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Understanding the level of household food security headed by women and its determinants in Indonesia

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ABSTRACT

Women, often the primary breadwinners and heads of the household, face a wage gap and limited access to education, rendering them more susceptible to food insecurity. This study addresses two main questions: analysis of household food security level headed by women and examining its determinants, which is highly relevant to our field of interest. The result unveils that 40.18% of households are classified as vulnerable regarding food security. The number of household members, education, type of employment, and level of access to technology are significant factors influencing household food security.

***Keywords**: Breadwinners; Education; Employment; Vulnerable; Wage.*

1 Introduction

Most Indonesians buy food at fluctuating prices, which tend to increase, triggering inflation. Inflation in Indonesia comes from core inflation, administered prices, and volatile foods. In Figure 1, it can be seen that administered price and volatile foods inflation have high volatility. Of the three types of inflation, volatile foods inflation is the most volatile and contributes more to general inflation. In February-August 2022, volatile foods inflation was higher than in the other two types. Although there was a decline in inflation in September 2022, it increased again in September 2023 due to unstable food commodity prices vulnerable to shocks in the foodstuff category, such as harvests, natural disruptions, or domestic and international food price developments. Price changes influence volatile food's price inflation in the commodities of tomatoes, rice, shallots, fresh fish, and purebred chicken meat.

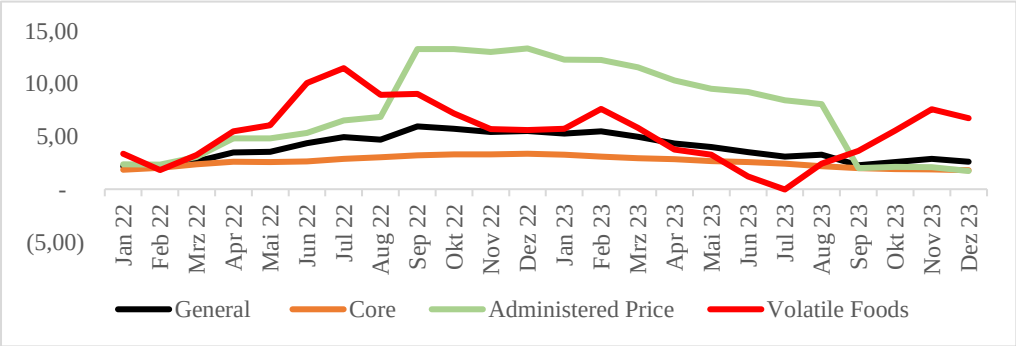

Figure 1. Inflation Rate by Disaggregation Component (BPS, 2024)

As food prices rise, the costs households spend on food also increase. On the other hand, if an increase in income does not accompany it, households will have to adjust their expenditure side. Generally, household expenses are regulated by the head of the household, whether male or female. Often, because women do more of the housework, it is their authority to manage family finances, regardless of whether they act as head of the household. Especially when they are heads of households who work and are responsible for meeting the family's food needs, they will be significantly affected by rising food prices. Therefore, this research focuses on households headed by women.

Another consideration is the wage differential between men and women labor in Indonesia. Women got lower wages than men, with men earning 212 USD/month and women only 165 USD/month. This has been going on for a long time and has not shown any change. In addition, women work more in the informal sector, the primary sector with low added value, and have voluntary status, which affects their income (Aqil et al., 2023; Yuniashri et al., 2023; Meylina, 2022; Setyawati and Abdullah, 2020).

Table 1.
Indonesia's Labor Market by Gender

Period	Percentage of Informal Labor		Proportion of Informal Employment (%)		Average Hourly Earnings of Employees (USD / Hour)		Average Hourly Earnings of Employees (USD / Month)	
	Men	Women	Women	Women	Men	Women	Men	Women
2018	17.20	48.20	53.90	61.90	1.09	0.97	212	166
2019	16.75	48.19	52.81	60.81	1.19	0.10	228	176
2020	17.59	46.87	57.29	65.35	1.26	0.12	211	167
2021	17.73	46.66	56.61	63.80	0.13	1.25	207	165
2022	16.13	46.59	56.03	64.43	1.16	1.02	212	165
2023	15.74	45.48	55.81	64.25	1.31	1.09	225	171

Source: BPS-Statistics Indonesia (2024)

The large number of women who work in the informal sector by opening small and medium businesses makes their income unstable. Meanwhile, those who work as employees often face wage disparities and discrimination (Aini, 2022); Panjaitan, 2023; Paramayudha, 2023). These factors influence income and impact expenditure allocation for food and non-food. If their income is disrupted, it can threaten food security and cause hunger because they cannot buy food, primarily if the head of the household must provide for all family members.

The indicators used to assess household food security are food consumption and the share of household food expenditure (Samantha et al., 2021; Martina et al., 2021; Lele et al., 2016; Rose et al., 2013). The share of household food expenditure is helpful because it is sensitive to price fluctuations, especially for staple foods. In Indonesia, high prices of essential commodities are the most significant contributor to inflation, ultimately affecting purchasing power. Decreased purchasing power will reduce people's access to food, especially for those with low and unstable incomes.

Previous studies about household food expenditure in Indonesia were conducted by Ibtiyah et al., 2023; Kalaba et al., 2022; Putra et al., 2020; Pahlevi et al., 2018; Samantha et al., 2021; Oostenbach et al., 2021; and Martina et al., 2021. Those studies did not focus on female-headed households and were only a case study in a particular area with few respondents. In addition, the determinants discussed are only in terms of respondents' demographics and do not include the influence of government assistance on the degree of household food security. Previous research that has discussed the effect of social security has been conducted in Nigeria (Abubakar et al., 2021), in El Salvador (Galindo et al., 2020), in Lesotho (Tingum and Kuponyini, 2020), and in Pakistan (Jahangeer et al., 2020). For this reason, this study discusses the effect of social security programs such as the Family Hope Program (PKH) and food assistance on food expenditure and household food security in Indonesia.

Meanwhile, in other countries, it has been done by Bafowaa, 2023; Xiao et al., (2023); Sangwan and Tasciotti (2023); Hajipoor et al., (2023); Lee and Capps (2023); Ojogho and Imade (2022); Ong'ute (2022); Abubakar et al., (2021); Tingum and Kuponyini (2020); Haque et al., (2020). All these studies focus on households in general. No research focuses on the food expenditure behavior of women as heads of households. In fact, with the low level of female labor participation, wage discrimination, and the significant role of women in serving food in the household, research should focus on them.

Those factors affect income, ultimately impacting expenditure allocation for food and non-food. If income is lower, expenditure allocation is also less, especially when a price increases. Thus, food insecurity becomes higher, especially in women with low and unstable incomes; women have more responsibility for managing the food menu than men. So, they should know and understand about healthy and nutritious food patterns for the family. Similarly, a variety of foods can be served when the price of one food commodity increases. For example, when there is an increase in the price of rice, bananas, yams, potatoes, or cassava, which are local foods in Indonesia, can be used to fulfill carbohydrates. Even though rice is the most significant and primary consumption for Indonesians, with the knowledge of homemakers, children, and other family members can be taught to diversify food.

Based on this background, this research focuses on households headed by women. Women are the head of the household, which means they are the primary breadwinners and the main decision-makers. This research is essential to fill the gap from previous research, namely discussing women's food security as heads of households. This research is hoped to help women struggling to make a living so their families can prosper and not be food insecure. Therefore, there are two objectives of this study. First, analyze the level of food security of female-headed households. Second, examine the determinants of the level of food security of female-headed households. The paper is organized as follows. The next section is a literature review; the following three sections describe the data and method, results, and conclusion.

2 Literature Review

2.1 Food Security

Based on the 1996 World Food Summit, food security is defined as having physical and economic access to sufficient safe and nutritious food at all times that meets people's dietary needs and food preferences for an active and healthy life. There are four dimensions of food security:

a. Food availability: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).
b. Food access: Individuals' access to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are the set of all commodity bundles over which a person can establish command given the legal, political, economic, and social arrangements of the community where they live (including traditional rights such as access to shared resources).
c. Utilization: Food is utilized through adequate diet, clean water, sanitation, and health care to reach a state of nutritional well-being where all physiological needs are met. This highlights the importance of non-food inputs in food security.
d. Stability: To be food secure, a population, household, or individual must have access to adequate food at all times. They should not risk losing access to food due to sudden shocks (e.g., an economic or climatic crisis) or cyclical events (e.g., seasonal food insecurity). Therefore, the concept of stability can refer to the dimensions of food security's availability and access.

The National Food Agency (Bapanas) in Indonesia also defines food security as food fulfillment for the country up to the individual, which is reflected in the availability of sufficient food in quantity and quality. Food should be safe, diverse, nutritious, equitable, affordable, and not conflict with the community's religion, beliefs, and culture. Therefore, people can live healthy, active, and productive lives sustainably.

Based on the dimensions of food security, individual and household food security can be measured using the food expenditure and consumption pattern approaches. Both are related to individual income. Income is essential in determining household expenditure, including family food consumption patterns. If income increases, consumption patterns will become more diverse, and the consumption of nutritious food will also increase. In limited conditions (low income), a person will prioritize fulfilling food needs; most of that income is spent on food consumption. The lower the share of food expenditure, the better the level of community welfare.

In low-income households, the nutritional quality of food is often compromised due to the dominance of food expenditure over non-food expenditure. The nutritional value of food, particularly in terms of energy and protein, is directly linked to the level of consumption. As income levels increase, households can purchase food with higher nutritional value, thereby enhancing their energy and protein intake.

Engels' Law, a fundamental economic principle, establishes a clear relationship between income and food expenditure. As income rises, the proportion of spending on food decreases. This principle not only provides a deeper understanding of the dynamics of household expenditure but also allows the composition of household expenditure to serve as an indicator of population welfare. A lower percentage of expenditure on food relative to total spending is indicative of a healthier economy, highlighting the significance of Engels' Law in understanding the relationship between income and food security.

At the household level, the development of food consumption levels also reflects income or household purchasing power. Increased income will cause individuals to increase the quality of their food consumption at a higher price. If income increases, food consumption patterns will become more diverse, so consumption of more nutritious food will also increase. The level of nutritional adequacy can be used as an indicator to show the level of population welfare, which is calculated based on the number of calories and protein consumed.

2.2 Determinant of household food security

Income can influence household food security levels. With limited data, income can be measured by the type and status of employment. The difference between the two shows the difference in wage levels received by workers. The results of the Blinder-Oaxaca decomposition analysis state that wage differences are caused by unobserved variables such as several aspects of culture, work effort, government regulations, whether the person is a member of a union or not, and the type of employment (formal /informal).

The Mincerian wage-level equation results show that human capital, socio-demographics, and location significantly influence individual wage levels in Indonesia. A high level of education determines the type of work workers will get, which determines the high or low wages they will receive.

Demographic factors such as marital status, number of household members, age, and education level also affect household spending and consumption patterns. Likewise, with household access to technology such as access to the internet, cellphones, and laptops. Ease of access to technology can affect the speed of households' search for information.

3 Data and Method

This study used data from the Indonesia National Socio-Economic Household Survey (Susenas) in 2022. The number of respondents who considered women household heads was 15,619. It is based on five provinces in Java Island: West Java, East Java, Central Java, DI Yogyakarta, and Banten. The first three provinces are producers of rice, which is the most consumed commodity in Indonesia. Meanwhile, DI Yogyakarta and Banten are not rice production centers with high rice consumption levels. The selected region is only Java Island because 56.10% of Indonesia's population lives there (BPS, 2021).

Based on Susenas data in 2022, most women who are heads of households are aged 51-65 years, and their husbands have passed away. So, they are forced to head the household and support their children, who are 1-2 people on average. Most of these women are elementary school graduates working in the agricultural sector, which means their income is unstable and low. Moreover, most have less than 0.5 hectares of land (PSKP, 2021).

Two methods were used to answer the objectives of this study: descriptive analysis and logit. The first objective was to investigate the level of food security of female-headed households, which was analyzed descriptively. Meanwhile, using logit methods, the second objective was to explore the determinants of females' food security levels.

3.1 The level of household food security headed by women

Objective 1 is measuring household food security using the household food expenditure pattern and household consumption indicators. Food expenditure is seen from the share of household expenditure on total household expenditure (Buri and Mantau, 2018; Arida et al., 2015; Perdana and hardinsyah, 2013):

$$Share\ of\ Food\ Expenditure\ (SFE) = \frac{Food\ Expenditure\ (\frac{USD}{month})}{Total\ Expenditure\ (\frac{USD}{month}} x100$$

While no internationally agreed thresholds exist, Smith and Subandoro (2007) have proposed that households spending over 75% of their income on food are considered very high and consequently food insecure, whereas 65-75% income expenditure on food is high, 50-65% is medium, and less than 50% is low. Akan tetapi, dalam penelitian ini kategori SFE dibedakan menjadi low jika food expenditure <50%, 50%-65% is medium, 65.1%-75% is high, and 75% is very high.

To quantitatively assess food consumption, parameters are used: Nutritional Adequacy Lel of Energy (NALE), Nutritional Adequacy Level of Protein (NALP), Nutritional Adequacy Level of Fat (NALF), and Nutritional Adequacy Level of Carbohydrates (NALC) (Buri and Mantau, 2018; Arida et al., 2015; Perdana and hardinsyah, 2013).

Each parameter is compared with the consumption and Nutritional Recommended Intake (NRI).

$$RNALE = \frac{Energy\ (kcal/capita/day)}{Nutritional\ Recommended\ Intake\ of\ Energy\ (kcal/capita/day)} x100$$

$$NALP = \frac{Protein\ Consumption\ (kcal/capita/day)}{Nutritional\ Recommended\ Intake\ of\ Protein\ (kcal/capita/day)} x100$$

$$NALF = \frac{Fat\ Consumption\ (kcal/capita/day)}{Nutritional\ Recommended\ Intake\ of\ Fat\ (kcal/capita/day)} x100$$

$$NALC = \frac{Carbohydrates\ (kcal/capita/day)}{Nutritional\ Recommended\ Intake\ of\ Carbohydrates\ (kcal/capita/day)} x100$$

The amount of NRI refers to the standards of the Regulation of the Minister of Health of the Republic of Indonesia Number 28 of 2019 concerning the recommended nutritional adequacy for the people of Indonesia (Ministry of Health, 2019). The nutritional recommended intakes for women based on these regulations are listed in Table 2.

Table 2.

Nutritional Recommended Intake by Ages

Age (years)	Calories/Energy (kcal/capita/day)	Protein (g/capita/day)	Fat (g/capita/day)	Carbohydrates (g/capita/day)
10-12	1,900	55	65	280
13-15	2,050	65	70	300
16-18	2,100	65	70	300
19-29	2,250	60	65	360
30-39	2,150	60	60	340
50-64	1,800	60	50	280
65-80	1,550	58	45	230
>80	1,400	58	40	200

Source: (Ministry of Health, 2019)

NALE scores are classified into four categories: Good: NALE ≥ 100% NRI; Medium: NALE ≥ 100% NRI; Low: NALE ≥ 100% NRI; and Deficit: NALE ≥ 100% NRI. Indicators of household food security can be seen from household expenditure; the greater the food expenditure, the lower the food security. This is because the income spent to meet food needs is more significant, so food security is low.

Households food security level categorized as high food security if NALE>80% and SFE<60%; marginal food security if NALE>80% and SFE≥60%; low food security if NALE ≤80% and SFE<60%; deficient food security if NALE ≤80% and SFE≥60%.

3.2 Determinants of the household food security level headed by women

Logit methods were used to analyze the determinants of households' level of food security to answer the second objective. The level of food security is 1 for households categorized as high food security and 0 for others. Previous research (Lee and Capps, 2023) was used in the Tobit model to estimate the food expenditure behavior of households in the United States Of America.

$$\left(\frac{P}{1-P}\right) = \alpha_i + demography_i + occupation_i + technology_i + socialsecurity_i + \varepsilon_i$$

The demographic variables are marital status, number of household members, age, and education level. Given the limitations of income data, the indicators used are type of employment, employment status, and whether or not the household receives social assistance from the government. The aid is cash that can be used to buy food or food provisions. As for access to technology, the indicators used are internet access and mobile phones and laptops.

4 Results and Discussion

4.1 Level of Food Security of Female-Headed Households

4.11 Household Food Expenditure

The food expenditure share (SFE) is calculated based on the value of household expenditure on food as a share of total expenditure. The results show that 44.27 percent of households headed by women have an average SFE of 57.95 percent, placing them in the middle SFE category. These households spend an average of $90.97 per month on food and $66.85 on non-food items, providing a clear picture of their financial situation.

Table 3.
Share of household food expenditure (SFE)-female headed

Level of SFE	Average of Food Expenditure ($/month)	Average of Non-Food Expenditure ($/month)	Average of Expenditure ($/month)	Average of SFE	Number of Households (%)
Low (<50%)	104.53	197.84	302.37	38.62	37.96
Medium (50%-65%)	90.97	66.85	157.82	57.95	44.27
High (65.1%-75%)	92.34	40.10	132.44	69.79	14.14
Very High (>75%)	98.30	27.02	125.32	78.34	3.64

Furthermore, SFE was calculated based on education level; the higher the education level, the lower the share of expenditure on food (Appendix 1). The average food expenditure share of household heads who graduated from elementary school was 55.91% (medium food insecure), while those who graduated from senior high school to university had food expenditure shares of 47.10% (low food insecure) and 39.00% (low food insecure), respectively. At the same time, the average expenditure share of households working in the paddy and secondary crop agriculture sector is 59.17% (medium food insecure), even though they produce food commodities. This high share indicates that the harvest will be sold and not used for consumption, so they are vulnerable to food security in the event of an increase in prices, especially since their income is uncertain.

The main food commodity in Indonesia is rice, with an average consumption of 6.81 kg/capita/month (BPS, 2022). Therefore, this commodity is often a contributor to inflation in Indonesia. Accumulatively, during 2023, rice contributed the largest share of inflation, amounting to 0.49% (y-to-d October 2023), which occurred in almost all provinces in Indonesia, both in production centers and non-production centers (BPS, 2023b). The main rice production centers in Indonesia, West Java, Central Java, and East Java, fall into the medium food insecure category, with a share of expenditure on food more significant than 50%. Meanwhile, other provinces, such as DI Yogyakarta and Banten, located in the production centers, are categorized as low and medium food insecure, respectively.

All these areas are interrelated because production in the centers will also be distributed to other places. If there is a production disruption, it will impact not only price increases in the region but also in different regions. These production disruptions can be caused by climatic factors, such as flooding, affecting the smooth distribution. If there is a distribution disruption, it can increase transportation costs and raise prices. Increased prices will reduce households' ability to purchase and access food, especially for families with low and unstable incomes.

4.12 Household Consumption

The nutritional adequacy level for energy, protein, fat, and carbohydrates per capita is good (>100%). This is supported by the habit of Indonesian people who like to consume rice. Rice has a low protein content, but because it is eaten in large quantities and often, it contributes significantly to daily protein consumption. (Adriani and Wirjatmadi, 2012). Apart from rice, several other commodities are the most widely consumed sources of protein, fat, and carbohydrates by Indonesians, namely wheat flour, cassava, fresh/preserved fish and prawns, beef, purebred/village chicken, purebred/village chicken eggs, sweetened condensed milk, shallots, garlic, red chilies, cayenne pepper, tofu, tempeh, coconut/cooking oil, coconut, and sugar (BPS, 2023b). However, the average fat adequacy is lower than the others at

only 106.54%, mainly sourced from beef, purebred/village chicken, and cooking oil consumption. These food commodities, including rice, are sourced from imports, making them highly vulnerable to price fluctuations.

Table 4.
Average Consumption of Energy, Calories, Protein, and Carbohydrates of Household

Categories	Calories	Protein	Fat	Carbohydrates
Consumption (kcal/capita/day)	2,484.65	75.08	53.51	354.02
Nutritional Recommended Intake (kcal/capita/day)	1,805.84	59.36	50.93	59.36
Nutritional Adequacy Level (%)	140.66	126.56	106.54	126.56

Although, on average, the number of households headed by women falls into the category of good nutritional adequacy level, there are still households with a medium to deficit status of nutritional adequacy. Especially for fat consumption, most households fall into the medium to deficit nutritional adequacy level category. Meanwhile, most households can consume protein and carbohydrates because it is supported by the large variety of foods that contain protein and carbohydrates in Indonesia. For example, animal protein in meat could be much better to fulfill the adequacy of eggs and fish due to its high price.

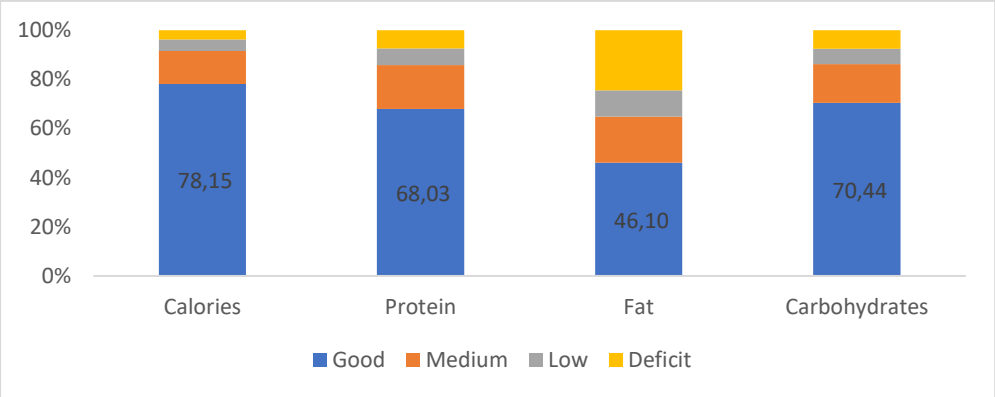

Figure 2. Number of Households by Nutritional Adequacy Level

The high carbohydrate consumption (354.02 kcal/capita/day), almost five times that of protein consumption, needs special attention. The primary source of carbohydrate consumption in Indonesia is rice, which is not sufficiently fulfilled from domestic production, so it must be imported, especially in the event of crop failure. So, the price of rice rises, and Indonesians continue to consume it without considering other alternative carbohydrate sources. Many local commodities, such as cassava, corn, bananas, and potatoes, can be used as alternatives.

In Indonesia, the food menu consumed by the whole family depends on the menu served by the housewife. Therefore, homemakers should be able to diversify their food menu. They can utilize local resources in the surrounding environment, so homemakers must have sufficient knowledge. This knowledge can be obtained easily online and accessed via mobile phone. Unfortunately, the data shows that 63.09% of female-headed households did not access the internet in the last three months. They also mostly do not use mobile phones, let alone computers/laptops, making it difficult to find information quickly (BPS-2023).

4.13 Household Food Security

Of the 15,619 respondents, 59.82% of female-headed households fall into the high food security category, and 40.18% fall into the vulnerable food security category consisting of marginal food security (31.83%), low food security (6.42%), and deficient security (1.93%). High food expenditures characterize households in the marginal and shallow food security categories.

Households that fall into the marginal food security category have a high proportion of food expenditure (≥60%). It is not necessarily that household incomes are already high, but rather the effect of high prices. For comparison, the price of rice in Indonesia is higher than in India and Thailand, which are both the largest producers and consumers of rice. The average price of rice in Indonesia is USD1/kg, while in India and Thailand, it is USD0.34/kg and USD0.27/kg, respectively. The lower prices in these two countries cause Indonesia to import rice from them, but rice remains the commodity that is the most significant contributor to inflation in Indonesia (BPS, 2024). Inflation will cause purchasing

power to decline and may affect food security. Thus, to achieve a sustainable food system through food security in Indonesia, it must pay attention to affordable and stable food commodity prices (Khairi et al., 2020; Arif et al., 2020).

Table 5.
Number of Households by Food Security Categorize (N=15,619)

Energy Consumption Rate (NALE)	Food Expenditure (SFE)	
	Low (< 60% Total Expenses)	**Tall (≥60% Total Expenses)**
Sufficient (>80% Energy consumption)	**High food security** 59.82%	**Marginal food security** 31.83%
Insufficient (≤80% Energy consumption)	**Low food security** 6.42%	**Deficient food security** 1.93%

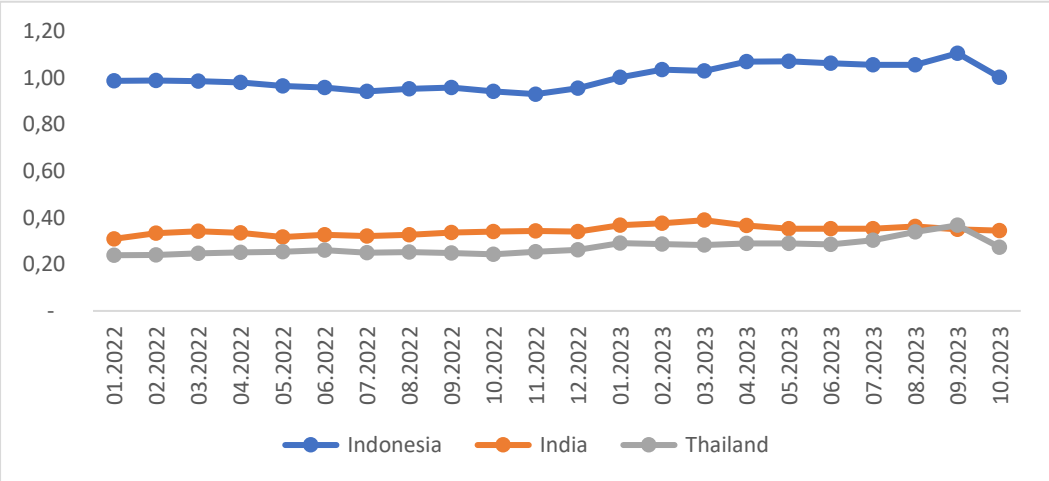

Figure 3: Price of Rice in Indonesia, India, and Thailand (Kg/USD) (CEIC, 2024)

4.2 Determinants of the level of food security of female-headed households

This section will explain the internal factors that determine the food security of female-headed households. Factors that significantly affect food security are the number of household members, level of education, location of residence, type of employment, level of access to technology, and availability of social security for food. The results related to the demographic factors of respondents and location align with the study's findings (Hajipoor et al., 2023; Lee and Capps, 2023; Ong'ute, 2022; Kalaba et al., 2022; Samantha et al., 2021; Martina et al., 2021). They are associated with significant social security variables in line with research from (Abubakar et al., 2021) in Nigeria and by Galindo et al. in El Salvador.

Number of households is significant to influence the level of food security. The probability of households with 3-4 members is 0.904 times lower than households with 1-2 members. The more household members there are, the higher the average difference in the share of food expenditure. It was followed by non-food expenditures such as school fees, house rent, and electricity costs. Thus, the head of the household must have sufficient income to meet the needs of all family members. Of course, the primary source of family income is the wage of the head of the household, which in this study is proxied using the type of employment.

Due to the limitations of income data, the type of employment and employment status approach was used to see the income levels of male and female household heads. Women work more in the primary agriculture sector, especially paddy and secondary crop agriculture (26.61%), with the status of casual employees, so their income is still being determined. The second sector that absorbs much female labor is the wholesale and retail, repair and maintenance, transportation, and warehousing sector, with the status of own-account workers in most small- and medium-scale enterprises. Thus, their income fluctuates to meet the family's needs, while the need for food must be fulfilled daily.

Table 6.
Determinant of Food Security Based on Respondent's Demography

Variables	Logit (Odds Ratio)
Number of family members (persons)	
Base: 1-2	
3-4	-.904***
5-7	-1.625***
8-10	-2.525***
Marital status	
Base: Single	
Married	-.083
Divorce	-.063
Widow	.09
Age (years)	
Base: >=20	
21-35	.953**
36-50	1.443***
51-65	1.865***
66-80	1.794***
>=81	1.551***

*Significance level: *** p<.01, ** p<.05, * p<.1*

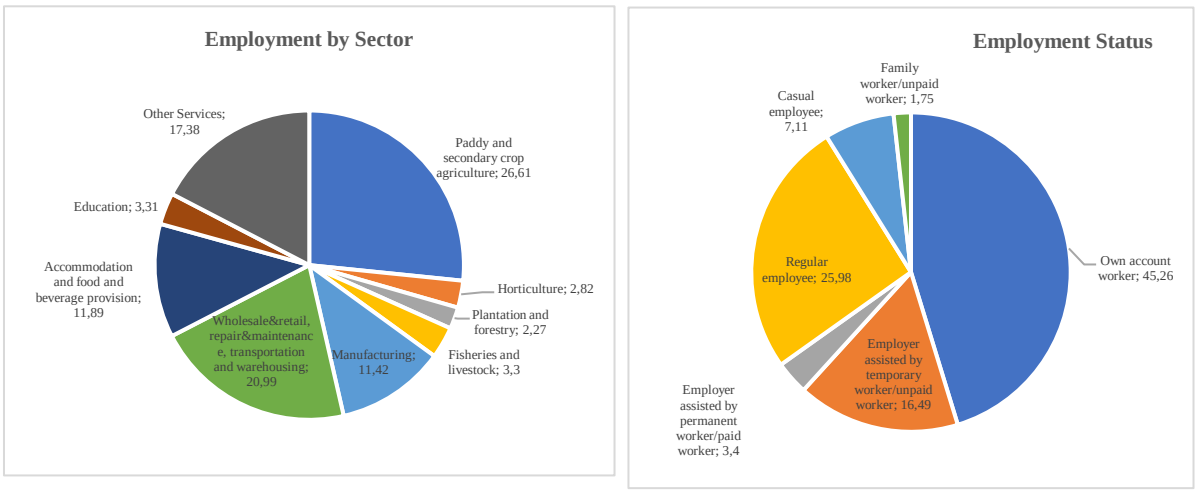

Figure 4. Main Employment of Female as The Head Household (Percent) (BPS, 2023)

The probability of a household being in the food secure category increases when the head of the household works in a sector with high added value (secondary and tertiary). Each sector has a different average income, where wages in the secondary and tertiary sectors are higher than in the primary industry. The average primary, secondary, and tertiary sector income was USD236.80/month, USD221.14/month, and USD239.55/month in August 2022. This value decreased in August 2023 to USD234.91/month and USD236 .78/month for the primary and tertiary sectors, while secondary sector wages increased to USD 227.05/month (BPS, 2023a). It was also revealed that families with high incomes tend to spend a lower proportion of their incomes on food, which is consistent with Engel's law.

Another factor that influences the share of household food expenditure is the education level of the head of the household, who, in this study, was female. The higher the level of education of women, the lower the share of food expenditure. Apart from being the head of the household, they are also responsible for the family food menu. Higher education will likely increase their income, and their knowledge regarding serving a varied food menu will also improve. In this way, the level of household food security will also increase. The probability of households whose heads of families are junior high school graduates is 0.281 times higher in the food secure category than those with only elementary school graduates. The higher the education, the higher the probability of being included in the food secure category.

Table 7.
Determinant of Food Security Based on Respondent's Occupation

Variables	Logit (Odds Ratio)
Field of main occupation	
Base: Paddy and secondary crop agriculture	
Horticulture	.184
Plantation and forestry	.025
Fisheries and livestock	.177
Manufacturing	.342***
Wholesaleandretail, repairandmaintenance	.476***
Accommodation and food and beverage provision	.393***
Education	.219
Other services	.137*
Main Employment Status	
Base: Own account worker	
Employer assisted by temporary worker/unpaid	.119
Employer assisted by permanent worker/paid worker	.15
Regular employee	-.285***
Casual employee	-.377***
Family worker/unpaid worker	-.087

*Significance at level: *** p<.01, ** p<.05, * p<.1*

Of course, higher education students have more opportunities to access technology (the Internet, mobile phones, and computers). Access to technology significantly influences food security. The more women's access to the Internet, the higher the probability of being included in the food-secure household category. However, it is unfortunate that women's access to technology is still shallow.

Due to the existence of households with low and uncertain incomes, the government assists in the form of cash that can be used to buy food. One form of program is the Family Hope Program (PKH), which provides conditional social assistance to underprivileged families (KM) designated as families of PKH beneficiaries. Providing PKH can affect the share of food security and food security levels, where the probability of those who receive PKH decreases by 0.279% and falls into the food secure category.

Those who receive PKH are in the poor household category, which is most likely at the level of food insecurity. The average share of food expenditure from households that receive PKH is 58.07% (medium food insecurity), higher than households that do not receive PKH (50.38%, low food insecurity). With the provision of PKH, they have cash to buy food, reducing their food insecurity. Align with the results of (2021), (Galindo et al., 2020), (Tingum and Kuponyini, 2020), (Jahangeer et al., 2020). This research emphasizes the need for expenditure subsidy policies for the poor and vulnerable, especially in rural areas. Likewise, the government should consider implementing policies to ensure a fairer income distribution for all citizens.

5 Conclusion

The average food expenditure for households headed by women has reached an excellent nutritional adequacy level, except for fat consumption. The highest consumption is food that contains carbohydrates, especially rice. When rice prices rise, household rice consumption remains high. So, there are still 40.18% in the vulnerable food security category. Factors that significantly influence the level of family food security are the number of household members, level of education, location of residence, type of work, level of access to technology, and availability of social security for food.

The results have serious policy consequences that require immediate proactive action by the government. Active policies are needed to increase women's labor force participation through increasing opportunities for schooling and access to technology. In addition, the government should implement policies to address the difficulty of accessing food commodities when prices rise. The government can create a market operation policy for the lower middle class or specifically for female-headed households. In addition, assistance should be in something other than cash but directly provide commodities to food-insecure communities that have experienced price increases. What must be prioritized by the government is valid household data so that the assistance provided is genuinely targeted.

Table 8.
Determinant of Food Security Based on Respondent's Education, Access to Technology, and Social Security for Food

Variables	Logit (Odds Ratio)
Education	
Base: Elementary School	
Junior high school	.281***
Senior high school	.343***
University	.787***
Internet Access	
Base: No	
Yes	.318***
Mobile phone Access	
Base: No	
Yes	.428***
Computer Access	
Base: No	
Yes	.676***
Social Security for Food	
Base: No	
Yes	-.279***
_cons	-1.623***

*Significance at level: *** p<.01, ** p<.05, * p<.1*

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Appendix 1. Socioeconomic Characteristics and Household Expenditure per Capita per month

Characteristics	Number Household (%)	Food Expenditure ($/month)	Non-Food Expenditure ($/month)	Total Expenditure ($/month)	Share of Food expenditure/total expenditure (%)
Age (years)					
- >=20	0.69	93.07	196.06	289.14	38.40
- 21-35	5.74	118.37	143.49	261.87	50.34
- 36-50	21.71	130.65	152.53	283.18	51.87
- 51-65	41.78	109.49	124.12	233.61	52.88
- 66-80	25.73	83.17	94.48	177.65	54.46
- >=81	4.36	66.32	72.20	138.52	57.66
Education					
- elementary school	58.52	91.15	81.60	172.75	55.91
- Junior high school	13.49	116.47	129.57	246.05	51.01
- senior high school	18.92	137.05	191.77	328.82	47.10
- university	9.08	168.56	328.93	497.49	39.00
Number of family members (persons)					
- 1-2	65.93	80.30	101.94	182.24	51.96
- 3-4	27.22	145.19	158.03	303.23	54.27
- 5-7	6.55	191.92	170.67	362.60	58.31
- 8-10	0.30	264.24	199.30	463.53	61.36
Marital status					
- Single	4.44	96.62	172.68	269.30	43.98
- Married	9.44	123.63	147.61	271.24	53.22
- Divorce	16.21	116.92	130.04	246.96	52.46
- Widow	69.91	101.44	113.47	214.91	53.71
Field of main occupation					
- Paddy and secondary crop agriculture	26.61	81.08	59.61	140.69	59.17
- Horticulture	2.82	80.63	79.25	159.88	56.84
- Plantation and forestry	2.27	79.19	68.91	148.10	57.80
- Fisheries and livestock	3.30	77.64	65.24	142.88	58.68
- Manufacturing	11.42	114.49	127.82	242.31	52.45
- Wholesale&retail, repair&maintenance, transportation&warehousing	20.99	114.73	134.65	249.38	50.50
- Accommodation and food and beverage provision	11.89	122.41	141.41	263.81	51.00
- Education	3.31	170.39	280.75	451.14	41.26
- Other services	17.38	125.04	166.18	291.22	51.45
Main Employment Status					
- Own account worker	42.01	103.50	115.45	218.94	52.67
- Employer assisted by temporary worker/unpaid worker	12.37	102.72	94.18	196.90	56.30
- Employer assisted by permanent worker/paid worker	4.34	131.55	205.80	337.35	49.28
- Regular employee	27.68	123.68	152.31	275.99	51.50
- Casual employee	11.90	80.47	60.03	140.49	59.63
- Family worker/unpaid worker	1.69	93.97	75.50	169.47	57.99
Location					
- Rural	39.28	87.16	72.26	159.43	57.69
- Urban	60.72	117.91	154.18	272.09	50.01
Provinces					
- West Java	24.93	112.51	131.55	244.07	52.41
- Central Java	28.50	98.66	113.35	212.01	52.51
- DI Yogyakarta	4.56	107.17	180.15	287.32	46.71
- East Java	35.30	98.6	107.24	205.84	54.84
- Banten	6.70	148.58	161.41	309.99	52.22

Technology					
Internet Access					
- No	63.09	85.90	75.25	161.14	56.70
- Yes	36.91	139.90	201.93	341.82	46.75
Mobile phone Access					
- No	52.82	85.43	71.47	156.90	57.61
- Yes	47.18	128.66	178.58	307.24	47.91
Computer Access					
- No	94.59	101.56	108.82	210.38	53.86
- Yes	5.41	180.45	352.52	532.96	38.50
Social security					
- No	65.59	114.74	149.39	210.38	50.38
- Yes	34.41	88.84	69.80	158.64	58.07