

Article

## Sustainable food security in modern framework for optimal nutritional well-being of Malaysians

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### Abstract

Food security is Malaysia's second Sustainable Development Goal (SDG), which ensures access to nutritious food available for everyone in the country. In 2006, the Ministry of Health (MOH) launched NPANM II, the National Plan of Action for Nutrition of Malaysia, to handle food and nutrition issues. National surveys revealed that most Malaysians still cannot completely comprehend and implement the Food Pyramid into practice. The Ministry intends to continue the programme through NPANM III to advance the population's health and strengthen food and nutrition security. Therefore, this empirical study aims to develop inclusive, sustainable food security in a modern framework to identify possible reasons affecting nutritional well-being. In the data collection phase, a questionnaire survey is administered among 318 respondents from five states, i.e. Selangor, Pinang, Johor, Kuantan, and Melaka. The data collection process was taken over three months, from January to March 2023, and it ensured the rectification of missing data. The results derived from the study would provide valuable insights to the policymakers towards identifying the most influential factors toward ensuring food security for enhancing the quality of health and well-being of the Malaysian population and have significant implications for achieving the objectives set under the NPANM III, 2016-2025.

**Keywords:** *Sustainable Development Goal, Sustainable Food, NPANM III, Nutritional Well-Being*

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## Introduction

Food security remains one of the top priorities of the Malaysian government. It is considered a global issue and a prevalent recurrence in both developed and developing nations, causing poor health and nutritional results (Mustapha et al., 2016). Food security exists only when a country has sufficient food and agricultural products to nourish its citizens (Godfray and Garnett, 2013). Therefore, it is a fundamental part of the agricultural sector, which relies heavily on various sector-specific policies. Food security policies regarding sustainability outcomes, price volatility, public-private partnerships, and agriculture potential are essential for economic stability and socio-economic development (Bazga, 2015). It is considered a complex phenomenon generally associated with a spectrum of factors varying in significance across various geographic and social boundaries. Food security depends on food production, stock levels, net trade, economic and physical access to food (income, expenditure, market infrastructure, price), long-term food stability, and food quality. (Mustapha et al., 2016). The primary function of food security in human well-being and development is viewed as a universal human right that billions of citizens do not currently enjoy (Perez-Escamilla, 2017).

The Ministry of Health (MOH) is concerned with the nation's health state as the report generated by the National Health and Morbidity Survey demonstrated an increase in the risk factor of non-communicable diseases (NCD) due to inadequate food intake (Rashid, 2017). It has been estimated that approximately 17 million Malaysians, constituting 60.7% of the total population, are suffering from NCD. It is further reported that 6.2 million adults are living with hypercholesterolemia. In contrast, 5.8 million citizens suffer from hypertension, with 2.6 million having diabetes and 2.5 million Malaysian adults suffering from obesity. Such statistics indicate that food security is more severe in Malaysia than in other regions. The hazardous effects of unhealthy food intake have also increased the Malaysian public concern about food safety (Nor et al., 2016). As more Malaysians are exposed to various health threats, there has been a favorable demand for safe, nutritional, and healthy food among Malaysians as they are more aware of the importance of healthy and secure food consumption habits (Hossain & Lim, 2016; Lian, 2017). Under such circumstances, a sustainable framework has become essential for ensuring food security among the Malaysian people. Therefore, this study is vital for appropriate procession and practices.

By understanding the objective of this study about formulating a sustainable food security framework, the remainder of the study will consist of a literature review, the development of hypotheses based on the literature, and the formulation of research processes. This will be followed by an analysis of the data and a discussion of the results. The study concludes with a discussion of the implications of the results and the direction of future research.

## Literature Review

The concept of sustainable development was first coined in the mid-1960s when suitable technology was developed as a meaningful way to facilitate countries to grow and evolve where human life can endure and flourish indefinitely (Khalili, 2011). Sustainability also represents an economic aspect where the demands placed upon the environment and natural resources needed by individuals and commerce are adequately addressed by not decreasing the environment's ability to provide for future generations' needs (Steer & Wade-Gery, 1993). Besides focusing on ecological or environmental aims, sustainable development goals shall be under

economic and social values based on a societal negotiation procedure, strategies, as models that can be articulated in an agreement to the socio-economic welfare along with societal cost-benefit analysis (Khalili, 2011; De Vries & Petersen, 2009).

Sustainability is considered an integral factor in the assessment of food security and a precondition for long-term food security (Berry et al., 2015). Sustainability is highly interrelated to food security and plays a crucial role in preserving the nutritional well-being of the public through the availability of food and production, physical and economic accessibility, and stability (Berry et al., 2015). Henceforth, from a theoretical perspective, food security depends on the components of availability, accessibility, quality and strength, and their presence is mandatory to ensure food security (Bazga, 2015).

Food security aligns with sustainable development, generally described as the development that adequately fulfils current needs without compromising the future generation's ability (Paul, 2008). It is an ongoing process focusing on long-term well-being without endangering the support systems on which all life relies (Moffatt, 2007). It necessitates a balanced analysis of three critical viewpoints, namely, economic, social, and environmental domains, representing a system guided by its special forces and goals (Khalili, 2011). First is the economic view, which emphasises the enhancement of human welfare mainly through improving the accessibility and consumption of goods and services. Next is the environmental domain, which concentrates on the security of ecological systems. In contrast, the third aspect, the social view, focuses on ameliorating human relationships and an individual's attainment along with group aspirations (Paul, 2008).

Food security is an essential end in itself and an integral part of human well-being (Ebo, 2017). Besides, sound governance is of utmost importance to ensure proper food security for the population (Godfray & Garnett, 2013). Food security ensues when all the citizens of a nation are physically and economically able to access adequate, safe, and nutritious food that sufficiently satisfies their dietary needs along with the food preferences required for living a healthy life (World Food Summit, 1996). On the other hand, food insecurity is uncertain or limited access to nutritionally adequate and safe food (Davidson & Morrell, 2018; Weigel & Armijos, 2018). However, food security is also a key indicator of public-centred, rights-based, inclusive and sustainable development that the government seeks to achieve (Perez-Escamilla, 2017). Investments in food security, mainly through the prevention of ill health, enhance a country's socio-economic output (Ritchie et al., 2018). The aspect of food security is closely related to nutrition security and health. For food security to translate into reality, it is of immense importance to provide households with unlimited access to a healthy and nutritious diet (Ahmed et al., 2017).

To a great extent, individuals' access to healthy diets relies on adequate economic resources and food availability in the nation, area or community where the households are located (Godfray & Garnett, 2013). Henceforth, the presence of an affordable and sustainable healthy food supply is integral for attaining food security at a national level (Weigel et al., 2016). A food shortage characterises a physical and psychological stressor that can increase individual risk (Perez-Escamilla, 2017). In line with such views, a biological pathway constitutes the probable associations between poorer dietary intakes, nutritional status, and the general well-being of citizens. A study undertaken in Malaysia demonstrated that poor dietary quality paves the way to more significant risks in terms of obesity and metabolic syndrome, followed by

chronic diseases like diabetes and premature death (Mohamadpour, 2012). From a psycho-emotional level, food insecurity has been associated with stress development, exclusion, deprivation, and adverse family and social interactions (Perez-Escamilla, 2017). Food security governance is mandatory for the preservation of the socio-economic stability of countries.

The Food and Agriculture Organization (FOA) noted that food security governance represents the formal and informal rules based on which public interests are pronounced and decisions concerning food security in a nation are taken, executed and imposed (FOA, 2006). Food availability is considered the “supply side” of food security and is regarded as an output of the national or local food production levels, import capabilities and food aid. Nevertheless, an adequate supply of food at a national or even an international level is insufficient to achieve an acceptable level of food security (Mbukwa, 2013). Government concern regarding inadequate food access has increased policymakers’ focus on various aspects such as income, expenditure, markets, infrastructure, and prices in attaining food security goals. Quality in terms of food security is generally comprehended based on how the individual’s body makes the most of different nutrients in the food (Razak, 2013). Adequate energy and nutrient consumption are a consequence of good personal care and dietary practices, healthy food preparation, diversity of the diet, and the intrahousehold distribution of food.

In comparison, food stability delineates permanent and durable access to the sustainability of food resources (Mustapha et al., 2016). Even if food availability is sufficient, food insecurity still exists when there is intermittently inadequate access to food, putting nutritional status at risk and impacting food security (Ahmed et al., 2017). Prior literature shows that food availability, accessibility, quality and stability are vital for food security (Bazga, 2015). Ebo (2017) mentioned that food security, to a large extent, is derived from the collective interaction of food availability, accessibility, quality and stability, whereby food security requires adequate quantities of food either from local agricultural production or imports and is threatened by the continuous increase in price. According to Mustapha et al. (2016) and Ali et al. (2016), the main determinants of food insecurity are inadequate availability, access, stability, and adverse food quality.

Based on the above discussion, food security has become an essential concern for the Malaysian government. Mohamadpour et al. (2012) and Razak et al. (2013) have studied food security in Malaysia. However, little effort has been directed toward implementing a sustainable food security framework for Malaysian public health concerns. In light of the government’s concern for food security in Malaysia and the nation’s socio-economic development, it has become of the uttermost significance to identify the most critical factor for successfully implementing the food security framework in Malaysia. In association with the literature above, the current study postulates the following hypotheses for the food security framework in Malaysia.

**H<sub>1</sub>:** Food security challenges positively affect the government to maintain sustainable food security.

**H<sub>2</sub>:** The government initiatives positively impact mitigating problems toward maintaining sustainable food security.

**H<sub>3</sub>:** The sustainable food security framework ensures optimal nutritional well-being among Malaysians.

**H<sub>4</sub>:** Local well-being has a positive impact on sustainable food security.

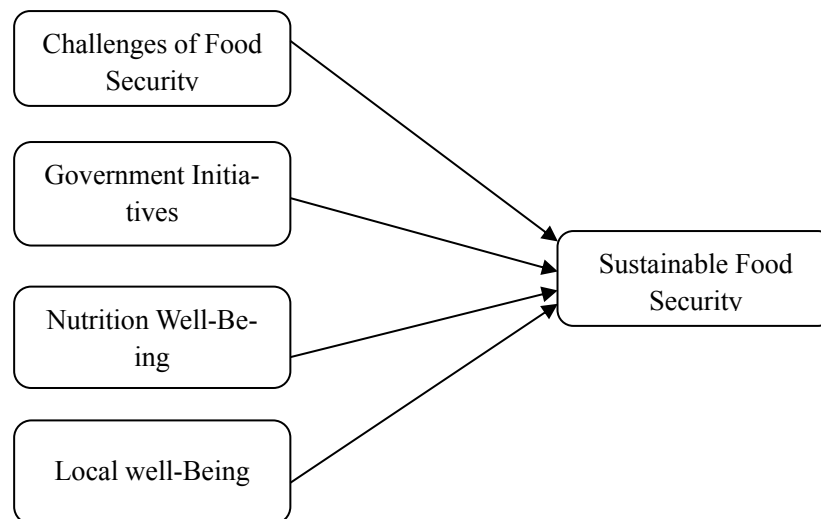


Figure 1. Conceptual Framework of the Study

## Methodology

To test the hypotheses, four constructs were assessed. The deductive approach used in this study focused on hypothesis development. This approach engrossed on the theoretical proposition and hypothesis development, data analysis and hypothesis testing. The rationale for selecting this design for this research is that the method helped gain a comprehensive understanding of food security in Malaysia. It is the most widely employed sampling method for the quantitative stage of research to identify as well as select participants who are well-informed about the phenomenon being studied and are also willing to provide the required information under knowledge or experience in an articulate, expressive as well as reflective manner (Etikan, 2016).

A structured questionnaire including socio-demographic variables (gender, age, education, region of residence), Seven items measuring challenges of food security (Bryce et al., 2015; Poria et al., 2004), six items measuring government initiatives (Taheri et al., 2014), eight items measuring nutrition well-being (Kim & Ritchie, 2014), six items measuring local well-being a heritage destination (De Rojas & Camarero, 2008; Žabkar, Brenčič, & Dmitrović, 2010) and seven items measuring sustainable food security (De Rojas & Camarero, 2008; Žabkar, Brenčič, & Dmitrović, 2010) designed this study.

Respondents were asked to evaluate the level of agreement on each measurement item using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Three academic experts in tourism reviewed the content validity of measures to assess the applicability and

representativeness of each measurement item. The items of the questionnaire were prepared in Malay native and English language. To get comments and feedback from the respondents, twenty-five sets of questionnaires were distributed for pilot testing. The population of the final survey comprises the general Malaysian public.

Data was collected from 1st week of February 2023 to the end of April 2023. The guideline by Hair et al., 2015 was applied to decide the sample size in this study. The sample size should be at least five times larger than the number of variables; therefore, 34 measurement items require a sample size of at least 170. 369 valid questionnaires were collected; however, 318 were qualified for data analysis after a data screening, including missing data, unengaged responses, and extreme multivariate outliers. The total number of valid responses (318) met the sample size requirement.

Data collection through the survey method was further analyzed using SPSS software. Exploratory and Confirmatory factor analysis is conducted, followed by Structural Equation Modelling analysis to test the statistical validity of the conceptual framework.

## Results and Discussions

### Profile of the Respondents

A total of 318 valid responses were collected for the present study. Most participants in the study were male (n=219), followed by female participants (n=99). The age group with the highest number of respondents was between 36 and 45, with 106 participants. Approximately 90% of the respondents were individuals employed in service-based occupations. A significant proportion of the participants (n=76) were residents of Melaka compared to other states.

Table 1. Demographic Analysis

Items	Category	Frequency	Percentage
Gender	Male	219	68.87
	Female	99	31.13
Age	18-25	67	21.07
	26-35	90	28.30
	36-45	106	33.33
	46-55	33	10.38
	56 and above	22	6.92
Occupation	Service	107	33.65
	Business	59	18.55
	Student	97	30.50
	Housewife	24	7.55
	Others	31	9.75
Region of Residence	Selangor	62	19.50
	Pinang	67	21.07
	Johor	62	19.50
	Kuantan	51	16.03
	Melaka	76	23.90

### Reliability and Validity of the Measurement Model

The study assessed the conceptions' validity and reliability and the convergent and discriminant validity of 34 indicators. The initial purpose of conducting exploratory factor analysis (EFA) was to identify the latent factors. The investigation revealed that more than 0.5 factors were placed, and no significant correlations existed between the items representing different constructs (Table 2). Nevertheless, a total of six items were removed during the course of the procedure. The instruments underwent additional evaluation to confirm the structure's reliability and assess its convergent and discriminant validity (Tables 2 and 3).

Table 2. Reliability and Validity Assessment

Construct	Item Code	Loadings	Cronbach's alpha ( $\alpha$ )	CR	AVE
Challenges of Food Security	CFS1	.781	0.811	0.519	0.896
	CFS2	.684			
	CFS3	.780			
	CFS4	.970			
	CFS6	.657			
	CFS7	.707			
Government Initiatives	GI1	.833	0.775	0.521	0.924
	GI2	.974			
	GI3	.773			
	GI4	.837			
	GI5	.749			
	GI6	.722			
Nutrition Well-Being	NWB1	.997	0.839	0.537	0.927
	NWB3	.717			
	NWB4	.538			
	NWB6	.931			
	NWB7	.749			
	NWB8	.722			
Local well-Being	LWB1	.831	0.807	0.501	0.887
	LWB2	.807			
	LWB4	.907			
	LWB5	.633			
	LWB6	.708			
Sustainable Food Security	SFS1	.755	0.798	0.542	0.890
	SFS4	.803			
	SFS5	.901			
	SFS6	.667			
	SFS7	.793			

According to Hair et al. (2019), constructs were considered reliable if their Cronbach's alphas and composite reliability values were greater than 0.70. Fornell and Larcker (1981) established that constructs were deemed acceptable if their average variance extracted (AVE) exceeded 0.50, indicating a substantial level of convergent validity. To ensure discriminant validity, it is necessary to examine both the cross-loadings and the HTMT (Heterotrait-Monotrait)

ratio of correlations. The findings indicate that the HTMT values for all latent variables were lower than the critical and conservative threshold of 0.85, as presented in Table 2.

Table 3. Heterotrait-Monotrait (HTMT) Ratio

Construct	Correlations				
	CFS	GI	NWB	LWB	SFS
CFS					
GI	.513				
NWB	.402	.433			
LWB	.339	.422	.562		
SFS	.622	.232	.452	.700	

Table 4. Fornell-Larcker Criteria

Construct	Correlations				
	CFS	GI	NWB	LWB	SFS
CFS	.771				
G.I.	.563	.621			
NWB	.443	.551	.611		
LWB	.341	.445	.632	.515	
SFS	.651	.431	.542	.414	.571

### Structural Model

The study utilized the structural equation modelling (SEM) approach, employing AMOS 25 software to analyze the proposed hypotheses. Confirmatory factor analysis was used to assess further the structural model, which encompasses both the measurements and models. The AMOS output served as the basis for the correlations between the three constructions: CFS, G.I., NWB and LWB. For evaluating the hypothetical relations, the structural model is calculated.



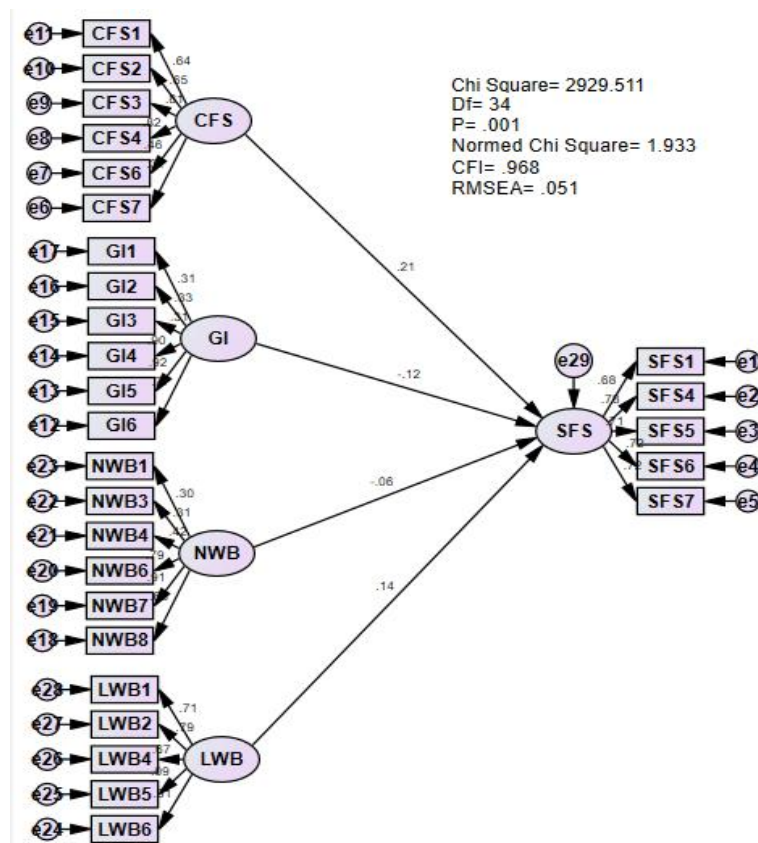


Figure 2. Structural Model of the Study

The results show that the goodness-of-fit indices are all within their acceptable levels and fit well for the data (Chi-Square = 2929.511;  $\chi^2/df = 34$ ; RMSEA = 0.051; CFI = 0.968). According to the goodness-of-fit statistics, the structural model fits the data well. Among four, three hypotheses were supported (Table 4). Table 4 summarizes the findings of the path analysis, which were then utilized to evaluate the hypotheses.

Figure 2 presents the standardized coefficients and associated t-values representing the structural relations. The significant connections include Challenges of Food Security, Government Initiatives, Nutrition Well-Being and Local well-being towards Sustainable Food Security in the model. Based on the t-values, two of the three hypothetical paths were significant ( $H_1$ ,  $H_2$ ,  $H_4$ ), and the other hypothesis ( $H_3$ ) was found insignificant.

The  $R^2$  value serves as the principal criterion for assessing the quality of structural models within the context of SPSS-SEM. The coefficient of determination derived from the outcome is commonly referred to as this value. However, the acceptable threshold for the  $R^2$  value is contingent upon the specific research context (Hair et al., 2019). According to the findings of Chin's study in 1998,  $R^2$  values of 0.67, 0.33, and 0.19 can be categorized as substantial, moderate, and weak, respectively. In this study, the  $R^2$  coefficients for "Challenges of Food Security" (CFS) (0.38), "Government Initiatives" (G.I.) (0.44), Nutrition Well-Being (NWB) (0.51), Local well-Being (LWB) (0.63) and Sustainable Food Security (SFS) (0.61), suggesting the model constructs were well predicted (Chin, 1998; Hair et al., 2017).

## Hypotheses Test Results

Table 5. Hypotheses Test Results

$H(x)$	Path	Estimate	S.E.	$t$ -value	$p$ -value	Results
$H_1$	SFS<---CFS	.829	.283	2.933	.003	Supported
$H_2$	SFS<---GI	.131	.065	2.003	.045	Supported
$H_3$	SFS<---NWB	-.102	.109	-.933	.351	Not-Supported
$H_4$	SFS<---LWB	.414	.196	2.116	.034	Supported

To assess the degree of correlation between the challenges of food security and sustainable food security, the initial hypothesis ( $H_1$ ) was subjected to testing and subsequently confirmed (S.E. = 0.283,  $t$  = 2.933,  $p < 0.003$ ). It indicated that the acceptance of challenges influenced sustainable food security. It is in line with the arguments and findings of the previous literature that the challenges of food security are significantly related to sustainable food security (Ariffin et al., 2015).

The hypothesis ( $H_2$ ) examined if government initiatives were congruence positively with sustainable food security. Government initiatives are mandatory elements with many aspects for inhabitants of a country in the food security process. However, a significant relationship was found between government initiatives in food safety and sustainable food security (S.E. = 0.065,  $t$  = 2.003,  $p > 0.045$ ). Similar to the previous evidence (Weigel & Armijos, 2018), this study's findings revealed a stronger significant relationship between government initiatives and sustainable food security and accepted hypothesis  $H_2$ .

An insignificant relationship was found between Nutrition well-being and sustainable food security (S.E. = 0.109,  $t$  = -0.933,  $p > 0.351$ ). Despite the insignificant relationship between constructs, the essential of nutrition well-being is featured in previous studies (Ritchie et al., 2018). Therefore, the finding is inconclusive for this study as the hypothesis ( $H_3$ ) was not supported.

Considering their significance, the investigation examined the relationship between local well-being and sustainable food security. The dilemma of food availability in Malaysia aligns with the prevailing trends observed in countries experiencing economic growth. However, a significant relationship was found between the construct (S.E. = 0.196,  $t$  = 2.116,  $p < 0.034$ ), demonstrating that the  $H_4$  hypothesis is supported. The finding also empirically corroborates the previous study (Weigel & Armijos, 2018).

### Implications

Past studies on sustainable development have focused primarily on economic growth through eradicating poverty. The importance of human evolution has rarely been emphasized and explored in the context of developing countries. Very recently, we have witnessed research interest in ecological life support, which addresses the environmental aspects of sustainable development. However, the relevance of food security in the sustainable development ecosystem has not been explored. Recently, food security has become a policy focus for the government, especially in developing countries. Hence, analyzing the extent and importance of food security toward ensuring the well-being of the disadvantaged group can provide valuable evidence on the importance of this component in the sustainable development ecosystem. The Sustainable

Development Goals (SDGs) established by the World Bank have already set the target to eradicate world hunger by 2030. The Malaysian government has also developed a National Plan of Action for Nutrition of Malaysia III (2016-2025) to address such challenges. A critical review of available studies in the field of food security in Malaysia has allowed researchers to identify the essential lack of discussion on the effectiveness of such governmental programs toward ensuring food security and well-being in Malaysia. Therefore, this research is expected to reduce the gap by critically evaluating the government program for food security in the context of an emerging country. Such examination of current developments on food security in Malaysia will allow us to develop an inclusive, sustainable food security framework that could be implemented in countries with a similar socio-economic background to eradicate hunger and ensure the achievement of the SDGs.

### **Limitations**

The present study has demonstrated a distinct demarcation of local well-being; however, it is important to note that no statistically significant findings were observed concerning sustainable food security. Insufficient scholarly attention has been directed towards investigating the various aspects of the Malaysian context. Consequently, the study was constrained by the accessibility of prior research conducted within a similar context. The survey data were obtained from most states in Malaysia, although it did not encompass all remaining states. To a certain degree, future research may provide additional clarification to address this constraint.

### **Conclusion**

Food security, the second Sustainable Development Goal (SDG), requires access to nutritious food available for everyone in the country. Ministry of Health (MOH) started the National Plan of Action for Nutrition of Malaysia (NPANM II) in 2006 to address food and nutrition challenges in the country. Findings of national surveys show that most Malaysians still cannot fully understand and translate the concept of the Food Pyramid into practice. Therefore, the Ministry aims to continue the program through NPANM III to enhance the health of the population and strengthen food and nutrition security. In 2019, Malaysia imported RM 20.28 billion of processed foods, reflecting MOH's concern for nutritional well-being. The results derived from the study would provide valuable insights to the policymakers towards identifying the most influential factors toward ensuring food security for enhancing the quality of health and well-being of the Malaysian population and have significant implications towards achieving the objectives set under the NPANM III, 2016-2025.

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