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Food Security in Malaysia: An Empirical Analysis of Macroeconomic Determinants

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Abstract

Food security is a pressing global issue, with approximately 1 billion people suffering from hunger, undernutrition, and malnutrition. The Food and Agriculture Organization (FAO) defines food security as ensuring that all individuals have continuous and stable physical and economic access to sufficient food. This concept encompasses four essential components: availability, access, utilization, and stability. This study aims to develop a conceptual model of food security and its economic determinants, with a focus on Malaysia. The research employs a comprehensive approach, combining time series analysis and econometric techniques to examine the relationship between food security and six macroeconomic variables: food production index, inflation, food imports, land under cereal production, precipitation, and temperature. The results indicate that food production, food imports, and temperature have a positive impact on food security, while the other variables are not statistically significant. The variance decomposition analysis reveals that own shocks are the primary source of variation for all variables, with land cereal and perticipation expected to have the highest impact on food security in the long run. The study's findings have implications for policymakers seeking to enhance food security in Malaysia and other developing countries.

Keywords: Food Security, Food Production. Food Imports, Climate Change, VAR Estimation

Introduction

The Food and Agriculture Organization, FAO (and further refined by the Committee on World Food Security), defines food security as ensuring that all human beings have continuous and stable physical and economic access to sufficient food (FAO, 1996b: 4). Food security exists when both food supply and effective demand are adequate to meet food requirements. Food insecurity occurs if either food supply, effective food demand, or both, fall short of these requirements at any time. This definition applies to individuals, households, or countries, with variations in methods of measurement and assessment for each context. Based on these definitions, food security is recognized to have four principal components: availability, access, stability, and utilization.

Availability, the first component, refers to the total amount of food available for human consumption. Access, the second component, refers to the ability to acquire food through effective demand within the food security framework. Stability, the third component, addresses fluctuations and deficiencies in food production, supplies, and effective demand over time. Additionally, food utilization, the fourth component, focuses on the nutritional and health aspects of food security and can be divided into nutritional status and health environment (Chung et al., 1997).

These components interact to determine the food security status of a household or country. However, each component alone does not sufficiently indicate food security. For instance, adequate national food availability does not guarantee that all individuals or households can access this food physically or economically. Similarly, sufficient caloric intake in one period does not ensure the same in the future, necessitating consideration of assets, reserves, and market integration to withstand supply and demand shocks. Moreover, these components are influenced by both domestic and global markets, necessitating analysis of their interaction and the policies affecting them in any food security assessment.

Over the past two decades, Malaysia has faced challenges such as unstable macroeconomic performance, susceptibility to external climate shocks, high population growth, limited land resources, and rural labor outmigration, all impacting its ability to meet food needs. Despite structural adjustments and trade liberalization improving macroeconomic indicators like reduced deficits and increased exports, Malaysia's food economy remains fragile, directly affecting its national food security.

While the definition of food security appears straightforward, its determinants are complex and challenging to measure accurately. Therefore, this study aimed:

1. To assess food security at the national level, particularly its response to and impact from economic globalization (a conceptual model of food security and its economic determinants will be presented in this study).
2. To evaluate country's food security status using an empirical model as a quantitative tool.

Literature Review

According to the Food and Agriculture Organization of the United Nations (FAO), food insecurity remains a significant global issue, affecting approximately 1 billion people through starvation, undernutrition, and malnutrition, thus falling short of achieving the Millennium Development Goals (MDGs) aimed at halving extreme poverty and hunger, which were extended to 2023. Global food production faces numerous challenges including achieving food security, sustainable agriculture, meeting demand for non-renewable resources, climate change, biodiversity loss, and shifts in dietary patterns (National Agro-Food Policy, 2011). Since June 2011, food prices have risen worldwide to unprecedented levels, surpassing those of the 2007-2008 food crisis. Consequently, millions of people are being pushed below the poverty line, and several developing nations are at risk of severe food shortages (Razak et al., 2013). The extent and severity of food insecurity in the developing world as we enter a new century and millennium remains deeply troubling.

Food security and insecurity can be assessed at various levels: national, household, and individual. At the national level, a country achieves food security when it maintains continuous and stable access to sufficient food to meet the needs of its population (Applanaidu et al., 2014). This can be achieved through domestic food production alone in a closed economy or by accessing food beyond domestic production in an open economy, highlighting the interplay between domestic and global factors in a country's food security. Food security comprises four essential components: availability, accessibility, utilization, and stability. Availability refers to the total food supply, including production levels, stock levels, net food trade (exports minus imports), and food aid transfers. Accessibility relates to individuals' ability to acquire food through adequate resources (entitlements) for a nutritious diet, influenced by economic and social arrangements (Aker & Lemtouni, 1999). Utilization refers to the utilization of food through a balanced diet, clean water, sanitation, and healthcare to achieve nutritional well-being. Stability encompasses the consistency of food availability and access over time, addressing both supply and access dimensions of food security.

To address food insecurity effectively, a country must ensure sufficient food availability, accessibility, and utilization as integrated components (USAID, 1992). Increasing domestic food production plays a crucial role in improving food security, as highlighted by Conceicao et al. (2011), who emphasize the link between food security and human development through enhanced production. However, food imports and aid also play critical roles, as argued by Wagstaff (1982), suggesting that a comprehensive approach is necessary. Additionally, developing countries often face challenges as both net food exporters and importers, depending on the type of food involved (Valdés and McCalla, 1999). Food aid remains crucial during emergencies and in bolstering national food reserves through financial and technical support (Thomson, 1983). Accessibility, involving income and infrastructural improvements such as paved roads, sanitation, and clean water, is pivotal in achieving food security and meeting Millennium Development Goals (MDGs) (Kennedy et al., 2004; World Bank, 1997). Improved market access through paved roads, as noted by Breisinger et al. (2010), significantly enhances food security in developing countries. However, economic access, as determined by household income, also plays a critical role (Chen and Kates, 1994).

Food utilization completes the dimensions of food security by ensuring adequate nutrition and health through proper diet, clean water, and sanitation (WTO, 1995). Improvements in sanitation are crucial for food safety and security, particularly in poor and developing countries where access to clean water and sanitation remains a challenge (Howard and Bartram, 2003; Mara, 2003).

The global food system has evolved significantly, transitioning from localized production to an internationalized system driven by efficiency, cost reduction, increased production, and consumer appeal (Anand et al., 2016; Popkin, 2016). These shifts have profound implications for food security globally, affecting production systems, trade dynamics, infrastructure, and cultural practices. Climate change poses additional challenges to food security by altering rainfall patterns, temperatures, and exacerbating extreme weather events, thereby impacting agricultural productivity (Gregory et al., 2005; Campbell et al., 2016). Such changes disproportionately affect developing countries, necessitating adaptive strategies to safeguard food production and security (Schmidhuber and Tubiella, 2007; Wei et al., 2017).

In Malaysia, efforts to enhance food security are underway amid projections of a population nearing 32 million by 2020 and economic contributions from agriculture (The Star Online, 2018). Despite progress, challenges persist, including reliance on food imports, particularly for vegetables, due to lower self-sufficiency levels in certain food categories and past economic crises (The Star Online, 2018). In conclusion, addressing global food insecurity requires a multifaceted approach that integrates agricultural productivity, infrastructure development, economic policies, and climate resilience strategies. By bolstering food availability, accessibility, utilization, and stability, nations can mitigate the impacts of food insecurity and build more resilient food systems for the future.

Data and Methodology

Data

This study utilizes a dataset spanning from 1990 to 2022, comprising six macroeconomic variables that are essential for analyzing food security. All variables are expressed in logarithmic form to facilitate analysis. The data sets were sourced from reputable organizations, namely The World Bank and Trading Economics websites. The six variables employed in this study are defined as follows:

i. Food Production Index (LNFPI): This variable captures the production of food crops that are edible and provide nutritional value, excluding coffee and tea due to their lack of nutritive value.
ii. Inflation, Consumer Prices (Annual %, LNCPI): Measured by the Consumer Price Index (CPI), this variable reflects the annual percentage change in the cost of a basket of goods to the average consumer.
iii. Food Imports (% of Merchandise Imports, LNFOODIMP): This variable represents the proportion of food commodities in total merchandise imports, including goods from SITC1 sections 0, 1, and 4, as well as SITC division 22.
iv. Land under Cereal Production (Hectares, LNLANDCEREAL): This variable refers to the harvested area of cereals, including wheat, rice, maize, barley, oats, rye, millet, sorghum, buckwheat, and mixed grains, excluding crops harvested for hay, green for food, feed, or silage, and those used for grazing.
v. Precipitation (mm, LNPERTICIPATION): This variable represents the average annual precipitation in depth (mm per year).
vi. Temperature (°C, LNTEMPERATURE): This variable captures the average annual temperature per year.

The selection of these six macroeconomic variables is based on the work of Jeder et al. (2004) in Tunisia, which demonstrated the significance of these variables in analyzing food security. This study builds upon their work by employing an updated dataset until 2022 and conducting a distinct analysis tailored to the unique characteristics of the country under study.

Model Specification

This study employs a comprehensive approach, combining time series analysis and econometric techniques to examine the food security model. Specifically, the unit root test, co-integration test, and Vector Autoregression (VAR) techniques are utilized to analyze the time series data. Food security is conceptualized as comprising four essential components: food availability, access to food, food use, and food stability (FAO, 2006). Food production is a critical aspect of food security, as it indicates the availability of food for the population, whether produced domestically or through a combination of domestic production and imports (Aker and Lemtouni, 1999). Food availability, a fundamental component of food security, encompasses the total amount of food available for human consumption, sourced from production, stocks, imports, or food aid. This study uses the food production index as a proxy for food security, as it reflects the availability of food for the population. Insufficient food supplies can lead to hunger and food insecurity. Based on the literature review of food security and its components, the model can be specified as follows:

$$FPI = F(CPI, FOODIMP, LANDCEREAL, PERTICIPATION, TEMPERATURE) \qquad (1)$$

In log terms, the Equation (1) becomes as follows:

$$lnFPI = \alpha_0 + \alpha_1 lnCPI + \alpha_2 lnFOODIMP + \alpha_3 lnLANDCEREAL + \alpha_4 lnPERTICIPATION + \alpha_5 lnTEMPERATURE + \varepsilon_t \qquad (2)$$

Where;

FPI = Food production index (2004-2006=100)
CPI = Inflation, consumer prices (annual %)
FOODIMP = Food imports (% of merchandise imports)
LANDCEREAL = Land under cereal production (hectares)
PERTICIPATION = Perticipation (mm)
TEMPERATURE = Temperature (°c)
$\alpha_0, \alpha_1, 2, \alpha_3, \alpha_4, \alpha_5$ = Coefficient for the explanatory variables
ε = error term and t = time series period

The five independent variables in this study capture the intricate dynamics of domestic and global supply and demand mechanisms that influence the food economy, thereby explaining food security at the country level. The outlined econometric model serves as a tool to assess food security at the national level, specifically examining the impact of domestic and international market forces on food security. To investigate the response of food security to selected macroeconomic variables, an unrestricted Vector Autoregressive (VAR) model is employed. This model provides a multivariate framework, enabling the analysis of how changes in a particular variable (e.g., biodiesel production) are related to its own lags and to changes in other variables, as well as the lags of those variables.

Result and Discussion

The Augmented Dickey-Fuller (ADF) unit root test results (Table 1) indicate that, at the level, the t-statistic values for all variables are not statistically significant, failing to reject the null hypothesis of non-stationarity. This suggests that all variable series are non-stationary at the level and contain a unit root. However, upon taking the first difference, the t-statistic values become significant, allowing us to reject the null hypothesis of non-stationarity. This implies that all variables are stationary at the first difference. The results indicate that all series are integrated of order one, denoted as I(1). Given that the variables in the model follow an I(1) process, the next step is to investigate whether a long-run relationship exists among the variables.

Table 1
The Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variable	Level Intercept	Intercept & Trend	First Difference Level Intercept	First Difference Intercept & Trend	Results
lnFPI	-0.522812 [1] (0.8735)	-2.033719 [1] (0.5586)	-3.298294 [0] (0.0237)	-3.241857 [0] (0.0951)	I(1)
lnCPI	-4.753588 [0] (0.0006)	-4.662117 [0] (0.0039)	-7.923245 [0] (0.0000)	-7.827172 [0] (0.0000)	I(1)
lnLANDCEREAL	-2.743579 [0] (0.0780)	-4.106521 [0] (0.0148)	-7.359295 [0] (0.0000)	-7.296827 [0] (0.0000)	I(1)
lnFOODIMP	-1.099900 [0] (0.7036)	-2.727184 [0] (0.2331)	-4.734663 [1] (0.0007)	-4.835811 [1] (0.0028)	I(1)
lnPERTICIPATION	-3.535426 [0] (0.0133)	-3.910985[0] (0.0232)	-6.367620 [0] (0.0000)	-6.248146[0] (0.0001)	I(1)
lnTEMPERATURE	-3.154956 [0] (0.0324)	-3.969723 [0] (0.0203)	-7.318648 [1] (0.0000)	-7.083491 [1] (0.0000)	I(1)

Notes: * denotes significant at the 0.10 level; ** denotes significant at the 0.05 level; *** denotes significant at the 0.01 level.

Following the unit root test, which revealed that all variables are integrated of order one (I(1)) and stationary at the same order, the Johansen co-integration test was conducted to examine the long-run relationship between the variables. The Johansen test is specifically designed to identify long-run relationships between two or more variables in the model. The results presented in Table 2 indicate that there are no cointegrating equations at the 5% level, suggesting that there is no long-run significant relationship between the food production index and the explanatory variables. In the absence of a long-run relationship, Vector Autoregression (VAR) estimates were conducted to examine the short-run relationships between the variables.

Table 2
Cointegration Test Results

Hypothesized No. of CE(s)	Statistics		Critical Value (5%)	
	Trace	Max-Eigen	Trace	Max-Eigen
None	85.979.9	29.02250	95.75366	40.07757
At most 1	56.95659	19.40200	69.81889	33.87687
At most 2	37.55458	14.44959	47.85613	27.58434
At most 3	23.10500	11.90850	29.79707	21.13162
At most 4	11.19650	11.18846	15.49471	14.26460
At most 5	0.008042	0.008042	3.841465	3.841465

Source: Compiled by authors from cointegration results

Table 3
VAR Estimates

	LNFPI	LNCPI	LNFOODIMP	LNLANDC...	LNPERTIC...	LNTEMPE...
LNFPI(-1)	0.992297	4.065524	-0.413189	0.139621	-0.653172	0.025483
	(0.23720)	(6.04921)	(0.98861)	(0.33812)	(1.16066)	(0.07644)
	[4.18338]	[0.67207]	[-0.41795]	[0.41294]	[-0.56276]	[0.33337]
LNFPI(-2)	-0.122281	-2.976664	0.693726	-0.234499	0.404237	0.017175
	(0.22160)	(5.65135)	(0.92359)	(0.31588)	(1.08432)	(0.07141)
	[-0.55181]	[-0.52672]	[0.75112]	[-0.74237]	[0.37280]	[0.24051]
LNCPI(-1)	-0.022815	0.021799	-0.011819	0.012285	0.067480	-0.003487
	(0.00959)	(0.24465)	(0.03998)	(0.01367)	(0.04694)	(0.00309)
	[-2.37823]	[0.08910]	[-0.29561]	[0.89837]	[1.43757]	[-1.12783]
LNCPI(-2)	0.001396	-0.169140	-0.051354	0.021322	-0.051397	0.003129
	(0.01059)	(0.27009)	(0.04414)	(0.01510)	(0.05182)	(0.00341)
	[0.13177]	[-0.62623]	[-1.16341]	[1.41237]	[-0.99180]	[0.91676]
LNFOODIMP(-1)	0.024427	-0.978450	0.606283	0.066178	0.142926	0.010725
	(0.05342)	(1.36232)	(0.22264)	(0.07615)	(0.26139)	(0.01721)
	[0.45728]	[-0.71822]	[2.72313]	[0.86909]	[0.54680]	[0.62303]
LNFOODIMP(-2)	0.083323	0.615051	0.055746	-0.059191	-0.060344	-0.021884
	(0.05099)	(1.30039)	(0.21252)	(0.07268)	(0.24950)	(0.01643)
	[1.63409]	[0.47297]	[0.26231]	[-0.81436]	[-0.24186]	[-1.33176]
LNLANDCEREAL(-1)	-0.476208	-0.972517	-1.736373	0.436272	0.062079	0.071791
	(0.18384)	(4.68851)	(0.76623)	(0.26206)	(0.89958)	(0.05925)
	[-2.59028]	[-0.20743]	[-2.26611]	[1.66477]	[0.06901]	[1.21174]
LNLANDCEREAL(-2)	0.015628	-3.091936	-0.052165	0.061919	-1.119907	0.013660
	(0.19725)	(5.03042)	(0.82211)	(0.28117)	(0.96518)	(0.06357)
	[0.07923]	[-0.61465]	[-0.06345]	[0.22022]	[-1.16031]	[0.21489]
LNPERTICIPATION(-1)	-0.051907	-0.250595	0.115752	-0.049112	0.645347	-0.025355
	(0.05215)	(1.33006)	(0.21737)	(0.07434)	(0.25520)	(0.01681)
	[-0.99527]	[-0.18841]	[0.53251]	[-0.66062]	[2.52882]	[-1.50859]
LNPERTICIPATION(-2)	0.085074	-2.071518	0.057928	0.031364	-0.043356	0.006171
	(0.05706)	(1.45524)	(0.23783)	(0.08134)	(0.27922)	(0.01839)
	[1.49089]	[-1.42349]	[0.24357]	[0.38560]	[-0.15528]	[0.33555]
LNTEMPERATURE(-1)	-0.737748	6.500702	1.251117	-0.085518	6.903472	-0.047431
	(0.83937)	(21.4060)	(3.49834)	(1.19647)	(4.10715)	(0.27050)
	[-0.87894]	[0.30369]	[0.35763]	[-0.07148]	[1.68084]	[-0.17535]
LNTEMPERATURE(-2)	0.286326	-26.62242	-6.960627	1.719889	-0.716500	0.009483
	(0.81616)	(20.8141)	(3.40161)	(1.16339)	(3.99359)	(0.26302)
	[0.35082]	[-1.27906]	[-2.04627]	[1.47834]	[-0.17941]	[0.03606]
C	8.027204	119.7461	42.03580	1.784406	-4.664389	2.106126
	(4.83008)	(123.180)	(20.1310)	(6.88505)	(23.6344)	(1.55656)
	[1.66192]	[0.97213]	[2.08811]	[0.25917]	[-0.19736]	[1.35307]
R-squared	0.993871	0.347854	0.907359	0.520339	0.450912	0.610576
Adj. R-squared	0.989785	-0.086911	0.845598	0.200565	0.084854	0.350961
Sum sq. resids	0.008129	5.286856	0.141205	0.016517	0.194629	0.000844
S.E. equation	0.021251	0.541954	0.088570	0.030292	0.103984	0.006848
F-statistic	243.2383	0.800097	14.69150	1.627210	1.231804	2.351847
Log likelihood	83.83095	-16.57126	39.58161	72.84179	34.60793	118.9350
Akaike AIC	-4.569739	1.907823	-1.714943	-3.860761	-1.394060	-6.834513
Schwarz SC	-3.968389	2.509173	-1.113593	-3.259411	-0.792711	-6.233164
Mean dependent	4.332842	0.711144	1.882149	13.44471	1.095856	3.272730
S.D. dependent	0.210261	0.519835	0.225404	0.033880	0.108698	0.008501

The output of the Vector Autoregression (VAR) estimation is presented in Table 3, with standard errors and t-statistics in parentheses. While individual coefficients may not be statistically significant due to multicollinearity, the F-test reveals that collectively, they are significant. The VAR results indicate the statistical and theoretical significance of the parameter estimates. Upon examining the results, the food price index (FPI), food imports (FOODIMPORT), and temperature (TEMPERATURE) are found to be statistically significant. Although most other variables are not significant, the high F-statistic value of 243.2383 suggests the overall significance of the model. The low values of the Akaike and Schwarz statistics further support the statistical significance of the parameter estimates. The results show that the food price index (FPI) employs a positive impact on food security, consistent with a priori expectations. Food imports and temperature also have a positive impact on food security, and all these variables are found to be significant.

Table 4
Variance Decomposition Analysis

Variance Decomposition of LNFPI:							
Period	S.E.	LNFPI	LNCPI	LNFOODIMP	LNLAND...	LNPERTIC...	LNTEMP...
1	0.021251	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.038088	83.39638	3.296709	0.221900	11.44688	0.609017	1.029112
3	0.051656	68.39996	3.138564	1.069937	23.72617	2.369931	1.295432
4	0.063594	54.51522	2.550205	2.502619	29.07141	10.47839	0.882142
5	0.076218	43.03232	2.132800	3.846816	31.86526	18.50640	0.616411
6	0.089461	34.59044	1.755317	3.961661	35.29696	23.94804	0.447578
7	0.102705	28.49497	1.501831	3.393781	38.22433	28.03038	0.354704
8	0.115188	24.25286	1.365367	2.831120	40.06554	31.18415	0.300957
9	0.126540	21.35885	1.314528	2.418364	41.15493	33.50199	0.251334
10	0.136731	19.36528	1.324224	2.129640	41.81575	35.14849	0.216627

The theoretical implications of the variables can be further evaluated through variance decomposition analysis. This study focuses on the importance of each variable's shock on food security, which is proxied by the food production index. To achieve this, forecast error variance decomposition is computed based on the VAR estimates. The variance decomposition allocates each variable's forecast error variance to individual shocks, measuring the quantitative effect of these shocks on the variables. As shown in Table 4, the results indicate that own shocks are the primary source of variation for all variables in the model. The shocks to food security, proxied by the food production index, exhibit a declining trend over time. In the first year, own shocks account for 100% of the variation, decreasing to 83% in the second year, and further declining to 68%, 54%, 43%, 34%, 28%, 24%, 21%, and 19% respectively from year three to ten.

In addition to its past values, land cereal, perticipation, CPI, food import, and temperature also contribute to the variation in food security. Land cereal shocks do not initially contribute to food security shocks in the first year, but their contribution increases to 11% in the second year and 23% in the third year. Similarly, perticipation shocks do not contribute initially, but their contribution rises to 0.6% in the second year and 10% in the third year. CPI shocks exhibit a mixed trend, contributing 3.3% to food security shocks in the second year, increasing until the third year, and then decreasing marginally until the 10th year. Food import shocks show a positive increase from year two to year six, followed by a decline from year seven to year 10. Temperature shocks contribute an increasing trend from year two to three, followed by a marginal decline until the 10th year. As evident from Table 4, land cereal and perticipation variables are expected to have the highest impact on food security in year ten. The consumer price index and temperature are expected to have the highest impact in year three, while food import is expected to have the highest impact in year six.

Conclusion

In conclusion, this research has presented a comprehensive analysis of food security in Malaysia, examining the complex relationships between food availability, access, utilization, and stability. The study employed a conceptual model of food security and its economic determinants, followed by an empirical model using a Vector Autoregression (VAR) approach to evaluate the impact of macroeconomic variables on food security. The results of the study indicate that food production, food imports, and temperature have a positive impact on food security, while land under cereal production, perticipation, and consumer prices also contribute to food security shocks. The variance decomposition analysis reveals that own shocks are the primary source of variation for all variables in the model, with land cereal and perticipation expected to have the highest impact on food security in the long run.

This research makes a significant theoretical and contextual contribution to the existing knowledge on food security by providing a comprehensive analysis of the complex relationships between food availability, access, utilization, and stability in the Malaysian context. The study's conceptual model and empirical approach using VAR and variance decomposition analysis offer a different perspective on food security determinants, highlighting the importance of considering both domestic and global factors. The findings, which identify food production, food imports, and temperature as key drivers of food security, while land under cereal production, perticipation, and consumer prices contribute to food security shocks, have significant implications for policymakers and stakeholders seeking to enhance food security in Malaysia. The research's emphasis on a comprehensive approach to food security, considering both domestic and global factors, aligns with Malaysia's national development goals and priorities, promoting sustainable development and food security. By providing valuable insights into the complex dynamics of food security in Malaysia, this research plays a crucial role in informing policy and practice, offering recommendations for a multifaceted strategy that addresses food availability, access, utilization, and stability to ensure sustainable food security.

Finally, the findings of this study have significant implications for policymakers and stakeholders seeking to enhance food security in Malaysia. The results suggest that increasing food production, improving food imports, and addressing climate change through temperature management can contribute to improved food security. Additionally, investing in land under cereal production, perticipation, and consumer price management can also have a positive impact on food security. Furthermore, the study highlights the importance of a comprehensive approach to food security, considering both domestic and global factors. The results emphasize the need for policymakers to adopt a multifaceted strategy that addresses food availability, access, utilization, and stability to ensure sustainable food security. In conclusion, this research provides valuable insights into the complex dynamics of food security in Malaysia, offering recommendations for policymakers and stakeholders to enhance food security and promote sustainable development.

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