AGROLAND: The Agricultural Sciences Journal
**Vol. 10, No. 2 Desember (2023), 87 - 93**
**P-ISSN : 2407- 7585 & E-ISSN : 2407- 7593, Published by Tadulako University**

**Original Research** **Open Access**

# ANALYSIS OF FACTORS AFFECTING FARMING HOUSEHOLD FOOD SECURITY POST-NATURAL DISASTER IN LAMBARA, CENTRAL SULAWESI

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Submit: 2 November 2023. Revised: 15 November 2023. Accepted: Desember 2023
DOI : https://doi.org/10.22487/agroland.v0i0.1935

## ABSTRACT

This research aims (1) to discover the factors influencing food security; (2) to determine food security after a natural disaster occurred on September 28, 2018. The research was conducted in Lambara, Central Sulawesi, from June to November 2021. The population of this study was 31 farmer households and, at the same time, became the study's sample. Data were obtained in several ways: literature study, interviews, and questionnaires. Data relating to food security is processed using portion of food expensesanalysis. On the other hand, an analysis of the factors affecting food security is carried out by OLS (Ordinary Least Square) analysis in multiple regression. Testing the hypothesis in multiple linear regression analysis is carried out by testing the regression coefficients, namely testing the regression coefficients as a whole (F-test) and the regression coefficients partially (t-test) with a 2-way test $\alpha = 5\%$. From the data processing results, it is known that the food security of farming households after natural disasters based on the share of food expensesis 70.97% food secure and 29.03% food insecure. Factors with significant effects on food security after natural disasters are income and level of education.

Keywords: Food security; Natural disaster.

## INTRODUCTION

Indonesia has more than 267 million people, and geographical conditions are very prone to disasters (Tahmidaten L and Krismanto W, 2019). Most of Indonesia's territory is in the Pacific Ring of Fire (ring of fire). This area has the potential for earthquakes and volcanic eruptions because of its position surrounded by the Pacific Ocean basin (Rianawati Hesti Mursudarinah Fatmawati and Siti, 2020). Central Sulawesi is one of Indonesia's provinces with a high potential for natural disasters. Central Sulawesi, which consists of twelve districts and one city, is quite susceptible to natural disasters, such as earthquakes, volcanic eruptions, floods, liquefaction, and tsunamis. Extreme rainy or dry seasons (El Nino and La Nina phenomena) also have the potential to cause crop failures, which can affect price fluctuations. Therefore, the government must be able to anticipate several

problems, such as health, economy, and security, that have the potential to arise. Natural disasters affected not only mapping disaster-prone locations and buildings but also permanent housing for residents. However, the government must also carry out efforts to maintain community food security.

The natural disaster that occurred on September 28th 2018 was a test for food security in Central Sulawesi because some people, within several months, were unproductive and only depended on food supplies from the government (Tondi K M, 2019). Likewise, farmers in several areas, such as in Sigi Regency, need help to produce the food the community needs. The existence of natural disasters also disrupted people's access to food because transportation infrastructure such as ports (sea and air) and roads were damaged, so food distribution was disrupted.

Preparedness for natural disasters must be carried out to minimize casualties and ensure the community's welfare. For actions to save residents, currently, the government has carried out socialization of disaster response through implementing disaster preparedness materials in the curriculum in schools from elementary to secondary levels. The government has also made other efforts, including conducting comparative studies in countries with the same hazard potential as Japan and other disaster-prone countries.

In conditions prone to disasters, the government must think about food security due to sufficient food capable of ensuring the community's survival, significantly when access is cut off due to disasters (Purwaningsih Y, 2008 and Sellia N M and Atmadja I B P, 2019), safety and health factors impact when food availability is not met (Sutriningsih A and Lasri L, 2017).

In development, enhancing food security is the priority because food is the most basic need for humans (Sulastina N A, 2020). Food security means the accessibility of adequate quantities, conveyed at reasonable costs and secure for utilization for each citizen to bolster their everyday activities at all times (Hermayanti M E Rahmah N L Wijana S, 2016). In the agricultural development program, the government explains that food security encompasses the household and national/regional levels. In an operational sense, it is translated that food security concerns the availability, accessibility, and stability of its procurement (Damayanti V L Khoirudin R, 2016).

After the natural disaster on September 28, 2018, which occurred in Palu and its surroundings, it created security problems in the form of looting and robbery of several shopping centers and minimarkets because victims of natural disasters and refugees do not have food supplies. Thus, one of the motivations for looting is to get food that can be used for survival.

The solution to overcome the problem of food insecurity, including emergency response conditions, now still refers to the provision of rice and instant noodles as food reserves. Providing food such as rice and instant noodles in an emergency does not solve the problem. In processing rice or instant noodles into ready to consume food, adequate availability of clean water is required. In contrast, in an emergency, the availability of clean water is often an obstacle. The quality and quantity of water that does not comply with human consumption standards can become a source of new problems for community groups affected by disasters.

Therefore, it is essential to study factors affecting food security following September 28, 2018, natural disaster in Central Sulawesi. This research was conducted to analyze the factors influencing food security in Lambara, Central Sulawesi, after the September 28, 2018, natural disaster. The existence of research on the factors affecting food security is currently fundamental for the government to carry out, considering some limitations, such as planning aspects which has yet to think about and predicted it.

## RESEARCH METHODS

This research took place in Lambara, Central Sulawesi. The location of the research was determined purposively with the consideration that in the Lambara there are rice farmers who were affected by the September 28 2018 earthquake. This research period was from June to November 2021.

The population consisted exclusively of all lowland rice farmers in Lambara with a total of 31 farming households which were then sampled in this study. Using the census method, the small population at the location can be sampled so the respondents were 31 farmers (Sugiyono, 2013).

The data collected in this study included primary data: data from direct interviews with farmers who cultivate paddy rice during one growing season (MT). Secondary data was obtained from a literature study by taking data from books, journals, BPS, and relevant literature. In this study, the equation for the analytical method is:

**The portion of food expenses**

Equation (1) was used to know portion of food expenses.

$$PPP = \frac{PPt}{TPt} x100\%$$

Description:
PPP = Portion of food expenses (%)
PPt = Expenditures for food shopping (IDR/month)
TPt = Total household expenses (IDR/month)

The criteria for the food security levels are as follows:

a. The portion of food expenses < 60% of total expensesis a food-secure household.
b. The portion of food expenses ≥ 60% of total expensesis food-insecure households.

**Analysis of factors affecting food security with OLS (Ordinary Least Square).**

To be able to find out the factors affecting food security, a model is used according to Equation .

$$Y = f(X_1, X_2, X_3, X_4, X_5)$$

Description:
Y = Food security
$X_1$ = Income (million/person)
$X_2$ = Age (years old)
$X_3$ = Education level (years)
$X_4$ = Family dependents (person)
$X_5$ = Land area (ha)

In this study, data were processed using SPSS version 25.

## RESULTS AND DISCUSSION

**Farmer household food security**

Based on Table 1, there are 70.97% of farmer households that have a portion of food expenses (PPP) of less than 60% (food security). This indicates that the farming households are food secure and there are 29.03% of the farming households are food insecure because their portion of food expenses is more than 60%, so the assumption is that farming households can buy other needs other than food. It is also known that the income of respondents is classified as good, namely an average of IDR 2,820,000.00/month compared to the provincial minimum wage of central sulawesi is IDR 2,500,000.00/month (Manurung D S L Br, 2020). Thus, this income has been able to finance the life of the farmer's household.

Table 1. Farmer household food security in Lambara, 2021.

| Food security | Percentage (%) |
|---|---|
| Share of food expenses <60% (Food Secure) | 70.97 |
| Share of food expenses ≥60% (Food Insecure) | 29.03 |
| Total | 100.00 |

Source: Primary Data, 2022

**Analysis of factors influencing food security**

Factors affecting food security are determined using the OLS (Ordinary Least Square) method in multiple linear

regression. Before doing the regression analysis, the classical assumption test was carried out first.

Based on the linear regression classical assumptions with OLS, a good linear regression model involves no multicollinearity, autocorrelation, heteroscedasticity, and normality (Ismunawan I and Triyanto E, 2020).

**Multicollinearity.**

The Variance Inflation Factor (VIF) values for the variable income, age of the head of the family, education level, number of family dependents, and land area are 1.229 each; 1.370; 1.130; 1.229, and 1.335, while the tolerance value is 0.813; 0.730; 0.885; 0.814; and 0.749, respectively. The VIF scores of the five variables are not greater than the permitted threshold values (5 or 10), so there is no multicollinearity in the five independent variables.

**Autocorrelation.**

The data for the linear regression estimation is time series data, so it needs to test the assumption that it is free from autocorrelation.

The Durbin-Watson value on the SPSS output refers to the calculated DW. If it is compared to the acceptance or rejection criteria of the Durbin Lower (dL) value. The value of d is the number of independent variables in the regression model (k) and the samples (n). The Durbin Upper (dU) and Durbin Lower (dL) values are shown in the Durbin-Watson (DW) Table with a significance level (error) of 5% ($\alpha$= 0.05). The DW table shows the dL value = 1.366 and the dU value = 1.768.

The calculated DW value of 1.952 is greater than 1.83 and less than 7.32, which means that the autocorrelation is not found. It then concludes that in the linear regression model, there is no autocorrelation.

**Heteroscedasticity**.

The heteroscedasticity test is performed by constructing a scatterplot between the residuals and the predicted values of the standardized dependent variable. The results of the heteroscedasticity test can be seen in the scatterplot. From this point, we can conclude that there is no heteroscedasticity, in other words, there is homoscedasticity because the distribution does not form any particular pattern or flow.

**Normality.**

Criteria for residual data use a normal probability plot (P-plot) approach that considers the distribution of the points present to determine whether they are normally distributed. If the distribution is around the straight line (diagonal), then the (data) residuals are normally distributed, but if the distribution of points is away from the straight line, then it is not normally distributed. Since the distribution in the image is known to be relatively linear, we can conclude that the (data) residuals are normally distributed. These results are consistent with the classical linear regression assumptions by the OLS approach. Multiple linear regression tests using SPSS 25 software to define the factors that influence the food security of farmer households in the has been done. The criteria was if the t-count probability value (SPSS output is shown in the sig. column) is less than the error rate (alpha) of 0.05 (which has been determined), then the independent variable (from the t-count) significantly affects the dependent variable. On the other hand, if the t-count probability value is greater than 0.05, then the independent variable has no significant effect on the dependent variable.

It is known that the t-count probability value of the independent variable income is 0.000, which is less than 0.05, so the independent variable income has a significant effect on the dependent variable food security at an alpha of 5%. In other words, farmers' income and education have a significant effect on food security. So at the 95% confidence level. On the other hand, the independent variables age, family dependents, and land area have no significant effect on food security because they are greater than 0.05.

The regression equation obtained from the results of data analysis is presented in Equation.

$$Y = 20.563 + 8.399X_1 - 0.004X_2 + 0.482X_3 - 0.131X_4 - 1.205X_5 + e$$

Description:
Y = Food security;
$X_1$ = Farmer's income (millions/month);
$X_2$ = Age of head of household (years);
$X_3$ = Education level of the head of the family (years);
$X_4$ = Family dependants (person);
$X_5$ = Land area (ha)

The coefficient of determination describes the variability of the independent variable's influence on the dependent variable. It is also the proportion of influence of all independent variables on the dependent variable. The coefficient of determination is measured by R-square or Adjusted R-square. R-square is used when there is only one independent variable, while Adjusted R-Square is used when the independent variable is more than one.

The R-square value of 0.920 indicates that the proportion of variables' impact on food security variables is 92.0%. That is income, the household head's age, education level, number of family dependents, and land area jointly affect food security, while the remaining 8% is influenced by other variables that are not included in the developed linear regression model.

The results of the F-test were done. Probability value. F-count is shown in the last column (sig.). Probability value. F-count (sig.) of 0.000 is less than the significance level of 0.05, so the estimated linear regression model is feasible to explain the effect of several factors put forward in this study on food security.

Interpretation or explanation of a resulting model is done after all stages (classical assumption test and model feasibility) have been passed. The classical assumption test is to make sure that the minimum requirements of the linear regression model (using the OLS approach) are met, so there is no failure to meet the assumptions. If classical acceptance tests are not met, model interpretation may be biased or inaccurate. Second, the feasibility test ensures that the estimated linear regression model is appropriate to explain the effect of the independent variables on the dependent variable. If the estimated model is not achievable, then the model cannot be used to interpret the effect of the independent variable on the dependent variable. Two things come into play when interpreting regression coefficients: the positive /negative sign and the coefficient significance (Arianto N 2020).

Signs indicate the direction of the relationship. The positive sign indicates a unidirectional relationship between the independent variables and the dependent variable (comparable), while the negative sign indicates an opposite relationship (inversely proportional).

The coefficient indicates the slope of the regression equation (Sugiyono, 2013). In this study it is known that the independent variables that have a positive effect are income and education level; where if there is an increase in income of 1%, there is a strengthening of food security by 8.39%, and every time there is an increase in farmer household education by 1%, there is a strengthening of food security by 0.48%. On the other hand, the variable age of the head of the family, the number of dependents, and the area of land negatively affect the food security of farming households.

Based on all the results obtained, several factors simultaneously influence the farmers' food security in Lambara, Central Sulawesi, namely income, age of the household head, number of dependents, level of education, and area of land cultivated. This is in line with research (Saputro WA and Fidayani Y, 2020). From the t-test results, partially the income and education level variables have a significant effect on the food security of farmer households.

Based on the linear regression test with OLS, the Equation for the condition

of food security after natural disasters are obtained, as shown in Equation.

$$Y = 20.563 + 8.399X1 – 0.004X2 + 0.482X3 – 0.131X4 – 1.205X5 + e$$

It can be seen that the variables of farmer income and education level have a positive influence on food security. Families who have sufficient income can buy food as needed.

It also known that the number of farmers who have income ≥ 1 million rupiahs is 21 people. This affects the food security of farming households in Lambara (Sumarni S Ayu C and Tajidan T, 2020). According to Engel's Law, when there is an income drop, the portion of food consumed goes up. Conversely, if income increases, consumers spend more on food in smaller portions (Sumarni S Ayu C and Tajidan T, 2020).

The education level of a farmer's household is very decisive in terms of deciding on the type of food consumed in the household. The higher level of individual education in the household means a higher individual's knowledge, including knowledge about food. Education is closely related to knowledge; the higher the education, the easier it is to receive food knowledge (Dewanti S Rijanta R and Rofi A, 2020).

The education level of farmer households in Lambara is in a good category. As much as 35.48% have secondary and undergraduate education levels. From the results of data processing on the portion of food expenses, it is known that after the natural disaster, the average household food security in Lambara based on the portion of food expenseswas 70.97% food secure and only 29.03% food insecure.

## CONCLUSION

Based on the results, the conclusions are:

Several factors significantly and positively affect the food security of farming households in Lambara, after the natural disaster, namely income and education level.

After the natural disaster, it was discovered that the average food security of farmer households in Lambara, based on the portion of food expenses, was 70.97% food secure and only 29.03% food insecure.

## ACKNOWLEDGEMENT

We thank kindly Hibah Penelitian Pembinaan of the Tadulako University, Ministry of Education, Culture, Research and Technology of The Republic of Indonesia, under funding 449a/UN28.2/PL/2021.

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