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Food Security of Households Paddy Rice Farmers in Tidal Land Barito Kuala Regency

Hartoni Hartoni, Karimal Arum Shafriani*

Departement of Agribusiness, Faculty of Agriculture, Lambung Mangkurat University, 70714, Banjarbaru, Indonesia

*Correspondence: karimal.shafriani@ulm.ac.id

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ABSTRACT

This article analyzes the factors that influence the food security of lowland rice farmers' households in tidal land, Barito Kuala Regency. The respondents of this study were 100 rice farmers in tidal land. The analysis for consumption patterns and food security used descriptive analysis with an approach to the level of adequacy of energy and protein, while for the analysis of factors that affect food security used a binary logistic regression model. The results showed that the pattern of energy consumption by rice farmers in tidal swamp land was 1,668 calories/capita/day and protein was 48.37 grams/capita/day. The number of farmers who were included in the food secure category was 62.00% and 38.00% were not food secure. Households with high food income, small proportion of food expenditure, large availability of food and large area of rice farming land have the opportunity to be more food secure.

Keywords: Binary logistic regression, Consumption patterns, Food security, Paddy rice farmer, Tidal land

1. Introduction

The process of realizing national food security that The Republic of Indonesia can currently do, one of which is through efforts to use suboptimal land that still exists. Tidal land as suboptimal land has characteristics and potential in various types of land, so technology that is technically relevant, economically affordable for farmers, and in line with local wisdom of the community is needed (Ak & Novitarini, 2020). Barito Kuala Regency is a regency area in South Kalimantan that has the most tidal land potential. Agricultural land in Barito Kuala Regency has been used for the development of food crops and horticultural crops (Shafriani & Hartoni, 2021). The area of tidal land in Barito Kuala Regency which is used as agricultural land covers an area of 115,896 ha (Statistics Indonesia, 2022a). If the potential of this tidal land is developed optimally, it will certainly make a very large contribution to the food availability in South Kalimantan and national.

As a basic human need, food is a must to maintain its adequacy (Saputro & Fidayani, 2020). The inability of households to meet food adequacy is a problem in food security (Sayekti, Wuryaningsih Dwi Viantimala et al., 2021). This food problem is ultimately related to the level of energy and protein consumption, as well as the diversity of types of food consumed (Safitri et al., 2017). Food security in an area is closely related to the condition of food security at the individual and household levels (Indriani, 2015).

Referring to existing nutritional norms, the importance of food consumption both in terms of quantity and quality can describe the indicators of food security itself. The share of food expenditure as an important part of consumption patterns is closely related to food security. This is in accordance with Engel's Law which means that the percentage of expenditure on foodstuffs will decrease along with an

increase in income, if tastes are not different (Nicholson, 1995). Household income has a significant relationship with the level of household resilience (Ihsan et al., 2021).

According to Maltus, production from agricultural commodities for human needs is developing slowly compared to the development of human numbers. The growth of food production increases according to the arithmetic progression, while humans increase according to the geometric progression (Mulyadi, 2003).

Non-food security is often found in poor groups of people (Damayanti, 2018). This condition is often associated with the life of rural people. Meanwhile, we know that rural people work as farmers. Based on the Statistics Indonesia (2022b) percentage of the number of poor people in South Kalimantan tends to increase based on data from 2020 to 2021. This condition also occurs in Barito Kuala Regency. The percentage of poor people in Barito Kuala Regency, is relatively larger than the percentage of poor people in South Kalimantan Province. In 2021, the percentage of the number of poor people in Barito Kuala Regency was 5.11% greater while in South Kalimantan Province was 4.83%.

The average per capita/month expenditure at the Barito Kuala Regency level (Rp 1,018,285/capita /month) is smaller than at the South Kalimantan Province level (Rp 1,644,260/capita/month). Consumption expenditure for the food group (46.72%) at the South Kalimantan province level was relatively smaller compared to the non-food group (53.28). Meanwhile, when viewed at the level of Barito Kuala Regency, it shows that consumption expenditure for the food group (56.92%) is relatively greater than that of the non-food group (43.08%) (Statistics Indonesia, 2022b, 2022a).

The availability of regional food can show the amount that can be consumed by the people in the area. Based on the Food and Nutrition Awareness System Report, the three sub-districts that have the highest rice production among the seven districts indicated to be food insecure are Belawang, Cerbon and Tabukan Districts. The production of rice as a staple food according to Statistics Indonesia (2022a) in the three districts is 26,488 tons, 20,706 tons and 22,778 tons, respectively.

The purpose of this study is to analyze consumption patterns, household food security, and analyze factors that affect the level of food security of paddy rice farmers in the tidal land of Barito Kuala Regency. Thus, it is hoped that this research can become one of the literatures for the benefit of further research in the same and related interests, as well as a recommendation for the development of food security for the community and the government.

2. Materials and Methods

This research was conducted in three sub-districts of Barito Kuala Regency, South Kalimantan Province. The selected agricultural area was an agricultural area that produces paddy rice and its land in the category of tidal land. Three sub-districts were selected through deliberate sampling, then two villages were taken in each sub-district. As the object of research there were peasant households who were trying to farm paddy rice on tidal land in the designated village.

The sampling process was carried out through stages, namely determining sub-districts, determining villages, and determining household samples. The determination of three sub-districts (Belawang, Cerbon and Tabukan Districts) from 7 sub-districts in the Barito Kuala Regency area considering that the three sub-districts were indicated to be food insecure and had a fairly high rice production. Furthermore, the determination of two villages in each sub-district was based on three types of tidal overflow in tidal land (type A, type B, and type C land). Patih Salira and Bambangin villages were chosen in Belawang District (type A land); Simpang Nungki and Sawahan villages in Cerbon District (type B land); and Karya Jadi and Karya Makmur Villages in Tabukan District (type C land). The determination of the sample of paddy rice farmer households in each selected village used proportion with a 100 of respondents.

The analysis used to analyze consumption patterns using simple tabulation analysis based on data processed through 24-hour food recall. Analysis of consumption patterns observed is the amount of energy consumption from calories/capita/day, as well as protein consumption from grams/capita/day. Data analysis to calculate energy and protein consumption used the nutri2008 application. Indicators used in analyzing food security were by looking at calorie and protein consumption. If the consumption of calories and or protein is less than 70% of the nutritional adequacy rate (AKG), then the person belongs to the category of non-food security (Sukandar et al., 2006).

The analysis used to determine the factors that affect the food security of paddy rice farmer households in tidal land is a binary logistic regression analysis. According to Hosmer and Lemeshow (2000), that the determination of the logistic regression model is as follows:

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

Considering that researchers need the form of a linear function model, the transformation process is carried out from the form of the function above, so that it becomes a logit model as follows:

$$logit\ [\pi(x)] = \ln\left[\frac{P}{1-P}\right] = g(x) \quad (2)$$

$$g(x) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 \quad (3)$$

Information
α : Intercept
β : logistics coefficient (from 1.2,...,6)
X_1 : Per capita income (Rp/capita/month)
X_2 : Proportion of food expenditure (%)
X_3 : Number of household members (persons)
X_4 : Housewife education (years)
X_5 : Rice availability (kg/capita/year)
X_6 : Area of rice farming (hectares)

The above variables were chosen with the consideration that these variables were economic characteristics that can determine the purchasing power of farming households. The determination of these variables refers to the research of Novita (2010) but added the variable of rice farming area as an additional variable in this study as a novelty of research and specifications of the location of rice farmers in tidal fields.

3. Results and Discussion

Food Consumption Patterns of Farmer Households

The food consumption pattern of farmer households is the amount of farmers' consumption of energy and protein, which comes from household food. The energy and protein consumption of paddy rice farmers in tidal land of Barito Kuala Regency in presented in Table 1.

Table 1. Energy and protein consumption of paddy rice farmers in tidal land

No	Energy (cal/cap/day)	Number (people)	Percentage (%)	Protein (gr/cap/day)	Number (people)	Percentage (%)
1	1,385 – 1,648	61	61	36.70 –45.92	50	50
2	1,649 – 1,912	19	19	45.93 –55.15	31	31
3	1,913 – 2,176	17	17	55.16 –64.38	12	12
4	2,177 – 2,440	3	3	64.39 –73.61	7	7
	Total	100	100		100	100

The predominance of paddy rice farmers who were respondents in this study consumed energy ranging from 1,385 – 1,648 calories/capita/day, which was 61 people. While energy consumption starts from 2,177 – 2,440 calories/capita/day only 3 farmers. Based on the average results, energy consumption by paddy rice farmers in tidal land was 1,668 calories/capita/day. This means that there is still a shortage of 332 calories/capita/day compared to the energy adequacy rate based on food pattern expectations.

The consumption of food containing protein by paddy rice farmers who were respondents in the study ranged from 36.70 – 45.92 grams/capita/day as many as 50 farmers. While at intervals between 64.39 – 73.61 grams/capita/day, only 7 farmers. Based on the average results, protein consumption by rice farmers who were respondents in the study was 48.37 grams/capita/day. This means that there is still a shortage of protein consumption of 3.63 grams/capita/day compared to the protein adequacy rate based on the expected food pattern.

Household Food Security

Household food security is determined based on the level of energy and protein consumption as measured based on the adequacy of nutrients that should be met. Based on the data shown in Figure 1,

it shows that the number of farmers who fall into the food security category is the most numerous group, which is 62.00%. Meanwhile, farmers who belong to the non-food security group are only 38.00%.

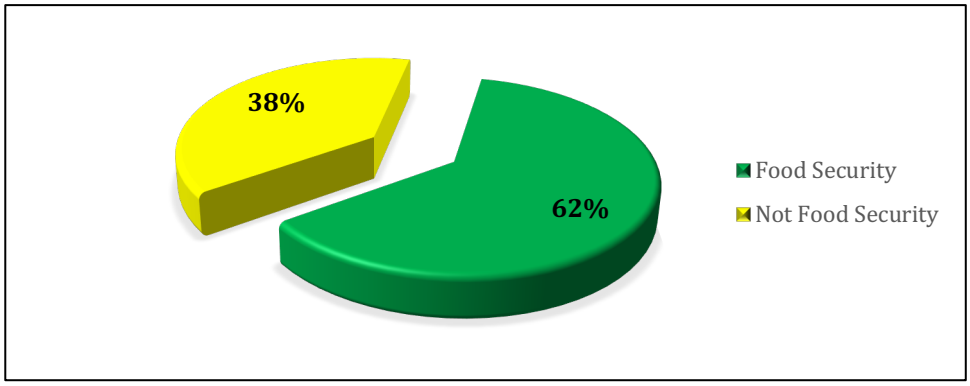

Figure 1. Diagram of the number of farmers based on household food security.

Factors Affecting the Food Security of Paddy Rice Farmer Households

If on the OLS (Ordinary Least Square) model to test simultaneous significance using the F-test, while on the logistic regression model using the Chi-Square value of the difference between -2 log likelihood before the independent variable enters the model and -2 log likelihood after the independent variable enters the model. This test is also called Maximum likelihood testing. Meanwhile, based on the results of the analysis with the Omnibus Tests of Model Coefificients, it shows that the resulting model is fit after the education variables of housewives of rice paddy farmers are eliminated. This is based on the smaller sig. value with a confidence level of α = 5% (0.05), with a Chi-square value of 101.398.

The values of Cox & Snell R Square and Nagelkerke R Square are used to assess the ability of independent variables to describe dependent variables. These values are also known as Pseudo R-Square, or if in the OLS (Ordinary Least Square) model model it is better known as R-Square. Based on the test results, it shows that the value of Nagelkerke R Square is 0.867 or 86.7%, which means that the ability of independent variables (socioeconomic factors) in explaining the dependent variable (food security of farmer households) is 86.7%, while the remaining 13.3% is explained by other factors outside the model, such as climate change, transportation, and others.

The Goodness of fit test (GOF) to find the value of Chi-Square Hosmer and Lemeshow is a test carried out in order to determine whether the model is formed correctly or not. It is said to be appropriate if the model with its observation value does not have significant differences. Hosmer and Lemeshow's Chi-Square value is shown at 0.906 with its sig. value of 0.999. Thus, the value of the sig. smaller (<) when compared to the confidence level value of α = 5% (0.05). So that the decision made that the model in this study is acceptable because there is no significant difference between the model and its observation value, and further hypothesis testing can be carried out.

The number of rice farmers in food insecure tidal lands was 62 real farmers in the study area based on survey data. While the number of farmers who are truly food safe seen from the logistics model is only 58 farmers, there are 4 farmers who are food secure in real terms but seen from the logistics model are not food secure.

The number of paddy rice farmers in tidal fields that are not food resistant is 38 people. Meanwhile, the number of farmers who are really not food secure is 34 people, and those who should be food secure, but not food secure are 4 people. Therefore, based on the results of the analysis, an overall percentage of 92.0% was obtained. This gives the understanding that the accuracy of the model in this study is 92.0%.

Table 2. Logistic regression analysis test results

Independent Variables	Coefficient	Wald	Sig	Exp (B)
Farmer household income (Rp/capita/month) (X_1)	0.000	5.152	0.023	1.000
Proportion of food expenditure (%)(X_2)	- 0.224	4.009	0.045	0.799
Housewife education (years) (X_4)	0.114	0.095	0.758	1.121
Household food availability (kg/capita/year) (X_5)	0.055	4.990	0.025	1.056
Area of rice farming (hectares) (X_6)	16.771	5.834	0.016	19211123

Constant	-23.615	5.033	0.025	0.000

Source: Primary data processing, 2022

Based on the data presented in Table 2, that four socioeconomic variables analyzed using multivariate analysis showed significant influences. The household income of paddy rice farmers, which is calculated based on per capita household income per month, indicates that it has a significant influence on the food security of paddy rice farmer households in the tidal land of Barito Kuala Regency. This can be seen from its sig.¬ value of 0.023, which means it is smaller than the Significant level (α) of 5% = (0.05). In addition, the Odds Ratio value on the farmer's household income variable is 1,000. This means that everyone rupiah increase in the income of farmer households will increase the chances of food security households by 1,000 times. So that to improve food security can be done through increasing the income of farmer households.

The proportion of household food expenditure of paddy rice farmers, which is calculated based on the proportion of food expenditure to total household expenditure, shows that it has a significant influence on the food security of paddy rice farmer households in the tidal land of Barito Kuala Regency. This can be seen from its sig.¬ value of 0.045, which means it is less than the level of trust (α) of 5% = (0.05). In addition, the Odds Ratio value in the variable proportion of farmers' food expenditure is the largest, namely 0.799. This means that every 1.00% increase in the proportion of food expenditure will reduce the chances of households being food secure by 0.799 times.

The availability of food for paddy rice farmers in tidal land of Barito Kuala Regency has a probability value of 0.025. This, if tested with a confidence level (α) of up to 5% (0.05) is still smaller in probability value (sig. = 0.025). The availability of household food, in this case rice for consumption is produced from the farmers' own production. The availability of this food is closely related to energy and protein consumption which is used as a determining indicator of food security in this study. In addition, based on the results of these tests, the Odds Ratio value in the household food availability variable is 1,056. This means that every increase of one gram/capita/year of food availability (rice) of farming households, will increase the chances of households being food secure by 1,056 times.

The area of rice farming land cultivated is certainly related to the provision of food for food consumption needs. So that the wider the farming land, of course, the estimated amount of food that can be consumed can be greater. This is in line with the results of the multivariate analysis test which shows that the sig value is 0.016. Thus, if tested at a confidence level (α) of 5% = (0.05), it resulted in a decision that the variable area of rice farming has a significant influence on the food security of paddy rice farmer households in tidal land of Barito Kuala Regency. In addition, the value of Odds Rati) in the variable area of farmland is 19,211,123. This means that every 1 hectare increase in the area of rice farming will increase the chances of food security households by 19,211,123 times.

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

4. Conclusions

The pattern of energy consumption by paddy rice farmers in tidal land is 1,668 calories/capita/day, while protein consumption is 48.37 grams/capita/day. This means that there is still a shortage of 332 calories/capita/day for energy consumption and 3.63 grams/capita/day for protein consumption compared to energy and protein adequacy figures based on food pattern expectations. The number of farmers who fall into the food security category is the most numerous, which is 62.00%. Meanwhile, farmers who belong to the non-food security group are only 38.00%.

Based on the binary logistic regression model, it shows that the variables that affect the food security of rice paddy farmer households are per capita income, proportion of food expenditure, food availability and rice farming area. While the variables that did not affect were the number of household members of rice farmers and the level of education of housewives.

Suggestions that can be given based on the conclusions of this study are 1) the development of business diversification/side jobs, as an effort to increase household income, which in turn can improve the food security of farmer households; 2) optimize rice production by implementing the principles of intensive cultivation and allocating resources (production factors) efficiently, so that the amount of food availability becomes greater; and 3)make extensification efforts for uncultivated idle lands, so that the amount of food produced becomes greater.

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