movement is getting further away from the long-term equilibrium so that the model used will be spurious (Kartiasih and Setiawan, 2020). The greater the ECT coefficient, the faster the adjustment to long-term equilibrium with other markets and vice versa.

A positive ECT indicates a deviation above the long-term equilibrium line, i.e. when a decrease in onion prices at the wholesale level is not followed by a decrease in onion prices at the farmer level. ECT negative indicates a deviation below the equilibrium line, when the increase in onion prices at the wholesale level is not followed by an increase in onion prices at the producer (farmer) level. The price of shallots at the production level is transmitted to the parent market.

Short-term transmission of shallot prices is seen to be significant at the farmer level, prices at the farmer level will be affected by prices at the parent market level at (t) one percent level. Conversely, prices at the wholesale level or parent market will not be affected by prices at farmers, good or bad. This short-term effect affects farmers every six weeks as seen from rounding the coefficient 0.567449 to six.

Long-term transmission with positive ECT and negative ECT coefficients shows the same and significant positive values. Positive ECT is 0.286909 and negative ECT is 0.289266, where when there is a price deviation above and below the average balance line of onion prices at the farmer level, it takes three weeks to adjust to the balance of changes in shallot prices.

3.3. Wald-test

The coefficient of positive shock and negative shock in the short and long term is identical or different and can be proven by the wald test. The results of the wald test are used to confirm the occurrence of asymmetry in price transmission.

In Table 3 the results of the Wald test show significance at the level of one percent which states that the transmission relationship of red shallots prices that occur between passers at the producer or farmer level and the parent market at the wholesale level is asymmetric in the long and short term, also prices at the producer level are influenced by prices at the wholesale level. Asymmetric

Table 2. Estimation of Asymmetric Price Transmission in Shallot Market.

Variable	HP to HG
HG	0.003297 0.6561
HP	0.567449 0.0000 ***
ECT ⁺	0.286909 0.0000 ***
ECT ⁻	0.289266 0.0000 ***

Note : *** Significant on a level 1%. HP: Price In; HG: Price Out; ECT⁺: positive Error Correction Term; ECT⁻: Negative Error Correction Term.

Table 3. Wald-test result.

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
t-statistic	3.62E+13	153	0.0000***
F-statistic	1.31E+27	(1, 153)	0.0000
Chi-square	1.31E+27	1	0.0000

Note : *** Significant on a level 1%; df: degree of freedom.

price transmission can be caused by abuse of market power, while symmetrical price transmission, in the long run, is caused by adjustment costs (Sherafatizangeneh et al., 2022). For agricultural products, the formed market structure leads to a market level of imperfect competition. This causes intermediary traders to act as price makers, while farmers and consumers will act as price takers. As a result, intermediary traders can freely abuse their market power for their welfare and benefit and the process of adjusting prices between marketing levels is imperfect (Vavra and Goodwin, 2005).

Without market power, the price will adjust back toward the balance line in the long run. The process of price transmission between farmers and traders in the parent market in the long run shows the abuse of market power with price changes that occur at the parent market level transmitted slowly to farmers. The shallot market leads to an oligopsony market structure (Jamalpour & Derabi, 2023; Haryati et al., 2023). Farmers have a weak bargaining position and wholesalers are more dominant in determining prices.

4. Conclusion and Suggestion

4.1. Conclusion

Today, agriculture, on the one hand, seeks to provide food for the growing population of the world, and on the other hand, seeks to create greater coordination and alignment between the process of increasing food production with the environmental, social and economic goals of the world. Achieving this goal requires increasing the efficiency of using inputs and cultivating and developing forgotten species of plants. One of the solutions for managing the ecosystem of agricultural systems is to increase yield, increase resource productivity, reduce the consumption of poisons and pesticides, compete with weeds, and have long-term sustainability. There is an asymmetric price transmission from the wholesale price level (Caringin Main Market) to production prices (at the farmer level). This is evidenced by a significant t value at the level of one percent. Asymmetric price transmission can be caused by abuse of market power. Long-term transmission with positive ECT coefficients and negative ECT showed the same and significant positive values. Positive ECT is 0.286909 and negative ECT is 0.289266, where when there is a price deviation above and below the average balance line of onion prices at the farmer level, it takes three weeks to adjust to the balance of changes in shallot prices.

4.2. Suggestion

The government needs to regulate shallot reserves and market operations when production is reduced and prices are high, optimal stock management and distribution of shallots is needed so that price stability and the need for shallots are met. This can also be realized in the form of cooperatives and product variations from shallots.

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