Household Food Security Analysis in Danau Panggang, Hulu Sungai Utara District

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Abstract. *Household food security as a system that is determined by the subsystem of food availability, food access and food consumption, so that the household is able to meet its food needs, so that it can live a healthy, active and productive life. The Food Independent Village Program as an effort to increase household food security. This study aims to determine the level of food security of households receiving the Food Independent Village Program (PDMP) and Non-Recipients of the Food Independent Village Program (NPDMP). Knowing the factors that affect the level of household food security (PDMP) and (NPDMP). The results showed that the average household food security index (PDMP) was significant at α=0,05 including the criteria for food insecurity with an average index value of 0,57. Meanwhile, the household (NPDMP) is significant at α=0,10, including the criteria for food resistance with an average index value of 0,69. The factors of household income, household food expenditure, housewife education, type of work and capital assistance have a significant effect on α=0,05 and α=0,10 on the level of household food security, while the factor of the number of household members and households receiving Raskin does not significantly affect significant at α=0,10 to the level of household food security.*

Keywords: *Food Security, Food Independent Program, Logistic regression*

I. Preliminary

Household food security is the ability of a household to meet the food sufficiency of its members in a balanced quantity, quality and variety from time to time in order to live healthy and be able to carry out daily activities productively. Household food sufficiency is fulfilled if they have access to food either from production or purchase. Food security in Indonesia is still in a vulnerable situation so that the government is forced to import foodstuffs to meet increasing needs so that food insecurity can be overcome. Food insecurity is caused by not achieving targets for food availability and access to food for the community (Suhaimi, 2008).

Sufficient food availability in an area does not guarantee that people will avoid food problems at the household level. One of the programs implemented to improve food security in an area is the Food Independent Village program which seeks to overcome food insecurity and poverty by increasing the ability of rural communities to develop productive businesses based on local resources and increase food availability (BKP, 2016) in the form of a capital assistance program aimed at changing a condition of vulnerability to a better condition. (General Guidelines for Demapan, 2011).

From the background description above, the problem formulation in this study is as follows:
1. What is the level of household food security for Food Independent Village Program Recipients and Non-Food Independent Program Recipients?
2. Factors affecting the level of household food security of Food Independent Village Program Recipients and Non-Food Independent Program Recipients?

Research purposes

Based on the background and problem formulations above, the objectives of this study are:
1. Knowing the level of household food security of the Food Independent Village Program Recipient
2. Knowing the factors that influence the level of household food security of Program and Non Program Recipient in Food Independent Villages

II. Research Methods

Place and time of research

This research was conducted in Danau Panggang, Hulu Sungai Utara District. The research was conducted from April to October 2020.

Types and Sources of Data

This study uses a survey method. The types of data used are primary and secondary data. Primary data obtained by direct observation to the research location and direct interviews with respondents using a list of questions in accordance with the research objectives. Meanwhile, secondary data is needed to support primary data obtained from literature studies, related institutions or agencies such as the Provincial and District Food Security Services, the Central Statistics Agency and other supporting agencies.

Withdrawal Method Example

This study used a stage proportional random sampling technique, namely the sampling was carried out in several stages, starting from selecting the location to taking the sample.
1. The first stage, determining the village. Danau Panggang District consists of 16 villages, 4 villages that follow (PDMP) and as many as 12 who do not participate or (NPDMP). Each village was chosen randomly as many as 1 unit, namely Desa Baru as (PDMP) and Desa Manarap as (NPDMP).
2. 2. The second stage. Based on the total population of each village (PDMP) as many as 132 households and villages (NPDMP) as many as 454 households. From this population, samples were taken proportionally, so that the total sample of villages (PDMP) was 24 samples and villages (NPDMP) were 76 samples, so that the total population was 100 households.

Research variable

Household food security level indicators are as follows:
1. The food availability aspect (X_1) includes indicators of food diversity (rice, fish, vegetables and fruits), amount of food (amount of rice availability), food prices and total income.
2. Food access or Distribution Aspects (X_2) include indicators of road conditions (river, footpath, asphalt), distance to market, level of welfare (poverty) in the form of Raskin assistance.
3. Utilization or food Consumption Aspects (X_3) include indicators of housewives' education, frequency of meals per day, utilization of clean water (rivers, PAMSIMAS and PDAM) and proportion of food expenditure.

The dependent factor or variable in the logit model is the level of food security and the independent variables are:
1. Household Income
2. Household Food Expenditure
3. Housewife Education
4. Number of Household Members
5. Type of Work (Farmer or non-farmer)
6. Raskin assistance (Recipient or non-recipient)
7. Capital Assistance (Recipient or non-recipient)

Data analysis

To answer the first objective, namely to determine the level of household food security in the Food Independent Village and Non-Food Independent Village programs, it was carried out by descriptive analysis by means of simple tabulation, then calculated by Index (I) with the following formula:

$$Indeks\ (jk) = \frac{X_{ijk} - X_{ijk\ min}}{X_{ijk\ max} - X_{ijk\ min}}$$

by:
Index   : Household Food Security Level Index
X_{ijk} : The value of the i-th indicator, the j-th aspect and the k-village
X_{ijkmax} : The maximum value of the i-i indicator, the j-th aspect and the k-village
X_{ijkmin} : The minimum value of the i-i indicator, the j-th aspect and the k-village
i   : Number of indicators
j   : Food security aspects (availability, distribution and consumption)
k   : Food Independent Villages (PDMP) and Non Food Independent Villages (NPDMP).

Tabel 1. . Household Food Security Level Criteria

Number	Rank / Score	Criteria
1	> 0,00 – 0,33	Not Food Resistant
2	> 0,33 – 0,66	Insecure Food
3	> 0,66 – 1,00	Hold Food

Source: Food Security Agency, 2014.

Furthermore, to calculate the average index (I) of household food security, the following formula is used:

$$Indeks\ (jk) = \frac{\sum_{j=1}^{n} Indeks\ (jk)}{Total\ aspek\ ke-j}$$

To test the research hypothesis, a statistical hypothesis is used. The statistical hypothesis for Food Independent Village Program (PDMP) Recipients is as follows:

H0 : PDMP = 0,66
H1 : PDMP < 0,66

While the statistical hypothesis for Non-Recipients of the Food Independent Village Program (NPDMP) is as follows:

H_0 : NPDMP = 0,66
H_1 : NPDMP > 0,66

To test the statistical hypothesis the t test was used with the following formula (Walpole, 2005):

$$t_{hit\ (k)} = \frac{\overline{Iik} - 0,66}{\frac{Sk}{\sqrt{nk}}}$$

by:

Iik : Average Food security index Household
0,66 : Hypothesized value
S : Standard deviation
n : Number of Samples
k : Independent Pangan Village and, Non Independent Food Village

The rules for decision making are as follows:
H_0 is rejected if $t_{count} > t_{table}$ at α=0,05
H_0 is accepted if $t_{count} \leq t_{table}$ at α=0,05

Meanwhile, to determine the second objective, namely the factors that affect the level of household food security in the Self-reliant Village and Non-Food Independent Villages, using logistic regression.

According to Hosmer and Lemeshow (2000), the determination of the logistic regression model is formed with a value of E (Y = 1 | x) as P, where P is denoted as follows:

$$P = \left[\frac{exp(g(x))}{1 + exp(g(x))} \right]$$

P : Chances of events occurring
exp : exponential

Model transformation is carried out to model the initial regression function, so that it becomes a linear function (Agresti, 1996):

$$logit[\pi(x)] = ln\left[\frac{p}{1-p}\right] = g(x)$$

$$g(x) = \alpha + b_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5D_1 + \beta_6D_2 + \beta_7D_3$$

$$g\ (x) = \alpha + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5D_1 + b_6D_2 + b_7D_3 + e$$

by:

$g\ (x)$: Estimated value of logit (food resistant = 1, not food resistant = 0)
α : intercept
b : logistic coefficient of each factor
X_1 : Household income (Rp)
X_2 : Household food expenditure (Rp)
X_3 : Housewife education (years)
X_4 : Number of household members (people)
D_1 : *Dummy* type of work, farmer = 0; non farmer = 1
D_2 : *Dummy* raskin assistance, recipient = 0; not a recipient = 1
D_3 : *Dummy* capital assistance, Food Independent Village Program = 0; Non Food Independent Village = 1

According to Hosmer & Lemeshow (2000), to test the simultaneous effect of all independent variables through the G test statistic. The G test is formulated as follows:

$$G = -2ln\left[\frac{L_0}{L_1}\right]$$

by:

G : *Maximum likelihood ratio test*

L_0 : Likelihood without explanatory variables (model consists of constants only)

L_1 : Likelihood with explanatory variables (model consists of all variables only)

Where L_0 is a function before the independent variable is entered, and L1 is a function that has been entered by the independent variable.

The G test follows the X^2 distribution (Chi-Square) with degrees of freedom p, so that the test rules use the statistical hypothesis as follows:

H_0 rejected if $G_{count} < X^2_{k(p)}$

H_1 rejected if $G_{count} \geq X^2_{k(p)}$

While for the partial test, the Wald test is used, namely the formula:

$W_i = \frac{\beta i}{SEi}$

by:

W : Wald test (partial)

β_i : Logistic regression coefficient for the ith variable

SE_i : The standard error value for the ith variable

With the hypothesis used are as follows:

$H_0 : \beta_i = 0$

$H_1 : \beta_i \neq 0$

The Wald test follows the standard normal distribution, so the rule for decisions is as follows:

H_0 rejected if $|W_{hitung}| > Z_{\frac{\alpha}{2}}$

H_1 rejected if $|W_{hitung}| \leq Z_{\frac{\alpha}{2}}$

III. Results And Discussion

Food Independent Village Program

The Food Independent Village Program is an effort to create food security in rural areas through the subsystem of availability, distribution and consumption to utilize local resources. The Food Independent Village Program is a capital assistance program aimed at changing a condition of vulnerability to a better condition.

Capital assistance received by households receiving the independent food program in the form of a capital loan of IDR 600.000 up to IDR 2.000.000/household. The payback mechanism is implemented after the sale of the harvest.

Respondent Characteristics

The characteristics of the village household (PDMP) and village (PDMP) which include data on the age of the housewife, number of household members, length of education and income are detailed as in the following description.

Age of the Housewife

The results showed that the age range for the most household mothers who received the Food Independent Village Program and Non Program was in the range of 41-50 years. This indicates that the age of housewives is generally still in the productive age range (15-64 years) according to Law No.13 of 2003.

Number of Household Members

The number of household members including the head of the recipient of the Food Independent Village Program is 5 people and the non-recipient households of the which is 4 people.

Housewife Formal Education

The results showed that the average length of education between housewives who received the Food Independent Village Program and Non Program was 7 years or equivalent to graduating from elementary school but not completing junior high school level. Meanwhile, the highest education level in households receiving the Independent Pangan Village program was 4,1% at the middle or high school level, and non-recipients of the Independent Pangan Village program at 6,57% at the tertiary level.

Household Income

Household income used is the value of net income received from all residents of the household. The results showed that the average total net income of households receiving the Independent Pangan Village program and households non-recipients of the Independent Pangan Village program was IDR 2.359.389 / month.

Household Food Expenditure

The average food expenditure for households receiving the Independent Pangan Village program is IDR 1.242.667/month. Meanwhile, the total food expenditure incurred by non recipient households of the Food Independent Village program was IDR 1.077.862 / month.

Household Food Security Level

The results showed that the level of household food security of farmers receiving the food independent village program in Danau Panggang District was included in the criteria for food insecurity with an average index value of 0,57. Based on the results of the t test, the value of tit was |2,00| . This value is compared with the results of the t table at a significant level of α=0,05 with the critical area t of |1,71| The t hit number is greater than the t table, then the null hypothesis (H$_0$) is rejected and the alternative hypothesis (H$_1$) is accepted. In other words, households receiving the food independent village program are significantly included in the food insecurity criteria.

In contrast to the level of household food security of farmers, the non-independent village program, Danau Panggang District, is included in the criteria for food resistance with an average index value of 0,69 (Table 1). Based on the results of the t test, the value of tit was 1,32. This value is compared with the results of the t table at a significant level of α =0,10 with the critical area t of 1,29. The t hit number is greater than the t table, then the null hypothesis (H$_0$) is rejected and the alternative hypothesis (H$_1$) is accepted. So that households that do not receive significant food independent village programs are included in the criteria for food resistance. The detailed explanation of each recipient and not the recipient of the independent village food program is as follows.

Table 1. Household food security index in Danau Panggang District

Food Security Sub-system	Household			
	Demapan program		Non demapan program	
	Index	Criteria	Index	Criteria
Household Food Availability	0,73	Hold Food	0,78	Hold Food
Household Food Access	0,67	Hold Food	0,77	Hold Food
Household Food Consumption	0,29	Can not stand Food	0,52	Insecure Food
Household Food Security	0,57	Insecure Food	0,69	Hold Food

Source: Primary data processing, 2020

Factors Influencing The Level of Household Food Security in Danau Panggang District

The similarity of household food security levels in Danau Panggang District is as follows:

$$Logit[P] = ln\left[\frac{P}{1-P}\right] = -12,154 + 0,066 X_1^{**} - 0,057 X_2^{**} + 0,376 X_3^{**} + 0,181 X_4$$
$$+1,684 D_1^* + 1,989 D_2 - 5,852 D_3^*$$

The Y value or the value of the dependent factor in the logit model above shows the level of household food security where households are included in the food insecurity criteria with an index value <0,66 are given a score of 0, while households with food resistant criteria with an index value> 0,66 are given score 1.

Model Goodness Test

Before the equation model above, an interpretation of the coefficients used is carried out, then the model is tested for the goodness of the model first to find out whether the model used is fit with the empirical data. Three tests of model goodness were performed on this equation model.

Overall Test

The first test simultaneously on the logistic regression model uses the Chi-Square value of the difference between -2 log likelihoods before the independent variable enters the model and -2 log likelihood after the independent variable enters the model. Based on the results of the analysis with the Omnibus Tests of Model Ceofificients on the G test, the Chi-Square value was 93,251 and the P value was less than α =0,05, namely 0,000. This shows that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted, so that together the independent variables used significantly determine the dependent factor, namely the level of food security.

Nagelkerke R Square

The second test is to assess the ability of the independent variable to explain the dependent variable, so the Cox & Snell R Square and Nagelkerke R Square values are used. Based on the test results, it shows that the Nagelkerke R Square value is 0,831. This shows that the level of household food security of 83,1% is determined by the independent variables in the function, while the remaining 16,9% is determined by factors outside the model or not included in the function model.

Goodness of fit test (GoF) atau *Hosmer and Lemeshow Test*

Goodness of fit test (GoF) or Hosmer and Lemeshow Test it is said to be right if there is no significant difference between the model and its observation value. Score *Chi-Square Hosmer and Lemeshow* shows the number 1,478 with a *P* value of 0,993. Thus the P value is greater (>) when compared with α = 0,05. This shows that the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. This means that the logistic model used is *fit* with the empirical data, is acceptable and there is no significant difference between the model and its observation value, so that further hypothesis testing can be carried out.

Partial Test

Table 2. Results of the logit analysis on the level of household food security

Predictor	Coef	SE Coef	Z	P	Odds Ratio
Constant	-12,154	3,908	9,674	0,002	0,000
RT Income (Rp)	0,066	0,017	14,486	0,001**	1,068
Food Expenditure (Rp)	-0,057	0,028	4,276	0,039**	0,945
RT Mother Education (years)	0,376	0,168	4,994	0,025**	1,457
Number of RT Members (person)	0,181	0,349	0,268	0,605	1,198
Profession	1,684	1,271	3,150	0,076*	5,386
Raskin recipients	1,989	3,335	2,448	0,118	7,304
Capital Assistance	-5,852	3,908	3,079	0,079*	0,003

Concurrent Test Criteria (Model):G=93,251, DF=7, P-*Value*=0,000 *Nagelkerke R Square*=0,831

Source: Primary data processing with the SPSS 21 application, 2020.
*Information:*** = significant α=0,05*
*   * = significant α=0,10*

Table 2 shows that the factors that significantly influence the level of household food security are income factor (X_1), food expenditure factor (X_2), education of housewives (X_3) at α = 0,05. While the factor of work (D_1) and recipients of assistance (D_3) has a significant effect on α = 0,10. While the rest, namely the number of household members (X_4) and Raskin recipients (D_2), did not have a significant effect on α = 0,10.

Household Income

The household income factor has a positive coefficient value and is significantly different from zero at α = 0,05 so that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. The combination of a positive coefficient value direction sign and an odds ratio of 1.068 means that if household income increases by ten thousand rupiah, the level of household food security will increase. This shows that a household with a higher income has 1.068 times the chance to approach the household food security level.

Household Food Expenditure

The household expenditure factor has a negative coefficient value and is significantly different from zero at α=0,05, so the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This means that the higher the expenditure on food, the household tends to be food insecure. The combination of the

negative coefficient value and the odds ratio of 0,945, it can be said that the increase in household food expenditure is ten thousand rupiahs, then the household is 0.945 times which tends towards food insecurity.

Housewife Formal Education

The education factor of the housewives obtained a positive coefficient value and was significantly different from zero at $\alpha=0,05$ so that the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted. The combination of positive coefficient values and odds ratios shows that if a housewife's formal education increases by one year, then it is 1,457 times that the household tends to be food-resistant.

Number of Household Members

The number of household occupants factor has a positive coefficient value and is not significantly different from $\alpha=0,10$ so that the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. Although not significant, the positive coefficient sign and the odds ratio explain that, an increase in the number of household members by 1 person has a 1,2 times greater chance of moving away from the level of food security, an increase in the number of family members means that food expenditure used for food needs also affects distribution of the amount of food consumption for each occupant of the household.

Job Dummy

The job dummy variable has a significant effect on the level of food security of a household, at $\alpha=0,10$ so that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. The combination of positive coefficient signs and odds ratio values means that 5,386 households whose jobs are not farmers have a more than 5 times chance of approaching the level of household food security compared to households whose jobs are farmers. This explains that the work of the head of the household who is a farmer or non-farmer is related to data collection. In terms of type, households that work in fields other than farmers, the household income is higher than that of farmers.

Raskin Dummy

Raskin dummy variable does not significantly influence the level of food security of a household, at $\alpha =0,10$ so that the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. The combination of a positive coefficient sign and the odds ratio value means that it is 7,304. Although it is not significant that households as recipients of Raskin have more than 7 times the chance to approach the level of household food security.

Capital Assistance Dummy

The last factor, namely the dummy variable of capital assistance for households that are not food resistant has a significant effect on $\alpha =0,10$ so that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This shows that the dummy factor of capital assistance has a significant effect on the level of household food security. The combination of negative coefficient values and odds ratios shows that as much as 0,003 times the households receiving assistance from the Desa Mandiri Pangan program in the form of capital assistance tend to have a lower level of food security than households that do not receive capital assistance. Capital assistance received by households receiving the independent food program in the form of a capital loan of IDR 600.000 up to IDR 2.000.000 / household is used for rice farming activities and has not had an impact on increasing food security and even tends to decline.

IV.   Conclusions And Suggestions

Conclusion

Based on the research results indicate that the conclusion is
1. Based on the index value, it shows that the food security level of households receiving the food independent village program is significant in the food insecure category. Meanwhile, households that do not receive the independent food program are significantly included in the food resistant category.
2. Factors of household income, household food expenditure, housewives education, employment and capital assistance have a significant effect on the level of resilience household food independent village program and not receive the independent food program in Danau Pangang District, while the factor of the number of household members and households receiving Raskin did not significantly influence the level of household food security.

Suggestion

Based on the results and discussion and conclusions in this study, it is suggested:
1. To improve the implementation of the Food Independent Village Program in Danau Panggang District, Hulu Sungai Utara Regency, the capital assistance program should be accompanied by training and mentoring so

that management in the use of capital will be better managed and can increase the change in the mindset of the community in using capital to minimize the risk of loss.

2. The level of education of housewives is one of the factors affecting the level of household food security, housewives play a role in household consumption patterns. To increase the knowledge of housewives, it is hoped that through counseling on the importance of nutrition for the family and empowerment of housewives to fulfill food diversity by planting vegetables and fruits in the yard so that family food needs can be met to increase the level of household food security. better.

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