Analysis of the Effect of Cayenne Pepper Prices in East Java

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Abstract. The erratic and often fluctuating price of cayenne pepper has caused many people to complain about the situation. Especially if the price increases significantly. This is because cayenne pepper is a basic necessity and cannot be separated from every Indonesian seasoning. Price changes that occur in cayenne pepper are due to various factors ranging from climate and weather, the perishable nature of chillies, seasonal production, religious factors and many others. In this study, the factors that will be examined to see the effect of changes in the price of cayenne pepper are the price of curly red chillies, the price of large red chillies, the production of cayenne pepper, and the harvest area of cayenne pepper. The data used is secondary data sourced from the Central Statistics Agency (BPS) and the Startegis Food Price Information Centre (PIHPS) with the help of multiple linear regression analysis tools and using data from 2020 to 2022. The result of multiple linear regression analysis is that the price variable of large red chillies has a negative and significant effect on the price of cayenne pepper. In addition, the variables of production and harvest area of red chilli have no effect and are not significant to price changes. Judging from the results of this study, it is hoped that the government can make policies so that the price of cayenne pepper remains stable.

Keywords: Cayenne Pepper, Influence, Multiple Linear Regression

1 Introduction

Cayenne pepper is one type of horticultural crop that has tremendous growth potential ((1)). The great potential of horticulture for the economy is suitable for development, so that the development of the horticultural sub-sector is supported by a legal umbrella, Law No. 12 of 1992 concerning agricultural cultivation and Law No. 13 of 2010 concerning horticulture. Cayenne pepper is also a seasonal vegetable crop commodity(2–6). Annual vegetable crops provide vitamins, salts, minerals, and other nutrients through consumed plant parts, namely leaves, flowers, fruits, and tubers that are less than a year old. Cayenne pepper is classified as a type of vegetable crop whose

K. B. Abiprayu and A. B. Setiawan (eds.), *Proceedings of the International conference of Economics Business and Economics Education Science (ICE-BEES-24)*, Advances in Economics, Business and Management Research 298,
https://doi.org/10.2991/978-94-6463-522-5_6

harvesting is done repeatedly or more than once (7). East Java Province is the largest producer of cayenne pepper in Indonesia and has been the centre of cayenne pepper production for many years. Therefore, cayenne pepper is a very economical business because it can boost the economy in Indonesia (8).

Cayenne pepper is also classified as a contributor to inflation (9), besides that because Indonesian cuisine, which on average has a spicy taste, makes cayenne pepper a staple of every dish (10,11) Over the past five years (2018-2022) the production level of cayenne pepper in Indonesia has been higher than that of large chillies (12). Based on the publication of the central statistics agency (13) in 2022 production reached 1.54 million tonnes, this result increased by 157,99 thousand tonnes compared to 2021 or an increase of 11.4%. In addition, cayenne pepper consumption in 2022 was 569,65 thousand tonnes, in 2021 it was 528,14 thousand tonnes or an increase of 7.86%. The three regions with the largest cayenne pepper production in Indonesia are East Java, Central Java, and West Java. The contribution of the East Java region to national production reached 41.88% in 2022 or the production reached 64,74 thousand tonnes.

The harvest area itself reached 80,61 thousand hectares. East Java as the largest producer of cayenne pepper in Indonesia, in 2011-2022 its production tends to increase. Based on data from Badan Pusat Statistik (BPS) and Kementrian Pertanian (Kementan) (1,3–5,14)), the largest production occurred in 2020 which reached 684,943 tonnes of cayenne pepper. The harvest area in 2022-2022 ranged from 47 thousand hectares to 80 thousand hectares. However, each year does not experience a significant increase. In addition, the price of cayenne pepper in East Java tends to fluctuate (15), this phenomenon occurs due to weather climate factors and the existence of holidays that cause price changes in cayenne pepper (11,16,17).

One of the factors for price fluctuations is because cayenne pepper is classified as a seasonal crop, besides that farmers tend to plant simultaneously, which automatically causes over supply during the harvest season (18,19). It is not uncommon for many farmers to complain about the up and down price situation, so that when the price drops, many of them hold demonstrations and throw away their chilli harvest for free. This is a form of farmer disappointment with the low price and is not proportional to the treatment of chillies so far. The chilli dumping action aims to create a chilli shortage so that it can increase the price of chilli again. Avoiding large and unpredictable price changes requires hedging risks, helping to formulate food policy, and the implications for the broader financial and macroeconomic environment (20) These actions cannot be separated from government intervention to overcome all existing problems in order to create a structured and systematic policy in overcoming changes in the price of cayenne pepper.

This research was conducted to see the factors that influence changes in the price of cayenne pepper that occur in Indonesia. The analytical tool used is multiple linear regression analysis, while the variables used include cayenne pepper price, large red chilli price, curly red chilli price, cayenne pepper production, and cayenne pepper harvest area. The purpose of this research is to find out what influences changes in the price of cayenne pepper (21–23) especially the East Java region in formulating policies in overcoming price fluctuations (24), which then farmers can receive direction from the government or related parties about the system and planting period (20,25). In addition,

this research also affects consumers on the price of cayenne pepper that will occur. Given the seasonal nature of cayenne pepper and its dependence on weather factors, prices often fluctuate (26). Price fluctuations are also caused by external factors such as ongoing political factors in Indonesia and economic conditions (27–29). This situation makes the role of marketing distribution and the role of the government very necessary to maintain price stability (23,30,31).

2 Method

The methods used are descriptive analysis and multiple linear regression analysis. The research was taken from 2020 to 2022 which is monthly data in time series (32,33), with the object of research being the East Java region as the largest producer of cayenne pepper in Indonesia. The data processed is secondary data sourced from Badan Pusat Statistik (BPS), and Pusat Informasi Harga Pangan Strategis(PIHPS). In addition, to support the research, data collection is also obtained from journals, articles, and related books.

There are five variables, namely one dependent variable (Y) and four independent variables (X), namely; the price of cayenne pepper as the dependent variable and the independent variables include the price of large red chillies, the price of curly red chillies, the production of harvest area, and the harvest area of cayenne pepper. Multiple linear regression analysis is used with the aim of estimating the value of the independent variable, if the independent variable is known. In addition, it is also to find out how the Y variable is related or related to the X variable. The existence of this analytical tool is to reinforce or support and find the cause of fluctuating chilli prices.

Mathematically, the multiple linear regression equation is as follows;

$Y = a + b1\ X1 + b2\ X2 + \ldots + bn\ Xn$

Description:

Y = dependent variable (influenced variable)

a = constant

b1,b2, ...,bn = regression coefficient value

X1,X2,...,Xn = independent variable

3 Result and Analysis

Changes in the price of cayenne pepper occur not only due to weather / seasonal conditions but are caused by other factors (19). In this study, the factors that influence the price of cayenne pepper focus on the variables of the price of large red chillies, the price of curly red chillies, production and harvest area of cayenne pepper. The purpose of this analysis is to identify the components that contribute to the decrease or increase in the price of cayenne pepper in East Java Province. This analysis was carried out with multiple linear regression analysis tools assisted by EViews version 12;

3.1 Classical Assumption Test

The static requirement in multiple linear regression analysis is the classical assumption test. In this test there are several classic assumption tests, namely multicollinearity test, heteroscedasticity test, autocorrelation test, and normality test.

3.1.1 Multicollinearity Test

The multicollinearity test is used to see the close correlation between the independent variables in the regression model under study. The results of the multicollinearity test can be seen in table 2 (A) from the VIF (Variance Inflation Factor) value, if VIF < 10 then there is no multicollinearity (passes the multicollinearity test). However, if the VIF value> 10 then multicollinearity occurs or there is a multicollinearity disorder in the model under study. It is known that the VIF value of Independent Variables of large red chilli price, curly red chilli price, cayenne pepper production, and cayenne pepper harvest area are (5.638594), (5.787080), (1.668579), (1.660684) respectively. There are two variables that exceed the number ten, namely the variable price of large red chillies and the price of curly red chillies > 10.00, so it can be concluded that there is a multicollinearity problem in the prediction model or does not pass the multicollinearity test.

Table 1. Multicollinearity Test

Variable	Centered VIF
D(Large Red Chilli Price)	5.638594
D(Price of Curly Red Chillies)	5.787080
D(Cayenne pepper production)	1.668579
D(Harvested Area of Cayenne Pepper)	1.660684

Source: EViews 12, data processed, 2024

3.1.2 Heteroscedasticity Test

The heteroscedasticity test is used to determine whether the regression model has classical assumption deviations or not. Heteroscedasticity testing in this study uses the White Test. Based on table 2, the results obtained in the form of a chi-squared probability value of 0.9514, the chi-squared probability value is greater than the 5% significance level (0.9514> 0.05), meaning that there is no heteroscedasticity problem in the research model. It can be concluded that the heteroscedasticity test assumption has been met or the data has passed the heteroscedasticity test.

Table 2. Heteroscedasticity Test

Heteroskedasticity Test : White			
F-statistic	0.152896	Prob. F(3,31)	0.9602
Obs*R-Squared	0.699260	Prob. Chi-Squared(3)	0.9514
Scaled explained SS	0.729231	Prob.Chi-Squared(3)	0.9477

Source: EViews 12, data processed, 2024

3.1.3 Autocorrelation Test

The autocorrelation test is used to see whether or not there is autocorrelation in the regression model used, then with the Bruesch-Godfrey test. Judging from table 2 (C), it is known that the Probability Obs * R-Squared value is 0.4401 > 0.05, so it can be concluded that the autocorrelation test assumption has been met or the data has passed the autocorrelation test. Based on the results of model testing, there are no symptoms of autocorrelation so that multiple linear regression analysis can be continued.

Table 3. Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.688972	Prob.F(2,29)	0,5104
Obs*R-Squared	1.641641	Prob.Chi-Square(2)	0,4401

Source: EViews 12, data processed, 2024

3.1.4 Normality Test

The normality test is used to ensure that the data under study is normally distributed. The normality test is considered important because data with a normal distribution is considered representative of the sample population. To see whether the data is normally distributed or not, it can be seen from the Jarque-Bera Probability value. Based on table 4, it can be seen that the Probability Jarque-Bera value is 0.585076 > 0.05, it can be concluded that the data is normally distributed (passes normality). Thus, it can be concluded that the data is suitable for use.

Table 4. Normality Test

Probability	0.58507

Source: EViews 12, data processed, 2024

3.2 Statistical Test

Hypothesis testing in multiple linear regression aims to determine the dependence between the independent variable and the dependent variable or estimate the impact of one independent variable on the dependent variable. Regression analysis test using EViews version 12, this study uses the t test, f test, and the coefficient of determination. Judging from table 5

The big red chilli price variable from the partial test results (t test) shows that the variable has a t-statistic value (-4.202848) > (2.03951) t-table and a Prob. (Significance) value of 0.0002 <0.05, so the big red chilli price variable has a negative and significant effect on the cayenne pepper price variable. It is said to have a negative influence because the t-statistic result is -4.202848, so the variable has a negative influence. This result is in accordance with the theory of the law of demand, which has an inverse and negative relationship.

Table 5. Statistical Test

Variable	Coefficient	t-statistic	Prob.
C	-117.6174	-0.086054	0.9320
D(Large Red Chilli Price) (X1)	-1.249643	-4,379718	0.0002
D(Price of Curly Red Chillies) (X2)	2.041259	6.241117	0.0000
D(Cayenne pepper production) (X3)	1.549364	0.118427	0.9065
D(Harvested Area of Cayenne Pepper) (X4)	-5.816040	-1.280682	0.2101
R-Square	0.682077		
R-Square (Adj)	0.639687		
F-Statistik	16.09062		
Prob.F	0.000000		

Source: EViews 12, data processed, 2024

The partial test results (t test) show that the curly red chilli price variable has a t-statistic value of (6.241117) > t-table (2.03951). While the Prob. (Significance) value of 0.0000 <0.05, it can be concluded that the variable (X2) curly red chilli price has a positive and significant effect on the variable (Y) cayenne pepper price in East Java. The research results that show a positive and significant effect mean that the high price of substitute / complementary goods of the main goods shows a relative decrease in

prices even though the price is fixed. This means that the demand for the main good will increase if the price of the substitute good increases, and vice versa. This is in accordance with the law of supply, which has a positive and directly proportional relationship.

Meanwhile, the results of the analysis of the cayenne pepper production variable, in the partial test (t test), that variable X3 has a t-statistic value of (0.118427) < (2.03951) t-table and a Prob. (Significance) value of 0.9065 > 0.05, so it can be concluded that the cayenne pepper production variable has no effect and is not significant on variable Y. The results of this study indicate that there is no relationship between cayenne pepper production and the price of cayenne pepper in East Java. This is also not in line with demand theory, namely when the production of cayenne pepper falls, the price of cayenne pepper rises and vice versa. This research is not in accordance with research ((8) which states that any increase in the production of goods will result in a decrease in the price of these goods, and vice versa.

The cayenne pepper harvest area variable has a directly proportional effect on the amount of production, that is, if the harvest area is higher, it will produce high production, and vice versa. Judging from the results of the partial test (t test), that variable X4 has a t-statistic value of -1.280682< 2.03951 (t-table) and a Prob value. Significance value of 0.2101> 0.05, it can be concluded that the cayenne pepper harvest area variable has no effect and is not significant on the cayenne pepper price variable in East Java Province. This result shows that there is no connection or relationship between the cayenne pepper harvest area and the cayenne pepper price variable in East Java. This condition is in line with research from (2) which proves that the harvest area variable has no significant effect on the price of cayenne pepper.

3.3 Interpretation of Multiple Linear Regression Analysis Results

D(HCR) = -117.61743019 - 1.24964285765*D(HCMB) + 2.04125912944*D(HCMK) + 1.54936452478e-05*D(PCR) - 5.81604044206e-05*D(LCR)

Based on the above equation, it can be seen that the constant value obtained is -117.61743019, it can be interpreted that if the variable big red chilli price (X1), curly red chilli price (X2), cayenne pepper production (X3), and cayenne pepper harvest area (X4) are considered constant or = 0, then the price of cayenne pepper (Y) will decrease by IDR 117.61743019 . The regression coefficient value of the large red chilli price variable (X1) is negative (-), which is equal to (-1.24964285765), it can be interpreted that every time the price of large red chilli rises by IDR. 1, the price of cayenne pepper will decrease by Rp. 1.24964285765, and vice versa, in accordance with the cateris paribus assumption, namely that the variable price of curly red chilli (X2), cayenne pepper production (X3), and cayenne pepper harvest area (X4) does not change or is considered constant.

The regression coefficient value on the curly red chilli price variable (X2) is positive (+) amounting to 2.04125912944, it means that if variable X2 (curly red chilli

price) increases by IDR 1, variable Y (cayenne pepper price) will also increase by IDR 2.04125912944, and vice versa with the assumption of cateris paribus, namely that the price of large red chillies (X1), cayenne pepper production (X3), and cayenne pepper harvest area (X4) does not change or is considered constant. The regression coefficient value of the cayenne pepper production variable (X3) is positive (+) amounting to (1.54936452478e-05), it means that every increase in cayenne pepper production by 1 Kilogram, the price of cayenne pepper (Y) will decrease by IDR 1.54936452478e-05, and vice versa, assuming cateris paribus, namely that the price of large red chillies (X1) and the price of curly red chillies (X2) does not change or is considered constant.
The regression coefficient value of the cayenne pepper harvest area variable (X4) has a positive value (+) of 5.81604044206e-05, it means that every increase in the harvest area of 1 square meter, the price of cayenne pepper (Y) will increase by IDR 5.81604044206e-05, and vice versa with the assumption of cateris paribus, namely if the price of large red chillies (X1), the price of curly red chillies (X2), and the production of cayenne pepper (X3) are considered constant or fixed.

4 Conclusion

This study measures the price of cayenne pepper that occurs in East Java, what are the influences on price changes that occur. The estimation results show that the large red chilli price variable has a negative and significant effect on the cayenne pepper price variable in East Java Province. This shows that there is a relationship or link between changes in the independent variable and the dependent variable.

Based on the estimation results, it shows that the curly red chilli price variable has a positive and significant effect on the cayenne pepper price variable in East Java Province. This means that the independent variable affects the dependent variable and has a close relationship between variables. In addition, the cayenne pepper production variable has no effect and is insignificant to the cayenne pepper price variable. Thus, the variable production of cayenne pepper in East Java Province has nothing to do with changes in the price of cayenne pepper. This is because the cayenne pepper production variable has no influence on the cayenne pepper price variable that occurs in East Java Province. The cayenne pepper harvest area variable has no effect and is insignificant to the cayenne pepper price variable. Thus, the variable harvest area in East Java Province has nothing to do with price changes in cayenne pepper.

The input for the government is to make policies and provide clear decisions to farmers so that there are clear rules for farmers. The monitoring of the price of cayenne pepper in the market and directly from the farmer producers so that it can be informed back to the farmers in the hope that price stability can occur and not harm the farmers and the community as consumers. The government can manage the marketing distribution system, given that the supply chain or marketing distribution in Indonesia is still long, causing prices to be high. While in reality the price received by farmers is low, which can harm farmers as producers because the price is too low, and harm

consumers due to the high price obtained. By conducting this research, it is hoped that it can be an input to the entire community and can be taken into consideration for the actors concerned.

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