



Food Security and its Conservation Technology

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ABSTRACT

Food security is the state in which all people, everywhere, have physical, social, and economic access to enough healthful food that meets their dietary needs and food preferences for an active and healthy life. Four separate characteristics have been identified as a result of varying degrees of food security: Individual Utilization, Home of Accessibility, National Availability, and Stability. This might be seen as a time element affecting each stage. All four of these conditions need to be met in order for there to be total food security. More recent developments have underscored the need of sustainability, which may be seen as the long-term temporal (fifth) dimension of food security. A causal, connected pathway from production to consumption is the best approach to think about food security. An integrated strategy that takes into account social, economic, and environmental aspects is needed to address food security. Through the adoption of sustainable practices and regulations, we may strive towards a future in which all people have access to enough food that is safe and nourishing. The issue of food security is complicated and has wide-ranging effects. Through tackling the many challenges and executing efficacious remedies, we may establish a global community in which every individual possesses the nourishing sustenance required for a salubrious and efficient existence. A multifaceted strategy involving social safety nets, sustainable agriculture methods, technology developments, and international collaboration is needed to achieve food security. Ensuring food security for everyone is still a top priority in the continuous struggle for a more fair and equitable future as the world's population continues to rise. The many facets of food security are examined in this review article, along with the variables endangering it and the continuous initiatives to guarantee that everyone has access to a nutritious diet. It looks at the obstacles to food security and discusses possible solutions.

Introduction

Just as air is necessary for breathing, food is necessary for life. But having two square meals a day is not the only definition of food security. The dimensions of food security are as follows (Devereux, 2016):

- (a) Food production within the nation, food imports, and the stock from prior years kept in government granaries are all considered sources of food availability.
- (a) Accessibility denotes that food is available to everybody.
- (c) Being affordable means having enough cash on hand to purchase enough wholesome, safe food to satisfy one's nutritional requirements.

At the Rome World Meeting on Food Problems in 1974, the word "food security" was first properly defined in science. At a related conference in 1996, the concept was then expanded upon and made clearer. In this context, "food security" refers to the situation when eating is both practically and monetarily possible. Physical food availability is often evaluated by considering the amount and diversity of food products that meet the effective demand in the corresponding demand zones. It refers to the nation's or region's food supply (FAO, 2018). Economists describe food security as defending the home market from unauthorized food imports while bolstering the standing of domestic producers. A fundamental human right and a key component of international stability is the capacity to consistently get appropriate amounts of reasonably priced, nutrient-dense food. Achieving food security for all people is still a difficult task, despite notable advancements in agricultural productivity. Millions of people still suffer from hunger and malnutrition, making food security a critical issue on a global scale (FAO, 2019). This review article explores the various dimensions of food security, the factors that threaten it, and ongoing efforts to ensure everyone has access to a healthy diet. It examines the challenges to food security and explores strategies to address them.

The Four Pillars of Food Security

Food security was defined as "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" at the World Food Summit in 1996 (FAO, 2006). This definition highlights four key dimensions:

Food Availability: This refers to the physical presence of sufficient food at the national, regional, and household levels. Factors like agricultural productivity, food storage, and international trade influence availability (World Bank, 2020a).

Food Accessibility: Even with adequate food supplies, individuals need the economic means to acquire it. Poverty, food prices, and distribution networks all play a role in accessibility (World Bank, 2020b).

Food Utilization: Food security transcends simply having enough to eat. It requires the body's ability to absorb and utilize nutrients from food. Factors like sanitation, healthcare, and dietary knowledge influence utilization (FAO, 2000).

Stability: Food security is not static. It requires resilience in the face of shocks like climate change, economic crises, or natural disasters (FAO, 2006).

Challenges and Threats to Food Security

Several factors threaten food security in the 21st century. They are as follows:

Population Growth: The global population is projected to reach 9.7 billion by 2050, putting immense pressure on food production systems (UNDESAPD, 2019). Rapidly growing populations strain food resources, exacerbating food insecurity (FAO, 2018).

Climate Change: Rising temperatures, erratic rainfall patterns, and extreme weather events disrupt agricultural yields and threaten food security, particularly in vulnerable regions. The monsoon rains are crucial to India's agricultural sector. Nonetheless, rainfall patterns are becoming more erratic, which causes water scarcity in some areas. Erratic weather patterns and extreme events disrupt agricultural production, leading to crop failures and food shortages. Unpredictable weather patterns, such as droughts, floods, and extremely high or low temperatures, have an impact on animal output and crop harvests (Smith et al., 2019).

Storage and Distribution: Significant food losses and waste are caused by ineffective cold chain systems and inefficient storage facilities (Balaji and Arshinder, 2016).

Land Degradation and Resource Scarcity: Soil erosion, deforestation, and water scarcity are reducing the amount of arable land and freshwater available for agriculture (Chartres et al., 2015).

Conflict and Political Instability: Wars, civil unrest, and displacement can severely disrupt food production and distribution networks, leading to food insecurity (Resilience, 2017). Wars and political conflicts disrupt food distribution systems, leaving populations vulnerable to famine (WFP, 2020).

Economic Inequality: A lot of people have trouble routinely affording and gaining access to wholesome food, especially in rural areas and marginalized populations. Poverty limits access to nutritious food, even in regions with plentiful supplies. This can lead to perpetuating cycles of malnutrition, hunger and its associated health problems (FAO, 2019).

Strategies for Enhancing Food Security

There are a multitude of approaches being explored to address these challenges and build a more food-secure future:

Sustainable Agriculture: Promoting practices such as agroecology and precision farming to improve yields while minimizing environmental impact. Practices that promote soil health, water conservation, and biodiversity can increase yields and resilience in the face of climate change (FAO, 2020).

Strengthening Social Safety Nets: Implementing programs like cash transfers and food vouchers to support vulnerable populations during times of crisis. Social safety nets like food banks and school feeding programs can provide critical support to vulnerable populations during times of food insecurity (Devereux et al., 2019; World Bank, 2020a).

Technology and Innovation: Harnessing advancements in biotechnology and digital agriculture to enhance productivity and resilience in food systems (FAO, 2021).

Policy Interventions: Enacting policies that prioritize food security, such as investing in rural infrastructure and regulating food markets (World Bank, 2020b).

Food Loss and Waste Reduction: One-third of all food produced globally is lost or wasted. Efforts to improve food storage, transportation, and consumer behavior can significantly increase food availability (Sawaya and Wajih, 2017).

Investments in Rural Development: Empowering smallholder farmers, particularly women, through better access to education, credit, and technology can significantly enhance agricultural productivity (Ogato et al., 2009).

International Cooperation: Global collaboration is crucial for tackling issues like climate change and fostering trade policies that promote food security for all (Maggio et al., 2016).

Areas where Technology can Help Agribusiness

Drone Technology: For the agricultural community, drone technology is seen as the way of the future. Precision agriculture uses drones to help farmers and improve overall performance. Drones for agriculture aid farmers in decision-making and environmental adaptation (Khan et al., 2021). Drone data is utilized for field soil analysis, agricultural damage assessment, irrigation, crop health, and field data collection. In order to do the operation more quickly and precisely, the scope has expanded recently, and drones are now being used in Tamilnadu to carry out seeding (Gupta et al., 2019).

Utilization of Biotechnology: The term "agricultural biotechnology" describes a variety of interventions, such as the use of conventional breeding methods to enhance plants or animals and create microorganisms for development and agriculture. Agri-production can become more affordable and controllable for farmers with the help of biotechnology. For example, crops that have been modified to withstand particular pesticides can effectively reduce weeds (Levidow, 2023). By protecting crops from weeds, insects, and pests, biotechnology has helped lower the likelihood that they would fail. By increasing crop productivity and food security, plant biotechnology has helped to lessen the environmental impact of agricultural expansion (Tyczewska et al., 2018).

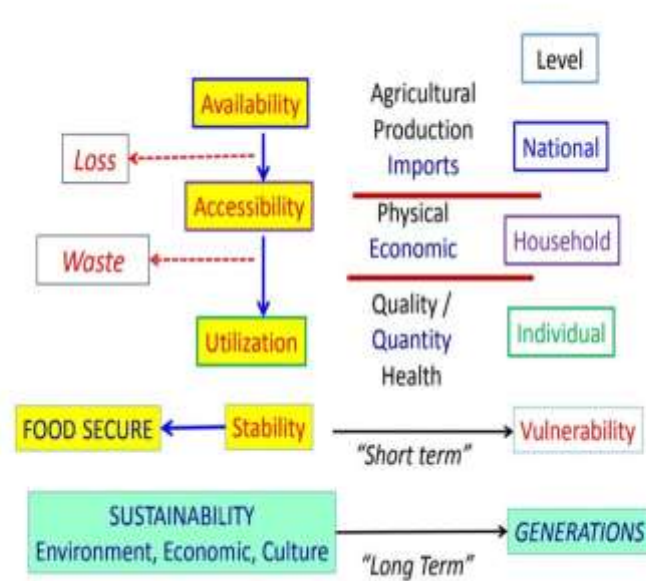


Fig. 1: Pathway of Food security

Other Strategies to Enhance Food Security and Supply

From our point of view, the food security mechanism is a collection of socioeconomic and legal requirements designed to keep an eye on food imports and production in order to avert food shortages. The population density is a factor in determining the necessary food consumption levels, since a decline in it might cause social instability (Umarjonovna and Gulomjonovna., 2022). The concepts of food safety contain boundary characteristics and are connected to threshold values. Certain nations have established food safety limits based on scientific evidence, medical standards, and social norms that are appropriate for the long-term and holistic development of an individual's health (Behnke and Janssen, 2020). Ensuring that all people have access to nutritious food is the state's primary duty, which it fulfills by thwarting both external and internal dangers. Economic studies and government documents from developing countries identify a wide range of risks related to food security. The results of the study show that a variety of reasons, such as artificial pollution, a lack of agrotechnical culture, breaches of agrochemical technology, and the environment, are primarily to blame for the high level of chemical, biological, and microbial contamination of the country's food. Foods can absorb and concentrate any environmentally hazardous substances present in the surroundings (Pandey and Madhuri, 2014). Food made from plants and animals is the route by which 70% of environmental toxins enter the human body. Since 1986, the amount of radionuclides in food has increased five to twenty times above that in the 1960s. In the past five years, there has been a five-fold rise in food contamination caused by nitrates and their breakdown products (Kalaycıoğlu and Erım, 2019).

Food security has long been an issue for developing countries. A country's ability to secure food is significantly impacted by the transition to a market economy. Because of this, we need to look into how the food supply is structured in a market economy in order to determine how best to provide high-quality food in the present while also increasing its accessibility to those who allow us to leave (Maxwell, 1990). Within the context of national security, food security in our nation is considered a crucial component of economic security, indicating both its economic stability and autonomy as well as its capacity to effectively provide the basic needs of its citizens. But food security goes beyond financial stability. Sociopolitical stability in society is associated with national security issues (Falcon and Naylor, 2005). The standards listed in the official papers specify different criteria for product safety. Any deviation from these guidelines, such as storing goods improperly, utilizing them in strange circumstances, or disobeying consumption guidelines,

might have serious repercussions for the client. A President once stated, "One of our biggest challenges is to choose wellness and to strengthen the health of our people", in reference to this, if we achieve peace and health, everything else will fall into place (Cowen, 1991). The promotion of people's wellbeing and the provision of food security must coexist. That is something we have to always remember. We believe that policies pertaining to food security are closely associated with government action in the political, economic, and agricultural domains. This economic category was first proposed at the 2018 World Food Summit and is based on the premise that there is always sufficient funding available to ensure sustainable food production and consumption, as well as to offset price fluctuations (FAO, 2006). In fact, the need for food increases along with the world's population. Consequently, there will be more food available. Under such conditions, close observation should be kept to ensure that the production or farming of inferior, hazardous items for human health does not rise (Haji et al., 2022).

Conclusion

A multifaceted strategy is needed to address food insecurity in India, including bettering farming methods, making sure that food is distributed fairly, cutting down on food waste, expanding access to social safety nets, and tackling poverty and malnutrition. The implementation of government policies and programs, together with international cooperation and support, is crucial in reducing food insecurity and enhancing food accessibility for all demographic groups. Although India has made significant strides in the direction of improved food security, the nation's efforts to ensure that every citizen has access to an adequate amount of healthful food are still hampered by issues like poverty, inequality, and the consequences of climate change. Sustaining policy initiatives, funding for rural and agricultural development, and a dedication to social safety nets and nutrition initiatives are all necessary to meet these issues.

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