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Household Food Security of Porang Farmers in Surakarta Buffer Districts

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ABSTRACT

Farmers are the majority of jobs of Indonesian people, including porang farmers in the Surakarta buffer district. The existence of porang farmers has begun to be shaken in recent times due to quite extreme climate change, so it is feared that in addition to affecting the production of porang farmers, it will also have an impact on the food security of porang farmer households in the Surakarta buffer district. This study aimed to determine the food security level of porang farmer households in the three Surakarta buffer districts: Sukoharjo, Wonogiri, and Karanganyar. Food security analysis is a cross between the share of food expenditure and the caloric adequacy percentage, analyzed using the Jonsson and Toole cross-classification method. The analysis showed that based on the value of the share of food expenditure, 88% of porang farmers were in a food-secure condition, and the remaining 12% were in a food-insecure condition. The average portion of porang farmers' food expenditure was 40.36%. The results of the AKE calculation show that porang farmers consume energy of 2,937 kcal/capita /day. Based on Jonsson and Toole's cross-classification, about 76% of porang farmers are in the food secure category, 12% are in the food vulnerable category, and the remaining 12% are in the food less secure category; no farmers are in the food insecure category. This study's findings are crucial as they demonstrate that despite climate variability and fluctuating price changes, porang farmers in the Surakarta buffer district are classified as food-secure.

Keywords: *Farmer's Household, Food Security, Jonsson and Toole, Porang*

BACKGROUND

Food is a basic human need to sustain life. Adequate food for everyone at all times is a basic right that must be fulfilled. Food also functions as a provider of nutrition for a person's growth. Therefore, adequate and healthy food is a necessity for everyone. On the other hand, food security is a pillar for the development of other sectors and cannot be compromised (Wahyu Widada and

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Handoyo Mulyo 2017), because it is impossible to build an economy without first solving its food. Food security will be achieved when every individual is physically able to meet their food needs consistently. However, this situation cannot always be met, especially for poor households (Yuniarti et al. 2022). The main problems that hinder the increase in food security are the very rapid population growth that is not balanced by food production (FAO 2020; Rahut et al. 2022), the large number of land conversions, the increasing frequency of disasters and extreme weather that cause food crop production to decline and also the volatility of food crop commodity prices which are considered to threaten food security.

The surplus of rice, corn, soybeans and several other agricultural commodities that occur are certainly inseparable from the role of farmers as producers of various agricultural products. Not all farmer's households can meet their food needs due to limited food affordability. The community's dependence on primary food commodities such as rice causes food security to be disrupted (Rozaki 2021; Trilaksana, Fawzi, and Qurani 2020). Another problem that causes limited food affordability is the problem of poverty which is still experienced by most farmer's households (Nurjanah, Situmorang, and Kasymir 2021; Rahut et al. 2022). The low income of farmer's families will also reduce the opportunity to obtain good quality food. The high income of a household means a greater level of accessibility to obtaining good food. Low income will result in poor household food conditions (FAO 2020; World Bank 2015).This reality encourages every farmer's household to be more aware and learn more about their food security. Food diversification is one solution to solving the existing problem.

Indonesia is a country rich in natural resources, including local food sources. The potential of food resources can be utilized through food diversification as part of the government's efforts to minimize socio-economic disparities with sustainable food security development programs (Rahmanto, Purnomo, and Kasiwi 2021). In Indonesia, food diversification is commonly done by reducing rice consumption while increasing non-rice consumption (Imelda, *et al* 2009). One important reason for food diversification is to reduce national dependence on rice imports. One way to implement food diversification in Indonesia is to utilize the diversity of local food resources as a substitute for rice. One of these local food resources is porang.

Porang (Amorphophallus muelleri) is a tuber that commonly grows in marginal lands and forests. When appropriately utilized, it has extraordinary health benefits. Porang is becoming an agricultural product with high economic potential. On a 1-hectare plot, 6,000 porang plants can be cultivated. The yield from porang cultivation on an area of 1 hectare produces more than 20 tons. This is what makes porang cultivation economically and productively beneficial for porang farmers (Sari and Suhartati ,2015).

The existence of porang farmers has recently been shaken by extreme climate change. Climate change impact is one of the main challenges farmers face in tropical and subtropical countries due to its adverse effects on agricultural activities. The increase in air temperature, changes in rain patterns, and extreme climate conditions are causing a decrease in agricultural production (Arifah et al. 2022). During climate change conditions, the agricultural sector should be watched closely as it can threaten food security (Akmalia 2022). Although the economic value of porang is very high, it does not automatically increase the income of porang farmers. The risk of crop failure accompanies the

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cultivation of this plant due to drought, disease, and prices (Irianto, Riptanti, and Mujiyo 2022). Extreme climate change is feared to affect the production of farmers' porang and the food security of porang farmers' households in the buffer district of Surakarta. This phenomenon also made porang farmers in Surakarta decide to be more independent by forming a porang farmer community, especially to help with the cultivation and marketing of porang in the areas around Surakarta, including Sukoharjo, Wonogiri and Karanganyar, which are areas close to Surakarta or buffer areas of Surakarta (Rizki, Suminah, and Sugihardjo 2024). The need for research to be conducted on porang farmers is because porang farmers are faced with various phenomena, especially the problem of falling prices from year to year, so that concerns arise as to whether with these falling prices the food needs of porang farmers' families will be met. Based on the description that has been mentioned, this study aims to determine the Household Food Security of Porang Farmers in Surakarta Buffer Districts

RESEARCH METHODS

This study uses a descriptive analytical method. Of course, samples are needed to answer research questions. The minimum number of samples in this study is between 30 - 60 people (Wibowo 2021). The population of porang farmers is 130 farmers, so the researcher took a sample of 50 porang farmers from three buffer areas of Surakarta City who cultivate porang purposively, namely Sukoharjo, Karanganyar, and Wonogiri Regencies. The sample was determined using the purposive method which is porang farmers who are still actively planting in the last two years. This research is located in the buffer area of Surakarta Regency including Sukoharjo, Karanganyar and Wonogiri because porang farmers in this buffer area form a porang farmer community called Sahabat Petani Porang Community. This study will later analyze Farmer Household Expenditure, Percentage of Calorie Adequacy and Food Security of Porang Farmer Households.

Farmer's Household Proportion of Food Expenditure

The household expenditure of porang farmers is the sum of food and non-food expenditures. The overall unit of calculation is Rupiah. After analyzing the income and expenditure of porang farmer households, the research continued by calculating the share of food expenditure. The proportion of food expenditure is a comparison between expenditure on food and the total expenditure of farmer's households (Kalaba et al. 2022)

$$PFE : \frac{FE}{TE} \times 100\%$$

Information :
PFE : Proportion of food expenditure (%)
FE : Food expenditure (Rp)
TE : Total household expenditure (Rp)

The criteria used are if the value of the food expenditure proportion is less than 60%, then the farmer household is classified as food secure; conversely, if the food expenditure proportion is more than 60%, then the farmer's household is classified as food insecure. After calculating the share of food expenditure, this research also measured the calory adequacy rate in porang farmer's households.

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The following is the formula used:

$$Calory\ adequacy\ Percentage : \frac{Caloric\ availability\ per\ adult\ equivalent\ unit}{Calory\ adequacy\ recomendations} \times 100\%$$

Farmer's Household Food Security

The amount of productive activities of farmer households, which include both farming and non-farming companies, will be used for consumption expenditures. Food consumption can be used to calculate energy sufficiency and food expenditure share. Food security can then be determined using Jonsson and Toole's cross-classification of energy sufficiency figures and food expenditure shares. The number of family members can influence the quantity of money earned from farming and non-farming industries. The variables that have been identified can be used to determine the factors that influence food security. Figures for the portion of food expenditure and energy adequacy are used to analyze the level of food security of porang farmer's households, using Jonsson and Toole's cross-classification in food security clustering. The cross-classification is presented in the following table.

Table 1. Jonsson and Toole Cross-Classification in Food Security Classteritation

Caloric availability per adult equivalent unit	Share of Food Expenditure	
	Low (<60% of total expenditure)	High (≥60% of total expenditure)
Adequate (>80% from Requirement)	Food Secure	Food Vulnerable
Inadequate (≤80% from Requirement)	Food Less Secure	Food Insecure

Modified From Maxwell (Maxwell et al. 2000)

Decision-making criteria:

1. Food Secure Households: households with a share of food expenditure <60% and energy sufficiency consumption >80% of energy sufficiency requirements.
2. Food Insufficient/Less Secure Households: households with a share of food expenditure <60% and energy sufficiency consumption <80% of energy sufficiency requirements.
3. Food Vulnerable Households: households with a share of food expenditure >60% and energy sufficiency consumption >80% of energy sufficiency requirements.
4. Food Insecure Households: households with a share of food expenditure >60% and energy sufficiency consumption <80% of energy sufficiency requirements.

RESULT AND DISCUSSION

Farmer's Household Proportion of Food Expenditure

Porang is a local food commodity still in the Surakarta residency area. Porang farmers plant it on marginal land or let it grow freely in the forests surrounding the settlements, using a rain-fed system. However, some farmers are intensively cultivating this porang plant. Porang farmers in the buffer district of Surakarta are experiencing a decline, partly due to crop failures during extreme

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seasonal changes, such as during El Niño and La Niña. These extreme climate conditions have caused the planted porang tubers to fail to grow. This has led to a decrease in the production of porang, which will impact the food security of porang farmers' households. This condition also states that the phenomenon of porang production in Sukoharjo, Wonogiri and Karanganyar is still trapped in the cobweb cycle, meaning that the price of porang continues to fluctuate because it is influenced by several factors, one of which is demand and supply which continues to change. So that it also affects the selling price of porang in the Surakarta buffer zone including Sukoharjo, Wonogiri and Karanganyar. This phenomenon also causes farmers to be reluctant to plant porang by 20% of farmers who are members of the farmer community in the research area (Putri 2023).

Table 2. Total Expenditure of Farmer's Household

Expenditure type	Value	Percentage (%)
Food :		
Rice	35.420	3,76
Corn	1.526	0,16
Tubers	17.222,71	1,83
Nuts	19.820	2,10
Flour and Crackers	31.630,31	3,36
Meat and Fish	0	0,00
Egg	16.737,37	1,78
Another Protein	8.672,5	0,92
Milk and dairy product	16.346,33	1,74
Fats	18.106,03	1,92
Sweetener	19.152,2	2,03
Vegetables	44.503,29	4,73
Drinks	14.490,29	1,54
Fruits	21.424,15	2,28
Spices	21.635,77	2,30
Vitamin	5.650	0,60
The sum of Food Expenditure	**292.336,97**	**31,05**
Non-Food :		
Cigarrete	62.788	6,67
Gas	20.925	2,22
Electricity	72.330	7,68
Tax	19.281	2,05
School fee	173.059	18,38
Gasoline	151.133	16,05
Phone	32.239	3,42
Health fee	10.055	1,07
Bath and laundry supplies	38.333	4,07
Clothes	8.816	0,94
Contribution and donation	60.343	6,41
The sum of Non-Food Expenditure	649.301	**68,95**
Total Expenditure	**941.638,97**	**100,00**

Household income sources consist of various business activities in the on-farm, off-farm and non-farm sectors. The main source of income for farmers is mainly obtained from on-farm businesses. On the other hand, farmers can add activities by working on yard land or processing post-harvest

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production. On-farm, off-farm and non-farm businesses play an important role as a source of income. Household income obtained from these three sectors, the first priority is expenditure for consumption in the form of food needs with a share of food expenditure at a certain limit. The amount of productive activities of farmer households consisting of farming and non-farming businesses will be used for consumption expenditure (food and non-food). From the food consumption, the energy sufficiency figure and the share of food expenditure can be known. Then by using the Jonsson and Toole cross-classification of the energy sufficiency figure and the share of food expenditure, food security can be known. From this share of expenditure, the food security score of porang households in the research area can later be known.

This research was conducted on 50 households of porang farmers in Surakarta's three buffer districts: Sukoharjo, Wonogiri, and Karanganyar. It analyzes the food expenditure proportion of porang farmer households to measure food security levels. The proportion is calculated from food spending compared to the total expenditure of porang farmer households. The household expenditures of porang farmers consist of food and non-food expenses. Farmers use food expenditures to meet their dietary needs, such as staple foods, vegetables, side dishes, fruits, and supplementary food and beverages. Meanwhile, non-food expenditures are expenses for household needs other than food, including taxes, water, electricity, school fees, cigarettes, etc. The average proportion of expenditure on food is 31.05%, which is smaller than the proportion of non-food expenditure (68.95%). Household consumption expenditure is influenced by several factors, namely economic and non-economic factors. Economic factors impacting household income, wealth, and government policies aimed at reducing income distribution inequality. Meanwhile, the non-economic factors refer to the socio-cultural aspects of society, such as geographical conditions, eating habits, family value systems, and changes in ethics (Nurjati 2022).

Food is a human primary need that must be met, including Porang farmers. This food is needed to meet physical needs to be able to carry out daily activities and to maintain health. Table 2 indicates that Porang farmers have a minimum proportion of food expenditure compared to non-food expenditure. This indication is a good thing. The fulfillment of these two aspects must always be met so that Porang farmers are able to produce plants that are cultivated to harvest so that needs are fulfilled. Table 2 also states that the largest non-food needs are in the school fee section. These costs include the habit of parents in Indonesia to provide school provisions in the form of pocket money even though school fees in Indonesia are still free to senior high school levels. Kencana, Rubiyanto, and Widadie (2024) stated that for non-migrant households, education expenditure is the second-largest category of non-food expenses. This is significantly different from migrant households, where annual education expenditure is lower. Education expenditure includes school fees, uniforms, textbooks, courses, and education insurance.The second largest non -food expenditure is the expenditure of gas refill purchases. This indicates that the household is almost certain to cook food at home rather than buying food outside. This is also supported by the phenomenon of society in general, especially households, who often cook to meet food needs (Utami 2017). Therefore, it is not surprising that the community's need for gas is quite high and is a basic household expense.

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Table 3. Proportion of food expenditure

PFE	Total	Percentage (%)
Food Secure (< 60%)	44	88
Food Insecure (≥ 60%)	6	12
Total	50	100

Community expenditure consists of food expenditure and non-food. Food expenditure is one of the variables that can be used to analyze the welfare of the community by looking at the fact of total expenditure. The share of food expenditure is a percentage of household food expenditure on total household expenditure consisting of food and non-food expenditure. The lower the share of food expenditure means that the better level of community welfare (Badan Pusat Statistik Kabupaten Kebumen 2021; Mutawakkil, Susanti, and Safrida 2021). The share of food expenditure and food security has an inverted relationship. The decreasing the share of food expenditure shows increasing food security.

Based on the Food Expenditure Proportion calculation, 88% of porang farmer households are categorized as Food Secure, while the remaining 12% fall into the Food Insecure category. A farmer's household is considered food secure if its share of expenditure is less than 60%. A low proportion of food expenditure indicates an improvement in the welfare of the farmer's household. If a household has a large share of expenditure, the household food security will be lower. And vice versa if a household's share of food expenditure is getting smaller, the household food security will be even greater. This can be linked that the share of food expenditure and resistance has a reverse relationship (Rahayu et al. 2021). Furthermore, according to Engel's Law, the more significant the proportion of household expenditure on food, the poorer that household is (Suparmin, Budastra, and Tajidan 2022). If farmers can meet their basic needs, they are considered prosperous (Mulyana et al. 2023). This means that household consumption is focused on food, and farmer households can also fulfill non-food needs. One way to measure the level of household welfare is by comparing the level of income with the minimum living needs. While the economic welfare of the community is determined by purchasing power. If the community's purchasing power decreases, then the ability to meet the needs of life also decreases. This indicates a decrease in the level of community welfare (Mayangsari and Puryantoro 2020)

Table 4. Calory Adequacy Percentage

Caloric availability per adult equivalent unit	Total	Percentage (%)
Adequate (>80% from Requirement)	44	88
Inadequate (≤80% from Requirement)	6	12
Total	50	100

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The proportion of food expenditure and energy consumption is a component for determining household food security. Energy acts as a fuel in the activities of living things. Energy consumption is a certain amount of food energy expressed in kcal consumed on average per person/day. Household energy consumption is calculated using the quantity of energy contained in the foods consumed. The calorie adequacy percentage measures the food security level of porang farmers' households. Based on the table above, the caloric sufficiency of farmers' households is mostly categorized as adequate (>80% of the requirement), while the remaining 12% falls into the inadequate category. Energy fulfillment comes from consuming rice, corn, tubers, and other complementary food ingredients. This is in line with research by Widodo and Wulandari (2016) which states that not all farmers are in the category of moderate-risk or food-secure food populations who have achieved nutritional adequacy figures of more than 80%, but there are also farmers who are still in the category of very food-insecure populations with low nutritional adequacy figures.

Farmer's Household Food Security

Using Jonson's cross classification and the tool from the energy adequacy rate and the share of food expenditure can be known the value of the real food security of the household farmers. From the cross classification, four categories can be known: Food secure households, food insufficient/less secure households, food vulnerabel households, and food insecure households. According to Jonson and Toole's classification, households with a share of food expenditure <60% and energy sufficiency consumption >80% of energy sufficiency requirements. Proportion of food expenditure results are used to measure the food security level of porang farmer households. The proportion of food expenditure and energy sufficiency figures are entered into the Jonsonn and Toole cross-classification. The results are shown in the following table.

Table 5. Farmer's Household Food Security

Categorize	Total	Percentage (%)
Food Secure	38	76
Food Vulnerable	6	12
Food Less Secure	6	12
Food Insecure	0	0
Total	50	100

In Indonesia, the concept of food security is contained in Law No. 8 (2012), where food security is a condition of fulfilling food for the state and individuals as reflected in the availability of sufficient food in both quantity and quality. Safe, diverse, nutritious, fair, affordable, and does not conflict with religion, beliefs, and culture to sustainably live a healthy, active, and productive life (Kifli, Fahmi W., Mulyo, Jangkung Handoyo., Darwanto, Dwidjono Hadi., Hartono 2017). Based on this research results, about 76% of Porang farmer's households in Surakarta buffer district are classified as food secure, about 12% vulnerable, and 12% less secure. None of them are classified as food insecure. The number of family members, income, education, and experience of farmers can all

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have an impact on the food security of their households (Ariyadi 2021). One of the efforts to improve food security is to encourage activities that generate non-agricultural income, such as independent entrepreneurship. This requires support from the government and financial institutions. In addition, efforts need to be made to provide education on food diversification (Setyarini et al. 2023), especially for farmers who fall into the categories of food vulnerable, food less secure, and food insecure.

Table 5 also shows that two things need to be fixed because there are still porang farmers who are in the category of Vulnerable and less secure households. This states that there are still porang farmer's households that have an excessive portion of food expenditure and are in a condition of calorie or energy adequacy less than the standard. This is a reflection of table 5 that there are still porang farming households that fall into the Food Vulnerable and Food Less Secure categories. The conditions of both categories provide one positive side but have shortcomings on the other side. Porang farming households that are in the Food Vulnerable category indicate that this household is good in terms of nutritional intake. Still, in terms of the share of food expenditure it is too high. In contrast, porang farming households that fall into the Food Less Secure category indicate something different, that in terms of nutritional intake it is poor. Still, in terms of the share of food expenditure it is good. Education for each household member is the most important thing because the average porang farmer household does not know the limits of energy sufficiency or the share of existing food expenditure. Households should have a record of sufficient food requirements for each household member, which can be controlled through the presence of the mother. Of course, it is the mother who has the responsibility to provide food needs through cooking, and must be adjusted to the food needs of each household member both in terms of calories and energy elements. The proportion of food expenditure should also be controlled by matching needs with the frequency of monthly shopping so it will not be excessive. The availability of food in the farmer's households should be under the needs of household members and the nutrients that must be met. Education related to food security can be done not only through housewives, but also to the wider community through several campaigns that can be optimized by local government agencies. This has been done a lot through various existing social media channels. The level of household concern for food shares and energy sufficiency is important so that each household member can carry out activities optimally considering that food is a basic need and supports individual activities.

Porang farmer's households must also think about three things to strengthen their household food security. The first is regarding the household's economic level. The higher the economic level of a family, the higher the accessibility of food they have. This is in line with research by Abu and Soon (Abu and Soom 2016)which states that household income is an important component in strengthening the value of household food security. The higher the income of the head of the family, the household has a high possibility of obtaining a good household food security score. Moreover, if there is support from family members who work and contribute to supplying household food needs. Open access to food with sufficient household income where household needs can be met properly. In addition to food accessibility, it is also supported by Addisu's statement (Addisu 2015) which states that household purchasing power will increase along with the increasing economy and income of a household. The second step that can be taken to strengthen the level of food security is to optimize land independently to meet household needs. Food needs can be met by planting food needs in the

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land area or yard. In fact, this can still be optimized in porang farmers who still have space. The third step is to increase the creativity of women in the household. The level of creativity of women or housewives needs to be optimized to provide food to household members that is quite balanced in terms of quantity and energy sufficiency.

Strengthening porang production is also the key to success in strengthening the food security of farmer households. The better and more feasible production of porang will certainly provide high profits for households (Wijayanti et al. 2023) High household profits will open up high food accessibility. Moreover, in this case, porang is one of the export commodities. This statement indicates that export commodities have their own value (Nuraini et al. 2023). Maintaining adequate food energy for each household member involves several strategies that can be implemented sustainably. The first step is to consume a balanced diet. Food consumption must be balanced by including nine main food groups, such as grains, tubers, animal foods, oils and fats, oily fruits/seeds, nuts, sugar, vegetables and fruits, and other groups. Each food group has a certain weight and criteria to ensure good nutritional adequacy. In Indonesia, there is a Sustainable Food Reserve Program that can overcome the problem of malnutrition in the Community and the program aims to empower the community through the development of household gardens as a model of sustainable food reserve areas. The existence of this program helps the Community provide diverse food independently, balanced food consumption, ensure adequate nutrition and food security (Wijaya et al. 2021a). The sustainable food program promoted by the Indonesian government is aimed at increasing the consumption of vegetables from home gardens. Increasing vegetable consumption is an important component of changing to healthier eating patterns and towards sustainability (Wijaya et al. 2021b). The second step is to access a variety of food ingredients. The availability of a variety of food ingredients can ensure adequate energy and nutrients. Households that have good access to various types of food tend to have better levels of nutritional adequacy. The third is to get every household used to using the nutritional adequacy rate (AKG) as a reference. Households that achieve the ideal standards as determined can be considered sufficient in terms of energy adequacy. The fourth step is to use good food management strategies. Good food management strategies, such as the use of several digital applications on smartphones, can help monitor daily nutritional intake and ensure that energy and nutrient needs are met. The last step is to increase nutritional literacy. Nutrition literacy can help households understand the importance of a balanced nutritional intake. Education about nutrition can be done through farmer groups or more intensive nutritional literacy programs. By implementing the strategies that have been stated, households can increase food energy adequacy and ensure good nutritional status for each family member.

There are several implications of the research results obtained in order to improve and increase food security so that farming households are in a state of food security. One of the things that is needed to improve food security is increasing the income of farming households. Income is inversely related to the share of food expenditure, so that increasing income actually reduces the share of food expenditure and if the share of food expenditure decreases, the level of food security will increase. Income can be increased by improving efforts to increase farming efforts and increasing income obtained from outside farming efforts. In addition to increasing production in optimizing farmer income, there needs to be government intervention regarding several aspects such as monitoring the

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means of production equipment needed by farmers must be complete and affordable, especially if there is incentives for farmers in the form of assistance for the required means of production. Stabilizing product prices is also an important part carried out by the government, especially affordable food ingredients so that the dimension of food accessibility is perfectly realized. Controlling food prices and several non-food prices that support living needs is also important under the pretext of adjusting the development of farmer income. Farmer income which is generally not too high must be sufficient to meet both food and non-food needs so that price is an important key in the implications of the research. Further research is also needed to find out what factors may influence the food security value of porang farmers.

CONCLUSION AND SUGGESTION

Based on Jonsson and Toole's cross-classification, about 76% of porang farmers are in the food secure category, 12% are in the food vulnerable category, and the remaining 12% are in the food less secure category. No one of the farmer is categorized as food insecure. The importance of the government's role in improving the education of housewives in particular and the wider community in general regarding nutritional needs and food security, as well as household expenditure control, can be implemented to manage household spending. Through government encouragement, farmer households can do three things to strengthen their household food security, such as improving the economic level of the household, optimizing land for self-sufficient food fulfillment, and enhancing women's creativity in providing adequately and balanced nutritious food. Sustainable strategies to maintain the energy adequacy rate of porang farmer’s households can be done by consuming foods with balanced nutrition, accessing a variety of foodstuffs, using the nutritional adequacy rate as a benchmark in household consumption, implementing good food management strategies, and finally, increasing nutritional literacy.

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