

## FOOD SECURITY OF FARM HOUSEHOLDS: A CASE OF LAND CONSOLIDATED PARTICIPANTS IN SUKOHARJO REGENCY

**Maharestri Rahmi Widarso<sup>1</sup>, Jamhari<sup>2</sup> & Sugiyarto<sup>2</sup>**

*Department of Agricultural Social Economics, Faculty of Agriculture, Gadjah Mada University Jalan Flora, Bulaksumur, Caturtunggal, Depok District, Sleman Regency, Yogyakarta Special Region 55281*

*Corresponding author: maharestriw@gmail.com*

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### ABSTRACT

Food security is defined as the availability of food in sufficient quantity and quality, distributed at affordable prices and safe for every citizen to support their daily needs at all times is also intended for farmers participating in land consolidation. Land consolidation is a policy of restructuring tenure and land use to improve environmental quality and the maintenance of natural resources by involving community participation. The research aims to find out (1) the level of food security of the farm households, (2) the level of diversification of food consumption, and (3) factors that influence the food security of the farm household of land consolidation participants in Sukoharjo Regency. The location of the study was determined by purposive sampling in Dalangan Village, Tawang Sari District, Sukoharjo Regency. The selection of respondents was determined by a simple random sampling of 60 farmers participating in land consolidation. To determine the level of food security the Jonsson and Toole method was used. The level of diversification was analyzed by using the entropy method, and the factors that influence food security were analyzed by multiple linear regression. The results showed that the level of food security of farm households of land consolidation participants in Sukoharjo Regency was in the category of lack of food (76.7%). The level of food diversification of farm households of land consolidation participants in Sukoharjo Regency has not been completely diversified. Factor that increase the amount of food expenditure is the number of family members, while factors that decrease the amount of food expenditure are food diversification, the number of school children, and mother's education. Factors that increase the number of energy sufficiency are cooking oil price, mother's education, and menu variations, while factors that reduce the energy sufficiency rate are food diversification and the number of family members.

*Keywords: Food Security, Food Diversification, The Amount of Food Expenditure, The Number of Energy Sufficiency, Land Consolidation*

### INTRODUCTION

Food security is available food in enough quantity and quality, distributed at affordable prices, and safe for consumption for every citizen to support their daily activities at all times. Food of Law No.7 of 1996 states that food security is a condition for fulfilling food needs for households as reflected in the availability of sufficient food in quantity and quality, safe, fair, and affordable. One of the national development achievements is updating systems and programs to achieve effective and efficient performance. One of the government programs to advance the agricultural sector is to promote modern rural programs. The current agricultural program is a development in the farming industry by utilizing technology and innovation. The form of modern agriculture is land consolidation. Land consolidation is a policy regarding rearrangement of control and use of land as well as efforts to improve environmental quality

and maintenance of natural resources by involving community participation (KaBPN Regulation No. 4 of 1991 in Machyus, 2009). Land consolidation is carried out based on land use regulations, especially management to reduce management costs (Guanghui et al. 2015). The executor of land consolidation in Indonesia, which is still running until now in Sukoharjo Regency, to be precise in Dalangan Village, Tawang Sari District, Sukoharjo Regency. Election of Dalangan Village, Tawang Sari District, consolidation The background is because this village has a rice field area of 160 ha and has an agricultural machinery service business (UPJA) which is coordinated with the association of farmer groups, therefore agricultural machinery can be used effectively and efficiently. The application of land consolidation by removing paddy fields so that several rice fields comprise one area. Management in land consolidation can increase land productivity by reducing production costs and involving active

community participation (Vitikainen, 2004). Decreasing production costs in farming will indirectly increase farm household income. According to Damayanti and Khoirudin (2016) household income can affect the level of household food security. This study aims to determine the effect of land consolidation on the household food security of farmers, especially in Dalangan Village, Sukoharjo Regency.

**METHOD**

The basic method used in this research is descriptive method. The data analysis in this study was carried out qualitatively and quantitatively. The method used is survey technique. The method of determining the location of the area using a purposive sampling method is in Dalangan Village, Tawang Sari District, Sukoharjo Regency. Determination of the sample using simple random sampling method as many as 60 respondents of land consolidation farmers in Dalangan Village, Tawang Sari District, Sukoharjo Regency with the number of farmers, especially members of the Tani Mandiri farmer group association. Tani Mandiri group has 187 members consisting of 55% tenant owners, 30% landless tenants, and 15% seasonal / annual tenants. Therefore, the sample in this study consisted of 30 tenant farmers and 30 tenant owner farmers. Food security is measured by knowing in advance the energy adequacy rate and the share of food expenditure, as follows:

a. Adult Equivalent Energy Consumption

$$KED = \frac{KErt}{JUED}$$

Where:

KED = Energy consumption per adult equivalent

KErt = Household real energy consumption

JUED = Number of adult equivalent units (equivalent to the number of household members)

b. Energy Adequacy Percentage

$$KED = \frac{KED}{2150} \times 100\%$$

Where:

PKE = Energy Adequacy Percentage (%)

KED = Energy and protein consumption per adult equivalent

c. Food Expenditure Share Approach

$$PPP = \frac{FE}{TE} \times 100\%$$

Where:

PPP = Share of food expenditure (%)

FE = Expenditure for food expenditure (IDR / year)

TE = Total household expenditure (Rp / year)

The share of food expenditure <60% of total expenditure is food security households. The share of food expenditure ≥ 60% of total expenditure is food insecurity households. Then identified using the food security indicator Jonsson and Toole.

Table 1. Indicators of Food Security

Energy consumption per adult equivalent unit	Share of food expenditure	
	Low (<60% of total expenditure)	High (≥60% of total expenditure)
Enough (> 80% energy adequacy)	Food Security	Food Vulnerable
Less (≤80% energy sufficiency)	Food Lack	Food Insecurity

Source: Jonsson and Toole (1991) cit. Maxwell et al. (2000)

Diversification of household food consumption for land consolidation participants in Sukoharjo Regency using the entropy index measurement of the share of calorie expenditure (Thiele et al, 2003 and Moon, 2002) is as follows:

$$E = - \sum_i^n W_i \ln w_i$$

$$= W_i \ln (1 / w_i)$$

$$W_i = \frac{P_i Q_i}{Y}$$

Where:

E = Entropy index

W<sub>i</sub> = Share of household nutritional food expenditure for commodity Q<sub>i</sub>

Y = Total expenditure on certain foods

P<sub>i</sub> = Price for certain types of food

Q<sub>i</sub> = The number of certain types of food consumed

Source: Analysis Primary Data, 2019

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

Where:

- s = Standard deviation
- $x_i$  = The value of x to i
- $\bar{x}$  = Average
- n = Sample size

The factors that affect food security are divided into two, namely factors that affect energy sufficiency rate and factors that affect the share of food expenditure. The test is applied using multiple linear regression which has previously passed the classical assumption test. Mathematically, the model can be written as follows:

$$Y_t = \beta_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \mu$$

Description:

- Y = Amount of food security
- with  $t_1$  = Share of Food Expenditure
- $t_2$  = Energy Adequacy Rate
- $\beta_1$  = Constant
- $\beta_{1-12}$  = Coefficient of variable
- $X_2$  = food verified
- $X_3$  = Number of school children (people)
- $X_4$  = Price of rice (Rp / Kg)
- $X_5$  = Oil price (Rp / l)
- $X_6$  = Price of eggs (Rp / Kg)
- $X_7$  = Amount member family (person)
- $X_8$  = Number of adults (people)
- $X_9$  = Household income (IDR / year)
- $X_{10}$  = Mother's education (year)
- $X_{11}$  = Menu variations (kinds)
- $X_{12}$  = Number of family members work (people)
- $\mu$  = Error term

## RESULTS AND DISCUSSION

The share of food expenditure is the ratio between food expenditure and total household expenditure. Total household expenditure is obtained from food expenditure and non-food expenditure.

Table 2. Distribution of Consolidated Participant Farmers' Household Food Expenditure Share Land in Sukoharjo Regency in 2019

Share of Food Expenditure	Farmer Household	
	Amount	Percentage (%)
Low	57	95
High	3	5
Total	60	100

Based on the information obtained in Table 2, it can be seen that the share of household food expenditure on land consolidation participants in Sukoharjo Regency is in the low category (<60% of total expenditure). The number of farmer households participating in the land consolidation is in the low category, namely 95% or as many as 57 households. Meanwhile, farmer households that participated in the land consolidation were in the high category ( $\geq 60\%$  of total expenditure), namely only 5% or as many as 3 households. The lower the share of food expenditure to total household expenditure, the household is said to be food resistant, and vice versa. This shows that with the share of food expenditure approach, the majority of farmer households participating in the land consolidation fall into the food security category.

The classification of food security with the Jonsson and Toole category is by crossing the share of household food expenditure with the energy adequacy rate. Energy adequacy figure is a reference number to determine the amount of energy needed by the body for food consumption every day.

Table 3. Energy Adequacy Figures for Farmers Participating in Land Consolidation in Sukoharjo Regency

Numbers Energy Adequacy	Farmer Household	
	Amount	Percentage (%)
Less	49	81.7
Enough	11	18.3
Total	60	100

Source: Analysis Primary Data, 2019

Based on the information contained in Table 3, it can be seen that many of the farmer households participating in the land consolidation in Sukoharjo Regency have insufficient energy adequacy rates (<80% of the energy adequacy rate). The number of households with an energy sufficiency rate of less than 80% was 49 households with a percentage of 81.7%. Households participating in the land consolidation with an energy sufficiency rate of more than 80% were 11 households with a percentage of 18.3%. Energy adequacy figures can be met if the food consumed by each individual in the household contains adequate nutrition. The education of housewives and knowledge of good nutrition by family members is essential to realize a well-nourished household.

The result of crossing the share of household food expenditure and energy sufficiency figure, obtained 4 categories, namely food security, food insecurity, food vulnerable, and

food lack. The following is the number of farmer households participating in land consolidation in Sukoharjo Regency according to the level of Jonsson and Toole food security shown in Table 4.

Table 4. Number of Farmers Households Participating in Land Consolidation in Sukoharjo Regency by Food Security Level of Jonsson and Toole

Food Security Level	House Farmer's Ladder	
	Amount	Percentage (%)
Food Security	11	18.3
Food Vulnerable	0	0
Food Lack	46	76.7
Food Insecurity	3	5
<b>Total</b>	<b>60</b>	<b>100</b>

Source: Analysis Primary Data, 2019

Based on the information obtained in Table 4, it can be seen that the majority of farmer households participating in the land consolidation in Sukoharjo Regency fall into lack of food category. The level of household food security of farmers participating in land consolidation in Sukoharjo Regency only falls into 3 of the 4 existing categories. The three categories are food security, lack of food, and food insecurity. No household is categorized as food vulnerable. This shows that there is no household with a high share of food expenditure with sufficient energy sufficiency. There were 11 households in the food resistant category with a percentage of 18.3%. Meanwhile, there were 46 that is categorized as low food with a percentage of 76.7% and food insecurity category as much as 3 households with a percentage of 5%. Many of the farmer households participating in the land consolidation are in the food lack category. This is because many households consume foods with low nutritional content. Therefore, although the share of household food expenditure is good, the absorption of nutrients needed by the body is still insufficient.

Diversification of household food consumption by land consolidation participants in Sukoharjo Regency was measured using data on the share of food expenditure which was then measured using the Entropy Index. The value of the Entropy Index ranges from 0 to 1. A value of 0 means that the household only consumes 1 food ingredient, while the value of 1 means that the household is perfectly diversified. The Entropy Index results in a diversification analysis of food consumption which is shown in Table 5 below.

Table 5. Analysis of Diversification of Household Food Consumption of Farmers Participating in Land Consolidation in Sukoharjo Regency

Variable	Minimum	Maximum	Average
Entropy Index	0.56	0.93	0.76

Source: Analysis Primary Data, 2019

Based on the results of the analysis contained in Table 5, it can be seen that the average Entropy Index value is 0.76. The minimum value of the diversification index is 0.56 while the maximum value of the diversification index is 0.93. This shows that of the 11 food components consumed by farm households, there is not a single farm household whose food consumption is diversified into the 11 food components.

Based on the calculation of the standard deviation, the result is 0.07. Determination of low and high groups using standard deviation by means of means (Table 5) ± standard deviation. The results obtained for the low group were 0.69 and the high group was 0.83. So, we get the low (0-0.69), medium (0.70-0.83) and high (0.84-1) group ranges. The results of the Entropy Index level classification from low, medium, to high levels are shown in the following table.

Table 6. Classification of Entropy Index Levels for Farming Households Participating in Land Consolidation in Sukoharjo Regency

Group	Total (Houses Stairs)	Percentage (%)
Low	9	15
Medium	45	75
<b>High</b>	<b>6</b>	<b>10</b>
<b>Total</b>	<b>60</b>	<b>100</b>

Source: Analysis Primary Data, 2019

Based on the information obtained in Table 6, it is known that the Entropy Index level groups for household food diversification of the land consolidation participants are classified as moderate (0.70-0.83). Meanwhile, the mean for the entropy index (Table 5) is obtained at 0.76. It can be said that the level of household food diversification of farmers participating in the land consolidation in Sukoharjo Regency is in the average range.

Factors that are thought to affect household food security based on the share of food expenditure and energy adequacy figures in this study are the number of family members, the number of adults, mother's education, number of school children, income, rice prices, egg prices, oil prices, menu variations, diversification of food, and many family members working. Before the multiple linear regression analysis was carried out, the classical assumptions were tested, including the normality test, multicollinearity test, and heteroscedasticity test. The factors affecting the share of food expenditure and energy adequacy figures are presented in Table 7.

Table 7. Comparison of the Results of Multiple Linear Regression Analysis of Factors Affecting the Share of Food Expenditure and the Energy Adequacy Rate of Household Farmers Participating in Land Consolidation in Sukoharjo Regency

Variable	Share of Food Expenditure			Energy Adequacy Rate		
	Sign Hope	Coefficientt-Statistics	Probability	Sign Hope	Coefficientt-statistics	Probability
C		111.223.72	0.0005		54.771.03	0.31
Food Diversification	-	-54.91 **-2.83	0.006	+	-63.55 *-1.85	0.07
Number of School Children	-	-4.87 **-2.59	0.01	+	-3.38ns-1.01	0.32
Price of Rice	+	-0.0002ns-0.23	0.82	-	0.0007ns0.41	0.68
Oil Price	+	-0.0003ns-0.42	0.68	-	0.004 **3.01	0.004
Egg Prices	+	-0.0006ns-0.60	0.55	-	-0.0007ns-0.37	0.72
Number of Family Members	+	3.45 *1.96	0.06	-	-8.57 **-2.73	0.008
Number of Adults	-	-2.76ns-1.57	0.12	+	-0.20ns-0.06	0.95
Income	-	-6.20E-08ns-1.29	0.20	+	4.16E-08ns0.49	0.63
Mother's Education	-	-1.56 *-1.76	0.08	+	2.93 *1.86	0.07
Menu Variations	-	1.84ns1.45	0.15	+	3.83 *1.70	0.09
Number of Working Family Members	-	-2.99ns-1.62	0.11	+	1.72ns0.53	0.60
R <sup>2</sup>			0.37			0.42
Adjusted R2			0.23			0.29
F-statistics			2.58			3.15
Prob (F-statistic)			0.01			0.003

Source: AnalysisPrimary Data, 2019

In Table 7, it is shown that the independent variables for the dependent variable on energy adequacy rate that have a significant effect on the dependent variable are diversification, oil prices, number of family members, maternal education, and menu variations. The descriptions of each significant independent variable on the dependent variable are as follows:

a. Food Diversification

Food diversification is defined as the large variety of food consumed by farmer households participating in the land consolidation in Sukoharjo Regency within one year. Table 7 shows that each increase of 1 type of food diversification will reduce the energy adequacy rate by 63.55 kcal. This shows that although the farmer households participating in the land consolidation consume a variety of foods, they have not been able to meet the energy needed in each household.

b. Oil Price

According to Table 7, for every 1 unit increase in oil prices, the energy adequacy figure increases by 0.004 kcal. This result is supported by research from Saliem and Ariningsih (2008) regarding SUSENAS data for the years 1999-2005 that cooking oil has remained relatively stable over time. Farm households participating in the land consolidation in Sukoharjo regency consume fried side dishes every day, so that the need for cooking oil will always be there every day.

c. Number of Family Members

Table 7 shows that for every increase of 1 person in the number of family members, the energy adequacy rate decreases by 8.57 kcal. This result is in accordance with the fact, the more the number of family members, the smaller the energy absorption of a household. The greater the number of family members, the smaller the portion of food that will be divided for each family member.

d. Mother's Education

Table 7 shows that every one year increase in mother's education will increase the energy adequacy rate by 2.93 kcal. A mother's education is very important to manage her family's daily diet. Highly educated mothers will definitely be very careful in presenting their food menu so that they can fulfill their daily nutrition.

e. Menu Variations

Table 7 shows that each increase in one kind of menu variation will increase the energy adequacy rate by 3.83 kcal. The menu variation in this study means the diversity of the menu that is consumed. The nutritional content of each food consumed everyday must be different. This result is in accordance with the fact, where the more varied the menu, the more various nutrients the

body will absorb.

Table 7 shows that the independent variables for the dependent variable share of food expenditure that have a significant effect on the dependent variable are food diversification, number of school children, number of family members, and mother's education. The descriptions of each significant independent variable on the dependent variable are as follows:

a. Food Diversification

Table 7 shows that each additional one unit of food diversification will reduce the share of food expenditure by 54.91%. This result is not in accordance with the theory that should be, because the more diverse household foods, the higher the share of food expenditure. According to Darsono (2012) the share of household food expenditure in the short term is relatively fixed. Meanwhile, food diversification as a government program, in the short term will disrupt household spending.

b. Many School Children

The information in Table 7 shows that the number of school children has a significant effect on the share of food expenditure. The regression coefficient obtained in this analysis is -4.87. This value means that with an increase in school children by one person, the share of food expenditure will decrease by 4.87%. This result is in accordance with the fact that the more households that have family members who attend school, the more the household will allocate expenditure for education.

c. Number of Family Members

This shows that the number of family members has a significant effect on the share of food expenditure. While the regression coefficient value obtained is 3.45. This shows that for every increase in the number of family members by one person, the share of food expenditure will increase by 3.45%. This is in accordance with the fact that the more the number of family members, the higher the expenditure on food.

d. Mother's Education

Table 7 shows that maternal education has a significant effect on the share of food expenditure. Meanwhile, the regression coefficient for maternal education was -1.56. This means that every one year increase in mother's education, the share of food expenditure decreases by 1.56%. This is consistent with the fact that the higher the education of the mother, the more organized food expenditure will be.

Based on this description, it can be seen that the distribution of households based on food diversification and food security status. This distribution is shown in Table 8 below.

Table 8. Household Distribution Based on Food Diversification and Food Security Status

Diversification Level Food	Resistance Food			
	Food Insecurity	Food Lack	Food Vulnerable	Food Security
Low	1 (1,7)	18 (30)	0 (0)	6 (10)
High	2 (3,4)	28 (46,7)	0 (0)	5 (8,4)

Source: Analisis Primary Data, 2019

Where:

Low: Food diversification with an entropy index below the average (Table 6)

High: Food diversification with an above average entropy index (Table 6)

**CONCLUSION**

1. The majority of farmer households participating in the land consolidation in Sukoharjo Regency are at the level of food lack with a percentage of 76.7%, while the percentage for food security is 18.3% and food insecurity is 5%.
2. The level of household food diversification of farmers participating in land consolidation in Sukoharjo Regency has not been completely diversified.
3. The factors affecting food security based on the share of food expenditure and energy adequacy figures are as follows:
  - a. Food diversification, the number of school children, and maternal education reduce the share of expenditure food. Meanwhile, the number of family members increases the share of food expenditure.
  - b. Food diversification and the number of family members reduce energy sufficiency. Meanwhile, the price of oil, maternal education, and menu variations increase the energy adequacy rate.
4. The absorption of the energy adequacy of the farmers participating in the land consolidation in Sukoharjo Regency is below the national standards recommended by the government.

**SUGGESTION**

1. Mother’s education is one of the variables that affects the share of food expenditure and energy sufficiency rate, so the government and social institutions need to provide counseling or training for housewives on the importance of nutritious food.
2. The number of family members affects the share of expenditure and the energy adequacy figure, both the central government and the government area need promote Family

3. Planning (KB) in order to create food security in each region.
3. The number of school children affects the share of food expenditure but does not affect the energy adequacy rate, so the government, in collaboration with schools, needs to provide counseling on the importance of nutritious food and the distribution of milk or mung bean juice to meet balanced nutrition for school children.
4. The amount of food diversification based on the entropy index is still categorized as not yet completely diversified, it is better if people consume more diverse foods in order to fulfill a balanced nutrition.
5. There is a need for counseling on the importance of balanced and sufficient nutritious food by the government in order to increase the absorption of energy adequacy of farm households participating in land consolidation in Sukoharjo Regency.

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