

THE ROLE OF URBAN FARMING TO HOUSEHOLD FOOD SECURITY IN THE SURAKARTA CITY, INDONESIA

Umi Barokah*, Wiwit Rahayu, and Ernoiz Antriandarti

Agribusiness, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Central Java, Indonesia

*Correspondence Email: umibarokah.uns@gmail.com

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ABSTRACT

Urban areas are densely populated areas, so that land for agricultural production is minimal. The city of Surakarta is the center of the economy in the Soloraya region, whose agricultural land area continues to decrease. The study aimed to analyze household food security and the role of urban farming on household food security. The data used in the research was primary data collected by interview, recording, observation, and food recall methods. Respondent to the research consists of 60 households that carried out urban farming in 5 districts (Pasar Kliwon, Jebres, Banjarsari, Laweyan, Serengan) in Surakarta. The analytical data used food security analysis with indicators of food expenditure and energy consumption levels and descriptive analysis for urban farming to household food security. The results showed that as many as 21 or (35.00%) were categorized as food secure households, 12 or (20.00%) were classified as food vulnerable households, 22 or (36.67%) were categorized as lack of food households, and 5 (8, 33%) was categorized as food insecure. The role of urban farming on household food security is indicated by its contribution to food expenditure of Rp 87,336.00 or 7.69% to total food expenditure per month. It is necessary to increase the role of urban farming in household food security both in increasing income and providing food for households. This can be done, among other things, by intensifying and diversifying urban farming businesses.

Keywords: *energy consumption level, food expenditure, urban area*

BACKGROUND

Food is a basic human need whose fulfillment is the right of every human being. Fulfilled food in terms of quantity and quality will determine the quality of human resources and national resilience. Therefore, efforts to achieve food sufficiency must be carried out seriously. Several food security policies in Central Java include the development of agricultural areas and spatial planning, infrastructure development, research and development of superior seeds, investment and food-based industries, and increasing the quantity and quality of food consumption (Governor Expert Staff for Food Sovereignty, 2018). The realization of food security is the responsibility of the government together with the community (Husodo & Muchtadi, 2004).

Food Security is defined as a condition for the fulfillment of food for the state to individuals, which is reflected in the availability of sufficient food, both in quantity and quality, safe, diverse, nutritious, equitable, and affordable, and does not conflict with religion, belief, and community culture, to be able to live healthy, active and productive in a sustainable manner (UU No. 18 Year 2012). Food security requires the fulfillment of two sides simultaneously, namely (a) the availability

side, the availability of sufficient food for the entire population in quantity, quality, safety, and affordability, which takes precedence over domestic products, and (b) the consumption side, namely the ability to every household has access to sufficient food for each of its members to grow healthily and productively from time to time. Both sides require an efficient distribution system, which can reach all levels of society (Nainggolan, 2005).

The Central Java population's energy consumption tends to increase. The average consumption of energy in 2016 was 1,964 kcal/person/day, increasing to 2,054.43 kcal/person/day in 2020. The average energy consumption level is categorized as sufficient (100%). Based on the location of residence, it is known that the average energy consumption and energy consumption level of the population in rural areas is higher than that of the population in urban areas (Rahayu et al, 2021). Jorinda (2021) emphasized the importance of availability, access, utilization, stability, sustainability, and distribution to address food security issues effectively. Increasing rural production will ensure food security for the global population. Currently, 80% of food stocks in urban areas are met from rural regions and imports.

Urban communities can reduce their dependence on food from villages by developing urban agriculture. Urban agriculture is defined as food production that occurs within city boundaries. This food production occurs in backyards, on roofs of houses, in vegetable and fruit community gardens, and in public spaces or places not used. Market demand for organic products is a motivating factor for people to get involved and innovate urban farming that leads to business sustainability (Sumardjo et al., 2020). Urban agriculture includes commercial activities that produce food in greenhouses and open spaces but is more often small-scale and scattered around cities (The State of Food and Agriculture, 1996).

The development of urban agriculture requires the support of many factors. Urban agriculture has the potential to become a secondary food source if it is supported by creative and adequate infrastructure (Didomenica et al., 2016). Innovative Urban Agricultural (IUA) can contribute to global food security by supporting local food supplies, strengthening food value chains, and adopting more sustainable practices than conventional agriculture (Armanda et al., 2019). Peri-Urban Agriculture (PUA) around Jakarta as well as in the East and Northeast of Jabodetabek has contributed to increasing food affordability and strengthening food security policies (Okta & Pauleit, 2016).

The city of Surakarta is the center of the economy in the Soloraya region, whose agricultural land area continues to decrease. The Head of Economy of the Regional Secretariat of Surakarta, Sukendar, Wednesday, June, 9th 2019 said that "Referring to the data from the National Land Agency (BPN), there were 135 hectares of agricultural land in Surakarta in 2013. Four years later, it has decreased to 110 hectares. There are also 50 hectares left in 2018" (Central Java Post, 2019). Impacts of the dependence of the population of Surakarta on other areas for household food supply. The food contributor areas in Surakarta are the regencies in Soloraya and some even come from East Java. Head of DPLPP Surakarta Diversity and Security Division Wisnu Dwi Endro said that it still relies on supplies from surrounding areas to meet food commodities in Solo (Central Java Post, 2019).

To overcome limited land and meet food needs independently, the government of Surakarta city has launched a Food Smart City program. The Department of Agriculture, Food Security and Fisheries (DPKPP) Surakarta strives to create a Food Smart City through independent food processing even though the land owned is limited. Head of Surakarta's DPLPP Diversity and Security Division, Wisnu Dwi Endro, said that the independent food cultivation or processing activities were

strengthened by the socialization of the Sustainable Food House Area (KRPL) and empowered Women Farmers Group (KWT) in Solo City. Currently, around 26 KWT have been formed. The problems faced include not all KRPL and KWT are active and developing so they are not optimal in providing food for households.

The dense population in urban areas, the limited land owned by residents and the city government's policies to unravel these problems need to be examined in detail. This paper highlights the food security of the urban population and the efforts made to achieve food security through urban farming. Based on these backgrounds and problems, this study aims to find out (1) the proportion of food consumption expenditure to total household expenditure, (2) the level of energy consumption, (3) household food security and (4) the role of urban farming on household food security in the city of Surakarta. It is hoped that the results of this study will be useful as information to increase the role of urban farming in supporting household food security in Surakarta City.

RESEARCH METHODS

This research was conducted in Surakarta, considering that the city of Surakarta is in the city center of the Soloraya region, which (1) has a high population density. The population density in the city of Surakarta is the highest in Central Java, reaching 12,391 people per square km in 2021 (2) decreasing agricultural land: "Referring to data from the National Land Agency (BPN), there were 135 hectares of agricultural land in Surakarta in 2013. Four years later, it shrank to 110 hectares. There are also 50 hectares left in 2018." and (3) Women Farmers Groups (WFG) have been formed in all regions as pioneers and main actors of Urban farming. The research was conducted in July-August 2020. Primary data were taken from 60 samples of urban farming households in Surakarta City. The sample was determined purposively from KWT in five sub-districts in Surakarta City, namely Pasar Kliwon, Jebres, Banjarsari, Laweyan, Serengan. To find out the proportion of food consumption expenditure to total household expenditure (pn) with the formula :

$$Qp = \frac{Kp}{pn} \times 100\%$$

Information:

Kp : Food consumption expenditure (Rupiah)

pn : farmer's total expenditure (Rupiah)

Qp : proportion of food consumption expenditure to total expenditure (%)

Energy Consumption Level is assessed from the amount of food consumed using the Food Ingredients Composition List (Hardinsyah & Martianto, 1992):

$$TKE = \frac{\sum \text{Energy Consumption}}{\text{Recommended AKE}} \times 100\%$$

$$G_{ij} = \frac{BPj}{100} \times \frac{Bddj}{100} \times KG_{ij}$$

$$G_e = \frac{BP_j}{100} \times \frac{Bdd_j}{100} \times KGe_j$$

Information:

- TKE : Household energy consumption rate (%)
- K_{gij} : The content of certain nutrients from the food consumed
- BP_j : Weight of food consumed (grams)
- Bdd_j : Edible part (in % or grams of 100 grams)
- G_{ej} : Energy consumed from food j
- G_{pj} : Protein consumed from food j

Food Security is analyzed with indicators of proportion of food expenditure and level of energy consumption (Rachman and Ariani, 2002). Food security analysis is carried out using indicators of the proportion of food expenditure and the level of energy consumption (Rachman and Ariani, 2002). The balance of food expenditure is calculated by comparing food expenditure with total household expenditure multiplied by 100%.

$$Q_p = \frac{K_p}{p_n} \times 100\%$$

Information:

- K_p : Food consumption expenditure (Rp)
- p_n : Farmer's total expenditure (Rp)
- Q_p : Proportion of food consumption expenditure to total expenditure (%)

The Energy Consumption Rate (TKE) is the ratio between the total household energy consumption and the recommended Energy Adequacy Rate based on the age group and gender expressed in percent. Energy Consumption Rate (TKE) is calculated by the formula based on the criteria of the Ministry of Health (1990) in Supriasa (2002), the Energy Consumption Level (TKE) is classified into four groups (Rachman and Ariani, 2002).

Table 1. Category of Energy Consumption Rate (TKE)

Proportion Food Consumption	Energy Consumption	
	Enough (> 80% AKG)	Not enough (≤ 80% AKG)
Low (≤ 60%)	Food Security	Lack of Food
High (> 60%)	Food Vulnerability	Food Insecurity

*AKG based on the 2018 National Food and Nutrition Workshop (WKNPG).

The analysis of the role of urban farming on household food security was carried out descriptively by calculating household food expenditure savings.

RESULT AND DISCUSSION

Respondent Household Characteristics

Respondents in this study were urban farming households in Surakarta City. Household characteristics include the identity of the respondent and family members of the respondent. These data include age, education level, and the number of family members. The household characteristics are presented in Table 2.

Table 2. Household Characteristics

No	Characteristics	Average
1.	Age (years)	54
	a. Husband	51
	b. Wife	
2.	Education (years)	
	a. Husband	12
	b. Wife	10
3.	Number of family members (people)	4

Source: Primary Data, 2020

Table 2 explains that the average age of the respondents, both husband, and wife, is included in the productive period. The average age of respondents who are still in the productive group allows respondents to carry out urban farming activities. The level of education will affect a person's knowledge and insight. The average level of education for the head of a family is 12 years (senior high school level), and the intermediate level of education for wives is ten years or has not finished high school. High enough education makes it easier for respondents to receive knowledge and skills in urban farming development. Meanwhile, the number of household members affects household food needs and the person's availability in carrying out urban farming.

In the implementation of urban farming, women (wives) play a more important role than husbands because the main actors are women who are members of the Women Farmers Group. Urban farming is done in the yard. The land area ranges from 2 - 200 square meters with an average of 30 square meters planted with vegetables, medicinal plants, fruit trees and some who cultivate catfish and raise native chickens. Vegetable cultivation is done in polybags, pots, or in the ground directly. Respondents also used used goods such as bottles or plastic cups as a place to plant. Meanwhile, catfish cultivation is carried out in ponds made of tarpaulin and in plastic barrels.



Figure 1. Tomato and eggplant cultivation at KWT Kahuripan Mojosongo Banjarsari



Figure 2. Catfish Cultivation at KWT Sekar Mandiri Serengan

Household Food Security

Household food security is analyzed using cross indicators of the proportion of food expenditure and the level of energy consumption. The balance of household food expenditure is an indicator of a household's economic capacity to meet food. The level of energy consumption is one aspect of food security, which shows the ability of a household to have sufficient food memes for each of its members so that they can live healthily.

The Proportion of Food Consumption Expenditure

The proportion of food consumption expenditure is the percentage of total food expenditure compared to the total expenditure. Total expenditure is expenditure for food consumption plus non-food expenditure. Food consumption covers 14 groups, and especially in the city of Surakarta the largest expenditure is for the type of grain (reaching 19.80%). The amount of expenditure for this type is because the household food pattern throughout the year is rice. Flour from this type of grain is also often used as ingredients for making side dishes such as bakwan, peyek, and flour fried soybean cake.

Table 3 shows that the average total expenditure of respondent households in Surakarta City in this study is Rp 2,341,056.88, including food expenditure of Rp 1,206,070.15 or 48.48% of total and non-food expenditure amounting to Rp 1,134,986.73 or 51.52%. The proportion of food expenditure that is smaller than the proportion of non-food expenditure indicates that households have better incomes so they have the ability to buy the food they need. High-income households allocate income to non-food rather than food needs (Rustanti, 2019).

Table 3. The Proportion of Food And Non-Food Consumption Expenditure

Expenditure	Rp/month	Expenditure
Food	1,206,070.15	48.88
Non Food	1,134,986.73	51.52
Total Expenditure	2,341,056.88	100.00

Source: Primary Data Analysis, 2020

Based on the data in Table 3, it can be concluded that the proportion of food expenditure is smaller than the proportion of the non-food expenditure. This occurs when income is higher, with the same nominal amount of food expenditure, the proportion becomes smaller. Engel's law states that the lower the proportion of food expenditure, the higher the household welfare. This means that most of his income does not meet food needs as a basic human need to sustain life but has met non-food

requirements. This result is different from rice farming households in Gampong Alue Merbau Langsa City where food expenditure reaches 52%, higher than non-food expenditure (Hanisah *et.al* . 2022).

The Energy Consumption Rate (TKE)

Food consumption is the number of foods and drinks that a person eats or drinks to meet his physical needs for everyday activities. Food consumption is assessed by energy consumption. The distribution of households according to the energy consumption level category is in Table 4.

Table 4. The Distribution of Households According to The Energy Consumption Level Category (TKE)

The Energy Consumption Level Category	Number of Households	Percentage (%)
Good (TKE \geq 100% AKE)	15	25.00
Enough (TKE 80–99% AKE)	19	31.67
Less (TKE 70–79% AKE)	8	13.33
Deficit (TKE <70% AKE)	18	30.00
Total	60	100.00

Source: Primary Data Analysis, 2020

Table 4 showed that only 25% of households were in the good category. The majority of households' energy consumption is less than the AKE (recommended Energy Adequacy Ratio). It can be seen that 75% of households with TKE are less than 100% with sufficient, less, and deficit categories. This shows that most of the households have TKE which is less than the recommended AKE. The increase in TKE can be done by increasing the consumption of food sources of energy. This reinforces the results of research by W Rahayu et al (2021) that the TKE of urban residents is lower than that of rural residents.

Household Food Security

The number and percentage of respondent households according to food security category are presented in Table 5.

Table 5. Number and Percentage Households According to Food Security Category

No.	Food Security Category	Households	Percentage (%)
1.	Food Insecure	5	8.33
2.	Lack of Food	22	36.67
3.	Food Vulnerable	12	20.00
4.	Food Secure	21	35.00
Total		60	100.00

Source: Primary Data Analysis, 2020

Table 5 showed that there were five households in the category of food insecurity, or 8.33%. This happens because households are economically deficient and their energy consumption levels are also less than the recommended adequacy. Households in the food insecure category are the

households that need the most attention because efforts to realize household food security must be pursued through increasing income and also increasing knowledge of nutrition.

This figure is smaller than the results of a study conducted by (Nagappa et al., 2020) in Rural Puduchery (32 % food insecurity), (Ahmed et al., 2017) in Pakistan and (Sileshu, 2019) in East Hararghe. Families in the insecure food category are economically deficient, and their energy consumption level is also less than the recommended adequacy. Households in the insecure food category need the most attention because efforts to achieve household food security must be pursued through increasing income and increasing nutritional knowledge. Several factors that cause household food insecurity are gender, age, remittances, education, unemployment, assets, inflation, and disease (Abdullah et al., 2019), plant diseases, rising food prices, and water shortages (Ahmed et al., 2017). Rahayu (2016) showed that poor households in Sukoharjo Regency are classified as food insecure households seen from the proportion of food expenditure to total household expenditure and the level of energy consumption. (Abu & Soom, 2016) research in Nigeria Using the calorie intake method, the results showed that food insecure in rural households (24%) less than in urban communities (26%). Furthermore, research (Nagappa et al., 2020) on Rural Puducherry households is divided into experienced severe (17%), moderate, (13%) and mild (2%). Number of children in the family, use of poor family cards, and socioeconomic status are significantly related to food insecurity. Furthermore, according to the time dimension of the study (Sileshi et al., 2019) in East Hararghe showed that 36.03% and 42.64% of the total households suffer from current and future food insecurity, respectively. When considering current and future food insecurity, it has been found that around 24.26% suffer from chronic food insecurity, 11.765% experience temporary food insecurity, and 18.38% suffer from temporary food insecurity.

This research also shows that there were 22 households classified as lack of food, or 36.67% of the total respondents. Lack of food in Surakarta is lower than in Central Lampung Regency which reaches 50% (Nanda, 2019). Households' lack of food is the same as a proportion of food expenditure <60% of total household expenditure and less energy consumption ($\leq 80\%$ energy adequacy). This condition shows that households can fulfill food from an economic perspective, but the energy consumption is still less than adequate. This indicates that the problem is not the ability to access food economically or lack of income, but more with the ability of households to allocate revenue for food, choose nutritious foods, and determine the amount of food consumed. Therefore, for families with a food deficiency category, an effort that can be made to strengthen food security is to increase knowledge about food and nutrition. Increasing knowledge of nutrition can be done by counseling about food and nutrition. KWT as an urban farming development institution can be used to increase the nutritional knowledge of KWT member mothers.

There was 20.00%, or 12 households are categorized as food vulnerable. Food vulnerable households have a proportion of food expenditure $\geq 60\%$ of total household expenditure and have sufficient energy consumption ($> 80\%$ energy adequacy). Households vulnerable to food from the economic side are less than suitable, as indicated by the high food expenditure. However, they allocate most of their income for food to meet energy sufficiency with unfavorable economic conditions. Improvement of household status from food insecure to food secure can be carried out by increasing revenue.

There were 21 households classified as food secure (35%). Food-secure households have a proportion of food expenditure less than 60% and energy consumption levels of more than 80% AKE.

The proportion of food expenditure is less than 60% indicating that households have sufficient income to meet food needs. Engel's law states that the higher the income, the smaller the proportion of expenditure on food. Adequate income enables households to meet food needs so that their energy consumption level is sufficient (> 80%).

This figure is higher than the research by (Dirhamsah et al., 2016) which states that only 4% of households are food insecure in Food Independent Villages in Java. However, household food security in Surakarta is lower than the findings of (Nanda et al., 2019) in Lampung (50% food security) and research by (Abu & Soom, 2016) on urban households in Nigeria (42% food security). Households are said to be food secure if food secure households have less than 60% food expenditure and energy consumption levels of more than 80%. The food expenditure of less than 60% indicates that the household has sufficient income to meet food needs. Engel's law states that the higher the income, the smaller the proportion of expenditure on food. Good income allows households to fulfill food so that the level of energy consumption is sufficient (> 80%). The achievement of food security can be realized through increasing food availability, food accessibility, food utilization, and food stability (Manap, 2020). Research (Dirhamsyah et al., 2016) regarding household food security for the Food Independent Village Program in Java: 222 households (74%), food insecurity are not food insecure 66 households (22%), and 12 households food security (4%).

The last, Table 5 shows that there was 20.00%, or 12 households are categorized as food vulnerable. Food vulnerable households have a proportion of food expenditure 60% of total household expenditure and have sufficient energy consumption (> 80% energy adequacy). Households vulnerable to food from the economic side are less than suitable, as indicated by the high food expenditure. However, they allocate most of their income for food to meet energy sufficiency with unfavorable economic conditions. Improvement of household status from food insecure to food secure can be carried out by increasing revenue.

According to Pamungkas et al. (2022), food security in Wonosobo District can be improved through socialization and training of the Food Independent Village Program (DMP) and institutional growth. Research Sari, Silfi Novita (2020) states the need for social capital in realizing food security for KRPL members in Malang City. Research (Boratynska & Huseynov, 2017) and (Ahmed et al., 2017) states that in order to achieve food security, it is necessary to have direct policies in the form of structural change interventions in relative prices and food subsidies. Also indirect policies such as improving agricultural infrastructure, the general economic environment, and providing new agricultural technologies to farmers.

The Role of Urban Farming on Household Food Security

Urban farming has the potential to increase household food security. Households in the city of Surakarta use their yards for various purposes. Among them are making the yard more beautiful, channeling hobbies, filling spare time, and expecting the results/fruits. Therefore, the cultivated plants are diverse, including flowers, ornamental plants, vegetable/fruit plants, and spice plants.

In this research, the role of urban farming on household food security can be seen from the savings in food. Based on the study results, it is known that urban agriculture contributes to the savings in food expenditure of Rp 87,336.00 or 7.69% of the total monthly food expenditure, which is Rp 1,134,987.00. Although the contribution is small, food production from urban farming in Surakarta contributes to increasing household food stability. Yields from the yard are proven to

reduce dependence in purchasing food, as well as support household farming practices towards the realization of food self-sufficiency.

The results of this study are in line with (Ramakunty et al., 2015) findings that urban farming can only make a limited contribution to achieving urban food security in low-income countries. Moreover, Kurniasih (2015) mentioned that urban farming improve the food security of the poor community, and it is indicated by the improvement of food stock and the relief for food expense. More research, urban agriculture also plays a role in food security in Malaysia by providing urban dwellers with access to nutritious, safe, acceptable, and cost-effective food (Golnaz, Mad, and Zainalabidin, 2016). Besides increasing food security, it can contribute to rising household income. In addition to the benefits mentioned above, Juniawati (2017) added that urban farming also reduces unemployment, improves the welfare of urban communities, environmental sustainability, and health quality. The research of Skara et al. (2020) that urban farming can change the urban food system and increase the contribution of agriculture in creating sustainable and environmentally friendly cities. Furthermore, Zimmerer (2021) added that the socio-ecological interaction of urban farming has the potential to combine concern for ecosystems, production, and sustainable social empowerment. To realize the multifunctionality of urban farming, Bohn (2021) stated the need for green infrastructure to bridge the gap between agroecological problems in urbanized areas and meeting food needs in urban areas.

CONCLUSION AND SUGGESTION

The results of the household food security analysis showed that as many as 21 households (35.00%) were categorized as food resistant, 12 households (20.00%) were classified as food insecure, 22 households (36.67%) were categorized as lack of food, and five households. Households (8.33%) are classed as food insecure. The role of urban farming on household food security is shown by its contribution to food expenditure savings of Rp 87,336.00 or 7.69% of total food expenditure per month. In addition, urban farming plays a role in providing food for households, especially vegetables, fruit and fresh water fish. The role of urban farming in household food security in Surakarta City is still small, so it is necessary to increase the role of urban farming in household food security both in increasing income and providing food for households. This can be done, among other things, by intensifying and diversifying urban farming businesses. Increasing productivity through agricultural technology innovations by urban conditions is necessary to ensure sustainable production.

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