

**Food Security Analysis of Shallot Farmer Household During the Covid-19
Pandemic in Probolinggo Regency**
(A Case Study on Shallot Farmer Household in Mranggonlawang Village, Dringu District,
Probolinggo Regency)

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ABSTRACT

The Covid-19 pandemic has had an impact on the agricultural sector, both in terms of trade, prices, and the decline in farmers' income levels. Amid the COVID-19 outbreak, food security is something that the government must pay attention to so that there is no food crisis. If farmer households have not realized food security, it won't be easy to create food security at higher levels such as the village, district, provincial, and national levels. This study aims to analyze food security based on EAR and SFE values and determine the effect of socioeconomic factors on household resilience. Determination of the research location was determined purposively, and the number of samples was taken by cluster sampling. The analytical method uses the Jonnson and Toole model to determine household food security and multiple linear regression analysis to determine the effect of socioeconomic factors on EAR. The results of the food security analysis show that 51.7% of households with energy consumption >80% and expenditure of 60% are categorized as food vulnerable. The results of the analysis of socio-economic factors that can affect EAR are income, number of dependents in the family, length of education of housewives, and age of the head of the family with a confidence level of 80%. The analysis results show that most shallot farming households are in a food-insecure state.

Keywords : farmer household food security; EAR; SFE

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1. Introduction

In early February 2020, the COVID-19 pandemic in Indonesia began to be confirmed, the number of people infected with this virus every day continued to increase (Pulubuhu *et.al.*, 2020). The Covid-19 outbreak has had a significant impact on various aspects of human life both economically and non-economically, including the agricultural sector (Rozaki, 2020). At the

household micro scale, the pandemic has an impact on decreasing people's purchasing power in terms of food consumption and changes in behavior and mobility of family members (Relawati *et.al.*, 2021 and Syafiq *et.al.*, 2022).

The World Food Program in 2020 stated that during the COVID-19 pandemic there were 768 million people who experienced chronic hunger due to increasing world poverty. In dealing with the spread of COVID-19, the agricultural sector is a priority need because it is directly related to national food security (Syakirotn *et.al.*, 2022). If the trade in agricultural commodities is disrupted, food stability will also be disrupted

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(Sadiyah, 2021). Directly, the COVID-19 pandemic affects food systems through impacts on food supply and demand, and indirectly through reduced purchasing power, ability to produce and distribute food (Food and Agriculture Organization, 2020).

The government's effort to break the chain of the spread of COVID-19 is that people are encouraged to reduce social interactions by maintaining social distance and physical distancing. In addition, the government also issued a policy of Large-Scale Social Restrictions (PSBB) and restrictions on the operation of land, sea and air transportation facilities that apply to several regions in Indonesia (Masniadi *et.al.*, 2020). However, the implementation of the PSBB policy has an impact on hampering the flow of trade in several types of goods and services as well as decreasing people's purchasing power (Prasada, 2021).

Due to the COVID-19 pandemic, food security has become the most discussed issue by various parties. This is because food is a basic need of every individual that must be met. Moreover, during a pandemic, people are required to be extra in maintaining their body's immunity due to viruses that easily spread and infect the body. However, this is not matched by the economic capacity that is getting worse due to declining farmers' income. Thus, it is necessary to conduct research on food security which is determined based on the pattern of expenditure and the energy adequacy rate of shallot farmers, especially in Mranggon Lawang Village, Dringu District, Probolinggo Regency. This paper offers efforts that farmer households can take to improve food security amid of the Covid-19 pandemic.

2. Theoretical Underpinning

Food security is defined as a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2002). Household food security is determined by various factors such as food access, availability of food consumption, food consumption, and household stability (Mohamed, 2017). In this study, the household food security of shallot farmers is determined based on the food availability factor.

Measuring food security at the household level involves five categories of indicators dietary diversity and food frequency, spending on food,

consumption behaviors, experiential indicators, and self-assessment measurements (Peng and Berry, 2019). Boly and Sanou (2022), food security can be measured using indicators such as daily per capita energy consumption, number of malnourished people, and food production index.

Several studies have used calorie expenditure and consumption indicators to measure food security (Diramo *et.al.*, 2018; Kahsay *et.al.*, 2019; Ruhyana *et.al.*, 2020; Mohammed, *et.al.*, 2021; Getaneh *et.al.*, 2022). In contrast, Ouba and Sawadogo (2022) and Ngema, *et.al.* (2018), measured food security using a household food consumption and diversity score.

Food security at the household level is largely determined by various social, economic, demographic and institutional factors. Acheampong *et.al.*, (2022) used variables such as gender, age, family size, farming experience, gender of the head of the household, education, increasing variation, total household income, marital status, residence status, association membership, extension access, access to credit, household heads and regions to see the determinants of food security. Getaneh *et.al.*, (2022), added variables such as the size of irrigated land, livestock owned, improved pasture production practices, experience with shocks, food assistance and contact with development agents in measuring household food security.

The research results of Ruhyana *et.al.* (2020), the status of rural households is dominated by households with food vulnerability. Meanwhile, the factors that influence household food security are education, age, smoking habits, number of household members, rural residence, and employment as farm laborers. Different from Limi *et. al.*, (2021), food security is influenced by income, the age of the head of the household, and the age of the housewife. In the research of Getaneh *et.al.*, (2022), these findings reveal that household status is dominated by the food insecure category. Based on the logit regression model; age, marital status and family size negatively affected household food security. Whereas, irrigation land use, livestock ownership and access to credit were affected positively.

3. Research Methods

The research location was conducted in Mranggon Lawang Village, Dringu District, Probolinggo Regency which is one of the shallot production centers in East Java. The population of this study is farmer households who grow

shallots in the planting season in January-March 2021. The method of determining the sample uses a *cluster sampling technique* and the number of samples is determined using the Slovin formula so that 60 respondents are obtained. Data were collected by interview using a questionnaire.

3.1 Analysis of Energy Adequacy Ratio (EAR)

The percentage of energy adequacy rate figures is formulated by the following equation:

$$EAR = \frac{E}{2} \times 100\% \dots \dots \dots (3)$$

Where:

EAR : Energy Adequacy Rate (%),
E : Energy Consumption per Adult Equivalent (kcal)
2100 : EAR standard set by WNPG XI 2018.

3.2 Food Expenditure Calculation Analysis

The share of food expenditure is the amount of food expenditure issued by households in one year. The formula for calculating the share of food expenditure as presented by Ilham and Sinaga *in* Mulyo *et.al* (2015) is as follows:

$$SFE = \frac{E}{T} \times 100\% \dots \dots \dots (4)$$

Where:

SFE : Share of Food Expenditure (%)
EFF : Expenditure of Food Expenditure (Rp/year)
THE : Total Household Expenditure (Rp/year)

3.3 Crosstab Analysis of Energy Adequacy Figures on the Share of Food Expenditure

The trend of the energy adequacy rate in influencing the share of expenditure is seen by the crosstab method. Considering that the energy adequacy rate is considered to be higher if the share of food expenditure decreases.

3.4 Household Food Security Analysis

Household food security was analyzed using the *Jonsson and Toole model*. In this method, cross-classification is carried out between the energy adequacy rate (EAR) and the share of food expenditure (SFE). The results of the analysis obtained four categories of household food

security, namely food security, food insecurity, food insecurity, and food insecurity. Farming households are said to be "Food Secure" if the EAR value is >80% and the PPP value is <60%. Meanwhile, a household is said to be "Food Vulnerable" if the EAR value is >80% and the SFE value is 60%. Farming households are said to be "Food Less Secure" if the EAR value is 80% and the SFE value is <60%. Meanwhile, a household is said to be "Food Insecure" if the EAR is 80% and the SFE value is 60% (Jonsson and Toole, 1991 *in* Maxwell *et. al*, 2000).

3.5 Analysis of the Effect of Socio-Economic Factors on Household Food Security

To determine the effect of socioeconomic factors on the energy adequacy rate, the researchers used multiple linear regression analysis. Here's the equation model:

$$EAR = a + b_1I + b_2NFD + b_3LEH + b_4AFH + b_5LEFH + e \dots \dots \dots (5)$$

Where:

EAR : Energy Adequacy Rate (kcal)
a : Constant
b₁ – b₄ : Coefficient
I : Income (Rupiah)
NFD : Number Family Dependents (Persons)
LEH : Length of Education Housewife (Years)
AFH : Age of Family Head
LEFH : Length of Education Family Head
e : Error Rate

4. Result and Discussion

4.1 Analysis of Energy Adequacy Rate

The energy adequacy rate is determined by comparing the amount of energy consumption with the recommended energy adequacy rate. The energy adequacy rate generated from the measurement of energy consumption for each household can reflect household food security in Mranggonlawang Village, Dringu District, Probolinggo Regency. A household can be said to be food insecure if it reaches at least 80% of the fixed energy adequacy rate in accordance with the 2019 Minister of Health Regulation. The results of the analysis of the distribution of food security for shallot farmer households are presented in Table 1 below.

Table 1. Distribution of Household Food Security of Shallot Farmers in Mranggonlawang Village

Category Energy Adequacy Rate (EAR)	Total Household	Percentage (%)
Less (<80% Energy Adequacy Rate)	5	8,3
Sufficient (>80% Energy Adequacy Rate)	55	91,7
Total	60	100

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Table 1 shows that the distribution of energy supply levels for shallot households is more than 80% from fixed levels of 2,100 kcal/capita/day (WNPG XI, 2018). This shows that 91.7% of shallot farming households have sufficient energy absorption, which means food security. as per the research results of Aisy *et.al.* (2022), farmer households are classified as food insecure. While the remaining 8.3% is included in the poor category, which means that it is not food safe. The average daily food consumption of a person is 1754.87 kcal/capita/day or 83.56%. This means that the average level of energy adequacy

per person in the shallot household is above 80% or is included in the sufficient category. Meanwhile, the average food consumption per household is 6463.8 kcal/capita/day or 106.18%.

4.2 Analysis of Share Food Expenditure

The share of food expenditure is a comparison between spending on buying household food with total expenditure consisting of food and non-food expenditures. The following is the average allocation of food and non-food consumption of shallot farmer households which is presented in Table 2 below.

Table 2. Average Allocation of Household Consumption of Shallot Farmers in Mranggonlawang Village in One Year

Consumption Allocation	Annual Expenditure (Rp)	Percentage (%)
Food Consumption	20.059.125	54,3
Non-Food Consumption	16.899.188	45,7
Total	36.953.313	100

Based on table 2, the average consumption allocation for farmer households is dominated by food expenditure, which is Rp. 20,059,125 or 54%. Food expenditure which is greater than non-food expenditure indicates that farmers are still focused on meeting their basic needs. The results of this study are in line with previous studies which showed that the household expenditure of farmers was dominated by food expenditure

(Cahyani *et.al.*, 2020; Martadona and Leovita, 2021; Ariyadi, 2021).

The expenditure components are from each food and non-food consumption group. The following are the details of household consumption expenditures of shallot farmers on food consumption by component or type, which are presented in Table 3.

Table 3. Proportion of Household Food Expenditure of Shallot Farmers in Mranggonlawang Village in One Year

Types of Food Expenditure	Average Expenditure (Rp)	Percentage (%)
Grains, Roots and Processes	4.243.210	21,6
Meat and Processed	1.303.050	6,5
Fish and Processes	2.528.820	12,6
Eggs and Milk	852.750	4,2
Vegetables	1.537.245	7,6
Fruits	785.500	3,9
Nuts and Processes	1.554.450	7,7
Spice	1.617.500	8,1
Fat	1.052.900	5,2
Prepared Foods and Other Food	1.353.600	6,7
Ingredients Foodstuffs/ Beverages and Tobacco	3.230.100	16,1
Average Amount	20.059.125	100

Based on table 3, the highest food expenditure was expenditure on grains, tubers, and their processed products, amounting to Rp. 4,243,210 or 21.6% of total food expenditure. This is because the expenditure of grains, namely rice, is the staple food of shallot farmer households in

the village of Mranggon Lawang. These results are in line with previous studies if the highest food expenditure of farmers is the type of grains, especially rice (Suyudi *et.al.*, 2020; Utami *et.al.*, 2021; Anzaini *et.al.*, 2022).

Table 4. Proportion of Non-Food Expenditure of Onion Farmers Households in Mranggonlawang Village in One Year

Types of Non-Food Expenditure	Average Expenditure (Rp)	Percentage (%)
Lighting Fuel, Electricity and Water	1.859.262	11,1
Household Equipment and Maintenance	1.864.402	11,2
Clothing	1.633.433	9,6
Personal Items	564.400	3,3
Health Services and Medicines	481.513	2,9
Physical Care and Cosmetics	972.275	5,7
Education, Recreation and Sports	1.237.560	7,3
Transportation and Communication	5.283.440	31,3
Land and building tax and other taxes and other expenses	879.345	5,2
Average Amount	16.899.188	100

Expenditure on transportation and communication ranks first in non-food expenditure with an average annual expenditure of IDR 5,283,440 or 31.3% of total non-food expenditure. This expenditure is dominated by communication expenditures for the purchase of data packages. This is because school activities are conducted online, thus requiring an internet connection. While the smallest expenditure is health services and medicines with an average of Rp 481,513. This is because most shallot farmers rarely get sick and when they are sick they prefer

to buy their own medicine instead of going to the doctor. Thus the results of research from Adriani *et.al.*, (2020) state that most members of farmer households, if they are sick, they tend to seek treatment themselves or use health insurance from the government.

The following is a distribution table for the share of household food expenditure of shallot farmers in Mranggonlawang Village obtained from the comparison of food consumption and total household consumption, which is presented in Table 5 below.

Table 5. Distribution of Household Food Expenditure Share of Shallot Farmers in Mranggonlawang Village

Share Food Expenditure Category	Total Household	Percentage (%)
Low (60% Share Food Expenditure)	26	43,3
High (60% Share Food Expenditure)	34	56,7
Total	60	100

Table 5 shows that the share of food expenditure of most shallot farming households is in the food insecure category. This is because the proportion of food expenditure is high and the energy consumption is still lacking. This condition is also the same as the results of research from Adelina *et.al.*, (2019) which states that the level of household resilience of farmers is classified as food insecure. According to Apid *et.al.* (2022), the share of food expenditure has the opposite relationship with food security. This means that

the higher the share of food expenditure, the lower the food security, and vice versa.

4.3 Trend Analysis of Energy Adequacy Figures on the Share of Food Expenditure

Cross-tabulation analysis was used to see food trends toward the energy levels of onion farmers' households. The following are the results of the cross-tabulation analysis which are presented in Table 6.

Table 6. Results of Crosstab Energy Adequacy Rate Analysis of Food Expenditure Share in Shallot Farmer Households in Mranggonlawang Village

Share Food Expenditure Category	Energy Adequacy Rate (%)	Total Household
Low (60% Share Food Expenditure)	67.78-80.00	3
Low (60% Share Food Expenditure)	80.01-129.16	25
High (60% Share Food Expenditure)	60.85-80.00	2
High (60% Share Food Expenditure)	80.01-136.69	30
Total	60	100

There is a tendency for households with a high portion of food expenditure to have a higher level of energy sufficiency. These results prove that households allocate most of their expenditures to food needs so that the level of energy sufficiency can be fulfilled. In meeting energy needs, shallot farmers consume rice as the main energy source. According to Anzaini *et.al.* (2022) rice is the main staple of the largest energy contributor. The second source of energy for shallot farming households is fish, according to

research from Utami *et.al.* (2021), fish is the second largest expenditure after rice. On the other hand, the food expenditure of onion farmer households in processing fish by frying has an impact on increasing consumption of cooking oil which increases in food expenditure. In order to be able to see the large changes in the energy adequacy rate along with the share of food expenditure, it can be seen in Figure 1 below.

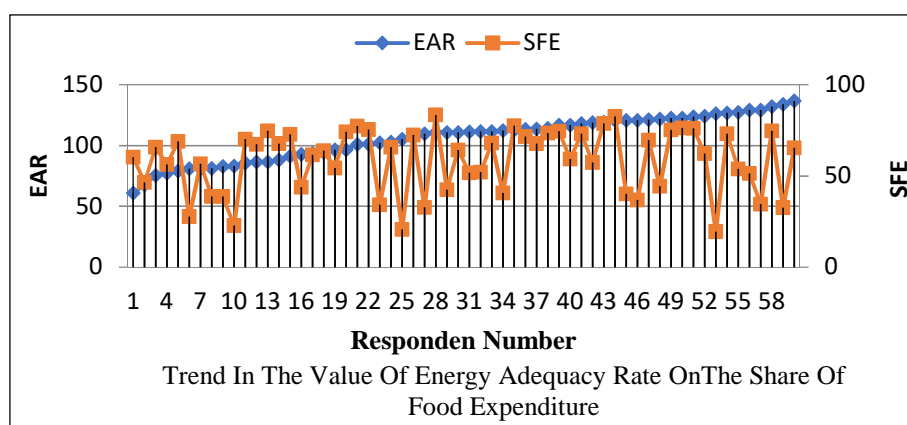


Figure 1. Graph of Crosstab Analysis of Energy Adequacy Rate Figures on Food Expenditure Share of Shallot Farmers in Mranggon Lawang Village

Based on Figure 1, there is a tendency that the higher the energy adequacy level of the shallot farmer household tends to result in the proportion of the share of food expenditure getting smaller and at a certain point an increase in the proportion of the share of food expenditure. This indicates the possibility of a transition from consumption of non-food expenditure to food expenditure. The increase in household food consumption is caused by several factors, including the increase in the number of family dependents which causes household food needs to increase (Azhar, *et.al.*, 2022) and are increasingly diverse to fulfill. In addition, higher household incomes also have an impact on the ability of households to obtain more diverse food and spend on food products of better quality and higher prices. This is to Yanti's statement (2019) that higher household income can affect increasing food expenditure so that the ability to choose and buy food is higher and more diverse. For example, it was found that some shallot farming households have a high proportion of food expenditure allocation but are at a high level of energy sufficiency. Upon further

investigation, the household allocated more to buy chicken meat, fish, and eggs than other expenses. These three products have a higher price compared to the prices of other foodstuffs. So it will increase the proportion of food expenditure.

4.4 Household Food Security Analysis

After knowing the value of the Energy Sufficiency Rate and the Food Expenditure Share of shallot farmer households in Mranggonlawang Village, it can determine household food security by cross-classification between the two components. and Share of Food Expenditure using the Jonnson And Toole model. Energy Sufficiency Rate is directly proportional to food security while Food Expenditure Share is inversely proportional. Thus, a household will have better food security if the Energy Sufficiency Rate value is high (>80% Energy Adequacy) and the Food Expenditure Share is low (60% Total Expenditure). The following is a cross-classification between the energy adequacy rate and the share of food expenditure, which is presented in the following Table 7.

Table 7. Household Food Security of Shallot Farmers in Mranggonlawang Village

Energy Consumption per Adult Equivalent Unit	Share Food Expenditure	
	Low (60% Total Expenditure)	High (60% Total Expenditure)
Sufficient (>80% Energy Adequacy)	Food Secure 24 (40%)	Food Vulnerable 31(51.7%)
Less (80% Energy Adequacy)	Food Less Secure 2 (3.3%)	Food Insecure 3(5%)

The results show that 51.7% of shallot farming households are classified as food insecure. Food households are households that have a high share of food but consume enough energy. Due to their low income, they have only enough to spend on food, so the household energy figures can be fulfilled (Purwaningsih *et.al.*, 2010). According to Sabaora *et.al.*, (2021) food insecurity conditions are caused by the lack of employment opportunities in rural areas in urban areas, so rural houses have limitations in terms of income sources. In addition, the income received from available jobs in rural areas is relatively lower than in urban areas.

4.5 Analysis of the Effect of Socio-Economic Factors on Household Food Security

Socio-economic factors that affect the food security of farmer households were analyzed using multiple linear regression. The dependent variable in this study is Household Energy Adequacy which is influenced by the independent variables, namely income, number of family dependents,

length of education of housewives, age of family head, and education of family head. The results of the regression analysis of the influence of socio-economic factors on the energy adequacy rate can be presented with the following multiple linear regression equation.

$$\text{EAR} = 3491.70 + 0.068 \text{ I} - 266.047 \text{ NFD} + 87.887 \text{ LEH} + 36.315 \text{ AFH} + 21.063 \text{ LEFH} + e$$

Information:

EAR = Energy Adequacy Rate (kcal)

I = Income (Rupiah)

NFD = Number of Family Dependents (Persons)

LEH = Length Of Education Housewife (Years)

AFH = Age of Family Head (Years)

LEFH = Length of Education Family Head (Years)

e = Error Rate

Based on the above equation, the results of the multiple linear regression analysis of the influence of socio-economic factors on the energy adequacy rate in Mranggonlawang Village are presented in Table 8 below.

Table 8. Results of Regression Analysis of the Effect of Socio-Economic Factors on Household Food Security in Mranggonlawang Village

Variable	Coef. Regression	t-value	Sig.	Information
Constant	3491,70	2,372	,021	
Income	.068	6,521	,000	Significant at the 99,9%
Number of Family Dependents	-266,047	-1,384	,172	Significant at the 83%
Housewife Education Length	87,887	1,519	,135	Significant at the 87%
Age of Family Head	36,315	1,840	,071	Significant at the 93%
Family Head Education Length	21,063	,357	,722	Not Significant
Dependent Variable : Energy Adequacy Rate				
R ² : 0,510				
F-value : 11,232; F-table: 0,466				
T-table : 1,296				
Confidence level :80%				

Based on table 8, it can be seen that the coefficient of determination (R²) is 0,5010, meaning that 50,10% of the variation in the dependent variable can be explained by the independent variables in the model. While 49,90% is explained by variables outside the model. The results of the F test show that the variables in the

model can simultaneously affect the energy adequacy figures.

The t-test was conducted to see partially whether each independent variable had a significant effect on the dependent variable. The test is determined by looking at the significance value of each independent variable. In this study,

four variables affect the energy adequacy figures. The first independent variable that has an effect is income with a significance value of less than 20% alpha, which is 0,000. The regression coefficient value of the income variable is 0,068 and is positive so that it can increase income by one unit, it will increase the energy adequacy rate by 0,068 units. Ndhleve *et. al.* (2021); Limi *et.al.* (2021) state that a high level of income will increase food security and vice versa.

The variable number of family dependents has a significant value of less than 20% alpha, which is 0,172. The regression coefficient value of the variable number of family dependents is -266,047 and a negative value so that it can be interpreted that every increase in the number of family dependents will reduce the energy adequacy rate by 266,047 units. The addition of one family member can reduce the possibility of household food security status (Fikire and Zegeye, 2022; Ruhjana *et.al.*, 2020). *Ceteris paribus*, each additional member of a household increases the probability of food insecurity (Ademola *et.al.*, 2021). According to Getaneh *et. al.*, (2022); Ayinu *et.al.*, (2022); Makonnen *et.al.*, (2021) which states that household size with a high ratio has a role in influencing the likelihood of households becoming food insecure.

The variable length of the mother's education has a significant value of less than 20% alpha, namely 0,135. The regression coefficient value of the variable length of the mother's education is 87,887 and is feasible to be positive. This means that increasing the length of a mother's education will increase the energy adequacy rate by 87,887 units. The longer the education of the housewife, the better the nutrition of the food, so that the food consumed is more nutritious (Sadevi, *et.al.*, 2020).

The age of the family head, this variable has a significant value and a coefficient of 0,71 and 36,315, respectively. The coefficient value on the age family head variable is positive. That means if the age of the family head increases, it will increase the energy estimate by 36,315 units. Households with an older age of head of the household tend to be more food secure than the younger age of head of the household (Joshi and Joshi, 2017; Abdullah *et.al.*, 2019; Fikire and Zegeye, 2022; Awoke *et.al.*, 2022).

5. Conclusion

The results of this study can be concluded that the household food security of shallot farmers

is mostly included in the food vulnerable category, namely 51.7%. Analysis of socioeconomic factors that have a positive and significant influence on the energy adequacy rate is the income variable, the mother's length of education, and the age of the head of the family. While the variable number of family members has a negative and significant effect on the household energy adequacy rate. When viewed from the income variable, increasing the energy adequacy rate can be done by conducting training on more efficient farming methods and creating a Prosperous Family Empowerment program. In future research, it is hoped that Raskin can be used as an independent variable to see its effect on the energy adequacy rate.

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