

## Analysis Production of Cayenne Pepper Farming in Brondong District Lamongan Regency East Java Indonesia



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**ABSTRACT:** This research has several objectives, about cayenne pepper farmers characteristic and the main aim of which is to determine the influence of land area, seed costs, fertilizer costs, agricultural chemicals costs, labor costs, farming experience and climate on the amount of cayenne pepper production. The research results show that the land area ( $X_1$ ), seed cost ( $X_2$ ), fertilizer costs ( $X_3$ ) and agricultural chemicals costs ( $X_4$ ) has a significant effect on cayenne pepper production, while labor costs ( $X_5$ ) did not have a significant effect on cayenne pepper production, the role of climate was analyzed using a questionnaire showing that respondents agreed that climate had an effect on cayenne pepper production.

**KEYWORDS:** cayenne pepper, production, climate, multiple linear regression

### INTRODUCTION

Cayenne pepper is an important commodity in the agricultural cycle in Indonesia. National cayenne pepper productivity figures will reach 1,386,447 tons in 2021, the largest province producing cayenne pepper is East Java with total production from 2018-2020 of 2,253,262 tons. The applications for using cayenne pepper are quite diverse, both at individual and commercial levels, ranging from households, traditional markets, MSMEs, to the industrial sector. This high and varied need is the reason why cayenne pepper is a commodity that is worth cultivating.

Farming activities involve various important factors such as land, seeds, fertilizer, agricultural chemicals, labor and climate so that farming produces maximum production. Cayenne pepper farming income is an important factor because it is related to the income earned by farmers in one season. The price of cayenne pepper in Indonesia is quite volatile, rising and falling according to market needs. Fluctuations in cayenne pepper prices also have an impact on business actors. The high interest in consuming cayenne pepper proves that the absorption of the cayenne pepper trade in traditional markets is up to 90%. Apart from that, it has just entered the processing industry such as dried cayenne pepperes, cayenne pepper powder and cayenne pepper sauce. This is what causes demand for cayenne pepperes to continue to increase from time to time (Sejati, 2017).

Lamongan Regency is one of the districts in East Java Province, Indonesia. This district has an area of 1,813 km<sup>2</sup> and among them there are 20 sub-districts. One of them is Brondong District which has an area of 70.13 km<sup>2</sup>. The harvest area for cayenne pepper commodities in Lamongan Regency has increased every year from 2018-2021, namely 3,407 ha, 2,661 ha, 3,889 ha and 22,322 ha. Cayenne pepper productivity from 2018-2021 was 898,093 tons, 1303,215 tons, 1266,906 tons and 1267,315 tons (Badan Statistik Nasional Lamongan, 2021). Brondong District is one of the sub-districts located in the north of Lamongan Regency and is one of the largest producers of cayenne pepper in Lamongan Besar Regency with production respectively 3254 tons, 10,349 tons, 32,480 tons and 43,664 tons (Badan Statistik Nasional, 2020 ).

### RESEARCH METHOD

Location, Time and Research Objects

The research was conducted in Lamongan Regency, East Java Province, the sample area was determined randomly *Purposive Sampling* with consideration of selecting sample areas based on the sub-districts with the highest productivity. The consideration for choosing the location is that Brondong District is the center for cayenne pepper production on land in Lamongan Regency, East Java Province. The duration of the research was carried out from September to October 2023. The object of this research is cayenne pepper farmers.

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The data used in this research includes primary data and secondary data. Primary data includes the total production costs of cayenne pepper farming and the characteristics of cayenne pepper farmers obtained through observation and interviews. The secondary data presented was obtained from the literature. In general, the percentage of error that can be tolerated in social research is 5% - 15% because in social research results it is difficult to ensure the accuracy of the data as in exact science research. In this study, an error tolerance of 5% was used. The results of these calculations show that the number of samples taken from the total population was 104 samples.

The quantitative analysis used in this study is multiple linear regression analysis, where in the first multiple linear regression analysis the factors will be analyzed, namely X1 (land area), X2 (seed costs), X3 (fertilizer costs), X4 (agricultural chemicals costs), X5 (labor costs), against (Y1) production. The data obtained will be analyzed using *software minitab 21*. For climate factors (X<sub>6</sub>) will be analyzed using a Likert scale using software *microsoft excel*.

### DATA ANALYSIS

#### 1. Production Cost

Total Cost of Production can be measure by add up fixed cost and variable cost (Suhardi, 2016):

$$TC = FC + VC$$

Description :

TC: Total Cost or Total Cost (Rp/Planting Season)

FC: Fixed Cost or Fixed Cost (Rp/Planting Season)

VC: Variable Cost (Rp/Planting Season)

#### 2. Multiple Linear Regression Analysis of Cayenne Pepper Production

Multiple linear regression analysis is linear regression to analyze the magnitude of the relationship and influence of more than two independent variables (Suharyadi and Purwanto, 2011).

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$$

Description:

Y: Cayenne Pepper Farming Production (Kg)

a : Constant

b<sub>1</sub>: Regression coefficient for cayenne pepper farming land area

b<sub>2</sub>: Regression coefficient for cayenne pepper farming seed costs

b<sub>3</sub>: Regression coefficient for the cost of fertilizer for cayenne pepper farming

b<sub>4</sub>: Regression coefficient for the cost of agricultural chemicals for cayenne pepper farming

b<sub>5</sub>: Regression coefficient for labor costs in cayenne pepper farming

X<sub>1</sub>: Variable of Cayenne Pepper Farming Land Area (Ha)

X<sub>2</sub>: Variable Cost of Cayenne Pepper Farming Seeds

X<sub>3</sub>: Variable Cost of Fertilizer for Cayenne Pepper Farming

X<sub>4</sub>: Variable Cost of Agricultural Chemicals for Cayenne Pepper Farming

X<sub>5</sub>: Variable Labor Costs for Cayenne Pepper Farming

e : Standard error

#### 3. Likert Analysis

Likert scale according to Sugiyono (2018):

$$P = \frac{\sum R}{N} \times 100\%$$

## RESULTS AND DISCUSSION

### Identifying Characteristics of Cayenne Pepper Farmer Respondents

#### 1. Age

**Table 1. Distribution of Number and Percentage of Respondents Based on Age**

Age (Years)	Number of Respondents (People)	Presentase (%)
15 – 64	99	95,2
≥ 65	5	4,8
<b>Amount</b>	<b>104</b>	<b>100</b>

Source: data analyzed, 2023

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The age of cayenne pepper farmer respondents was mostly 15-64 years old, namely 99 respondents or if presented, it was 95.2%. The age of the other respondents was above 64 as many as 5 respondents or 4.8%. From the results of this presentation, it can be concluded that the majority of cayenne pepper farmer respondents are of productive age. Productive age is the most optimal age for working and farming, because at this age farmers have the physical abilities and ability to follow developments in farming technology that can be applied in cayenne pepper farming. The younger the farmer, the more enthusiastic they are to learn, so they will try more quickly to adapt innovations even though they have no experience in this matter (Soekartiwi, 2005).

### 2. Gender

**Table 2. Distribution of Number and Percentage of Respondents Based on Gender**

Gender	Number of Respondents (People)	Presentase (%)
Man	94	90,4
Woman	10	9,6
<b>Amount</b>	<b>104</b>	<b>100</b>

Source: data analyzed, 2023

Based on table 2, the gender distribution of cayenne pepper farmer respondents in Brondong District is 90.4% male and 9.6% female. Farming activities are physical work, from land preparation, planting to harvesting, requiring great strength and the use of heavy equipment such as hand tractors. Land preparation is mostly carried out by male workers because it includes hoeing and preparing the soil so that it is optimal for planting. Meanwhile, female workers will play a role in maintenance and harvesting. During maintenance, labor will be needed to clear weeds and when harvesting.

### 3. Education

**Table 3. Distribution of Number and Percentage of Respondents Based on Education Level**

Level of education	Number of Respondents (People)	Presentase (%)
Didn't Attending School	11	10,57
Didn't finish Elementary School	9	8,65
Elementary School	18	17,3
Junior High School	19	18,26
Senior High School	41	39,42
Bachelor degree	6	5,76
<b>Amount</b>	<b>104</b>	<b>100</b>

Source: processed data, 2023

The percentage of respondents' education level was quite varied, ranging from no education to a bachelor's degree. Judging from the percentages starting from the least having a bachelor's degree (5.76%), elementary school not completed (8.65%, didn't attending school (10.57%), elementary school (17.3%), middle school (18.26%) and senior high school (39.42%). The data shows that as many as 63.44% of respondents have received sufficient education through mandatory 9 years of study. More than half of the respondents have received junior high school education and above. The other 46.56% of respondents have not received adequate education because some did not go to school, elementary school but did not complete it and some stopped at elementary school level only. The level of education has an important relationship with the ability to make decisions and find solutions based on information that has been obtained during the formal education process which can be applied in cayenne pepper farming. This is in accordance with the opinion of Ramli (2012), formal education influences thought patterns and responses to things, including technological innovation. Someone who is highly educated tends to be more open to accepting and trying new things.

### 4. Number of Dependent Family Members

**Table 4. Distribution of Number and Percentage of Respondents Based on Number of Family Dependents**

Number of Dependents (People)	Number of Respondents (People)	Percentage (%)
0 – 2	90	86,53

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3 – 4	13	12,5
≥ 5	1	0,97
<b>Amount</b>	<b>104</b>	<b>100</b>

Source: Data analyzed, 2023

Based on table 4, the distribution of the number and percentage of respondents based on the number of dependents shows that the highest percentage distribution is for 0-2 dependents, amounting to 86.53%. For dependents of 3-4 people, the percentage is 12.5% and for dependents of more than 5 people is 0.97%. The number of dependents referred to are children under 15 years of age who cannot yet live independently to earn money. The number of family dependents is related to the amount of expenses that must be borne by the respondent to meet living needs.

### 5. Farming Experience

**Table 5. Distribution of Number and Percentage of Respondents Based on Farming Experience**

Farming Experience (Years)	Number of Respondents (People)	Percentage (%)
1 - 10	9	8,65
11 - 20	36	34,62
≥ 20	59	56,73
<b>Amount</b>	<b>104</b>	<b>100</b>

Source: Data analyzed, 2023

Based on table 5, the distribution of the number and percentage of respondents based on farming experience is that most are very experienced farmers with a percentage of 56.73%. Respondents with sufficient farming experience had a percentage of 34.62% and respondents with less experience had a percentage of 8.65%. Farming experience is related to the length of time farmer respondents have been carrying out cayenne pepper farming activities. The longer the time spent in farming, the more knowledge and skills will be gained.

### 6. Land area

**Table 6. Distribution of Number and Percentage of Respondents Based on Land Area**

Land Area (Hectare)	Number of Respondents (People)	Percentage (%)
0,00 - 0,5	100	95,2
0,5 - 1	4	3,8
<b>Amount</b>	<b>104</b>	<b>100</b>

Source: Data analyzed, 2023

Based on table 6, the distribution of the number and percentage of respondents based on land area, the highest percentage at 95.2% are respondents with small land areas in the range of 0-0.5 hectare. Respondents with medium land areas in the range of 0.5-1 hectare were 3.8% and land areas of more than 1 hectare were 0%. Land area is related to the amount of production and the amount of income that cayenne pepper farmers will get.

### 7. Climate

**Table 6. Results of the Farmer Respondent Questionnaire on the Effect of Climate on Cayenne Pepper Production**

Variable	Respondent's Answer					Number of Respondents	Total score
	5	4	3	2	1		
Is climate affect farming production	60	39	5	0	0	104	471

Description of Respondent's Answer:

5: Very Agree

4: Agree

3: Neutral

2: Less Agree

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1: Disagree

Based on the responses given by respondents in table 5.7, it can be calculated using a Likert scale:

$$P = \frac{471}{505} \times 100\% \\ = 93,26\%$$

Based on data obtained from 104 respondents, the results of 98.26% when analyzed are included in the Very Strong category. Which means 98.26% of respondents agree that the climate influences the farming activities they undertake. Climate is the weather conditions over a long period of time in an area.

### Cayenne Pepper Production

**Table 7. Average Variable Costs and Fixed Costs of Cayenne Pepper Farming in Brondong District, Lamongan Regency on One Growing Season**

No	Description	Unit	Amount (Rp)
1	Production	Kg	1.152
2	Cost		
	Variable Costs (VC)		
	- Seeds	Rp	132.183
	- Fertilizer	Rp	1.927.423
	- Agricultural Chemicals	Rp	976.587
	- Labor	Rp	2.528.750
	- Others	Rp	324.750
	<b>Total Variable Costs</b>		<b>5.312.769</b>
	Fixed Costs (FC)		
	• Tool Depreciation	Rp	
	- Hoe	Rp	3.634
	- Stable	Rp	1.686
	- Fork	Rp	2.472
	- Scissors	Rp	1.483
	- Sprayer	Rp	13.353
	- Hand Tractor	Rp	177.963
	• Land lease	Rp	1.131.010
	<b>Total Fixed Costs</b>		<b>1.329.915</b>
2	Total Cost (VC+FC)		
	a. Variable Costs (VC)	Rp	5.312.769
	b. Fixed Costs (FC)	RP	1.329.915
	<b>Total Production Costs</b>		<b>6.642.684</b>

Source: data analyzed, 2023

Based on table 7, the variable cost of cayenne pepper farming is IDR 5,312,769 which includes costs for fertilizer, agricultural chemicals, labor and other costs such as fuel and water. Fixed costs of IDR 1,329,915 include depreciation costs for hoes, sickles, forks, scissors, *sprayer* and *hand tractor*, as well as land rental costs. The total production cost of cayenne pepper farming is IDR 6,642,684 in one planting season.

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## Multiple Linear Regression Analysis

### 1. Classic assumption test

#### Normality test

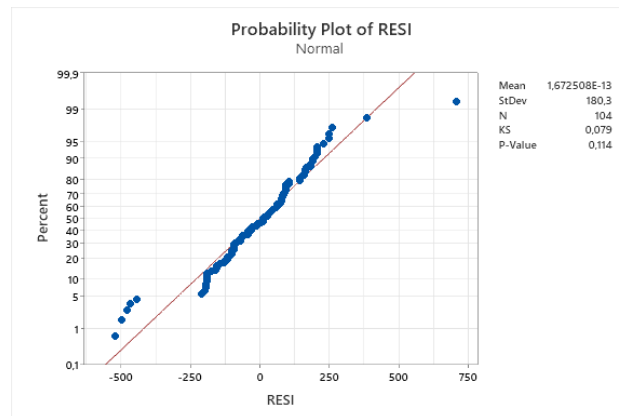


Figure 1. Normality Test Results

Based on Figure 5.1, it shows that the distribution of the plot is around and the line length is 45°. Thus, it shows that the data on the research variables is normally distributed.

#### Multicollinearity Test

Table 8. Multicollinearity Test Results

#### Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-612,7	62,4	-9,82	0,000	
Luas Lahan (X1)	532	183	2,91	0,004	2,03
Biaya Benih (X2)	0,003880	0,000357	10,86	0,000	3,73
Biaya Pupuk (X3)	0,000259	0,000038	6,90	0,000	6,73
Biaya Obat-obatan (X4)	0,000394	0,000065	6,05	0,000	4,91
Tenaga Kerja (X5)	0,000040	0,000022	1,85	0,067	2,74

The test results for all predictors tested using the VIF value of all independent variables show a VIF value that is smaller than 10. This means there is no multicollinearity problem in the regression.

#### Heteroscedasticity Test

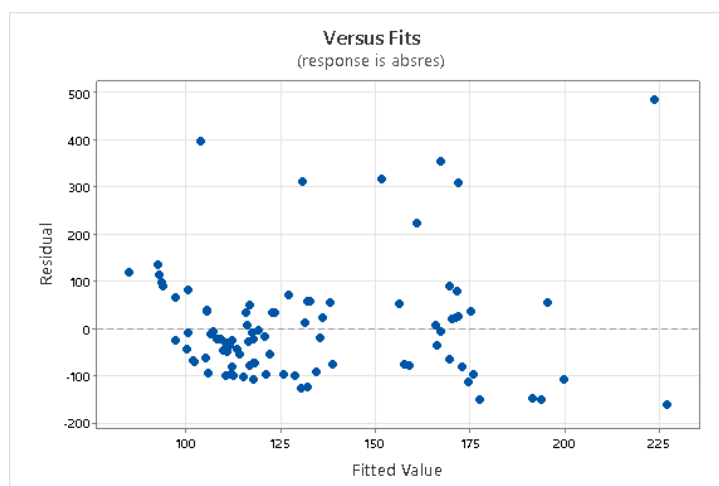


Figure 3. Heteroscedasticity Test Results *Probability Plot* Cayenne Pepper Farming Production

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From Figure 3, it can be seen that the distribution of points does not form a particular pattern/flow according to the heteroscedasticity testing criteria, so it can be concluded that heteroscedasticity does not occur in the model. The classic assumption about heteroscedasticity in this model is fulfilled, namely it is free from heteroscedasticity.

### Autocorrelation Test

#### Durbin-Watson Statistic

Durbin-Watson Statistic = 1,84634

Figure 4. Durbin Watson Autocorrelation Test Results

The calculation results show the number 1.846, which means  $d$  (durbin watson) is located between  $d_U$  and  $(4-d_U)$ , so there is no autocorrelation. The upper limit  $d_U$  value with a significance level of 5% and  $k=5$  is 1.7823. Entered into the testing criteria:  $d_U < d < 4-d_U$  then  $1.7823 < 1.846 < 2.2177$  ( $4 - 1.7823$ ). So the Watson Durbin value obtained is 1.846, which is between the upper limit of  $d_U$  (1.7823) and 2.2177 ( $4-d_U$ ), so that the decision maker accepts  $H_0$ , which means there is no autocorrelation.

Table 9. Multiple Linear Regression Analysis of Cayenne Pepper Farming Production

#### Coefficients

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Constant	-612,7	62,4	-9,82	0,000	
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Biaya Obat-obatan (X4)	0,000394	0,000065	6,05	0,000	4,91
Tenaga Kerja (X5)	0,000040	0,000022	1,85	0,067	2,74

Information:

1. Dependent variable= Production (ln Y)
2.  $R^2 = 0,9678$
3. F table = 2.3072
4. Fcount = 589.41
5. T table = 1.9834
6. Confidence level 95% or 0.05

The results of the regression analysis based on table 8 show the following equation:

$$Y = -612,7 + 532 X_1 + 0,0038 X_2 + 0,0002 X_3 + 0,0003 X_4 + 0,00004 X_5$$

Information:

Y: Production amount

$X_1$ : Land area

$X_2$ : Seed Cost

$X_3$ : Fertilizer Costs

$X_4$ : Cost of Agricultural Chemicals

$X_5$ : Labor costs

### Coefficient of Determination ( $R^2$ )

Determinant coefficient ( $R^2$ ) is used to find out how big the relationship is in the use of production factors (Y) to variables ( $X_1, X_2, X_3, X_4, X_5$ ). The determinant coefficient value from the analysis results is 0.9678 which means that 96.78% of cayenne pepper production in Brondong District is influenced by the land area factor ( $X_1$ ), seed cost ( $X_2$ ), fertilizer costs ( $X_3$ ), cost of agricultural chemicals ( $X_4$ ) and labor costs ( $X_5$ ). Meanwhile, the other 3.22% is influenced by other variables such as natural conditions, pests and diseases as well as variables that are not included in the independent variables. The results of the analysis show that there is a strong influence on all independent variables.

### f-test

The f-test is used to determine the independent variable against the dependent variable. The significant value is  $0.000 < 0.05$  and the F value  $F_{count} = 589,41 > F_{table} = 2.3072$  so it can be interpreted that together the variables of land area, seed costs,

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fertilizer costs, agricultural chemicals costs and labor costs have a significant effect ( $H_1$  accepted and  $H_0$  rejected) on cayenne pepper production in Brondong District.

### t-test

#### 1. Land Area ( $X_1$ )

The results of the t-test analysis show the  $T_{count} > T_{table}$  ( $2.91 > 1.9834$ ) which means that land area has a significant effect on cayenne pepper production. Land area coefficient value ( $X_1$ ) is 532 with a positive value or in the same direction so that for every 1% increase in land area there will be an increase in the amount of cayenne pepper production by 532% assuming the independent variable remains constant. Land is one of the production factors that has a large contribution to farming. The area of land planted with cayenne pepper in Brondong District varies from 0.25 to 1 hectare with an average land area of 0.40 ha. In the world of agriculture, land can be likened to a production house, the size and scale of large or small will influence the amount of production. This is in accordance with previous research which states that land area influences the amount of farming production.

#### 2. Seed Cost ( $X_2$ )

The results of the analysis show that  $T_{count} > T_{table}$  ( $10.86 > 1.9834$ ) means that seed costs have a real effect on cayenne pepper production. The coefficient value of seed costs ( $X_2$ ) is 0.0038 with a positive value or in the same direction so that for every 1% increase in seed costs there will be an increase in cayenne pepper production of 0.0038% assuming the independent variable remains constant. Seeds are an important production factor in cayenne pepper farming. Without seeds, production will not be able to run. The seeds planted will grow and produce cayenne pepper.

#### 3. Fertilizer Cost ( $X_3$ )

From the results of the t-test, the value  $T_{count} > T_{table}$  was obtained ( $6.90 > 1.9834$ ), which means that fertilizer costs have no real effect on cayenne pepper production. The fertilizer cost coefficient value is 0.0002 with a positive value or in the same direction so that for every 1% increase in fertilizer costs there will be an increase in cayenne pepper production by 0.0002% assuming variable costs remain constant. Fertilizer is an important factor in farming. Fertilizer plays a role in optimizing the growth of cayenne pepper. In terms of getting fertilizer, it costs money to buy fertilizer or is called fertilizer costs.

#### 4. Agricultural Chemicals Costs ( $X_4$ )

Based on the analysis results, it shows that the value of  $T_{count} > T_{table}$  ( $6.05 > 1.9834$ ) means that the cost of agricultural chemicals such as fungicide, herbicide and pesticide has a real effect on the production of cayenne pepper. The coefficient value for agricultural chemicals costs is 0.0003 with a positive value so that for every 1% increase in agricultural chemicals costs, cayenne pepper production will increase by 0.0003% assuming the independent variable remains constant. Pesticides are one of the production factors. Its existence aims to control pests that attack cayenne pepper plants so that they can avoid harvest failure.

#### 5. Labor Costs ( $X_5$ )

Based on the analysis results, it shows the  $T_{count} < T_{table}$  ( $1.85 < 1.9834$ ) which means that labor costs have no real effect on cayenne pepper production. The labor cost coefficient value is 0.00004 which is positive so that for every 1% increase in labor costs, cayenne pepper production will increase by 0.00004% assuming the independent variable remains constant. This result support by previous research by Mahyudin (2017), said that labor cost didn't have real effect to palm sugar farm processing. Labor is important variable, but generally the labor used is family labor and the numbers do not have much differ from one labor to another farm labor.

## CONCLUSION

Based on research conducted with the title Production and Income Analysis of Cayenne Pepper Farming in Brondong District, Lamongan Regency, it can be concluded that:

1. The characteristics of cayenne pepper farmers in Brondong District, Lamongan Regency, namely that they have an average age of 15 to 64 years, can be categorized as productive age and on average they are male. The average level of education is high school. The average number of family dependents is 0 to 2 people. Length of farming experience over 20 years. The average area of land cultivated is 0.00 to 0.50 hectares.
2. There are four factors that influence the production of cayenne pepper farming, namely land area, seed costs, fertilizer costs and agricultural chemicals costs. There is one factor that has no significant influence, namely labor costs. Both factors that have a significant effect and those that do not have a significant effect must still be considered to increase the production of cayenne pepper farming in Brondong District, Lamongan Regency.

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