Agricultural Socio-Economics Journal
Volume XX, Number 1 (2020): 23-30

P-ISSN: 1412-1425
E-ISSN: 2252-6757

ANALYSIS OF MARKET INTEGRATION CAYENNE PEPPER (*Capsicum frutescens L.*) IN MALANG DISTRICT

Artianti Anin Hanani*, Ratya Anindita, Rini Mutisari

Department of Agricultural Economics, Faculty of Agriculture, Universitas Brawijaya
*corresponding author: artiantianinhanani@gmail.com

Abstract: Cayenne pepper is one of the main food ingredients that is always needed by the people of Indonesia. This makes the compilation of chili prices at the consumer level going up to eliminate losses for farmers, because prices agreed to by consumers are not comparable to the profits obtained by farmers. The price gap that occurs makes farmers not increase. The purpose of this research are to analyze the market integration and analyze the cayenne reference market. The data used are time series price data during 2014 - 2018. The method of data analysis uses the Error Correction Model (ECM) test and the Engle-Granger Causality test. The application used for data analysis is Eviews 10. The results showed long-term and short-term differences among the price of cayenne. There is one-way relationship while producer prices increase the prices of retailers, so the cayenne reference market is famers.

Keywords: *Cayenne Pepper, Market Integration, Reference Markets*

http://dx.doi.org/10.21776/ub.agrise.2020.020.1.4

Received 20 July 2019
Accepted 15 December 2019
Available online 31 January 2020

INTRODUCTION

Chili is a food needed by the people of Indonesia. This is indicated by the presence of high cayenne consumption data even though it tends to increase every year. Consumption of cayenne pepper in 2013 reached 1.92 kg/ capita/ year fluctuating to 2.28 kg/ capita/ year in 2017. Statistically during 2013-2017 even though consumption of cayenne fluctuated but tended to increase from year to year (Agency Statistics Center, 2018). Fluctuations in cayenne production are also experienced in 2017, it is known from monthly data that tends to rise and fall. In certain seasons, farmers produce cayenne pepper in a certain amount that affects the supply conditions and causes the price of chili to fluctuate. If the price of cayenne increases, the farmers will plant cayenne simultaneously which makes the stock of chili pepper abundant, resulting in a decrease in the price of chili due to a harvest (Manado, 2016).

Price increases are also experienced when cayenne production decreases, this can occur due to crop failures which affect market availability and make prices tend to be more expensive (Agricultural Data and Information System Center, 2016). Price increases are also related to marketing activities. When compared to prices at the consumer level, chili prices at the producer level are lower. Some factors that influence include transportation factors, low chili endurance, and low purchasing power (Manado et al., 2016). The large price gap between producers and consumers indicates an asymmetric price transmission (Siskaperbapo, 2018).

Price gap or price disparity occurs at the level of farmers and consumers due to high price fluctuations and allows traders to manipulate information at the producer level. In 2016 the price of cayenne at the producer level was Rp. 18,000, while at the consumer level it was Rp. 34,600. In 2017 the price of cayenne pepper increased, at the producer level for Rp. 47,000 and at the consumer

CITATION: Hanani A. A., Anindita R., Mutisari R. (2020). Analysis of market Integration Cayenne Pepper (Capsicum frutescens L.) in Malang District. Agricultural Socio-Economics Journal, 20(1), 23-30
DOI: http://dx.doi.org/10.21776/ub.agrise.2020.020.1.4

level for Rp. 101,047. In 2018 the price of cayenne at the producer level decreased, which was worth Rp 20,000 and at the consumer level for Rp 48,836. The large price gap between producers and consumers indicates an asymmetric price transmission (Siskaperbapo, 2018). The gaps that occur cause farmers not to get optimal profits and consumers pay which should not be paid.

The gap that occurs causes farmers not to get optimal profits and consumers pay higher prices. The price gap that occurs between marketing institutions can be measured by market integration. A market can be said to be well integrated if the price in a marketing institution can be transformed to other marketing institutions in one marketing chain (Dang and Lantical, 2011).

Based on the description above, it is important to analyze the integration of the cayenne market at the producer level and at the retailer level so as to minimize the price gap that occurs in the cayenne marketing agency, and to describe the conditions of the producer market relationship with retailers using the price data of both levels. Market integration analysis is also to see which level is the reference market between the level of producers and retailers at the price of cayenne.

RESEARCH METHODS

Research on the integration of the cayenne market was carried out in Malang District, East Java. The choice of location in Malang District is done by purposive method that is deliberately. Determination of location because there is no research on the integration of the cayenne market in Malang District, so researchers want to know how the relationship between the price of cayenne at the producer level and at the level of retailers. The time of the study was carried out in February 2019 until April 2019.

Data used for time series price data for a period of five years from January 2014 to December 2018, prices used at the producer (farmers) level and retailer level. The secondary data is extracted from official government agencies, literature studies, articles, previous research and trusted journals.

The data analysis method used to answer the two objectives in this study was the analysis of the integration of the cayenne market using stationary test, co-integration test and Error Correction Model (ECM) test, and to see the reference market using an engle-granger causal test on cayenne at the level producers and retailers. Data analysis using the Eviews 10 application.

1. Stationary test

The method used is a test (Augmented Dickey-Fuller) to find out a time series data fulfilling stationary assumptions using the following equations (Anindita and Baladina, 2017). First, do the Dickey Fuller (DF) test on level conditions, with the following equation:

$$P_t = \alpha_1 P_{t-1} + \varepsilon_t$$

Information:

P_t : variable price of cayenne pepper at every level of the market per tonne (Rg / Kg)

α : coefficient

εt : error term.

Second, when it is not stationary at level conditions, what must be done is through stationary testing with the Augmented Dickey Fuller (ADF) test in the condition of first different (I (1)) and if there are still those that are not stationary then second different is done (I (2)) and so on until all data is stationary, the following is the ADF test for order 1:

$$\Delta P_t = \beta_1 + \beta_2 + \delta Pt_{-1} + \alpha_1 \sum_{k=1}^{k=K} \Delta P_{t-1} + \varepsilon_t$$

This equation is an intercept model where β_1 and β_2 are trends.

$$\Delta Pt = \delta P_{t-1} + \varepsilon_t$$

Information:

P_t : variable price of cayenne pepper at each market level in the t-period (Rp / Kg)

P_{t-1} : variable price of cayenne pepper at each market level in the t-period minus the lag value or in the previous period (Rp / Kg)

ΔP_t : Pt - Pt-1 is the operator difference (the difference operator) for each price variable

t : time

β_1 : intercept

α,β,δ : coefficients

ε_t : error term

Test criteria: H1 = 0, alternative H = 1

a. If the statistical t test for the α coefficient > ADF critical value then reject H_0 and accept alternative H_1.
b. If the statistical t test for the α coefficient < ADF critical value then accept H_0 and reject alternative H_1.

2. Co-integration test

Co-integration analysis is a powerful tool in providing clear results about the presence or absence of relations between two groups of time series data (Anindita and Baladina, 2017). The equation used is as follows:

$$PP_t = \alpha + \beta PE_t + U_t$$

Information:

PPt : selling price of cayenne at the producer level in the period t (time) (Rp / Kg).

PE_t : the selling price of cayenne at the retailer's level in the period t (time) (Rp / Kg).

α : intercept.

β : parameter coefficient.

U_t : error term.

Test criteria:

a. Time series price data is often non-stationary, so price relations in both markets are seen through U_t.
b. Stationary U_t implies that changes in prices at the producer level are not contradictory or distorted in the long run at the retailer level (co-integration data).

3. Error Correction Model (ECM) Test

The ECM test to correct short-term imbalances towards long-term equilibrium, and can explain the relationship between the dependent variable and the independent variable at the present time with the past. The process of error correction as aligning short-term behavior has the potential to experience an imbalance in the direction of long-term behavior that presents a balance condition. The ECM equation used is as follows:

$$\Delta PP_t = \alpha_0 + \alpha_1 \Delta PE_t + \alpha_2 \, ECT + \varepsilon_t$$

Information:

ΔPP_t : changes in the selling price of cayenne at the farm level in the period t (time) (Rp / Kg).

ΔPE_t : changes in the selling price of cayenne at the consumer level in the period t (time) (Rp / Kg).

α_0 : intercept.

α_1 : short term coefficient.

α_2 : the proportion of errors in the balance that occurs in the last period which will be corrected for one tofu or speed of backequelibrium adjustments (1 / α2).

ε_t : error term.

Based on the results of statistical research, if the significance has a negative sign it means that the model used in the study is valid. The short term coefficient of the ECM equation is presented by the coefficient value of ECT. Short-term test results will be significant if the probability value is <0.05 (Ajija et al., 2011).

4. Engle Granger Causality Test

Causality tests are used to conduct reciprocal tests or two-way relationships in knowing the direction of the influence of market integration. Test criteria as follows:

a. If PP_t does not granger cause to PE_t have a probability value > value α (0.05) then accept H_0: (the results are not real) can be interpreted that PP_t does not affect the PE_t.
b. If PPt does not granger cause to PEt have a probability value < value of α (0.05) then reject H_0: (tangible results) can be interpreted that PP_t affects PE_t.
c. If PE_t does not granger cause to PPt has a probability value > α (0.05) then accept H_0: (the results are not real) can be interpreted that PE_t does not affect PP_t.
d. If PE_t does not granger cause not PP_t has a probability value < value of α (0.05) then reject H_0: (tangible results) can be interpreted that PE_t affects PP_t.

RESULTS AND DISCUSSION

Market integration is an indication of marketing efficiency, especially price efficiency, so that market integration is used to see the extent to which one market with another interacts in price changes that occur due to demand and supply that occur in the market. Two levels of the market are said to be integrated or integrated if the price changes at one level of the market are channeled to another market. Market integration will be achieved if there is adequate market information and is channeled quickly to other markets so that engaged actors at both market levels (reference markets and follower markets) have the same information (Asmarantaka, 2009). The following are the results of an analysis of the integration of the cayenne market, as follows.

1. Stationary Test

The stationary test is done using the Augmented Dickey Fuller (ADF) test. When the time series data at level conditions are not stationary, the stationary test is followed by testing on the first difference condition. If the data on the test on the condition of the first difference remains in a non-questionnaire

state then proceed to test at the second difference level and so on until the time series data is stationary.

Table 1. Stationary test results at level

Variable	DF *Statistic*	*Critical Value*			Prob.	
		1%	5%	10%		
Produser	-3,58	-4,12	-3,48	-3,17	0,03	Stationary
Retailer	-3,22	-4,12	-3,48	-3,17	0,09	Not stasionary

Source: Secondary Data processed, 2019

Based on the stationary test results show that from the two variebles at the retailer level there is no unit root (not stationary). Because the probability value at the retailer level has a value greater than the value of α, which is 0.09 so it must be tested again in the first difference condition. While for the producer level, the unit has a root (stationary). When the probability value is less than the value of α which is 0.05, it means that the sequential data at that time has a root unit (stationary). After stationary testing at a level condition that shows at the stationary producer level, but at the retailer level it is not stationary, then the next step is to do stationary testing in the first difference condition. In the condition of first difference there is a test of intercept equation and none intercept equation test.

Table 2. Results of stationary test results in first difference

Variable	ADF *Statistic*	*Critical Value*			Prob.	Info.
		1%	5%	10%		
Produser *(None)*	-9,23	-2,60	-1,94	-1,61	0,00	Stationary
Produser *(Intercept)*	-9,05	-4,12	-3,48	-3,17	0,00	Stationary
Retailer *(None)*	-8,11	-2,60	-1,94	-1,61	0,00	Stationary
Retailer *(Intercept)*	-7,97	-4,12	-3,48	-3,17	0,00	Stationary

Source: Secondary Data processed, 2019

The test results show that at the producer level and the level of retailers already have a root unit (stationary) seen in Table 2. Because the first difference testing is done at the retailer level, the testing is also carried out at the producer level so that the two variables used in the study have units root under the same conditions. So that both variables are known to have a root unit (stationary) in the first difference condition in the intercept equation test and no equation test shows that the two variables are known to have a root unit (stationary).

2. Co-integration Test

The co-integration test results obtained by forming residuals are obtained by regressing the independent variable on the dependent variable in OLS. The residual must be stationary at the level to be said to have co-integration (Basuki, 2017).

After stationary testing it is known that the data is stationary on the order of first difference I (1). The second stage is to test the regression value produced stationary or not. The residual value is generated from the regression model between prices at the producer level and at the retailer level, where prices at the producer level as the dependent variable and the price at the retailer level are independent variables. The regression results from prices at the producer level and at the retailer level can be seen in Table 3 as follows.

Table 3. Results of regression between prices at the producer level and at the level of retailers

Dependent Variable: Producer Price (PP)					
Variable	Coefficient	Standard Error	t-stat	Probability	R^2
Retailer Price (PE)	0,81	0,03	21,67	0,00	0,89
C	124	167	0,74	0,46	

Source: Secondary Data processed, 2019

The residual values of the two variables are significant at the 95% confidence level. This can be seen in the probability value produced less than the significant value (α) which is 0.05 and the R-squared value is close to one, which is 0.89. The R-square value obtained explains that 89% of the price of cayenne pepper at the producer level can be explained by the price of cayenne at the retailer's level.

In the regression results between the prices at the producer level and at the retailer level a residual value can be formed which will then be stationary test on the residual value, can be seen in Table 4 below.

Table 4. Co-integration Test Results between Prices at the Producer Level and at the Level of Retailers

Co-integration Test	Level condition			
	t-Statistic	Critical Value	Probability	Info.
Prices at the producer level and at the retailer's level	-5,61	5% (-3,48)	0,00	Stationary

Source: Secondary Data processed, 2019

The co-integration that occurs between the two variables shows that between prices at the producer level and at the retailer level there is a long-term relationship. This can be seen from the residual value of the two variables that are stationary at the level condition, where the t-statistic value is less than the critical value with a probability value of less than 0.05, which is 0,00. These results are in accordance with the terms of co-integrated data, where the data used must be integrated in the same degree. That is, if two or more data have different degrees of integration, for example the producer price conditions I (1) and the price of the retailer condition I (2), then the two variables cannot be co-integrated (Engle-Granger in Astuti, 2001).

3. Error Correction Model (ECM) Test

The next is correcting the imbalance (Error Correction Model-ECM). Short-term relationships using the ECM method will produce the coefficient value of ECT (Error Correction Term). This coefficient measures the response rate of each period which deviates from balance. (Basuki, 2017).

According to Widarjono (2007) the ECT imbalance correction coefficient is in the form of an absolute value that explains how fast time is needed to obtain a balance value. Testing with ECM is done to correct short-term imbalances towards the long term. The test results can be seen in Table 5 as follows.

Table 5. Results of testing of the ECM Model between Producers and Retailers

Dependent Variable : Producer Price (PP)					
Variable	Coefficient	Standard Error	t-Statistic	Prob.	R^2
Retailer Price (PE)	0,83	0,05	16,26	0,00	0,86
ECT (-1)	-0,71	0,05	-16,42	0,00	
C	213	177	0,12	0,90	

Source: Secondary Data processed, 2019

Based on Table 5 shows the formation of ECM estimates between the price of cayenne at the producer level and the price of cayenne at the retailer's level, which indicates that the ECT value on the model is negative and statistically significant at the 95% confidence level can be seen from a probability value of less than significant value (0.05) which is 0.00. This explains that the model used in this study is valid to use.

At the R-square value that is produced close to one, which is 0.86, which means the better the accuracy of the independent variable in explaining the dependent variable. The R-square value of 0.86 also explains that 86% of price changes at the producer level can be explained by price changes at the retailer's level and the remaining 14% can be explained by variables outside the model. This means that the price of cayenne pepper at the producer level is affected by 86% by the movement of cayenne prices at the level of retailers.

The ECT Coefficient value produces an ECT value of -0.71 which indicates the proportion of errors in the balance condition to be corrected. The coefficient value explains that the mismatch between the long-term and the short-term that can be corrected for one year is around 71%. This means that price adjustments in the condition of the price balance of cayenne at the producer level and at the retailer's level require around 1.4 months (1 / 0.71).

Based on the results of testing the relationship between the price of cayenne at the producer level and at the retailer level has been integrated. The negative value on the ECT coefficient value indicates that the two variables have a long-term relationship but the movement of cayenne prices in short-term equilibrium conditions is getting further away. This shows that even though it is integrated, the price has not been transmitted perfectly, so there is still information that has not been conveyed perfectly.

The PE coefficient value explains that the increase in the price of cayenne that occurs at the retailer's level will cause an increase in the price of cayenne at the producer level, but the price movement of cayenne is further away from the short-term balance. This is indicated by the coefficient value of PE produced at 0.8333 which means that if there is an increase in the price of cayenne at the retailer level of Rp. 1,000.00 it will cause an increase in the price of cayenne at the producer level of Rp. 833.30, but the increase in the price of cayenne at the producer level tends to be lower than the increase that occurs at the level of retailers.

Based on these results indicate that the price of cayenne at the producer level and the level of retailers has been integrated. Ravalion (1986) in Magfiroh et al (2017) which states that in an integrated market the prices of different markets have a positive relationship as a reflection of the smooth flow of market information. In addition, in Baffes and Bruce (2003) in Magfiroh et al (2017) also states that market integration will be achieved if there is the same market information, adequate, channeled quickly to other markets and has a positive relationship between the prices in different markets.

4. Engle-Granger Causality Test

The Engle-Granger causality test is conducted to see whether or not there is a causality relationship between variable prices at the producer level and prices at the retailer level. Causality relationship between variables can be known through its probability value, when the probability value is less than a significant value of 5% then between variables have a causality relationship, whereas when the probability value is greater than a significant value of 5%, between variables there is no causality relationship. The test results are as follows.

Table 6. Test Results of Engle-Granger Causality

Null Hypothesis	F-Statistic	Prob.
Producer price Does Not Granger Cause retailer price	5,72	0,02
Retailer price does not Granger Cause Producer price	0,00	0,95

Source: Secondary Data processed, 2019

The results of the granger causality test in Table 6 above explain that between the price variables at the producer level and prices at the retailer level have a causality relationship. This is shown by a probability smaller than a significant value of 0.05. The causality relationship between producers and retailers is known to be in the same direction, because only producers affect retailers, while there is no causality from retailers to producers.

This is in accordance with research by Utari (2018) that the price of the wholesale market with consumer prices shows a one-way relationship. Where retailers will set a selling price based on the purchase price in the wholesale market. When there is no price increase at the wholesale market level, it will also be followed by price increases at the consumer level. Similarly, prices at the wholesale market level, where prices in the wholesale market are affected by prices at the farm level, when the harvest season occurs, prices at the wholesale market level will automatically adjust to prices formed at the farm level.

CONCLUSION

Based on the analysis of market integration between the price of cayenne at the producer level and at the level of retailers in Malang Regency, there is integration. This is indicated by the results of the ECM estimation test producing a negative ECT value and statistically significant at the 95% confidence level and the probability value is less than the value of α (0.05) which is 0.00. The ECT Coefficient value in the ECM model estimation results in an ECT value of -0.71, this indicates that even though it is integrated but the price has not been transmitted perfectly, so there is still information that has not been conveyed perfectly. The ECT coefficient value indicates that a non-conformity can be corrected for one year around 71%. Price adjustments in balance conditions require around 1.4 months.

Based on the results of the Engle-Granger causality test shows that the cayenne reference market is the price at the producer level. This is indicated by the probability value (0.02) less than the significant value (0.05), so that the market can be said to be dominant in the producer in the formation of prices, if the price changes that occur at the producer level can be transmitted to the retailer level.

ACKNOWLEDGEMENTS

Based on the conclusions that have been obtained, the advice that can be given is the need for farmers and retailers to actively dig up information so as not to become victims of price games from those who want a one-sided profit. The need for the government to empower farmers by providing solutions for the cultivation and marketing of cayenne. Related to further research it is recommended to be able to conduct spatial integration research between Malang Regency and other regions that produce cayenne pepper, and see which markets are the reference market.

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