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Market Integration of Horticultural Commodity Between Angsoduo and Talang Banjar in Jambi City

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Abstract. *The horticulture commodities (chilies and shallots) acts as a food ingredient while the price often experiences instability. Market efficiency needs to be considered in order to achieve its price stability, so it needs to be studied their market integration (between Angsoduo and Talang Banjar Market). This research is aimed to analyse the horticulture market integration especially chili and shalot product. Data were analysed descriptively and inferentially by using the Coefficient of Variance (CV), t test and the Market Connection Index (IMC). The results showed that there was no difference in the variance or price of chilies on the different market. IMC value for red chilies was negatif (-0,165), which means there was no conclusion to be made weather market integration had occurred or not. There was no market integration on shallot (IMC (7.89) > 1). While there was a significant difference between average price of shallot in both market. As well as there was also a significant difference on variance of shallot prices between the two market (Talang Banjar (1.0875) and Angsoduo (0.0426))*
Keywords*: shallots, chilies, price, horticulture, stability*

INTRODUCTION

In 4th quarter of 2022, Jambi Province's economic grew up to 5% based on current prices and the agricultural sector has occupied the highest distribution as 30.35% (BPS Jambi Province, 2023). In the agricultural sector it self, horticulture is a sub-sector that provides several types of food and medicinal resources that are useful for society. The price of horticultural products can determine the efficiency of the trading system. The price changes at one level of the market can affect prices at other levels, businesses can make more informed decisions about product pricing, production, and distribution. The price dynamics at various market levels, which is crucial for strategic decision-making and effective business development for farmers. Then the trading system mainly concerned with short-term market integration is very important to be discussed. Kustiari, (2018) and Tenriawaru et.al., (2021) stated that market integration can affect the supply and demand of horticultural products by changing the flow of goods and services between different markets.

Chilies and shallots are horticultural commodities that have a huge influence on the national economy. In several areas, especially in Sumatra, these two commodities are often used as food ingredients to provide a spicy taste and are often processed into chili sauce or seasonings for foods such as rendang, curry etc. Overall, chilies and shallots are the favourite foods of Sumatran people so their availability is very important to be cared. Price is an important indicator in assessing the availability and market demand for these commodities.

The price of chilies and shallots in one area can be different from the another area, depending on factors such as local production, market demand, transportation costs, etc. However, market integration can affect the overall price of chilies and shallots. Kustiari (2018) and Tenriawaru et.al., (2021) stated that market integration can lead to changes in supply and demand dynamics, transportation costs, and infrastructure development, which can further impact chili prices. Market integration is a measure that shows how far price changes that occur in the reference market will cause price changes in other markets (Nuraeni et.al., 2015). In this case, different markets are connected and influence each other's prices, Note the market price of the commodity in one region is linked to markets in other regions, so that prices in one region can be influenced by prices in other regions. This market performance can be studied by market integration which is the result of the actions of traders and the operating environment determined by the infrastructure available for trading and policies that influence the transmission of prices from one market to another. In terms of market integration, information and transportation technology play an important role in connecting different markets and facilitating trade in chilies and shallots between regions. With easy access to information and transportation, red chili and shallot traders can quickly find out prices in other markets and make the right business decisions. Market integration is related to the transmission of prices between different markets.

Studies on price transmission and market integration have been carried out previously, such as Elvina et.al., (2018) who studied price transmission and sequential bargaining game market behaviour between red chili marketing institutions in Indonesia with the aim of analysing vertical price transmission along marketing channels. chilies (manufacturers, wholesalers and retailers) and analyse the market behaviour of market players. Vertical price transmission was analysed using the Asymmetric Error Correction Model (AECM) approach using weekly data from January 2012 to October 2014. The research results showed that price transmission along the red chili marketing

channel was symmetrical and wholesale prices were the reference for producer prices and retail prices. Samantha et. al., (2021) also studied the spatial integration of the curly red chili market in Central Java using the vector error correction model method. Correction Model (VECM) to see the closeness of relationships, both short and long term. The VECM model obtained had a MAPE accuracy value for HCMK Semarang of 15.93%, Demak Regency 17.61%, Pati Regency 15.88%, and Pekalongan Regency 14.49% which could be interpreted as good model performance. On the other hand, Nuraeni et.al. (2015) studied the, analysis of price variations and integration of shallots in West Java. This research aimed to analyse the level of price variation and market integration of shallots in West Java. The research results showed that the level of fluctuation in shallot prices at the producer, wholesale and retail levels was high and unstable. Between the producer market and the wholesale market there was no long-term market integration but there was integration in the short term. Fluctuations in shallot prices at the producer, wholesale and retail levels were high and unstable based on the Ministry of Trade's criteria, because they were above 9%.

Furthermore, research on the formation of prices for curly chilies without brackets by analysing commodity prices in production centres and wholesale markets was carried out by Sukmawati, (2017b). The analysis results showed that the highest correlation coefficient value was between Caringin and Gedebage market, the % age change was 99%, meaning that price changes that occur in Caringin market were transmitted perfectly to Gedebage market. The results of the market integration analysis showed that one rupiah increase in the price of curly chilies in the Cikajang production centre will increase the price of curly chilies by Rp.0.77 (77% change) in Kramat Jati market, this showed that Kramat Jati market was dominant in shaping the price of curly chilies. Furthermore, researchers are interested in focusing on research similar to previous research but carried out in the city of Jambi by studying the phenomenon of commodity price fluctuations and market integration, especially chilies and shallots. It was hoped that the research results can be used as a basis for policy making for producers, traders, consumers and the government.

RESEARCH METHODS

The research was carried out in 2023 in Jambi city, specifically located at two large markets, namely Angsoduo market and Talang Banjar. The data analysed was a secondary time series i.e. the past 11 months or the past 312 days, precisely from July 2022 – June 2023. The data was analysed descriptively, both qualitatively and quantitatively to describe the market profile, prices of chilies and shallots in each market. The market description concerns on price fluctuations using the variance coefficient indicator (coefficient of diversity) with the following formula (Wasrob N, 1999):

$$(CV=(s/\bar{x}\ )X\ 100\%$$

$$s = \frac{\sqrt{\Sigma\ (x_i - \bar{x}\ )^2}}{n - 1}$$

Note:

CV : Coefficient of Variance
s : Standard deviation (standard deviation) (Rp)
$\bar{x}$: Average (mean) data value (Rp/Kg)
n : Amount of data (312 data)

The difference between the average price and its variance of the two commodities was tested using the t test for two independent sample means. To see whether there was a market integration between the two markets, it was known by using the Index Market Connection (IMC) indicator. This analysis is used to see price efficiency in the commodity trading system. The econometric model used to analyse this integration was developed by Ravallion (1986) with the following formula:

$$IMC = \beta_1/\beta_3$$

Note :
IMC = Index Market Connection
β 1= Regression coefficient of (Pit -1) variable (previous price of chilies or shallots at Talang Banjar Market)
β 3= Regression coefficient of (Pjt-1) variable (previous price of chilies or shallots at Angsoduo Market)
Decision rules:
If IMC ≥ 1 There is no market integration for chilies or shallots between Angsoduo and Talang Banjar Market
If IMC < 1 There is a market integration for red chili or shallot between Angsoduo and Talang Banjar Market
IMC is determined from multiple linear equations:

$$P_{it} = C + \beta_1\ (P_{(it-1)}) + \beta_2\ (P_{jt} - P_{(jt-1)}) + \beta_3\ (P_{(jt-1)}) + Ut$$

Note :
P_{it} : Commodity Prices at Talang Banjar Market on day t
$P_{(it-1)}$: Commodity Prices at Talang Banjar Market on day t–1
P_{jt}-$P_{(jt-1)}$: Difference in Commodity prices at the Angsoduo Market between days t and t-1

P_{jt} : Commodity Prices at Angsoduo Market on day t
$P_{(jt-1)}$: Commodity Price at Angsoduo Market day t–1
βi : Model coefficients (i = 1,2,3)
Ut : Random error.
C : Constanta

According to Zainuddin, (2012) the previous price (t-1) in the original market is the main factor that influences today's price (t) in the next market, so the two markets are well related. In this case, price changes in the originating market are communicated to subsequent markets. Then Zainuddin, (2012) gave anote that:

- IMC that close to 0 or β_1 is close to -1, so the previous original market price has no effect on the next market price t.
- If $\beta_1=0$ and $\beta_3>0$ then IMC will be equal to zero, this indicates strong short-term integration.
- If $\beta_1 > 0$ and $\beta_3= 0$ then the IMC will be infinite, this shows that there is market segmentation. In essence, short-term integration is achieved when the IMC value is closer to 0.
- β_2 closer to 1, the higher the degree of association, meaning the integration of the two markets is stronger in the long term.

Determinant coefficient can be used to know how much does the dependent variance (Y) can be explained by the variance of the independent variable, the formula R^2 is used as follows:

$$R^2 =(\Sigma yi.xi)/(\Sigma(yi^2))$$

Note :
R^2: Determinant coefficient
Bi: Regression coefficient of the its variable
yi : The number of deviations of the dependent variable from its average value
xi: The number of deviations of the 1st independent variable from its mean
yi^2: the sum of the squares of a 1st variable from its mean value

R^2 value has a range of 0-1, the higher of R^2 closer to 1, indicating that all data is on the same linear line. F test is carried out to prove whether the independent variables (X) have a simultaneously significant effect on the dependent variable (Y) (Sudjana, 1992).

$$F_{count} = \frac{R^2/K}{(1-R)/(n-K-1)}$$

Decision rules:
If $F_{count} \geq F_{table}$ or $(F_{count})_{Sig} \leq (F_{table})_{Sig}$
So reject Ho (This means that the independent variables simultaneously have an influence on the dependen variable).
If $F_{count} < F_{table}$ or $(F_{count})_{Sig} > (F_{table})_{Sig}$
So accept Ho (This means that the independent variables have no simultaneously influence on the dependent variable).

t Test (Partial). To determine the influence between variables partially, the t test is used, with the following formula (Sudjana, 1992):

$$t_{count}= \beta i/(Se_{\beta i})$$

Note :
βi : Regression efficiency of variable i
$Se_{\beta i}$: Standard error

Decision rules:
$t_{count} \geq t_{table}$ or $(t_{count})_{Sig} \leq (t_{table})_{Sig}$
So reject Ho (This means that the independent variable is an explanation of the dependent variable).
$t_{count} < t_{table}$ or $(t_{count})_{Sig} < (t_{table})_{Sig}$
So accept Ho (This means that the independent variable is not an explanation of the dependent variable).

To assist the analysis process, the 23th version SPSS program was used by inputting "daily price data" for the last 11 months (312 daily price data).

RESULT AND DISCUSSION

Overview of The Two Traditional Markets

Based on office information of Angsoduo Market in 2023, this market was the largest traditional market in Jambi City. The market is located on the edge of the Batanghari River and has been around since the 1960s. This market is located on Sultan Thaha street, Legok Village, Danau Sipin District, Jambi City. It has around 7,2 hectares of area and has 4 blogs as a place to trade. Each block is designated for a different commodity, for example block A is

only for clothing commodities while blocks B to D are intended for the vegetable and animal product. The number of stalls are 3.500 units, but less than half of the places have been filled, (1.500 units). Based on the number of traders of more than 750, Angsoduo Market is included in the class 1 market category. The size of its stalls is 3X4 m. Previously, the location of Angsoduo Market was located closer to the river but was moved on November 11th 2018 to the new location which is not far from the original one. The condition of the new market is neater and cleaner and also more orderly with a wider parking area, although today the parking payment system is not working as it should be.

Talang Banjar Market is located at Orang Kayo Pingai street, Talang Banjar Sub-district, East Jambi District, Jambi City. This market is also a moving market location in 2018 from the previous market location with the same address. This market is managed by a head market manager and his staff. Each stall is not charged a rental fee but has the right to use with a daily levy fee of Rp. 7.400/day for the small shop category and Rp. 3.200/day for the stall category. This market has 11.778 m2 area of land with a total of 279 small shop (Size : 2x3 m) and 653 stalls. The number of traders in this market are 931. Based on the number of traders of more than 750, Talang Banjar Market is also categorized as a class 1 market in Jambi City.

Phenomenon of Horticultural Commodity Prices (Chilies and Shallots) at Angsoduo and Talang Banjar Market.

The analysed data in SPSS application were daily price data for 312 days. The price of red chili and shallot can be seen in Table 1.

Table 1. Mean and Variance of Red Chili and Shallot Prices at Angsoduo and Talang Banjar Markets, Jambi City.

Analysed Variables	Market		Significance of differences (α = 5%)
	Angsoduo	T. Banjar	
RED CHILLI			
Average Price (Rp/Kg)	41.139	41.139	Non-significant
Average Price Variance	17,444	17,444	Non-significant
SHALLOT			
Average Price (Rp/Kg)	30.314	32.641	Significant
Average Price Variance	0,0426	1,0875	Significant

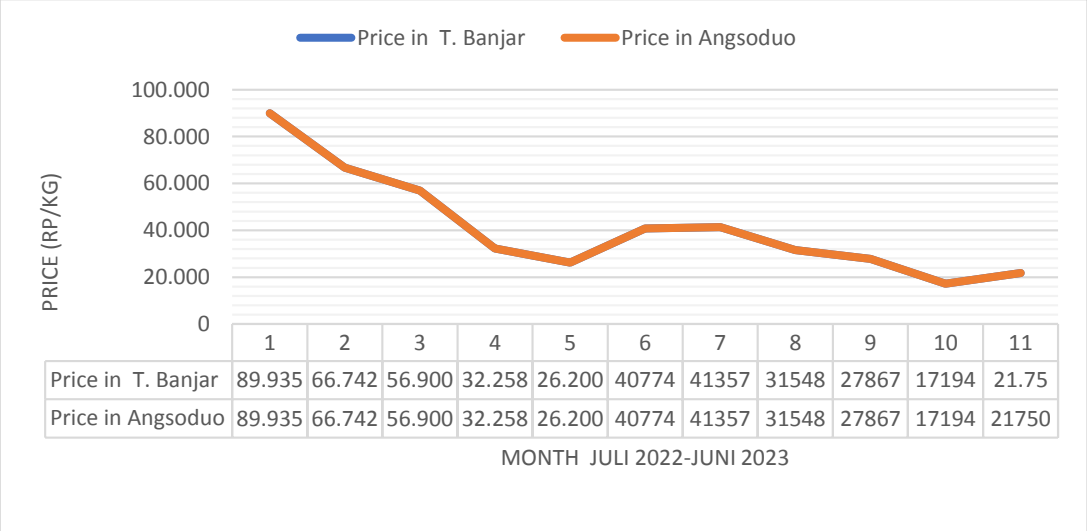
Price of Red Chili at "Angsoduo" and "Talang Banjar" Market

In this case the red chili studied was represented by curly chilies. The price of this red chili, both at Talang Banjar and Angsoduo Market, over the last 312 (11 months) had fluctuated moved with a standard deviation of Rp. 22.988,48. The price of red chili in both markets showed the same range as Rp.16.000-150.000/Kg with the same average of Rp. 41.139/Kg. Thus, there was no significant difference in prices fluctuations of chilies between Angsoduo and Talang Banjar Market. This was different from the results of research by Sandra et.al., (2012) which studied price behaviour and market integration of chilies in Bengkulu Province, which showed that the price of chilies differs between producer and consumer areas in a region, and consumer areas had a stronger influence on price determination.

The standard deviation of chilies as a result of this research in Jambi (22.988,48) was higher than its Price Fluctuations in West Java Province As researched by Sukmawati (2017a) which was focusing in her research on price fluctuations of curly chilies in production centres and wholesale markets. This research used time data series of red chili prices at the Cikajang curly red chili production centre, Garut Regency and Kramat Jati Main Market, using daily curly red chili price data in 2014. The data used was sourced from the West Java Food Crops Agriculture Service and analysed using the EVIEWS 8 program. Fluctuations in the price of chilies in both places experienced high price fluctuations compared to other types of vegetables. Chilies were a commodity that experiences price fluctuations all the time. Over a period of 10 years, the price of chilies in 2 places had fluctuated with different ranges. Prices in the wholesale market fluctuate more than production centres. This was based on the results of the analysis of the standard deviation of the Cikajang production centre (15.165,64) and Kramat Jati Main Market (18.302,01). This price instability was because in the market the market mechanism did not work, the distribution between market players was unfair, this shows that the red chili market was inefficient or unhealthy. An unhealthy market was indicated by prices that were too cheap, which would harm producers, and prices that were too high will harm consumers. This occurs due to changes in supply and demand which cause price fluctuations. This had the same results with a research in Jember Regency done by Eliyatiningsih & Mayasari, (2019) which showed that there were fluctuations in the price of chilies in the producer market which were higher than the consumer market. This research aimed to determine price behaviour, market integration, and markets which dominates the formation of red chili prices in Jember Regency. The research was conducted using time series data on monthly prices of chilies in the consumer market and producer market in Jember Regency for the period 2010 to 2016. Price behaviour was analysed using coefficient of variation analysis.

The Engle Granger cointegration approach was used to determine the existence of long-term integration and the Granger causality test to determine which market dominates price formation. The research results showed that the price behaviour of chilies in the producer market and the consumer market showed the same movement. The Variance Coefficient value for the producer market was greater of 63,39 % , compared to the consumer market, of 50,15%. This showed that the price of chilies in the producer market fluctuates more than in the consumer market. The red chili producer and consumer markets in Jember Regency were strongly integrated. There was no causal relationship between the producer market and the consumer market in the marketing of chilies in the Regency

Based on figure 1 show that the prices of the two commodities were always the same in two markets. The development of the average monthly price of chilies at Angsoduo and Talang Banjar Markets, Jambi City (From July 2022 - June 2023), it showed that the lowest price occurred in the 10th month, namely May 2023 (Rp.17.194/Kg) while The highest price was seen in the 1st month, namely June 2022 (Rp.89.935/Kg) with an average per month of Rp. 41.139/Kg. Apart from that, both markets showed the same average monthly price fluctuations. Likewise, the monthly price fluctuations that occurred during the last 11 months also showed the same thing, namely that both have a same variance value of 17,444, thus indicating that there was no difference in the average fluctuation of curly red chili prices between the two markets. Development of the Average Monthly Price of Red Chilies at both market (July 2022-June 2023) can be seen in figure 1.

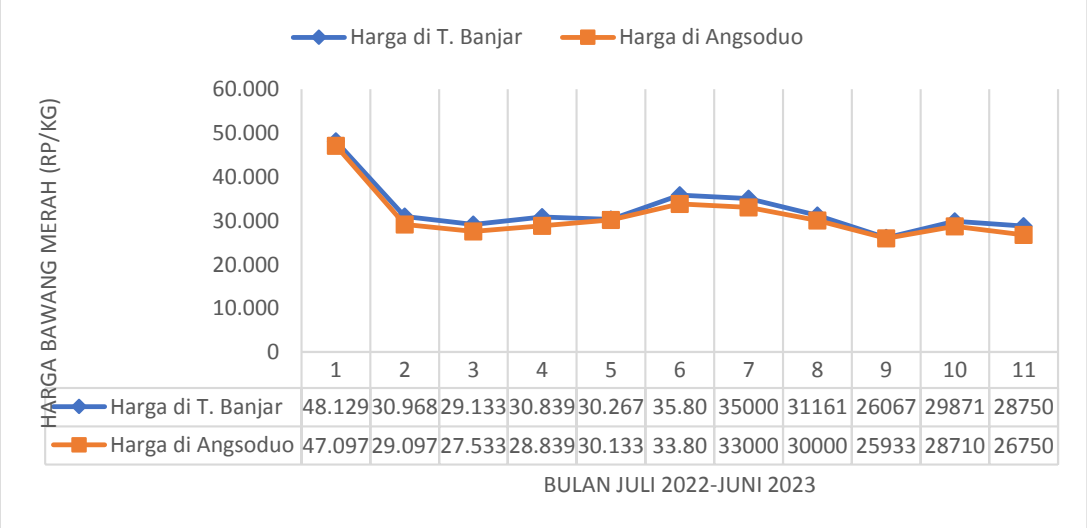


	1	2	3	4	5	6	7	8	9	10	11
Price in T. Banjar	89.935	66.742	56.900	32.258	26.200	40774	41357	31548	27867	17194	21.75
Price in Angsoduo	89.935	66.742	56.900	32.258	26.200	40774	41357	31548	27867	17194	21750

Figure 1. Development of The Average Monthly Price of Red Chilies at Both Market (July 2022-June 2023)

Price of Shallots at Angsoduo and Talang Banjar Market

The price of shallot at Angsoduo Market over the last 312 days had fluctuated in the range from Rp. 24.000–50.000/kg with an average price of Rp. 30.314 ± 6.328,93. Meanwhile, the price range at Talang Banjar Market moves from Rp. 24.000-52.000/Kg with an average price of Rp.32.641±6.254,93. Development of the Average Monthly Price of shallot at both market (July 2022-June 2023) can be seen in Figure 2



	1	2	3	4	5	6	7	8	9	10	11
Harga di T. Banjar	48.129	30.968	29.133	30.839	30.267	35.80	35000	31161	26067	29871	28750
Harga di Angsoduo	47.097	29.097	27.533	28.839	30.133	33.80	33000	30000	25933	28710	26750

Figure 2. Development of the Average Monthly Price of Shallot at Both Market (July 2022-June 2023)

The development of monthly average prices showed that the lowest price at the Angsoduo Market occurred in the 9th month (April 2023 as Rp.25.933/Kg). Meanwhile, the highest monthly average price was showed in the 1st month, namely June 2022 (Rp.47.097/Kg). Based on Table 1, the average monthly prices, it could be noted the price of red shallots at Talang Banjar Market was higher (Rp.32.6412/Kg) than the price at Angsoduo Market (Rp.30.314/Kg) and the analysis results showed that there was a significant price difference. There was a fluctuation in monthly average prices as indicated by the variance for the last 11 months of 0,0426 in Angsoduo and 1,0875 in Talang Banjar. This different variance was explained by the results of the t test analysis of the difference between two independent means that there was a significant difference between the two price variances. The price variance for red shallots in Talang Banjar looked bigger (1,0875) than the price variance in Angsoduo (0,0426). This shows that the price of shallots at Talang Banjar Market fluctuates was more higher than at Angsoduo market.

Kustiari, (2017) analysed fluctuations in shallot prices at the producer and consumer levels and studied market integration using the Johansen cointegration approach. A study of price behaviour and market integration of shallots in Indonesia found that fluctuations in shallot prices increased after the implementation of the Horticultural Product Import Recommendation policy. This study also found that here was no causal relationship between the prices of shallots among consumers and producers in Indonesia, which was caused by market forces and market failures. This study showed that managing shallot production levels and the amount of shallot supply in the Central Java market was the key to ensuring the stability of shallot prices at the national level. This study also identifies the dominant market in Central Java which could be used as a reference market in predicting the dynamics of consumer shallot prices in Indonesia. During the period January 2011–December 2016, shallot price movements showed the same pattern with different levels of fluctuation. Producer prices move more stably compared to consumer prices. The coefficient of variation (CV) of consumer prices reached 12,6%, while the CV of producer prices was only 9,3%.

Results of research by Hasan & Suprapti, (2020) regarding price fluctuations and horizontal integration of the shallot market in Madura. This article aimed to describe fluctuations in the price of shallots compared to the amount of production in four districts in Madura and to analyse horizontal market integration between the four districts. The secondary data used was monthly data on consumer prices for shallots in four districts during the period January 2015-August 2020 obtained from the East Java Department of Industry and Trade. Data were analysed using the coefficient of variation to determine price fluctuations and Engle-Granger cointegration to test integration between markets. The results of the analysis showed that the coefficient of variation always changes every year with the largest average being in Sumenep Regency (24,1%) and the lowest in Pamekasan Regency (22,0%). The highest production quantity did not guarantee the lowest fluctuation. This fact showed that production numbers did not have much influence on fluctuations. This means that there were other factors that had a more dominant influence. There was strong integration in price formation between markets in the four districts.

Markets Integration of Horticultural Commodity (chilies and shallots) Angsoduo and Talang Banjar Market.

Red chili market integration between Angsoduo and Talang Banjar Market.

The data was completed by Department of Industry and Trade of Jambi Province. The regression equation illustrates that the price of chilies at Talang Banjar Market today (P_{it}) will be influenced by three things, namely the price of chilies at Talang Banjar Market one day earlier (P_{it-1}), price changes in the reference market (Angsoduo Market) between today with the previous day (P_{jt}–P_{jt-1}), and the previous Angsoduo market price (P_{jt-1}). From the results of the SPSS 23 analysis, the following regression equation was obtained:

$$P_{it} = 1147{,}85 - 0{,}180\ (P_{it-1}) + 1{,}80*(P_{jt} - P_{jt-1}) + 1{,}094\ (P_{jt-1})$$

Note :

P_{it} : Price of red chili at Talang Banjar Market day t (Today)

$P_{(it-1)}$: Price of red chili at Talang Banjar Market on day t-1 (Previously)

P_{jt} : Price of red chili at Angsoduo Market on day t

$P_{(jt-1)}$: Price of red chili at Angsoduo Market on day t-1

$(P_j - P_{jt-1})$: Difference in prices of red chilies at Angsoduo Market.

Table 2. Partial Analysis Result of Red Chili Market Integration (α : 5%).

Model		Unstandardized Coefficients				Cunclution
		β	Std. Error	t	Sig.	
	(Constant)	1147,85	456,090	2,517	0,012	
1	(X_1) previous Chili Price in Talang Banjar (t-1).	-0,180	0,767	-0,234	0,815	(ns)
2	(X_2) Chili price differ in Angsoduo	1,180	0,039	30.446	0,000*	(s)
3	(X_3) previous Chili Price in Angsoduo	1,094	0,767	1.425	0,155	(ns)
	R^2 : 0,973					
	F_{count}: 3771,57 (s)					

Dependent Variable: (P_{it}) Chilli price at Talang Banjar Market today

The coefficient of determination (R^2) was 97,3% for the red chili integration model and 99,5% for shallots. Simultaneously the variations of previous prices at Talang Banjar Market (P_{it-1}) and price differences at Angsoduo Market (P_{jt}–P_{jt-1}) and previous prices at Angsoduo Market (P_{jt-1}) could explain variations in today's red chili price formation at Talang Banjar Market (P_{it}) of 97,3%. There were still 2,7% other factors that also influenced the price of chilies today at Talang Banjar Market but were not detected in the equation model above.

The F Test results showed a significant effect at the 95% confidence level. This showed that simultaneously the previous price at Talang Banjar Market (P_{it-1}) and the price difference at Angsoduo Market (P_{jt}–P_{jt-1}) and the previous price at Angsoduo Market (P_{jt-1}) influence the formation of chili prices red today at Talang Banjar Market. In the other side partially, the independent variable that influences the formation of daily red chili prices at Talang Banjar Market was only the price difference at Angsoduo Market (P_{jt}–P_{jt-1}). This was indicated by the significance figure of the analysis results (0,000) which was smaller than 5%. This explains that the greater the price difference (today price and the previous one) in the Angsoduo market, the higher the price of chilies today would be in Talang Banjar Market. In this case, today's price of chilies at Talang Banjar Market was not significantly influenced by the previous price of chilies at Talang Banjar Market and the previous price of chilies at Angsoduo Market.

The level of integration could be determined by looking at the IMC (Market of Connection Index) value as follows:

$$IMC_{(Curly\ chilies)} = \beta_1/\beta_3 = (-0,18)/1,094 = -0,165$$

This study of market integration using the IMC indicator showed that the ratio between the coefficient β_1 and the coefficient β_3 was the coefficient of previous red chili price variable at Talang Banjar Market. The coefficient β_1 which was negative (-0,180) indicates that previous price increase in Talang Banjar was followed by a decrease in current prices and vice versa, previous price decrease was followed by an increase in current prices. This was not in accordance with theoretical rules. Usually previous price increase in a market is followed by a price increase the next day and vice versa. The negative value of β_1 causes the IMC value also to be negative and this value cannot be identified to conclude whether market integration had occurred or not, because this value did not comply with the correct theoretical rules (IMC is at least zero). IMC = 0 means that today's commodity prices in the follower market are really influenced by commodity prices in the reference market so it is very clear that there is market integration. IMC which is increasingly moving towards number 1 indicates that the dependence of current commodity prices in a market is weakening on previous prices in the reference market and increasingly indicates the absence of market integration.

This was different from the research results of Sandra et.al., (2012) which analysed price behaviour and market integration of chilies in Bengkulu Province using statistical methods such as the Granger causality test and stationarity test. The results of the Granger causality test show that the red chili market in Bengkulu Province was not dominated by one market leader, but showed a high level of market integration between producing and consumer areas.

Shallot Market Integration between Angsoduo and Talang Banjar Market.

The price of red shallots at Talang Banjar Market today (P_{it}) was thought to be influenced by three things, i.e. the previous price of red shallots at Talang Banjar Market (P_{it-1}), the price difference at Angsoduo as a reference market ($P_{jt} - P_{jt-1}$), and Angsoduo's previous price (P_{jt-1}). The results of SPSS (23 version) analysis produce the following regression equation:

$$P_{it} = 293,44 + 0,884(P_{it-1}) + 0,926(P_{jt} - P_{jt-1}) + 0.112(P_{jt-1})$$

Note :

P_{it} : Price of shallots at Talang Banjar Market at day t (today)
$P_{(it-1)}$: Price of shallot at Talang Banjar Market at day t-1 (Previous Price)
P_{jt} : Price of shallots at Angsoduo Market at day t (today)
$P_{(jt-1)}$: Price of red shallot at Angsoduo Market at day t-1 (Previous Price)

The coefficient of determination (R^2) value of 95,5% showed that the variation of the previous price of shallots at Talang Banjar Market (P_{it-1}) and the price difference at Angsoduo Market (P_{jt}–P_{jt-1}) and the previous price at Market

Angsoduo (P_{jt-1}) could can explain the variation in today's shallot prices at the Talang Banjar Market (P_{it}) of 99,5%. There was still another 0,5% for other factors that also influence today's shallot prices at the Talang Banjar Market but were not detected in the equation model.

Table 3. Partial Analysis result of Red Shallot Market Integration (α : 5%)

	Model	Unstandardized Coefficients				Conclusion
		B	Std. Error	t	Sig.	
1	(Constant)	293,44	133,553	2,197	0,029	
	(X_1) Previous Price of shallot in Talang Banjar (P_{it-1})	0,884	0,027	32.922	0,000*	(s)
	(X_2) Price Difference in Angsoduo ($P_{jt} - P_{jt-1}$)	0,926	0,023	40.895	0,000*	(s)
	(X_3) Previous Price in Angsoduo (P_{jt-1})	0,112	0,027	4.127	0,000*	(s)
2	R^2: 0,995 F_{count} : 20.856,84 (s)					
	Dependent Variable: (Y) Price of Shallots at Talang Banjar Market today					

Model Unstandardized Coefficients t_{Sig}.

The F test results showed a significant effect at 95% confidence level. This showed that simultaneously the previous price of shallots at Talang Banjar Market (P_{it-1}) and the price difference at Angsoduo Market (P_{jt}–P_{jt-1}) and the previous price at Angsoduo Market (P_{jt-1}) significantly influence simultaneous in the formation of today's shallot prices at the Talang Banjar Market (P_{it}). Partially, all independent variables, in this case the previous price of shallots at Talang Banjar Market (P_{it-1}) and the price difference at Angsoduo Market (P_{jt}–P_{jt-1}) and the previous price at Angsoduo Market (P_{jt-1}) influenced the formation of shallot prices today at Talang Banjar (P_{it}).

Table 3 shows that all significance values from the t test analysis results were smaller than 0,05. The positive coefficient number on the independent variable indicates that the formation of shallot prices in the Talang Banjar market moved in the same direction as the shallot price that occurred in each independent variable. The regression coefficient on the previous shallot price variable at Talang Banjar Market (P_{it-1}) was 0,884, indicating that if there was an increase or decrease in the previous price of red shallots at Talang Banjar Market by Rp. 1.000/Kg, the price would be higher or lower in the next day amounting to Rp. 884/Kg.

The level of integration can be determined by looking at the IMC (Market of Connection Index) value as follows:

$$IMC_{(Shallot)} = \beta_1/\beta_3 = 0,884/0,112 = 7,89$$

The Index Market Connection (IMC) value for shallot was greater than one. This means that there was no integration between markets at Talang Banjar Market and Angsoduo Market for shallot. Tomycho O. et.al., (2020) stated that Market integration can affect the distribution of shallot by changing the flow of goods and services between different markets. Market integration can lead to changes in transportation costs, infrastructure development, and supply and demand dynamics, which can further impact shallot prices. Kustiari, (2017) analysed price behaviour and market integration of shallots in Indonesia. This research used monthly producer and consumer price data for 2011-2016. Price fluctuations were analysed using the coefficient of variation.

Market integration was analysed using the Johansen cointegration approach using the Vector Error Correction Model (VECM). Studies showed that price fluctuations at the producer and consumer level increased after the implementation of the Horticultural Product Import Recommendation policy. The Engle-Granger causality test showed that there was no causal relationship between consumer prices of shallots and producer prices in Indonesia. Market forces and market failure were caused by the absence of causality. The results of the forecasting error variance decomposition analysis showed that the market in Central Java was the dominant market and could be used as a reference market in predicting the dynamics of consumer shallot prices in Indonesia. Management of shallot production levels and the amount of shallot supply in the Central Java market was the key to ensuring the stability of shallot prices at the national level.

The value of β_2 shallot was closer to 1 (0,926) than the value of β_2 chilli (1,18). It showed a higher degree of association for shallot. finally it had a meaning that the integration of the two markets for shallot was stronger than cilli in the long term.

CONCLUSION

The following conclusions could be obtained from the results of the research that had been carried out:

The price of this red chili, both at Talang Banjar Market and at Angsoduo Market over the last 312 days (11 months) had fluctuated with a standard deviation of Rp.22.988,48/Kg and showed the same range (Rp. 16.000-150.000/Kg) with an average price of Rp. 41.139/Kg and the Angsoduo Market variant was 17,444. Meanwhile, the price of shallot at Angsoduo Market ranges from Rp. 24.000 – 50.000 per kg with an average price of Rp. 30.314 ±

6.328,93. In contrast, the price range at Talang Banjar Market moved from Rp. 24.000–52.000/Kg with an average chilli price of Rp.32.641±6.254,93.

The difference in average monthly prices could be seen where the price of shallots at Talang Banjar Market was higher (Rp. 32.362,82/Kg) than the price at Angsoduo Market (Rp. 30.990/Kg) and showed a significant difference. The price variance for shallots in Talang Banjar looked bigger (1,0875) than the price variance in Angsoduo (0,0426).

The coefficient of determination (R^2) was 97,3% for the integration model for red chilies and 99,5% for shallots. Simultaneously, the previous price at Talang Banjar Market (P_{it-1}) and the price difference at Angsoduo Market ($P_{jt}–P_{jt-1}$) and the previous price at Angsoduo Market (P_{jt-1}) influence the formation of today's red chili price at Talang Banjar Market. Partially, the independent variable that influences the formation of daily red chili prices at Talang Banjar Market was only the price difference at Angsoduo Market ($P_{jt}–P_{jt-1}$). The index market connection (IMC) value for red chilies was less than one (-0,165< 1), which means there was integration between Talang Banjar and Angsoduo Market for red chili. Meanwhile, for shallots, the coefficient of determination (R^2) was 95,5%. Simultaneously, the previous price of shallots at Talang Banjar Market (P_{it-1}) and the price difference at Angsoduo Market ($P_{jt}–P_{jt-1}$) and the previous price at Angsoduo Market (P_{jt-1}) significantly influenced the formation of today's shallot prices in Talang Banjar Market (P_{it})t. Partially, all independent variables influence the formation of today's shallot prices at the Talang Banjar Market (P_{it}).

The Index Market Connection (IMC) value for the red chili was less than one (-0,165). This means that there was integration between markets at Talang Banjar Market and Angsoduo Market for red chili. Meanwhile, the IMC value for shallot was greater than one (7,89). This means that there was no integration between markets at Talang Banjar Market and Angsoduo Market for shallot. This indicated that the price of shallot that occurs in the Talang Banjar market was not caused by the distribution of the goods flow from the Angsoduo market but it was possible that the shallot products in the Talang Banjar market are supplied from other suppliers outside the Angsoduo market.

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