
Comparative analysis of FSVA and FSQ methods in food security in Indonesia

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Abstract Food security measurement plays an important role in determining regional food policy and identifying vulnerable areas. The results showed substantial differences between the two approaches across food availability, accessibility, utilization, and overall food security classifications. FSVA generally produced more conservative classifications based on absolute production, population, and land productivity, while FSQ tended to generate more optimistic results due to its emphasis on commodity contribution and specialization. Significant differences were particularly found in food availability and food utilization dimensions. Central Bengkulu Regency, for example, was categorized as very vulnerable by FSVA because of low total food production, but was classified as very resistant by FSQ due to the relatively high contribution of cassava production. Overall, FSQ tended to classify more regions as food secure compared to FSVA, potentially leading to overestimation of regional food security conditions if used as a single measurement approach. These findings are indicated that different food security indicators may produce contrasting interpretations and policy implications. Therefore, the selection of appropriate and complementary food security measurement methods is essential to support more accurate and comprehensive food security policymaking.

Keywords: Household Food Security, FSVA, FSQ

Introduction

Food security is a strategic issue faced by nearly every country, including Indonesia. As an agrarian nation with a large population, Indonesia is confronted with increasingly complex challenges in ensuring the availability, accessibility, and stability of food for all its citizens. According to data from Statistics Indonesia (Central Bureau of Statistics, 2025a), as of June 30, 2025, the country's population reached 284 million—an increase of 1.09% compared to the previous year. Meanwhile, the production of staple foods such as rice and maize continues to fluctuate from year to year. In 2024 (Central Bureau of Statistics, 2025c), rice production reached 53.14 million tons, a decrease from the previous year, while maize production increased from 14.77 million tons to 15.14 million tons. Peak

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production occurred in 2022, with 54.75 million tons of rice and 16.53 million tons of maize. This imbalance between population growth and food production signals a growing risk to future food security. Most rural areas, especially in district areas, are producers of agricultural commodities, especially food (Mulyani and Putri, 2020).

According to the Food and Agriculture Organization (FAO), food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food (FAO, 2008). The FAO outlines four key dimensions of food security: availability, access, utilization, and stability. In Indonesia, national policy focuses primarily on the first two dimensions—availability and access—as reflected in Presidential Regulation No. 81 of 2024 on the Acceleration of Food Diversification Based on Local Resource Potential. Sufficient and quality food intake with adequate nutritional composition is the main prerequisite for a healthy and productive life (Rusmawati *et al.*, 2023).

However, efforts to maintain national food security continue to face structural and ecological challenges. From an ecological standpoint, climate change and land-use conversion pose serious threats to agricultural production. Rising temperatures, unpredictable rainfall, droughts, and floods have shortened and disrupted growing seasons, reducing productivity (Algarni *et al.*, 2025). In addition, the conversion of agricultural land to industrial and residential use has significantly reduced available farmland. Over the past five years, rice harvested area has declined from 10.66 million hectares (2020) to 10.05 million hectares (2024), highlighting the need for a more systemic and sustainable approach to food policy.

From an economic perspective, purchasing power is a critical factor in food access. Food price increases severely affect low-income groups, who allocate most of their spending to basic needs such as rice. Sudden price spikes reduce purchasing power and increase the risk of food insecurity. Conversely, price drops during harvest periods harm farmers and discourage production. These economic shocks also affect the education and health of poor families and risk triggering social instability. Additionally, high price volatility discourages investment in the agricultural sector (Wibowo *et al.*, 2023). Higher household purchasing power improves food security (Ambarsari *et al.*, 2020). People with relatively low incomes have lower purchasing power and will consume cheaper goods in smaller quantities (Silvia *et al.*, 2021). Central Bureau of Statistics (2025b) data shows that the poverty rate hovered around 9% between 2021 and 2024, with monthly per capita expenditure below IDR 582,932. Although government social assistance rose from IDR 19.8 trillion in 2019 to over IDR 40 trillion post-pandemic, these short-term measures have not addressed the

structural roots of food insecurity—particularly price instability and inefficiencies in food distribution systems.

Purchasing power is closely linked to poverty rates. On the Indonesian island of Sumatra, Bengkulu Province has the second-highest number of poor people. As of September 2024, Bengkulu Province had a population below poverty line of 12.52%, exceeding the national figure of 9% (Table 1).

Table 1. Percentage of population below the poverty line on the island of Sumatra, Indonesia per province in the last 5 years

Province	2020	2021	2022	2023	2024
Aceh	15.43	15.53	14.75	14.45	12.64
Sumatera Utara	9.14	8.49	8.33	8.15	7.19
Sumatera Barat	6.56	6.04	6.04	5.95	5.42
Riau	7.04	7.00	6.84	6.68	6.36
Jambi	7.97	7.67	7.70	7.58	7.26
Sumatera Selatan	12.98	12.79	11.95	11.78	10.51
Bengkulu	15.30	14.43	14.34	14.04	12.52
Lampung	12.76	11.67	11.44	11.11	10.62
Kep. Bangka Belitung	4.89	4.67	4.61	4.52	5.08
Kep. Riau	6.13	5.75	6.03	5.69	4.78

Source: Central Bureau of Statistics, 2025b

Measuring the food security status of a region is crucial because it will impact the direction of policymaking. In Indonesia, there is a measurement that describes the level of food security in a region called the food security index (IKP), which consists of three indicators: food availability, food access, and food quality (Pujiati *et al.*, 2020). This index is issued by the National Food Agency (BPN) in the form of the Food Security Vulnerability Atlas (FSVA). Another method commonly used to determine food security status is the Food Security Quotient (FSQ) analysis method (Raihan *et al.*, 2020; Rolenza *et al.*, 2025), a development of the Location Quotient (LQ) method. The study aimed to compare the results of the analysis using the FSVA / Food Security Index (IKP) with the FSQ in Bengkulu Province.

Materials and methods

The study focused on analyzing food security in Bengkulu Province. It used secondary data obtained from various sources. Due to differences in the indicators used for the FSVA and FSQ, the data sources were also different. The FSVA data came from the National Food Agency (BPN) Indonesia, while the

FSQ data were obtained from the Central Bureau of Statistics (BPS), the Department of Agriculture, the Department of Health, the Food Security Agency at both the provincial and district/city levels, and other sources such as books, journal articles, and others. This study used data in 2023. Bengkulu province consists of 9 districts and 1 city, namely: Bengkulu Selatan, Rejang Lebong, Bengkulu Utara, Kaur, Seluma, Mukomuko, Lebong, Kepahiang, Bengkulu Tengah and Bengkulu City. The research finding conveyed to food Security and Vulnerability Atlas (FSVA) is a thematic map that presents the geographic visualization of areas vulnerable to food insecurity. The FSVA was developed to provide accurate, comprehensive, and well-structured food security information to support efforts in preventing and addressing food and nutrition insecurity, while also serving as a basis for providing guidance and recommendations to policymakers in formulating programs, policies, and interventions at both the national and regional levels. The provision of this information is mandated by Law No. 18 of 2012 on Food and Government Regulation No. 17 of 2015 on Food Security and Nutrition, which assign the Government and Regional Governments, in accordance with their authority, to establish, compile, and develop an integrated Food and Nutrition Information System.

With this, the research investigation followed the FSVA which is based on three aspects of food security: availability, affordability/access, and utilization. Nine indicators are used in the FSVA as derived from these three aspects of food security.

Availability aspect is a ratio of per capita normative consumption to food availability. Food access aspect is percentage of population living below the poverty line households with food expenditure exceeding 65 percent and households without access to electricity. Food utilization aspect is average years of schooling for girls above 15 years, percentage of households without access to clean water, ratio of population per health worker to population density, percentage of toddlers with below-standard height (stunting) and number of life expectancy.

The FSVA analysis method is used a weighting method. The FSVA method is referred to a score formed on the food security index (IKP). The IKP is a numerical composite score generated from several indicators to measure the level of food security in a region. The weighting method is used to determine the relative importance of indicators to each aspect of food security. The weighting method in compiling the IKP refers to the method developed by the EIU in compiling the GFSI. If the variables used in calculating the index are different, then a weighting method is needed to form an aggregate index tailored to its purpose. The determination of the weighting amount used is obtained through

expert judgment (Table 2). The weight for each indicator reflects the significance or importance of the indicator IKP.

Table 2. Indicator weights based on expert judgement for Regency and Province

No	Indicators	Weight
Availability aspect:		
1	Ratio of per capita normative consumption to food availability	0.300
	Sub Total	0.300
Food access aspect:		
2	Percentage of population living below the poverty line	0.150
3	Percentage of households with food expenditure exceeding 65 percent	0.075
4	Percentage of households without access to electricity	0.075
	Sub Total	0.300
Food utilization aspect:		
5	Average years of schooling for girls above 15 years	0.050
6	Percentage of households without access to clean water	0.150
7	Ratio of population per health worker to population density	0.050
8	Percentage of toddlers with below-standard height (stunting)	0.050
9	Number of Life expectancy	0.100
	Sub Total	0.400

Source: National Food Agency (BPN)

Table 3. Indicator weights based on expert judgement for urban area

No	Indicators	Weight
Availability aspect:		
1	Ratio of per capita normative consumption to food availability	-
	Sub Total	-
Food access aspect:		
2	Percentage of population living below the poverty line	0.200
3	Percentage of households with food expenditure exceeding 65 percent	0.125
4	Percentage of households without access to electricity	0.125
	Sub Total	0.450
Food utilization aspect:		
5	Average years of schooling for girls above 15 years	0.080
6	Percentage of households without access to clean water	0.180
7	Ratio of population per health worker to population density	0.080
8	Percentage of toddlers with below-standard height (stunting)	0.080
9	Number of Life expectancy	0.130
	Sub Total	0.550

Source: National Food Agency (BPN)

For urban area analysis, only eight indicators related to food accessibility and utilization are applied, since food availability in cities depends on interregional trade rather than local production. Consequently, the weight of the normative consumption-to-net availability ratio is set to zero, as the Urban Food Security Index (IKP) does not include indicators from the availability aspect. The original 0.30 weight allocated to food availability is proportionally redistributed across the other eight indicators according to their respective aspects. The assigned weights for each indicator reflect their relative significance within the Urban Food Security Index (IKP City) (Table 3).

The food security index calculation was done in several steps

Standardize indicator values using z-scores and distance to scale (0-100). Add the results of multiplying each standardized indicator value by the indicator weight, using the formula:

$$Y(j) = \sum_{i=1}^9 a_i X_{ij}$$

i meant indicators 1st, 2nd, 3rd, ... 7th, 8th, and 9th. j meant regencies 1st, 2nd, 3rd, ... 7th, 8th, and 9th and meant city (bengkulu city). Yj meant Food Security Index of district/city j. a_i meant the weight of each i-th indicator. X_{ij} meant the standardization value of each i-th indicator in the j-th district/city.

Regions with the highest IKP values are the most food secure, conversely, those with the lowest IKP values indicate regions vulnerable to food insecurity.

Group regions into six groups based on the IKP cut-off point

The IKP generated in each region is grouped into six groups based on the IKP cut-off point (Table 4). The IKP cut-off point is the sum of each individual indicator's weight multiplied by the individual indicator's cut-off point based on the standardized z-score and distance-to-scale (0-100). Regions in Group 1 are regencies/cities/provinces that tend to have higher levels of vulnerability than regencies/cities in the groups above them. Conversely, regions in Group 6 are regencies/cities/provinces with the best food security.

Table 4. Cut off point food security index (IKP)

IKP Group	Cut off (Regency)	Cut off (City)	Cut off (Province)	Category
1	<= 41.52	<= 28.84	<= 37.61	Very Vulnerable
2	> 41.52 - 51.42	> 28.84 - 41.44	> 37.61 - 48.27	Vulnerable
3	> 51.42 - 59.58	> 41.44 - 51.29	> 48.27 - 57.11	Quite Vulnerable
4	> 59.58 - 67.75	> 51.29 - 61.13	> 57.11 - 65.96	Quite Resistant
5	> 67.75 - 75.68	> 61.13 - 70.64	> 65.96 - 74.40	Resistant
6	> 75.68	> 70.64	> 74.40	Very Resistant

Source: National Food Agency (BPN)

The Food Security Quotient (FSQ) analysis technique is a development of the Location Quotient (LQ) method. FSQ used to analyze and determining food security conditions based on the variables studied. The FSQ method formula is essentially the same as the LQ method, with changes in the FSQ analysis being found in the selection of variables used, namely variables that influence indicators of food availability, food access, and food quality (Vaulina *et al.*, 2022). The FSQ calculation formula is as follows:

$$\text{Food Security Quotient (FSQ)} = \frac{(Xr/RVr)}{Xn/RVn}$$

Xr meant variable value in Regency/City and Xn meant variable value in Province. RVr meant total variable value in Regency/City and RVn meant total variable value in Province. The FSQ index calculation is divided into five categories to more specifically determine the food security conditions of each region. The following in table 5. are the food security categories in the Food Security Quotient method:

Table 5. Food security category by FSQ

No	Index FSQ	Category
1	≤0.25	Very Vulnerable
2	>0.25–0.5	Vulnerable
3	>0.5–0.75	Moderate
4	>0.75–1	Resistant
5	>1	Very Resistant

Source: (Raihan *et al.*, 2020)

Table 6. Variables used by FSVA

Variable		
Availability	Access	Utilization
1. Rice Production (Tons)	1. Productive Population (15-64) (%)	1. Number of Toddlers & Elementary School Children Served by Health Facilities (%)
2. Rice Production/Capita (Tons/person)	2. Number of Working People (%)	2. Number of Toddlers Not Underweight (Malnutrition + Malnutrition) (%)
3. Rice Harvested Area (Ha)	3. Average Years of Schooling (Years)	3. Number of Toddlers Not Stunted (very short + stunted) (%)
4. Rice Productivity (Tons/Ha)	4. Affluent Population (%)	4. Number of Girls 15 Years and Over Attending School (%)
5. Corn Production (Tons)	5. Households with Access to Electricity (%)	5. Households Living a Healthy Lifestyle (%)
6. Corn Production/Capita (Tons/person)	6. Average Share of Food Expenditure (IDR)	6. Number of Health Workers (person)
7. Corn Harvested Area (Ha)	7. Employed Population (People)	7. Number of Community Health Centers (units)
8. Corn Productivity (Tons/Ha)	8. Human Development Index	8. Number of Hospitals (units)
9. Cassava Production (Tons)	9. Adjusted Per Capita Expenditure (IDR)	9. Number of Clinics (units)
10. Cassava Production/Capita (Tons/person)		10. Population with Access to Clean Drinking Water (%)
11. Cassava Harvested Area (Ha)		11. Life Expectancy Number (%)
12. Cassava Productivity (Tons/Ha)		
13. Sweet Potato Production (Tons)		
14. Sweet Potato Production/Capita (Tons/person)		
15. Sweet Potato Harvested Area (Ha)		
16. Sweet Potato Productivity (Tons/Ha)		
17. Regency/City Population Density (Km2)		

Source: (Raihan *et al.*, 2020)

Due to this study was a comparative method, the variables/indicators used in the FSQ method are as similar as possible to those used by FSVA. The variables used also refer to previous journal references, taking into account the availability of data sources. The variables analyzed had different units, therefore, different treatments were applied to each variable. Each variable was categorized based on the existing correlation, such as the Road Length variable compared to the Area data. Some variables also required additional data for comparison, such as the Employed Population (persons), Number of Health Workers (persons), Number of Community Health Centers (units), Hospitals (units), and Clinics (units) compared to the Population (persons) data. The variable illustrated in Table 6.

The used formula compared the ratio of district/city-level variable values to the ratio of provincial-level variable values to obtain an FSQ index value ranging from 0 to >1. The average FSQ value for each variable was calculated to obtain FSQ values at higher levels, namely per indicator, per district/city, and then per province. The calculation of the food security index between the FSVA and the FSQ is the sum of the weights multiplied by the food availability, food accessibility, and food utilization indices. The weights used by the FSQ follow those used by the FSVA.

The hypothesis in this study is that there is no significant difference between measuring food security using FSVA and FSQ in Bengkulu Province.

Results

The results of the FSVA and FSQ analysis consisted of four aspects, namely based on the aspects of food availability, food accessibility, food utilization, and food security, which is a combination of these three aspects.

Food availability refers to the physical availability of food in a particular area from various sources, including local agricultural products, food trade, and food aid. Factors influencing food availability include the amount of food produced in the area, food trade activities through local markets, stocks held by traders and reserves stored by the government, and food aid provided by the government or other organizations. Each district/city in Bengkulu Province has different characteristics in producing food crops. Food availability in Bengkulu Province is related to food availability such as variables including population, production, production/capita, harvested area and productivity (rice, corn, cassava, and sweet potatoes) which are the staple foods of the people of Bengkulu Province.

Table 7. Results of food availability measurements based on FSVA and FSQ

Area	FSVA	FSVA Category	FSQ Index	FSQ Category
Bengkulu Selatan	93.07	Very Resistant	0.82	Resistant
Rejang Lebong	79.13	Very Resistant	1.31	Very Resistant
Bengkulu Utara	63.91	Resistant	1.92	Very Resistant
Kaur	85.74	Very Resistant	1.10	Very Resistant
Seluma	85.28	Very Resistant	0.80	Resistant
Mukomuko	79.85	Very Resistant	0.99	Resistant
Lebong	94.69	Very Resistant	0.71	Moderate
Kepahiang	71.25	Resistant	1.10	Very Resistant
Bengkulu Tengah	39.46	Very Vulnerable	1.18	Very Resistant

The results showed food availability measurements per regency in Bengkulu Province (Table 7). Based on the FSVA analysis, almost all regencies in Bengkulu Province fall into the food secure (resistant) and highly food secure (very resistant) categories, except for Central Bengkulu. Central Bengkulu falls into the highly food insecure (very vulnerable) category. This is because the production of the four main food commodities (rice, corn, cassava, and sweet potatoes) in Central Bengkulu is much smaller than in other regencies, at 7.2 thousand tons (Table 8). The population is found to be also relatively high, with a density of 107 people per km². South Bengkulu, Lebong, Seluma, Rejang Lebong, Kaur, and Mukomuko fall into the highly food secure category due to their high rice and corn production. North Bengkulu and Kepahiang produce less rice than the other six regencies, making them food secure.

Table 8. The amount of production of main food commodities in Bengkulu Province

No	Area	Production (Tons)				Total
		Commodities				
		Rice	Corn	Cassava	Sweet Potato	
1	Bengkulu Selatan	51,124	16,377	2,247	933	70,681
2	Rejang Lebong	38,022	17,678	3,783	7,001	66,484
3	Bengkulu Utara	19,629	9,873	6,858	8,497	44,857
4	Kaur	25,808	12,755	3,531	760	42,854
5	Seluma	43,628	5,844	3,267	344	53,083
6	Mukomuko	26,232	1,490	2,351	1,143	31,216
7	Lebong	53,322	1,658	2,174	743	57,897
8	Kepahiang	18,933	1,996	1,996	2,191	25,116
9	Bengkulu Tengah	5,178	248	1,738	98	7,262

However, based on the analysis of food availability using the FSQ, the results obtained differ significantly, particularly in Central Bengkulu Regency. Of the nine regencies, only two showed the same category, namely Rejang Lebong Regency and Kaur Regency. This is because the FSQ method uses a comparison between the contribution per commodity and the total contribution of each commodity. Scores tend to be higher in areas with high commodity contributions but with small total contributions, vice versa (Table 9).

Table 9. Contribution of production of each commodity to total production per district

No	Area	Production (Tons)				Total
		Commodities				
		Rice	Corn	Cassava	Sweet Potato	
1	Bengkulu Selatan	0.72	0.23	0.03	0.01	1.00
2	Rejang Lebong	0.57	0.27	0.06	0.11	1.00
3	Bengkulu Utara	0.44	0.22	0.15	0.19	1.00
4	Kaur	0.60	0.30	0.08	0.02	1.00
5	Seluma	0.82	0.11	0.06	0.01	1.00
6	Mukomuko	0.84	0.05	0.08	0.04	1.00
7	Lebong	0.92	0.03	0.04	0.01	1.00
8	Kepahiang	0.75	0.08	0.08	0.09	1.00
9	Bengkulu Tengah	0.71	0.03	0.24	0.01	1.00
Total		0.71	0.13	0.07	0.05	1.00

The cassava's contribution was found to total production in Central Bengkulu Regency that was higher than in other regions (Table 9) as compared to the total contribution of only 7%, this yield was a higher value than the others (Table 10). The FSQ values for the production volume indicator for the four main food commodities are shown in Table 10.

The results showed food accessibility measurements per district in Bengkulu Province. Based on the FSVA analysis, all regencies in Bengkulu Province fall into the food secure (resistant) and highly food secure (very resistant) categories (Table 11). Based on the analysis of food accessibility using the FSQ, the results obtained are relatively similar and fall into the food secure (resistant) and highly food secure (very resistant) categories. However, of the nine regencies and 1 city, only 4 showed the exact same category, namely 2 in Rejang Lebong, Kaur, Seluma, and Kepahiang Regency. The other six regions

have different categories where the results from FSVA tend to be more food secure compared to FSQ.

Food utilization refers to dietary patterns, access to healthcare facilities, and individual and community sanitation and hygiene. It is emphasized how effectively communities use and consume available food to support health, as well as how well food consumption is managed in line with nutritional requirements.

Table 10. FSQ result for production indicator

No	Area	Production (Tons)				Average
		Commodities				
		Rice	Corn	Cassava	Sweet Potato	
1	Bengkulu Selatan	1.02	1.76	0.45	0.24	0.87
2	Rejang Lebong	0.81	2.03	0.80	1.95	1.40
3	Bengkulu Utara	0.62	1.68	2.16	3.52	1.99
4	Kaur	0.85	2.27	1.16	0.33	1.15
5	Seluma	1.16	0.84	0.87	0.12	0.75
6	Mukomuko	1.19	0.36	1.06	0.68	0.82
7	Lebong	1.30	0.22	0.53	0.24	0.57
8	Kepahiang	1.07	0.61	1.12	1.62	1.10
9	Bengkulu Tengah	1.01	0.26	3.38	0.25	1.22

Table 11. Results of food accessibility measurements based on FSVA and FSQ

Area	FSVA	FSVA Category	FSQ Index	FSQ Category
Bengkulu Selatan	71.11	Resistant	1.13	Very Resistant
Rejang Lebong	77.19	Very Resistant	1.40	Very Resistant
Bengkulu Utara	83.64	Very Resistant	0.95	Resistant
Kaur	68.82	Resistant	0.88	Resistant
Seluma	71.21	Resistant	0.91	Resistant
Mukomuko	82.67	Very Resistant	0.98	Resistant
Lebong	76.59	Very Resistant	0.96	Resistant
Kepahiang	76.94	Very Resistant	1.60	Very Resistant
Bengkulu Tengah	84.34	Very Resistant	0.96	Resistant
Bengkulu City	71.79	Resistant	2.37	Very Resistant

Table 12. Results of food utilization measurements based on FSVA and FSQ

Area	FSVA	FSVA Category	FSQ Index	FSQ Category
Bengkulu Selatan	63.43	Quite Resistant	1.20	Very Resistant
Rejang Lebong	64.43	Quite Resistant	0.93	Resistant
Bengkulu Utara	66.19	Quite Resistant	0.90	Resistant
Kaur	68.82	Resistant	0.91	Resistant
Seluma	61.72	Quite Resistant	0.85	Resistant
Mukomuko	69.69	Resistant	1.60	Very Resistant
Lebong	61.13	Quite Resistant	0.89	Resistant
Kepahiang	62.39	Quite Resistant	0.89	Resistant
Bengkulu Tengah	60.99	Quite Resistant	0.93	Resistant
Bengkulu City	78.87	Very Resistant	1.31	Very Resistant

The results showed food utilization measurements per district in Bengkulu Province. Based on the FSVA analysis, 7 regencies in Bengkulu Province fall into quite resistant category, namely Bengkulu Selatan, Rejang Lebong, Bengkulu Utara, Seluma, Lebong, Kepahiang, and Bengkulu Tengah regency (Table 12). The other areas fall into resistant and very resistant category. Based on the analysis of food utilization using FSQ, the results were significantly different. All regencies and city in Bengkulu Province fall into the food secure (resistant) and highly food secure (very resistant) categories. Compare between FSVA and FSQ result, the nine regencies and 1 city, only 1 showed the exact same category, namely Bengkulu City. The other 9 regions are differed categories where the results from FSVA tend to be more food insecure compared to FSQ.

Table 13. Results of food security index measurements based on FSVA and FSQ

Area	FSVA	FSVA Category	FSQ Index	FSQ Category
Bengkulu Selatan	74.63	Resistant	1.07	Very Resistant
Rejang Lebong	72.67	Resistant	1.19	Very Resistant
Bengkulu Utara	70.74	Resistant	1.22	Very Resistant
Kaur	73.90	Resistant	0.96	Resistant
Seluma	71.64	Resistant	0.85	Resistant
Mukomuko	76.63	Very Resistant	1.23	Very Resistant
Lebong	75.84	Very Resistant	0.86	Resistant
Kepahiang	69.41	Resistant	1.17	Very Resistant
Bengkulu Tengah	61.54	Quite Resistant	1.01	Very Resistant
Bengkulu City	75.68	Resistant	1.79	Very Resistant

The results showed food security index measurements per district in Bengkulu Province (Table 13). These results reflected a combination of all three aspects. Based on the FSVA analysis, almost all regencies in Bengkulu Province fall into the food secure (resistant) and highly food secure (very resistant) categories, except Bengkulu Tengah Regency. Based on the analysis of food utilization using FSQ, the obtained results were significantly different. All regencies and city in Bengkulu Province fall into the food secure (resistant) and highly food secure (very resistant) categories. Compare between FSVA and FSQ result, the nine regencies and 1 city, only 1 showed the exact same category, namely Mukomuko Regency. The other 9 regions are differed in categories where the results from FSVA tended to be more food insecure compared to FSQ.

Discussion

The findings revealed significant differences between FSVA and FSQ results, with FSQ generally presenting a more optimistic picture of food security.

Differences classification between FSVA and FSQ

Differences between FSVA and FSQ classifications are theoretically reasonable because food security is a multidimensional concept involving availability, access, utilization, and stability dimensions (Manikas *et al.*, 2023). Different indicators may capture different aspects of food security and therefore generate contrasting conclusions. FSVA focuses on absolute production, population, and land productivity. Thus, Central Bengkulu is categorized as food insecure due to low food output and higher population density. FSQ, however, emphasizes commodity contribution and specialization. This is led to higher food security estimates in Central Bengkulu, as cassava contributes a larger share to total production compared to other areas. The results showed that the FSQ method tends to produce higher estimates compared to FSVA, potentially leading to bias in assessing food security status. These findings highlight the importance of selecting appropriate measurement methods to inform accurate and effective food policy decisions.

Bias and policy risks

FSQ's tendency to classify more regions as food secure may lead to overestimation of regional food security conditions if used as the sole basis for policymaking. Manikas *et al.* (2023) noted that indicators focusing only on specific dimensions of food security may oversimplify food security outcomes

and fail to capture the full complexity of food insecurity. For example, Central Bengkulu could be misclassified as food secure despite insufficient overall production. This is highlighted the importance of method selection in food security measurement to avoid misleading policy decisions. The findings confirm that differences in food security measurement approaches may lead to contrasting interpretations of regional food security conditions. Tadesse *et al.* (2020) demonstrated that methodological differences in food insecurity assessment could produce significant bias and potentially misleading policy outcomes.

Food diversification and resilience

FSQ incorporates variability and diversity of food commodities, which aligns with the concept of reducing dependency on single crops to mitigate risks of crop failure or price shocks. This resonates with Presidential Regulation No. 81 of 2024 on Accelerating Food Diversification Based on Local Resource Potential, aiming to improve food quality and nutritional intake (Aslikhah, 2018).

Socio-demographic factors in food utilization

Bengkulu City's superior performance in food utilization is strongly linked to women's education levels. Previous studies confirm maternal education positively influences child nutrition (Pusparina and Suciati, 2022; Angraini *et al.*, 2021; Arlius *et al.*, 2017). Mothers with higher education are less likely to have stunted children and more likely to ensure better food choices, sanitation, and health practices.

Implications for food security policy

FSVA is offered a conservative and production-focused view, while FSQ highlights diversification and specialization. A combined approach may provide a more balanced and accurate basis for designing interventions at both central and regional levels.

Conflicts of interest

The authors declare no conflict of interest.

References

- Algarni, S. M., Elshekh, M. E., Abou Agiza, A. M. and Nassar, F. S. (2025). Analyzing the impact of climate change on rice production and strategies for enhancing efficiency, sustainability, and global food security. *International Journal of Innovative Research and Scientific Studies*. 8:2946-2957. <https://doi.org/10.53894/ijirss.v8i2.5888>
- Ambarsari, R., Isyanto, A. Y. and Yusuf, M. N. (2020). The Relationship Between Coping Levels and Food Security Levels of Poor Households (A Case in Cihaurbeuti District, Ciamis Regency). *Jurnal Ilmiah Mahasiswa Agroinfo Galuh*, 7:693. <https://doi.org/10.25157/jimag.v7i3.4000>
- Angraini, W., Amin, M., Pratiwi, B. A., Febriawati, H. and Yanuarti, R. (2021). Maternal Knowledge, Access to Clean Water, and Diarrhea with Stunting at the Mumpo Community Health Center in Central Bengkulu. *Jurnal Kesehatan Masyarakat*, 8:92-102. <https://doi.org/DOI: http://dx.doi.org/10.29406/jkmm.v8i2>
- Arlus, A., Sudargo, T. and Subejo, S. (2017). The Relationship between Family Food Security and Toddler Nutritional Status (Study in Palasari Village and Legok District Health Center, Tangerang Regency). *Jurnal Ketahanan Nasional*, 23:359. <https://doi.org/10.22146/jkn.25500>
- Aslikhah, Z. (2018). Diversification of Agricultural Businesses in Gajah District, Demak Regency, 1980-2003. *Je-Ournal Pendidikan Sejarah*, 6:317-323.
- Central Bureau of Statistics (BPS) (2025a). Mid-Year Population (Thousand People), 2025. Retrieved from <https://www.bps.go.id/id/statistics-table/2/MTk3NSMy/jumlah-penduduk-pertengahan-tahun--ribu-jiwa-.html>
- Central Bureau of Statistics (BPS) (2025b). Percentage of Poor Population (P0) by Province and Region (Percent), 2024. Retrieved from <https://www.bps.go.id/id/statistics-table/2/MTkyIzI=/persentase-penduduk-miskin--p0--menurut-provinsi-dan-daerah.html>
- Central Bureau of Statistics (BPS) (2025c). National Food Crop Production (Tons), 2025. Retrieved from <https://www.bps.go.id/id/statistics-table/2/MjM0NSMy/produksi-tanaman-pangan-nasional.html>
- Food and Agriculture Organization (FAO) (2008). An Introduction to the Basic Concepts of Food Security. Retrieved from <https://www.fao.org/agrifood-economics/publications/detail/en/c/122386/>

- Manikas, I., Ali, B. M. and Sundarakani, B. (2023). A systematic literature review of indicators measuring food security. *Agriculture & Food Security*, 12:10. <https://doi.org/10.1186/s40066-023-00415-7>
- Mulyani, S. and Putri, F. M. (2020). The Impact of Infrastructure Development on Food Security Conditions in Indonesia (Case Study of Bali Province) Economic Development of the Republic of Indonesia Law of the Republic of Indonesia. *Jurnal Ketahanan Nasional*, 26:421-438. <https://doi.org/DOI:http://dx.doi.org/10.22146/jkn.60703>
- Pujiati, S., Pertiwi, A., Cholina, S. C., Ibrahim, D. M. and Siti Hafida, H. N. (2020). Analysis of Food Availability, Affordability, and Utilization in Supporting the Achievement of Community Food Security in Central Java Province. *Jurnal Sosial Ekonomi Pertanian*, 16:123-133. <https://doi.org/10.20956/jsep.v16i2.10493>
- Pusparina, I. and Suciati, S. (2022). The Relationship Between Maternal Education and Parenting Patterns and Toddler Nutritional Status. *Jurnal Ilmu Kesehatan Insan Sehat*, 10:87-92. <https://doi.org/10.54004/jikis.v10i2.87>
- Raihan, R. Z., Kastaman, R. and Tensiska, T. (2020). Determining the Food Security Conditions of West Java Region IV Using the Food Security Quotient (FSQ). *Jurnal Ekonomi Pertanian Dan Agribisnis*, 4:68-76. <https://doi.org/10.21776/ub.jepa.2020.004.01.7>
- Rolenza, M. O., Romdhon, M. M., Wibowo, H. E. and Yuniarsih, E. T. (2025). Food security conditions in Bengkulu Province: Application of the Food Security Quotient (FSQ). *JIA (Jurnal Ilmiah Agribisnis): Jurnal Agribisnis Dan Ilmu Sosial Ekonomi Pertanian*, 10:144-154. <https://doi.org/10.37149/jia.v10i2.1954>
- Rusmawati, E., Hartono, D. and Aritenang, A. F. (2023). Food security in Indonesia: the role of social capital. *Development Studies Research*, 10. <https://doi.org/10.1080/21665095.2023.2169732>
- Silvia, D., Balafif, M. and Rahmasari, A. (2021). Factors Influencing the Level of Purchasing Power of the Community in Sidoarjo Regency. *Bharanomics*, 2:81-92. <https://doi.org/10.46821/bharanomics.v2i1.193>
- Tadesse, G., Abate, G. T. and Zewdie, T. (2020). Biases in self-reported food insecurity measurement: A list experiment approach. *Food Policy*, 92:101862. <https://doi.org/10.1016/j.foodpol.2020.101862>
- Vaulina, S., Kurniati, S. A. and Mulyani, S. (2022). Mapping Food Security Based on Food Availability in Pekanbaru City, Riau Province. *Dinamika Pertanian*, 37:285-292. [https://doi.org/10.25299/dp.2021.vol37\(3\).8938](https://doi.org/10.25299/dp.2021.vol37(3).8938)

Wibowo, H. E., Novanda, R. R., Ifebri, R. and Fauzi, A., (2023). Overview of the Literature on the Impact of Food Price Volatility. *Agritropica: Journal of Agricultural Science*. 6:22-32. <https://doi.org/10.31186/J.agritropica.6.1.22-32>

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