

Unveiling the Impacts of Food Security on Community Health: A Scoping Review

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ABSTRACT

Food security, defined as consistent access to sufficient, safe, and nutritious food, is crucial in shaping community health. This scoping review explores the multidimensional impacts of food security on physical, mental, and social well-being. Malnutrition, stemming from both undernutrition and overnutrition, links food insecurity to health issues such as stunted growth, obesity, and chronic diseases like diabetes and heart conditions. Moreover, the psychological toll of food insecurity is significant, manifesting as stress, anxiety, and depression while exacerbating social inequalities and perpetuating cycles of poverty and ill health.

Global and national perspectives reveal the persistent challenge of food insecurity, particularly in low- and middle-income regions, where economic disparities, climate change, and conflicts disrupt food systems. In Malaysia, rising food insecurity has highlighted gaps in nutrition quality and affordability, with vulnerable groups, including children and low-income households, experiencing the brunt of its effects. Addressing food security requires sustainable agricultural practices, effective policies, and robust social safety nets. National initiatives, such as Malaysia's Agrofood Policy 2021-2030, focus on enhancing food self-sufficiency, supporting farmers, and fostering sustainable practices through technology and education. However, challenges such as aging agricultural populations, land limitations, and climate variability remain barriers.

This paper underscores the importance of holistic approaches to food security, integrating nutrition education, mental health support, and economic interventions to foster healthier, more resilient communities. Food security is essential for improving public health and achieving broader socioeconomic stability and sustainable development.

Keywords

Food Security, Community Health, Malnutrition, Food Access, Agriculture, Crops, Diversification, Nutrition, Mental Health, Malaysia.

Food security is the capability to access adequate, safe, nutritious food to maintain a healthy and active life, which is integral to community health¹. This scoping review explores the multifaceted implications of food security on overall health by analyzing its physical, psychological, and social aspects. Malnutrition, associated with both undernutrition and overnutrition, provides a direct link between food insecurity and various health disorders,

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including diabetes, obesity, heart disease, and impaired physical and cognitive development among children ^{2,3}. Food insecurity exacerbates mental health problems due to stress, anxiety, and depression linked with uncertain and limited food accessibility ⁴. Furthermore, food insecurity amplifies social inequalities, entrenching disadvantaged groups in poverty and ill-health cycles ^{5,6}. This paper concluded that achieving food security involves a comprehensive approach that includes promoting sustainable agriculture, reducing food waste, improving economic conditions, and implementing effective social safety measures. Ensuring food security is, therefore, essential for individual health, community well-being, and social cohesion.

Food security considerably impacts community health, defined as when all people have physical, social, and cost-effective access to appropriate, safe, and nutritious food that meets their dietary needs and food inclinations for an effective and healthy life ^{7,8}. The intricate relationship between food security and the health of a community is a pivotal driver of population health outcomes ⁹⁻¹¹. Despite considerable agricultural practices and food production advancements ¹², food insecurity remains a pressing issue worldwide, affecting several communities across developed and developing countries ¹³⁻¹⁵. Food security represents more than just caloric intake; it encompasses the nutritional quality of food, which has significant health implications ^{16,17}. Sufficient intake of nutrient-dense food is vital for physical well-being ¹⁸, cognitive development ¹⁹, and disease prevention ²⁰. Conversely, food insecurity, which can manifest as undernutrition or obesity linked to poor diet quality, reinforces a plethora of health problems, including chronic illnesses, weak immune systems, and poor mental health ²¹⁻²⁴.

This review aims to reconnoiter the impacts of food security on community health, underlining the importance of establishing food-secure environments for fostering healthier, more vibrant, and equitable societies. In doing so, it will delve into food insecurity's physical, mental, and social health repercussions and the necessary initiatives and strategies to address this prevailing concern effectively.

REVIEW OF LITERATURES

Materials and Methods

This scoping review follows the PRISMA Extension for Scoping Reviews (PRISMA-SCR) guidelines to

systematically explore the impacts of food security on community health outcomes. The primary research question guiding this review is: What are the implications of food security on community health? A comprehensive search strategy targeted multiple databases, including PubMed, Scopus, Web of Science, Google Scholar, and the Cochrane Library. Key search terms related to “food security,” AND “community health,” AND “nutrition,” AND “public health,” AND “well-being” were employed, utilizing Boolean operators to refine the search results.

Inclusion criteria for this scoping review encompassed studies focusing on communities affected by food security issues, examining the relationship between food security and health outcomes such as nutritional status, mental health, and chronic diseases. All types of research designs were considered, including qualitative, quantitative, and mixed-methods studies published in English within the last ten years (2014-2024). Conversely, exclusion criteria eliminated non-research articles like reviews, opinion pieces, and editorials, as well as studies not directly addressing community health impacts on food security.

Data extraction was conducted using a standardized form, capturing essential information such as author(s), publication year, study design, population characteristics, and key findings related to food security's health impacts. An independent review process was employed to minimize bias, with two reviewers screening titles, abstracts, and full texts, resolving disagreements through discussion or consultation with a third reviewer.

A comprehensive search strategy was utilized to capture a broad range of literature, thus reducing selection bias. While this scoping review does not assess the quality of included studies, a descriptive summary of their methodological strengths and weaknesses will provide context to the findings.

Finally, a PRISMA-SCR flow diagram (Figure 1) was produced to represent the study selection process visually, highlighting the number of records identified, screened, included, and excluded, along with reasons for exclusions. This scoping review aims to provide a comprehensive overview of the impacts of food security on community health, identifying knowledge gaps and areas for future research.

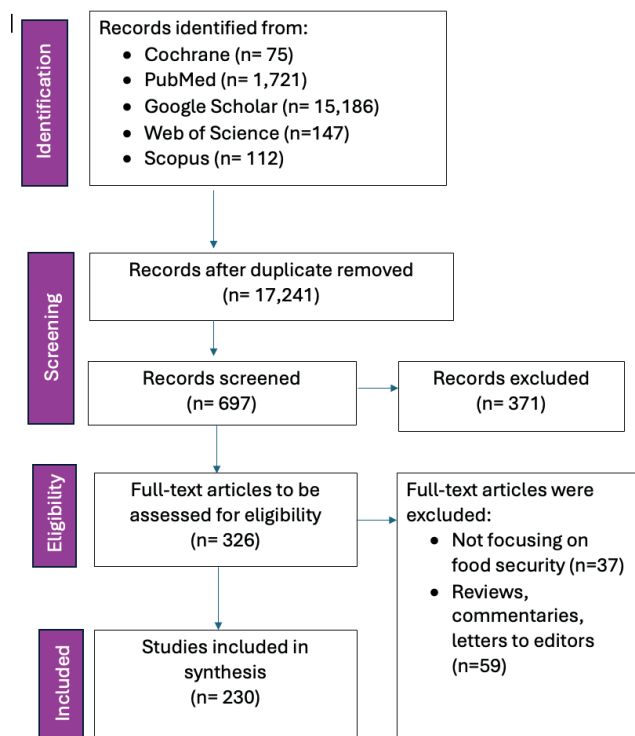


Figure 1: Illustrating Materials and Methods of this Scoping Review

Illustration Credit: Nor Faiza Mohd. Tohit.

GLOBAL BURDEN OF FOOD SECURITY

Food insecurity is a critical global issue with implications for health, economic development, and overall quality of life ²⁵. The impact is pervasive, although the severity and nature of food security vary significantly among populations and regions ²⁶⁻²⁸. The Food and Agriculture Organization (FAO) appraised that around 735 million people globally suffer from hunger in 2022, an increase of 122 million people compared to 2019 ²⁹. The disruptions caused by the COVID-19 pandemic are a significant contributing factor to this recent rise in food insecurity ^{30,31}. Food insecurity disproportionately affects low- and middle-income countries (LMICs), with many regions in Africa, Asia, and Latin America suffering the most ³²⁻³⁵. In 2022, around 19.7% and 282 millions of Africa's population were undernourished since the COVID-19 pandemic ^{15,29,36}. Undernourishment in the African continent triggered internal conflict between the ethnic groups, economic downturns, extreme meteorological alterations, the pandemic, and the Ukraine war are the primary drivers of these acute food crises ³⁷⁻⁴².

The World Health Organization (WHO) 2024 reported that around 149 million children below five years old are estimated to experience stunted growth due to inadequate nutrition. More than 45 million children are wasted (weight is too low for their height), a severe form of malnutrition ⁴³. Hunger and malnutrition at a young age can lead to long-term cognitive and physical problems ⁴⁴⁻⁴⁶. Women, especially in poor regions, often bear the brunt of food insecurity, mainly due to gender inequality ^{47,48}. Women comprise a significant portion of the agricultural workforce worldwide ⁴⁹ but frequently have less possibility to acquire resources and opportunities, significantly affecting their ability to secure food ^{50,51}.

The economic burden of food insecurity is a considerable issue (Figure 2) ^{6,52}. The societal costs (Figure 3) can add up to billions of dollars as direct healthcare costs due to poor nutrition and the indirect costs from the lost potential in work and education ⁵³. Changing weather patterns and increasingly regular extreme weather events intimidate global food security by reducing crop yields' quantity and nutritional quality, disrupting food deliveries, and inducing food price volatility ^{54,55}.

Addressing these burdens requires comprehensive strategies that work at local, national, and international levels. These strategies must address immediate needs and build resilient and sustainable food systems that can withstand future shocks and challenges while promoting equitable access and nutrition.

FOOD INSECURITY IN MALAYSIA

Malaysia has no exclusion to the emergent inclination of food restraint ⁵⁶. According to the Global Food Insecurity Index, Malaysia is ranked 41st (scoring 69.9) and 48th (scoring 69.9) out of 113 countries in 2022 ⁵⁷ and 2021 ⁵⁸, respectively. In the 2022 Global Hunger Index, Malaysia scored to a limited extent (1.6) for hunger. The hunger index was 10.9 and 12.5 in 2014 and 2022, respectively ⁵⁶. In Malaysia, moderate and severe food insecurity rose to 15.4% (around 5 million people) between 2019 to 2021 ⁵⁹. In Malaysia, 11.6% and 14.1% below the age of 5 years children were underweight, and 16.6% and 16.6% were stunted in 2011 and 2019, respectively ⁶⁰. Ahmed et al., 2020 reported that the Malaysian 35.7% of lower-income families faced insufficient quantity and quality. They have additionally reported that among research respondents, they must reduce meal portions of quality and quantity (21.9%)

ECONOMIC BURDEN OF FOOD INSECURITY

Increased healthcare costs

Higher rates of malnutrition and diet-related diseases lead to increased healthcare expenditures.

Reduced productivity

Food insecurity can impact physical and mental health, reducing workforce productivity and economic output.

Higher social welfare costs

Increased reliance on food assistance programs and social services can strain government budgets.



Loss of educational attainment

Children from food-insecure households may have lower academic performance, affecting future earning potential.



Impact on local economies

Food insecurity can lead to decreased demand for local products, harming farmers and local businesses.

Figure 2: Economic Burden of Food Insecurity.

Illustration Credit: Nor Faiza Mohd. Tohit.

SOCIAL BURDEN OF FOOD INSECURITY

Increased poverty rates

Food insecurity can perpetuate cycles of poverty, as families may prioritize immediate food needs over long-term financial stability.

Mental health issues

Chronic food insecurity can lead to anxiety, depression, and other mental health problems.

Social stigma

Individuals and families experiencing food insecurity may face shame and social isolation, affecting community cohesion.



Educational challenges

Children facing food insecurity may struggle in school, leading to long-term social and economic disadvantages.

Increased crime rates

Areas with high food insecurity may experience higher crime rates as individuals resort to illegal activities for survival.

Figure 3: Social Burden of Food Insecurity.

Illustration Credit: Nor Faiza Mohd. Tohit.

and skip meals (15.2%) for a minimum of one month yearly due to financial constraints⁶¹. Therefore, it can be concluded that Malaysia cannot ensure equal access to nutritious food at a reasonable price for all citizens. Consequently, the trend of food insecurity will most likely increase, and predictably, the food security gap will reach 40% in the next 4 decades^{56,62,63}.

MALAYSIA'S POLICY ON FOOD SECURITY

Malaysia's policy on food security is multifaceted and centers on promoting self-sufficiency, safeguarding the welfare of consumers and farmers, and ensuring stable food supply and prices. Various plans and programs have outlined key policy strategies and initiatives⁶⁴. National Food Security Policy Action Plan 2021-2025 was developed as a specific action plan to reinforce national food security, considering concerns and challenges along the food supply chain extending from agricultural contributions to wasted meals (thrown-away food)⁶⁵. The policy covers five primary stratagems, 15 supplementary plans, and 96 opening moves that uphold Malaysia's food supply network exclusively in the face of unforeseen circumstances^{65,66}.

Malaysia's National Agrofood Policy (NAP) 2011-2020 has set clear objectives to enhance the country's agricultural sector⁶⁷. The policy focuses on three key areas: increasing food production, enhancing industry competitiveness, and strengthening local institutions⁶⁸. Its main goals include boosting food production, ensuring the welfare of farmers and consumers, and improving overall efficiency and productivity in the agricultural sector⁶⁹. The National Agrofood Policy 2021-2030 aims to strengthen further and streamline efforts towards sustainable growth in the agrofood industry⁶⁹. The policy outlines four strategic thrusts: improving food security, raising competition in the agrofood industry to reduce the price of basic foods, reinforcing workforce resources, and supporting smart agricultural equipment venture⁶⁹.

The policy seeks to address critical challenges and capitalize on opportunities in Malaysia's agricultural sector through these strategic thrusts. Thus, by prioritizing food security, the policy aims to ensure a stable and sufficient food supply for the nation's population. Additionally, by focusing on increasing the competitiveness of the agrofood industry, the policy aims to boost exports, attract investments, and foster economic growth⁶⁸.

Recognizing the importance of human capital, the policy seeks to enhance the skills and knowledge of individuals working in the agrofood industry. This includes investing in education and training programs to develop a competent workforce to drive innovation and improve productivity. Furthermore, the policy emphasizes the importance of innovative technology investment to enhance efficiency and sustainability in the agrofood sector. The strategy endeavors to maximize yields, minimize the environmental effect, and optimize resource utilization by utilizing technological breakthroughs like digital solutions and precision farming⁶⁸.

The National Agrofood Policy 2021-2030 reflects Malaysia's commitment to ensuring a resilient and sustainable agrofood industry. Furthermore, by addressing key challenges, promoting innovation, and investing in human capital and technology, Malaysia aims to position itself as a leading player in the global agrofood market and ensure a prosperous future for farmers, consumers, and the nation. Agriculture is considered a National Key Economic Area (NKEA) in Malaysia. The main objective of the Economic Transformation Program (ETP) is to increase productivity, production, and farmers' income in the agriculture sector through modernization, commercialization, and the adoption of advanced technology⁶⁹.

The National Paddy and Rice Policy reduces the country's reliance on imported rice and promotes self-sufficiency. It encourages higher paddy production, improves the Paddy and Rice Board's management, and increases private sector involvement^{70,71}. In addition to these efforts, other initiatives aim to improve food security. This includes encouraging farmers to adopt modern agricultural practices, providing subsidies, funding, and access to new technologies^{72,73}, and establishing agencies such as the Federal Land Development Authority (FELDA) and the Farmers' Organization Authority (LPP or FOA) to support farmers^{74,75}. As highlighted by Yusof (2021), through these policies and initiatives, Malaysia is working towards improving food security, achieving self-sufficiency in certain food items, and developing more resilient and sustainable food systems⁷⁶. However, some challenges need to be addressed, such as limited land availability, an aging farmer population, and the impact of climate change⁷⁷⁻⁷⁹. The COVID-19 pandemic has further highlighted the importance of having robust and flexible food systems

to ensure food availability and prevent price inflation around the globe, including in Malaysia⁸⁰⁻⁸³.

FOOD SECURITY IMPACT ON COMMUNITY HEALTH

Food security, defined as having reliable access to enough affordable and nutritious food, has a profound direct and indirect impact on community health¹.

NUTRITIONAL HEALTH

Adequate nutrition is crucial for maintaining good health, e.g., physical⁸⁴ and mental health^{85,86}, minimizing the possibility of developing chronic communicable⁸⁷ and non-communicable diseases⁸⁸, maintaining a healthy pregnancy⁸⁹, and maintaining a long life span⁹⁰. Thus, having access to a varied and balanced diet supports overall health and development, improves lifespan, and enhances quality of life. On the other hand, food insecurity can lead to malnutrition and undernutrition, resulting in stunted growth among children, a compromised immune system, and an increased susceptibility to various diseases^{91,92}. Food insecurity and malnutrition are closely intertwined. Food insecurity often fails to maintain an active and healthy lifestyle daily. It raises the possibility of worse malnutrition, which refers to deficiencies, excesses, or imbalances in a person's energy intake and/or nutrients. Households experiencing food insecurity often have limited access to adequate food, which may not meet all members' daily energy and nutrient requirements⁹³⁻⁹⁵. As a result, undernutrition can occur. Limited financial resources may force individuals or families to opt for cheaper, energy-dense foods that are low in nutrients. These foods often lack the essential vitamins and minerals needed for optimal health, leading to micronutrient malnutrition, also known as hidden hunger^{96,97}. The relationship between food insecurity and malnutrition is often a vicious cycle. Malnutrition weakens the immune system, making individuals more susceptible to diseases^{91,98}. Chronic undernourishment, in turn, can reduce appetite and disrupt the body's ability to absorb nutrients, further worsening malnutrition⁹⁹. Chronic food insecurity can significantly impact children's development, as they have higher nutritional needs for growth. Consistent undernourishment can lead to stunting, where a child's height is below average for their age, and wasting, where a child's weight is below average for their height^{60,100}. Addressing food insecurity is a crucial step in preventing malnutrition. Improving

access to nutritious foods, promoting sustainable and resilient agriculture, and ensuring social safety nets are essential to successful public health strategies^{101,102}.

MENTAL HEALTH

Hunger and the stress of not having enough food can harm mental health. Conditions such as anxiety, depression, and insecurity are closely linked to food insecurity. Children who experience long-term food insecurity may suffer from cognitive problems and have difficulties in their social development. Food insecurity can lead to both emotional and physical stress. This can result in irregular eating habits and poorer dietary quality, worsening malnutrition risk^{22,103-106}.

Furthermore, food insecurity can significantly affect mental health in various ways. It creates a harmful cycle where mental health issues and food insecurity perpetuate each other¹⁰⁷. Living with the uncertainty of not having enough food can lead to chronic stress. This chronic stress can increase cortisol levels, known as the stress hormone^{108,109}. Elevated cortisol levels can contribute to a range of mental health problems, including anxiety and depression^{110,111}. Numerous studies have shown a strong relationship between food insecurity, depression, and anxiety disorders¹¹²⁻¹¹⁴. The burden of being unable to meet basic life needs can result in feelings of despair, inadequacy, and heightened fear, which are core symptoms of these conditions¹¹⁵⁻¹¹⁷. Food insecurity can also have a significant impact on children. It can contribute to developmental issues, psychological distress, and social difficulties¹¹⁸⁻¹²⁰. These difficulties can affect their self-esteem, academic performance, and social interactions, thus increasing the likelihood of developing mental health disorders¹²¹⁻¹²⁴.

Additionally, nutrient deficiencies caused by food insecurity can affect brain health¹⁶. Micronutrient deficiency decreases the synthesis of brain-derived neurotrophic factor (BDNF) and amplifies the stress reaction, immune, and oxidative process with reactive oxygen species (ROS) formation¹²⁵⁻¹²⁷. Critical nutrients like Omega-3 fatty acids, B vitamins (methylation and myelin sheath formation and maintenance), iron (myelin and neurotransmitter generation), and zinc (neurogenesis, synaptogenesis, and neuron migration) are essential for mental health^{16,128-134}. The lack of these macro and micronutrients (vitamins and trace elements) can lead to changes in mood, reduced concentration, and an increased risk of mental health disorders^{135,136}. Melchior

et al. 2016 revealed that children from food-insecure families (i.e., families that lack access to sufficient, safe, and nutritious food) are at risk for developmental problems¹³⁷. The stigma associated with food insecurity can contribute to feelings of shame and social isolation, further exacerbating mental health problems^{138,139}. There is a cycle between food insecurity and mental health¹⁰⁴. Mental health issues can make it more challenging for individuals to secure stable employment or effectively manage their resources, which can create or worsen food insecurity²². It is, therefore, essential to address both issues to break this vicious cycle. Promoting food security should be seen as a nutritional issue and a vital aspect of protecting and promoting equal physical and mental health^{22,106}. An all-encompassing strategy can address this critical public health concern by integrating mental health elements into food security initiatives and regulations^{106,140,141}.

CHRONIC DISEASES

Food insecurity often leads to unhealthy food choices due to the affordability of calorie-dense but nutrient-poor foods. These dietary habits can contribute to the development of obesity, diabetes, heart disease, and other chronic conditions over time^{21,93}. A comprehensive review by Thomas et al. 2021 revealed that food insecurity can worsen chronic diseases and affect their management in several ways¹⁴². Food insecure individuals often have limited access to fresh, healthy, and nutrient-dense foods such as fruits, vegetables, lean proteins, and whole grains¹⁴³. Instead, they rely on inexpensive processed foods high in sodium, sugars, and unhealthy fats^{11,21}. This can further exacerbate conditions such as hypertension, diabetes, and heart disease¹⁴⁴⁻¹⁴⁶.

Moreover, when individuals can choose between spending money on food or medications, they may skip or reduce their prescribed medications¹⁴⁷. This can lead to poor control of chronic conditions and adverse health outcomes¹⁴⁸. Furthermore, food-insecure individuals may struggle to adhere to specific dietary recommendations for managing chronic conditions^{93,149}. For example, a low-sodium diet recommended for those with hypertension or heart disease may be financially out of reach for many people. The chronic stress and anxiety associated with food insecurity can also have physiological impacts, such as elevated cortisol levels. These changes can negatively affect the management of chronic diseases and result in poorer health outcomes⁹³. It may seem paradoxical, but food insecurity can

contribute to obesity, which is a considerable risk factor for numerous chronic diseases¹⁵⁰. Limited resources and lack of access to healthier foods can lead to overconsumption of calorie-dense yet nutritionally poor foods, ultimately resulting in weight gain. The burden of managing food insecurity itself can also lead to poorer disease outcomes^{11,151,152}. Individuals who are food insecure are more prone to struggle with self-care and following treatment regimens, which frequently results in adverse health consequences. Therefore, addressing food insecurity is crucial for improving chronic disease outcomes. Ensuring access to nutritious food and alleviating the stress associated with food insecurity can significantly improve overall health and quality of life^{22,93}.

Community Productivity and Economy

Food insecurity harms the productivity of communities and overall economic development. When individuals in a community are malnourished or constantly worried about having enough food, it considerably impairs their ability to work or learn effectively^{22,91}. Adequate nutrition is vital for the physical and cognitive functioning of individuals. When there is malnutrition, individuals may experience reduced productivity due to illness or impaired cognitive abilities¹⁵³. Food insecurity can also harm children's education. It can hinder their ability to attend school regularly and concentrate on their studies, thus limiting their educational achievement. A lack of education can later restrict their future productivity and earning potential^{118,154}.

Additionally, food insecurity can lead to various health problems, resulting in increased healthcare costs and burdening the healthcare system. This resource diversion affects other economic sectors that could benefit from those resources¹⁵⁵⁻¹⁵⁷. Food insecurity, especially when it reaches hunger and malnutrition, can ignite social unrest and potentially destabilize regions, negatively impacting the economy^{158,159}. Countries heavily relying on food imports or experiencing significant post-harvest losses may encounter a negative trade balance, harming the national economy¹⁶⁰⁻¹⁶². Conversely, countries with prosperous agricultural sectors can enjoy robust exports, bolstering their economy^{163,164}. Agriculture, a primary pathway to achieving food security, considerably contributes to many countries' national gross domestic product (GDP). A plentiful and affordable food supply helps keep labor costs down and allows resources to be invested in other sectors, thus supporting broader

economic development^{13,165}. Economic advancement can result from addressing food security through initiatives and policies to improve it. It promotes agricultural development, enhances workforce productivity, and reduces healthcare costs by^{13,166}. Consequently, these efforts result in significant economic returns over time. Communities and countries may promote productivity, economic growth, and general well-being by realizing the significance of food security and implementing practical solutions to solve it^{76,167}.

Those Who Are at Risk of Food Insecurity Severe Impacts

Various factors can influence the risk of food insecurity, and certain groups are particularly vulnerable. Food insecurity is closely tied to poverty and low income². People who commonly experience food insecurity are women, households with limited financial resources, households that have more children and more children in school, non-working mothers, aborigines, poor urban, university students, elderly and migrant workers^{63,120,168,169}. Individuals without a stable income may struggle to afford sufficient and nutritious food. Single-parent households, especially those led by women, often have higher rates of food insecurity due to the challenges of providing for a family on a single income^{170,171}. Systemic social and economic disparities frequently expose certain racial and ethnic groups to a higher risk of food insecurity¹⁷²⁻¹⁷⁵. Those with disabilities, especially if they are unable to work, usually face elevated risks of food insecurity¹⁷⁶. Homeless individuals without regular access to cooking and storage facilities are particularly susceptible to food insecurity¹⁷⁷. Older adults may be at risk due to limited mobility, chronic health conditions, or inadequate pension plans and consequently suffer from insufficient food¹⁷⁸⁻¹⁸¹. It may seem paradoxical, but small-scale farmers and other rural populations often experience food insecurity due to poor access to markets, reliance on unpredictable agricultural income, and the impacts of climate change^{182,183}. Natural disasters like droughts, floods, and cyclones can devastate local food production and infrastructure, making communities in those regions particularly vulnerable¹⁸⁴. Displacement and conflict can disrupt access to food and sources of livelihood, significantly increasing the risk of food insecurity^{185,186}. Addressing food insecurity requires identifying these at-risk groups and developing strategies tailored to their specific needs and challenges¹⁸⁷. This approach can help ensure that interventions to promote food security are effective and fair.

Way Forward: Improving Food Security For Better Community Health

To enhance community health and well-being, it is essential to address the issue of food security directly. This involves recognizing the interconnectedness of nutrition, mental health, disease prevention, economic productivity, and overall wellness. Several measures should be taken to improve food security^{22, 106, 188}.

Sustainable Agriculture

Promoting sustainable agricultural practices can help increase food supply, improve local economies, and foster resilience to climate change^{189, 190}. In Malaysia, promoting sustainable agriculture to ensure food security involves various strategies¹⁹¹⁻¹⁹³:

- **Technology adoption:** Embracing modern technologies can improve crop and livestock production, making it more efficient and less environmentally damaging. With technologies such as precision farming, intelligent irrigation systems, and drones for monitoring crop health and mitigating disease outbreaks, farmers can optimize inputs to produce more while reducing resource waste and negative environmental impacts¹⁹⁴.
- **Resource management:** Educating farmers on sustainable farming practices such as conservation agriculture, organic fertilizers, and natural pest and weed management methods can also help. This promotes better use of natural resources while maintaining soil health and biodiversity¹⁹⁵.
- **Agroforestry:** This practice integrates trees and shrubs into crop and animal farming systems to create environmentally, economically, and socially sustainable land-use systems. It offers various benefits, including soil conservation, carbon sequestration, diversification of income, and increased resilience to climate change¹⁹⁶.
- **Climate-resilient farming:** Farmers need training to adopt climate-smart agricultural practices. These could involve using drought-resistant plant variants, innovating new farming techniques to handle fluctuating weather patterns, or practicing water conservation strategies (Figure 4). Adopting farming practices resilient to climatic changes can sustain food production, even under unpredictable weather conditions^{197,198}.

EXAMPLES OF CLIMATE-RESILIENT FARMING

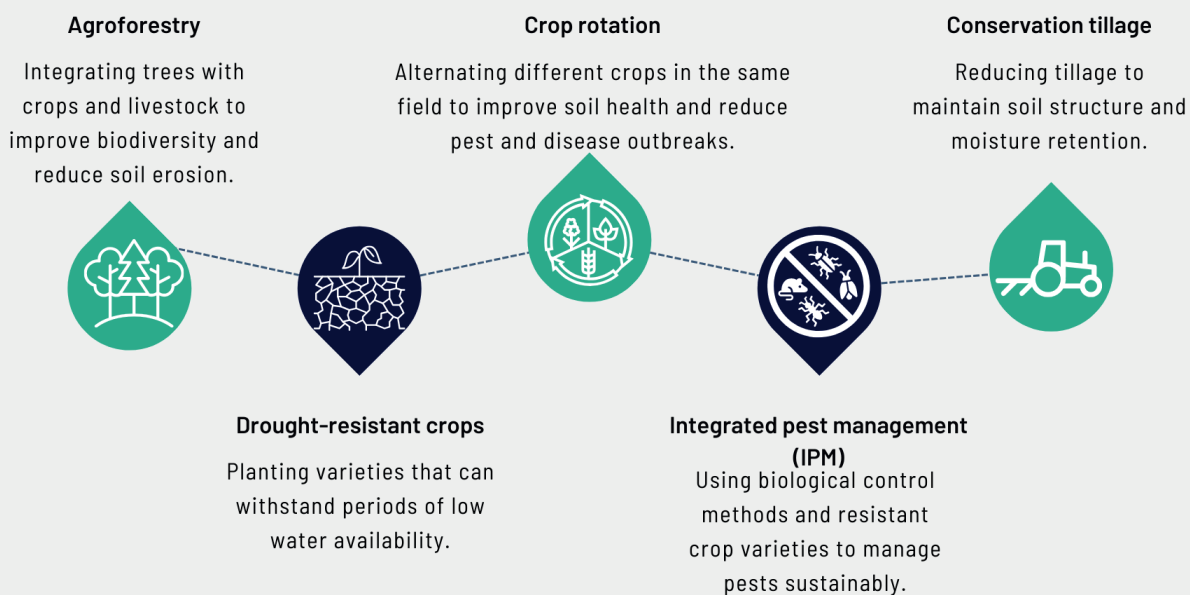


Figure 4: Climate-Resilient Farming.

Illustration Credit: Nor Faiza Mohd. Tohit.

ADVANTAGES OF DIVERSIFICATION OF CROP PRACTICES

Improved soil health

Diverse crops can enhance soil fertility and reduce erosion.

Pest and disease management

Crop diversity can disrupt pest life cycles and reduce the incidence of diseases.

Economic resilience

Farmers can reduce financial risk by having multiple crops to sell, providing a buffer against market fluctuations.

Enhanced nutrition

Growing a variety of crops can contribute to a more balanced and nutritious diet for communities.

Sustainable resource use

Diversification can lead to more efficient use of water and nutrients.

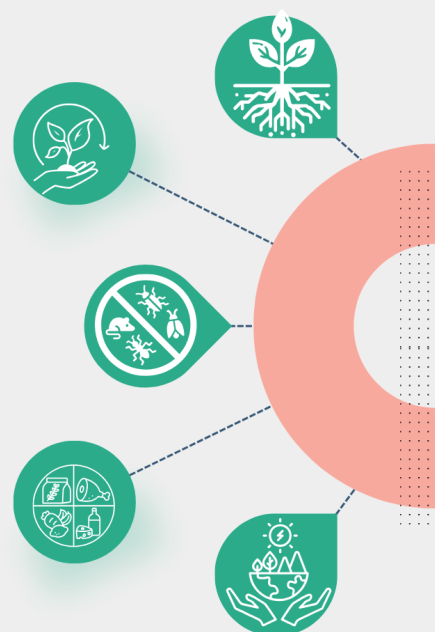


Figure 5: Advantages of Diversification of Crop Practices.

Illustration Credit: Nor Faiza Mohd. Tohit.

- **Diversification:** Encouraging farmers to diversify their crops and livestock can enhance food security and resilience against climate change. Diversification can enrich diets, provide alternate income in case one crop fails, and efficiently use different levels of land and water resources (Figure 5)¹⁹⁹.
- **Supportive policies:** Government policies play a critical role in promoting sustainable agriculture. This could involve funding research into sustainable agricultural practices, improving market access for small farmers, or providing subsidies that incentivize sustainable farming (Figure 6)²⁰⁰.

In these ways, Malaysia can promote sustainable agriculture, helping to ensure food security at present while preserving environmental resources for future generations.

Education and Training

Equipping communities with the knowledge and skills to grow food and understand nutrition can improve food security. Education and training are vital components when it comes to ensuring food security within a community²⁰¹. Here are some strategies to educate and

empower communities:

- **Agricultural Training:** Provide practical training to farmers on sustainable and climate-resilient farming practices. This includes educating them about soil management, water conservation, integrated pest management, crop rotation, agroforestry, and using technology in farming²⁰².
- **Nutrition Education:** Offer nutrition education programs that help individuals and families make healthy dietary choices, understand the importance of a diverse diet, and recognize the nutritional values of different foods²⁰³.
- **Home Gardening:** Teach community members how to start and maintain home gardens, which can bolster local food production and provide access to fresh, nutritious food. Training can cover composting, crop rotation, water-efficient gardening, and natural pest management²⁰⁴.
- **Cooking Workshops:** Offering cooking workshops can teach community members how to prepare balanced, nutritious meals, combat food waste by using all parts of their ingredients, and safely store

GOVERNMENT POLICIES TO ENSURE FOOD SECURITY

Food assistance programs

Implementing and funding programs like SNAP (Supplemental Nutrition Assistance Program) to support low-income families.

Investment in agriculture

Providing subsidies and grants to enhance agricultural productivity and infrastructure.



Nutrition education

Promoting programs that educate the public about healthy eating and food preparation.

Land use policies

Implementing zoning laws that protect agricultural land from development to ensure a stable food supply.

Emergency food distribution

Establishing frameworks for rapid food distribution in times of crisis, such as natural disasters.

Figure 6: Government Policies to Ensure Food Security.

Illustration Credit: Nor Faiza Mohd. Tohit.

and preserve foods²⁰⁵⁻²⁰⁸.

- **School Programs:** Schools represent an effective platform for food and nutrition education. Incorporate gardening projects and nutrition lessons into the curriculum. School feeding programs can also provide regular healthy meals to students, improving nutrition and encouraging school attendance^{209,210}.
- **Empower Women:** Women play a vital role in food production and preparation in many societies. Providing them with access to education and

resources can significantly improve a community's food security^{211,212}.

- **Community-Based Participatory Approaches:** Working alongside community members can help promote culturally appropriate strategies and address local needs^{213,214}.
- **Leveraging Technology:** Using digital tools, online resources, and mobile technology can provide access to training materials and platforms where communities can share experiences and learn from each other (Figure 7)^{215,216}.

LEVERAGING TECHNOLOGY TO EDUCATE COMMUNITY ON FOOD SECURITY

Online workshops and webinars

Utilizing digital platforms to provide education on food production, nutrition, and food systems.

Mobile applications

Developing apps that provide information on local food resources, gardening tips, and nutrition education.

Social media campaigns

Using social media to raise awareness about food security issues and share best practices.



Community forums

Hosting virtual or in-person forums that connect community members with experts in food security.

Data analytics

Utilizing data to identify food insecurity hotspots and tailor educational resources to specific community needs.

Figure 7: Leveraging Technology to Educate Community on Food Security.

Illustration Credit: Nor Faiza Mohd. Tohit.

- **Financial Literacy:** Providing financial education to farmers can help them understand and manage financial risks better, secure loans, manage debt, and improve investment in their farming operations^{217,218}.

By enacting these strategies, communities can be better equipped with the knowledge and skills to improve

their food security, nutrition, and overall well-being.

Social Safety Nets

Social programs such as food assistance, free school meals, and income support can protect vulnerable populations from food insecurity. Social safety nets are critical to ensuring food security among vulnerable populations^{63,219,220}. They can take several forms:

- **Fair Food Distribution:** Implementing fair food systems and policies reduces food waste and ensures an equitable food distribution ²²¹.
- **Cash Transfers:** Direct cash transfers can help households purchase the food they need, paying for nutritious ingredients that might otherwise be out of reach due to cost. They give the recipients the flexibility to spend as per their priorities ²²².
- **Food Assistance Programs:** These programs provide individuals and families with food directly. They can range from food banks to government-run initiatives providing staple foods, ready-to-eat meals, or food vouchers ²²³.
- **School Meal Programs:** These provide nutritious meals to children at school, ensuring they receive at least one balanced meal per day. They also address immediate food needs and improve school attendance rates, improving education outcomes ²²⁴.
- **Public Works Programs:** These programs provide employment opportunities, especially during lean seasons in agricultural societies, ensuring that households have a reliable source of income to spend on food ²²⁵.
- **Subsidies:** Government subsidies can help keep the cost of essential food items affordable or support farmers to produce enough food ^{226,227}.
- **Conditional Cash Transfers (CCTs):** These programs provide cash to households on the condition that they meet specific criteria, such as sending their children to school or attending regular health check-ups. This offers immediate financial assistance to buy food, leading to long-term human capital development ²²⁸⁻²³¹.
- **Nutrition Programs:** Some safety net programs focus on nutrition-specific interventions, such as providing supplements, fortified foods, or therapeutic foods to vulnerable groups, such as children or pregnant women ^{232,233}.
- **Crop Insurance:** This can protect farmers from income loss due to catastrophic events like natural disasters or crop diseases, ensuring food production doesn't suffer drastically during adverse situations ²³⁴.

These social safety nets can significantly reduce poverty and hunger, improve nutrition, and foster food security if well-designed and implemented. However, they require sufficient funding, robust institutions, and an excellent monitoring and evaluation system to ensure they reach those in need and achieve their goals.

CONCLUSION

Ensuring food security is not merely about providing sufficient food but also assuring access to nutritious, safe, and culturally acceptable food for all members of society, promoting a healthier and more resilient community. It entails incorporating many different strategies, such as advocating for sustainable agriculture, investing in agricultural research, creating and improving infrastructure, responding to climate change, and reducing food waste. Social safety nets are also paramount, as they provide critical support for vulnerable populations. Addressing food insecurity, considering the persistent problems of population expansion, climate change, and socioeconomic inequities, is becoming increasingly important. By prioritizing food security, we can improve community health and everyone's quality of life and well-being. Moreover, such a holistic approach will not only have immediate benefits in terms of health outcomes but also significant long-term impacts by breaking the cycle of poverty, improving social cohesion, and triggering economic growth. Therefore, food security should be at the heart of any comprehensive sustainable development plan, and concerted efforts must be made at the local, national, and international levels to achieve this goal.

CONSENT FOR PUBLICATION

The author reviewed and approved the final version and has agreed to be accountable for all aspects of the work, including any accuracy or integrity issues.

DISCLOSURE

The author declares that they do not have any financial involvement or affiliations with any organization, association, or entity directly or indirectly related to the subject matter or materials presented in this review paper. This includes honoraria, expert testimony, employment, ownership of stocks or options, patents, or grants received or pending royalties.

DATA AVAILABILITY

Information for this review paper is taken from freely available sources.

AUTHORSHIP CONTRIBUTION

All authors contributed significantly to the work, whether in the conception, design, utilization, collection,

analysis, and interpretation of data or all these areas. They also participated in the paper's drafting, revision, or critical review, gave their final approval for the version that would be published, decided on the journal to which the article would be submitted, and made the responsible decision to be held accountable for all aspects of the work.

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