

# Characteristics and Determinants of Household Food Consumption of Female Vegetable Farmers in Pekanbaru City, Riau Province, Indonesia

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**Abstract**—Food is a fundamental human need. Food must be provided in sufficient quantity, be of good quality, be safe to consume, and be affordable. Furthermore, the determining factor of household food consumption is income. If income increases, the consumption pattern of nutritious food will also improve. The study aimed to analyze the characteristics of female vegetable farmers, their household food consumption, and the determinants of household food consumption in Pekanbaru City. The research data were obtained through an interview survey, with 65 female vegetable farmers selected using simple random sampling. This study found that female vegetable farmers in Pekanbaru City were of productive age, had a high school education level, and mostly had 3-4 family members. The household food consumption of the participants fulfilled the PPH score target for Pekanbaru City but did not fulfill the national target. Therefore, the household food security of female vegetable farmers in Pekanbaru City has not been achieved nationally. The study further revealed that household income, number of family members, and education of female vegetable farmers were significant determinants of household food consumption. In contrast, the age of female vegetable farmers did not significantly affect household food consumption. Overall, the study highlights the importance of improving the food security of female vegetable farmers in Pekanbaru City by addressing the significant determinants of household food consumption. This can be achieved by implementing policies and programs to increase household income, improve education levels, and reduce family size.

**Keywords**— Household food consumption; determinants; household income; food security.

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## I. INTRODUCTION

Food is a basic human need. Food must be provided in sufficient quantity, be of good quality, be safe for consumption, and be affordable. This is the standard for achieving food security. Food security is the ability of a household to meet household members' food adequacy from time to time, live healthily, and be able to carry out their daily activities. The food adequacy of households can be seen from the quantity and quality of food consumption. Food consumption is usually measured by the level of energy adequacy (TKE) and protein (TKP). The quality of food consumption is measured by the expected dietary pattern (PPH) score. This food consumption parameter is achieved if it exceeds the Strategic Plan (Renstra) target of the Food Security Service. Pekanbaru City is not a food production center city. Their food needs are supplied from neighboring

areas, such as North and West Sumatra. The dependence on food supply in other regions is relatively high, while food production and reserves cannot meet their needs. This means that food vulnerability is precarious [1].

The food security condition or vulnerability to food insecurity in a region can be seen from the achievement of the food security index score (IKP). The IKP score is calculated from food security indicators that describe food availability, access, and utilization. The higher the regional IKP score, the better Pekanbaru City's food security condition. Based on the analysis of food security and vulnerability at the national level, Riau Province's IKP has decreased from ranking 25 (score of 64.12) in 2019 to ranking 29 (score of 62.37) in 2020. IKP Pekanbaru City ranked 13th (score 85.38) in 2019 to be ranked 22nd (score 82.85) in 2020 [2].

Food security is pursued through 3 pillars, namely: (1) availability, (2) access, and (3) utilization of food. Regarding food availability, food-provided needs of the population come

from regional original food production, food reserves, and imports or food supplies from outside the region. Food production is primarily determined by agricultural land. Agriculture can significantly contribute to household food security [3]–[8]. Meanwhile, agricultural land for food production in urban areas is decreasing because urban areas are industrial centers for various sectors, and there is increased demand for non-agricultural land. The increased population of metropolitan areas also increases land for settlements. Furthermore, increasing population will increase the need for food. Population growth is not matched with growth in food production and can give rise to food insecurity [8]–[18].

Food insecurity is the lack of food experienced by an area, community, or household at a particular time. Households with low food consumption induce a lack of nutritional intake, which impacts malnutrition. Malnutrition for toddlers disrupts their growth, such as weight and height not increasing or stunting from their age standards.

The determining factor for low household food consumption is income. If income increases, food consumption patterns with nutritional value will also increase. Poor households will find it challenging to provide food for their families, so they are vulnerable to food insecurity. Agricultural households tend to have low incomes, especially in urban areas with narrow land and borrow or lease status. One of the agricultural households in Pekanbaru City is a female farmer household. Females farm by utilizing the yard to plant vegetables. Their production can be sold so that their farming income can be used to support their household income. Most of the production is consumed for family needs. Based on this, researchers are interested in researching household food consumption of female vegetable farmers. This study aims to analyze the characteristics of female vegetable farmers, household food consumption, as well as the determinants of household food consumption patterns.

## II. MATERIALS AND METHOD

This study uses a survey method, and it is located in Pekanbaru City. The research population was female vegetable farmers in the sub-districts of Tenayan Raya, Tuah Madani, and Marpoyan Damai. The population is 253 people. Sampling was carried out using a farmer group approach consisting of 8 groups of female vegetable farmers. Each group of female farmers took 25% of the total, so the total sample was 65 people. The sampling method used was simple random sampling.

This study uses cross-sectional data for 2021. The data collection method is direct interviews with farming women using a questionnaire. The data collected includes the characteristics of female vegetable farmers, their farming activities, and household consumption data. Household consumption data is obtained using a 1x24-hour food recall.

Data analysis was performed with descriptive and inferential statistics. Descriptive analysis was used to analyze the characteristics of female vegetable farmers by calculating the average, highest, and lowest values of the variables age, education, farming experience, number of family members, and education of women farmers. These variables are presented in table form.

In addition, descriptive analysis is also used to calculate household consumption by calculating the level of nutritional adequacy as seen from the adequacy of energy and protein and the Expected Dietary Pattern Score. The nutritional adequacy level, which consists of energy adequacy level (TKE) and protein adequacy level (TKP), is calculated using the following formula [19], [20]:  
Energy Adequacy Level (TKE):

$$TKE = \frac{\text{Actual energy consumption}}{AKE} \times 100\% \quad (1)$$

Explanation:

TKE= Energy adequacy level (%)

Actual energy consumption= Protein consumption per capita of female farmer households (kcal/capita/day)

AKE= The energy adequacy figure, determined by WNPG 2018, is 2100 kcal/capita/day

The formula for the level of protein consumption is as follows:

$$TKP = \frac{\text{Actual protein consumption}}{AKP} \times 100\% \quad (2)$$

where TKP is protein adequacy level (kcal/capita/day), and AKP comprises the energy adequacy figure determined by WNPG 2018, which is 57 grams/capita/day. Decision criteria if:

1. TKE or TKP < 70 %, classified as severe deficit
2. TKE or TKP 70-79 %, classified as moderate deficit
3. TKE or TKP 80-89 %, classified as mild deficit
4. TKE or TKP 90-119 %, classified as normal deficit
5. TKE or TKP > 120 %, classified as excess

Further, calculate the expected food pattern indicators. This indicator is used as one of the successes in the quality of food consumption and food security. The higher the predicted food pattern score (PPH) will reflect the consumption of more diverse, nutritious, and balanced food. In this research, the standard PPH score used is 87.0 according to the Strategic Plan for the Food Security Service for 2017-2022 ([1]. The criteria used are (a) high if the household food consumption PPH score is above 87.0 and (b) low if the PPH score is below 87.0.

In addition to descriptive analysis, this study also uses econometric analysis with multiple regression. The food consumption model is formulated as follows:

$$C_p = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \epsilon \quad (3)$$

Explanation:

$C_p$  = Household food consumption of female farmers (IDR/month)

$X_1$  = Female farmer's household income (IDR/month)

$X_2$  = Number of family members (person)

$X_3$  = Length of education of the head family (year)

$X_4$  = Age of female farmers (year)

$X_5$  = Household assets of female farmers (IDR)

$X_6$  = Household savings (IDR)

## III. RESULTS AND DISCUSSION

### A. Characteristics of Female Farmers

The characteristics of the female farmers studied were age, length of education, number of family members, and farming experience. These variables can provide information about the

household food consumption of farming women in Pekanbaru City. Table 1 presents the characteristics of these female vegetable farmers.

TABLE I  
CHARACTERISTICS OF FEMALE VEGETABLE FARMERS IN PEKANBARU CITY, YEAR 2021

Characteristics	Amount (Person)	Percentage (%)
<b>Age (Year)</b>		
a. Productive (20-58)	56	86.15
b. Not productive (59-75)	9	13.85
<b>Length of Education</b>		
a. Low (< 9 years)	27	41.54
b. High (> 9 years)	38	58.46
<b>Number of Family Members</b>		
a. Small (3 Person)	37	56.92
b. Medium (4 Person)	14	21.54
c. Large (5-7 Person)	14	21.54
<b>Farming Experience</b>		
Inexperienced (< 5 year)	40	61.54
Experienced enough (5-10 years)	13	20.00
Experienced (> 10 years)	12	18.64
Amount	65	100.00

Table 1 shows that the age of female farmers is generally productive (20-58 years) as much as 86.15%, but there are still female farmers aged over 58 years (59-75 years) as much as 13.85%. Thus, the female farmer is muscular and can carry out activities well. The aspect of education shows that most female farmers are highly educated, namely high school graduates. The level of education will affect the selection of food ingredients for female farmers' household consumption. With the education level of female farmers as housewives, they will know how to consume diverse, nutritionally balanced, and safe foods for their families.

Characteristics of female farmers are also seen in the number of family members. The number of female vegetable farming family members is mostly three people, which is as much as 56.92%. This means that the household of female vegetable farmers is classified as a small household, which only consists of a husband and wife with one child. However, there are also medium and sizeable female farmer households. Households belonging to moderate farming women have four family members: a husband and wife with two children. Meanwhile, the household of female farmers is classified as significant, having six family members. The number of family members illustrates the amount borne by the head of the family. The greater the number of family members, the food supply will increase. Yard farming is expected to help women in farming households provide food for their families [10], [21].

Farming experience is the duration of farmers' farming. This will affect the success of his farming. Even though their education is low, farming experience will help them succeed in agriculture. The higher their experience of farming, the more they are used to facing the risks of farming and can overcome them. In this study, farming experience was grouped into three categories: less experienced, moderately experienced, and experienced. Table 1 shows that the experience of farming women vegetable farmers is generally less experienced, under five years, as much as 61.54%. However, some women farmers are pretty experienced (5-10

years), as much as 20%, and those with experience (more than ten years), as much as 18.64%.

### B. Household Food Consumption of Female Vegetable Farmers

The household food consumption of female vegetable farmers is measured in terms of the quantity and quality of their consumption. The amount of food consumption in the household of female farmers is measured by the level of energy adequacy (TKE) and protein adequacy (TKP). Food quality is measured by the expected food pattern score (PPH). The criteria for food consumption in the households of female farmers in terms of quantity and quality are presented in Table 2.

TABLE II  
HOUSEHOLD FOOD CONSUMPTION OF FEMALE VEGETABLE FARMERS IN PEKANBARU CITY, YEAR 2021

Household Consumption Assessment	Amount (Person)	Percentage (%)
<b>Energy Adequacy Level (TKE)</b>		
1. Severe deficit	0	0
2. Moderate deficit	0	0
3. Mild deficit	3	4.62
4. Normal deficit	62	96.38
5. Excess	0	0
<b>Protein Adequacy Level (TKP)</b>		
1. Severe deficit	0	0
2. Moderate deficit (70-79%)	1	1.54
3. Mild deficit (80-89%)	1	1.54
4. Normal deficit (90-119%)	62	95.38
5. Excess (>120%)	1	1.54
<b>Expected Food Pattern</b>		
1. High	27	41.54
2. Low	38	58.46

Table 2 shows that the TKE household food consumption of female vegetable farmers is generally classified as normal (96.38%), although a small proportion is classified as a mild deficit (4.62%). This means that the energy needs of the female farmer household have been fulfilled so that they can support various activities carried out by their household members. Thus, the households of female farmers are not considered food insecure.

Besides the TKE value, the TKP value also determines the quantity of household food because protein is an important nutrient for producing new cells and replacing damaged cells. Table 2 shows that, in general, female farming households have TKE values above 90-119%, which is classified as normal at 95.38%. Based on this, the protein needs of female farmer households in Pekanbaru City have been met. Therefore, the household is not food insecure.

The PPH score measures household food quality. PPH value is used as an indicator of food security. PPH is the composition of the main food groups, which, when consumed, can meet energy and other nutritional needs. The higher the PPH score, the more diverse, nutritious, and balanced food consumption (Food Security Agency, 2015). Table 2 shows the PPH score of a female farmer household as much as 58.46%, classified as low, and 41.54%, classified as high. Thus, the food consumption of female vegetable farming households is generally low. This low value indicates that

household food consumption is not diverse, nutritious, and unbalanced.

This research is in line with [19], [22]–[29]. Timisela (2021) states household food consumption in Salahutu District, Central Maluku Regency, is not diverse. Household food consumption is still dominated by rice. The PPH score is still low, with a value of 75–79.9. This shows that household consumption is not of high quality.

### C. Determinants of Household Food Consumption of Female Vegetable Farmers in Pekanbaru City

Household food consumption is the number of foods and drinks consumed by household members to meet their

nutritional needs, in this case, a female vegetable farming household in Pekanbaru City. Food consumption can be measured by the amount of food items consumed by household members or by the expenditure approach. This study measured household food consumption based on the amount of household food expenditure in a month.

Factors that influence the household food expenditure of female farmers in Pekanbaru City are household income, number of family members, length of education, age of female farmers, assets, and household savings. Table 3 presents the estimation results for the female farmer household food expenditure model.

TABLE III  
ESTIMATION RESULTS OF HOUSEHOLD FOOD CONSUMPTION MODEL FOR FEMALE FARMERS IN PEKANBARU, THE YEAR 2023

Variable	Parameter estimation	T value	Probability t	VIF	Elasticity
Intercept	287213.30	0.66	0.51		
Household Income	0.33	10.67	0.00*	1.09	0.72
Number of Family Members	9710.67	0.34	0.04**	1.14	0.02
Length of Education	22271.02	1.93	0.06***	1.09	0.15
Age	4981.77	1.58	0.12	1.17	-
Assets	0.002	0.45	0.66	1.36	-
Household Savings	-0.51	-6.25	0.00*	1.14	-0.10
R Square					0.746
F Value					28.41
F Probability					0.000
Durbin Watson					1.734

Explanation: confidence level \* $\alpha$ = 1%, \*\* $\alpha$ =5% dan \*\*\* $\alpha$ =10%

Table 3 explains that the independent variables that have a significant effect on the household food consumption of female farmers are household income, number of family members, and household savings at the confidence level of 99% and 95%, respectively, as well as the education of the female farmer at the 90% confidence level. The independent variables of age and household assets of female farmers do not significantly affect the household food consumption of female farmers.

There is a positive relationship between household income variables, the number of family members, and the length of education female farmers have on household food consumption. This means that an increase in household income, the number of family members, and the length of education of female farmers will increase female farmers' consumption of household food. Conversely, the saving variable has a negative relationship to household food consumption. This means that a higher amount of savings will reduce household consumption. The high savings show that households are holding back their consumption.

Table 3 shows that the household food consumption model has six independent variables. Four independent variables significantly affect household food consumption, and two independent variables are not significant. This shows the food consumption model both economically and statistically or econometrically.

Other statistical tests are the F test and the model suitability test. The F test shows that the calculated F is 28.41 with an F probability of 0.000 (Table 5). This value means that the independent variables of household income, number of household members, education, age, assets, and household savings of women farmers jointly significantly affect the household's food consumption. In other words, the female

farmer household food consumption model is statistically good.

Furthermore, a model suitability test was carried out with the coefficient of determination ( $R^2$ ). In this study, the  $R^2$  value was 0.746 (74.60%). This value means that the independent variable variations of household income, number of household members, education, age, assets, and household savings of female farmers can explain the household food consumption variable of 74.60% of female farmers, and the remaining 25.40% is explained by other variables not included, into the model represented by the error term. Based on this, the household food consumption model is statistically good.

A model in statistics or econometrics is said to be good if the model can be identified and has goodness of fit and theoretical consistency. The model can be identified, meaning there is only one estimation result for each parameter. The suitability of the model shows the fundamental strength of the analysis, which can explain as much as possible the variation of the independent variables on the dependent variable in the model. The value of  $R^2$  sees this. A high  $R^2$  value is considered a reasonable or appropriate model. Theoretical consistency assessment can be seen by marking the parameter estimation by the theory or not deviating from the theory [11], [25], [30]–[32].

Based on the explanation above, it can be concluded that the female farmer household food consumption model is reasonable or appropriate. This can be seen from the results of the study, which show that one independent variable has only one parameter value, and the  $R^2$  value is above 50 percent. It is high so that the criteria of the Goodness of Fit model are met. The theoretical consistency in the model is to the proven theory and research hypothesis. Thus, the

household food consumption model can be formulated, namely:

$$C_p = 287213.30 + 0.33X_1 + 9710.67 X_2 + 22271.02 X_3 + 4981.77X_4 + 0.002X_5 - 0.51X_6$$

Explanation:

$C_p$  = Household food consumption of female farmers (IDR/month)

$X_1$  = Female farmer's household income (IDR/month)

$X_2$  = Number of family members (person)

$X_3$  = Length of education of the head family (year)

$X_4$  = Age of female farmers (year)

$X_5$  = Household assets of female farmers (IDR)

$X_6$  = Household savings (IDR)

1) *Female Farmer's Household Income: Household income is the amount of money owned by household members, which they get from remuneration for their work. Household income is the sum of all incomes of working household members, both from farming and non-farming businesses—household income of women farmers is a variable that determines household food consumption.*

The results showed that household income significantly influenced the household food consumption of female farmers at the 99% confidence level. The estimated parameter value of the income variable is 0.33. This value means that if household income increases by IDR 1 per month, household consumption will rise by IDR 0.33 per month. This research is in line with [12], [17], [22], [24], [33]. The results of their study show that household income has a positive effect on household food consumption at the 99% confidence level.

Furthermore, the income elasticity value for food consumption is 0.72. This means that if household income increases by 1%, household food consumption increases by 0.72%. The results of this study indicate that the elasticity of household income is responsive to household food consumption, so household income has little impact on food consumption.

The results of the research by [8], [27], [29], [34], and [35] show that the elasticity of household income for staple food consumption is 0.364. This means that household income is irresponsive to household food consumption, so household income has little impact on their food consumption.

2) *Number of Family Members: The number of family members is the number of people who live in a building and eat from one kitchen. This variable affects household food consumption. The research hypothesis states that the number of family members is significant and has a positive effect on household food consumption, the more family members, the more food consumption increases.*

The results showed that the number of family members significantly and positively affected household food consumption at the 95% confidence level. Thus, this variable is by the hypothesis. The estimated parameter value is 9710.67. This value means that if the number of family members increases by one person, household food consumption will increase by IDR 9710.67 per month.

The number of family members shows the size of the family; the more members there are, the larger the size of the family is. Family size has a positive effect on food demand; as family size increases, food demand also increases. Food

consumption increases along with large family sizes [23]–[26] shows that the number of family members positively affects food consumption.

Calculating the elasticity of the number of family members obtained 0.02. This value means that if the number of family members increases by 1%, household food consumption rises by 0.02%. This means that the number of family members is not responsive to food consumption, having a small impact on food consumption. This study is in line with the results of the analysis of [26], where their study showed a family size elasticity value of 0.172 and was classified as inelastic because the value was below 1, so this variable had a negligible impact on household food consumption. [36] The fewer the number of household members, the less demand for food. [37]–[41] Household size positively affects household food security.

3) *Length of Education Female Farmers: Female farmers have a dual role as farmers and as mothers (wives). As a wife, they prepare food for their family. In this case, of course, education and knowledge are very important. A wife's education is important in determining household food consumption patterns. The level of knowledge or formal education and attitudes possessed by a mother (wife) determine the choice of food consumption. In deciding the food choices that will be consumed, the mother will find a good and healthy food composition for the family [19], [25], [26], [29], [34], [42], [43].*

The results showed that the education of female farmers had a significant and positive effect on household food consumption at the 90% confidence level. Table 3 shows the estimated parameter 22,271.02. This value means that if the education of female farmers increases by one year, household food consumption will increase by IDR 22,271.02 per month. Higher education provides broad insight into the importance of household food quality. Food quality is achieved by consuming various foods and getting good nutrition; the more varied food provided requires high food expenditure. This research is in line with the research of [12], [13], [15]–[17], [33], [44], where the results of his research show that the education of homemakers has a significant and positive effect on household food consumption.

Table 3 shows the educational elasticity of female farmers at 0.15. This value means that if education increases by 1%, household food consumption rises by 0.15%. This elasticity value is irresponsive to household food consumption, so changes in education will cause slight changes in household food consumption. Research by [15], [26], [32], [44] obtained a farmer's age elasticity value of 0.0002. This elasticity is irresponsive to household food consumption because the elasticity value is less than 1 [9], [19], [21], [29], [42], [45].

4) *Age of Female Farmers: A woman farmer's age is a variable included in the household food consumption model. However, this variable does insignificantly affect household food consumption because the probability t value is more significant than  $\alpha=5\%$  or  $\alpha=10\%$  (Table 3). This means that regardless of the age of female farmers, household food consumption does not differ from zero, accept the null hypothesis ( $H_0$ ) and reject the alternative hypothesis ( $H_a$ ). Other studies revealed that [46], as one's age increases, most*

members become less active and have poor involvement in food production.

5) *Farming Women's Household Assets*: farming women's household assets are a source of household economy. Likewise, the household assets of women farmers are also a source of the household economy. These assets include yards of houses used as land for growing vegetables, house buildings as residences cars/motorcycles, and jewelry in gold. These assets can be used as capital reserves for households. The research hypothesis states that household assets positively affect household food consumption, assets that can increase food consumption by selling assets. Including this variable is one of the strengths of this study because no other studies have included this variable.

The results showed that household asset variables did insignificantly affect food consumption at the 90% significance level. This means that household assets are insignificantly different from household food consumption, rejecting the alternative hypothesis ( $H_a$ ) and accepting the null hypothesis ( $H_0$ ). However, the sign of the parameter is by the hypothesis.

6) *Farming Women's Household Savings*: Household savings are the amount of money owned by a female farmer household that is kept in a financial institution. It is the money left over after the household uses its income to buy food and non-food needs and pay taxes. Accommodating the household savings variable in the model is an advantage of this study, where previous studies have not included this variable. The household savings variable is a determinant of household food consumption, where when household income is zero, households will use savings to buy household food needs. The research hypothesis states that farm women's household savings are significant and negatively affect household food consumption.

The results showed that household savings significantly affected the household food consumption of female farmers at the 99% confidence level and was negatively related to household food consumption. The estimated parameter value of household savings is -0.51. This value means that if household savings increase by Rp. 1, household food consumption decreases by Rp. 0.51 per month. When a household increases savings, household food consumption automatically decreases, because part of the household income is used for consumption, and some is saved. Sukirno [46] states that the household consumption tendency (MPC) and household saving tendency (MPS) are equal to one ( $MPC + MPS = 1$ ). If one of them increases, the other will decrease, the higher the MPS, the lower the MPC.

#### IV. CONCLUSION

The characteristics of female farmers seen from age, length of education, number of family members and participation in yard farming programs. The age of female farmers in Pekanbaru City is classified as productive age which ranges from 34-39 years with most high school education levels. The female farmer household generally consists of 4 people. In general, the quantity of food consumption in the household of female farmers has been met. Most of the household food consumption of female farmers is fulfilled by energy and protein needs. However, in terms of quality as seen from the

Expected Dietary Pattern score, household food consumption by female farmers in Pekanbaru City has not been fulfilled. Food groups that are consumed in excess are grains, animal foods, sugar and oils and fats. While the food groups that are consumed less are tubers, nuts, oily fruits/seeds and vegetables and fruit. Factors that significantly influence the household food consumption of female farmers are household income, education, number of family members, and household savings of female farmers. However, the age of female farmers and household assets do insignificantly affect household food consumption. These significant variables are irresponsive to household food consumption.

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