

Review Article

Global Food Security Dynamics and Challenges: A Systematic Literature Review

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Abstract

Global food security is a major concern that requires a deep understanding of its complexities and problems. This review brings together current research on global food security, pointing out important trends, gaps, and areas for further study. It looks at how factors like climate change, population growth, economic changes, and geopolitical shifts affect food security worldwide. The review also examines the role of global food security governance, technological progress, and vulnerabilities highlighted by events like the COVID-19 pandemic, stressing the need for sustainable solutions. It highlights the importance of inclusive and collaborative approaches, effective policies, and international cooperation to address the various aspects of food security. Through a detailed methodology involving research, screening, and data analysis, this review provides insights for creating informed policies and practices to address global food security challenges sustainably. The findings stress the crucial need for coordinated efforts across different sectors to ensure food security for all, especially the most vulnerable, in the face of changing global circumstances.

Keywords: Food Security, Climate Change, Covid-19, Sustainability, Resilience.

1. Introduction

Food security, as defined by the 1996 World Food Summit, encompasses the availability of safe, nutritious food for a healthy life with physical and economic access (FAO, 1996). Achieving food security requires addressing production, distribution, economic accessibility, and system resilience to external shocks (FAO, 1996). Global food security is a critical issue facing the world today, with the need to ensure that all individuals have access to an adequate and safe food supply. Despite sufficient global food production, around 800 million people remain undernourished, with millions of children succumbing to hunger annually (FAO, 1996). Resolving food security issues is crucial for achieving Sustainable Development Goals, enhancing livelihoods, and protecting the environment (Mughal and Fontan Sers, 2020; Gustafson and Raven, 2021; Aryal *et al.*, 2002).

The landscape of food security has evolved, influenced by environmental shifts, political complexities, and rapid urbanization. Control over trade routes impacts global food security, affecting knowledge and resource flow (Pawlak and Kołodziejczak, 2020; Molotoks *et al.*, 2021; Xie *et al.*, 2021). The evolution of food security governance emphasizes inclusive and sustainable approaches, with initiatives like the UN's Food Systems Summit and the SDGs providing frameworks for action (UN Food Systems Summit, 2021). Technological advancements offer opportunities to revolutionize food production, distribution, and traceability, enhancing efficiency and transparency in the food supply chain (Gupta *et al.*, 2021; Song *et al.*, 2020).

Global food security presents a formidable challenge, with interconnected dynamics influenced by climate change, population growth, economic fluctuations, and geopolitical shifts. The COVID-19 pandemic highlighted vulnerabilities in global food systems, emphasizing the need for comprehensive understanding and sustainable solutions (Farcas *et al.*, 2020; Rasul, 2021). Population growth is a significant driver of increased food demand, with the global population projected to reach 9.7 billion by 2050, putting immense pressure on agricultural systems (UN, 2019). This growth necessitates not only enhanced food production but also improved distribution networks to reach vulnerable populations, especially in regions already

facing food insecurity. Climate change further compounds the challenges of food security, disrupting agricultural productivity through shifts in temperature, precipitation patterns, and extreme weather events (IPCC, 2022). Economic instability also plays a crucial role in global food security, as downturns can reduce households' purchasing power, making it hard to afford sufficient food. Economic policies and trade barriers can disrupt food supply chains, causing shortages and price spikes (World Bank, 2020). The COVID-19 pandemic highlighted the vulnerability of global food systems to economic shocks (FAO, 2020). Geopolitical conflicts further complicate food security, disrupting agricultural production, displacing populations, and damaging infrastructure, all contributing to food shortages (WFP, 2021). Regions affected by conflicts often experience severe food insecurity, with millions relying on humanitarian aid for survival. Technological advancements offer promising solutions to food security challenges, with innovations like precision farming and genetically modified crops potentially increasing yields and reducing environmental impacts (Garnett *et al.*, 2013). However, the adoption of these technologies varies across regions due to disparities in access, affordability, and cultural acceptance (FAO, 2018).

Effective policy frameworks and international cooperation are essential to address the multifaceted nature of food security, integrating considerations of environmental sustainability, economic viability, and social equity (HLPE, 2020). Collaboration among international organizations, governments, and NGOs is crucial to implementing strategies to ensure food security for all. This systematic literature review aims to synthesize current research on global food security dynamics and challenges, identifying trends, gaps, and areas for future research. The goal is to contribute to informed policies and practices that sustainably address food security challenges. Addressing global food security challenges requires a comprehensive understanding and collaborative action. This study aims to provide insights into sustainable and inclusive solutions in global food security by exploring these dynamics through a systematic literature review.

To meet the study's goals, we carefully formulated the research question, making sure it captured the main query we aimed to answer. This process involved a systematic approach, considering the unique context and variables of the research topic. Crafting a precise research question is crucial for guiding the study and outlining a clear roadmap for future research efforts.

The guided questions were as follows:

- 1) What is the concept of global food security?
- 2) What are the dynamics of global food security?
- 3) What are the key challenges to achieving global food security?
- 4) What are the recommendations and strategies for potential future issues that could impact global food security?

2. Methodology

The authors conducted a scoping investigation from September to November 2023 using Google Scholar and Mendeley. This aimed to define study objectives, assess search word sensitivity, and choose final terms. The goal was to find relevant material, test various word combinations, and note the number of hits. The publication identified the dynamics and challenges to comprehensively explore global food security.

2.1. Inclusion Criterion

Studies that provided pertinent data were included in this systematic review. The scoping review investigated the research pertinent to the world's food security concerns to gather information on the identification of dynamics and challenges of global food security. The study eliminated literature reviews on certain subjects unrelated to identifying food security through literature. To emphasize the interdisciplinary significance of the identification of literature to address the study's objectives and obtain a thorough understanding of the dynamics and the underlying obstacles and challenges of global food security, the publication seeks to advance understanding and inform discourse on critical aspects of this multifaceted issue.

2.2. Identification of Literature

Each study underwent a detailed analysis, categorizing comparable subjects and organizing themes based on their relationships. Three main steps—preliminary evaluation, screening, and selection followed to gather data. Popular databases like Google Scholar and Mendeley were utilized, employing search terms like "global food security," "food production," "food availability," and "food sustainability." The search was limited to articles published between 2018 and 2023. A refined search process resulted in the identification of 130 potential articles relevant to the concept of global food security.

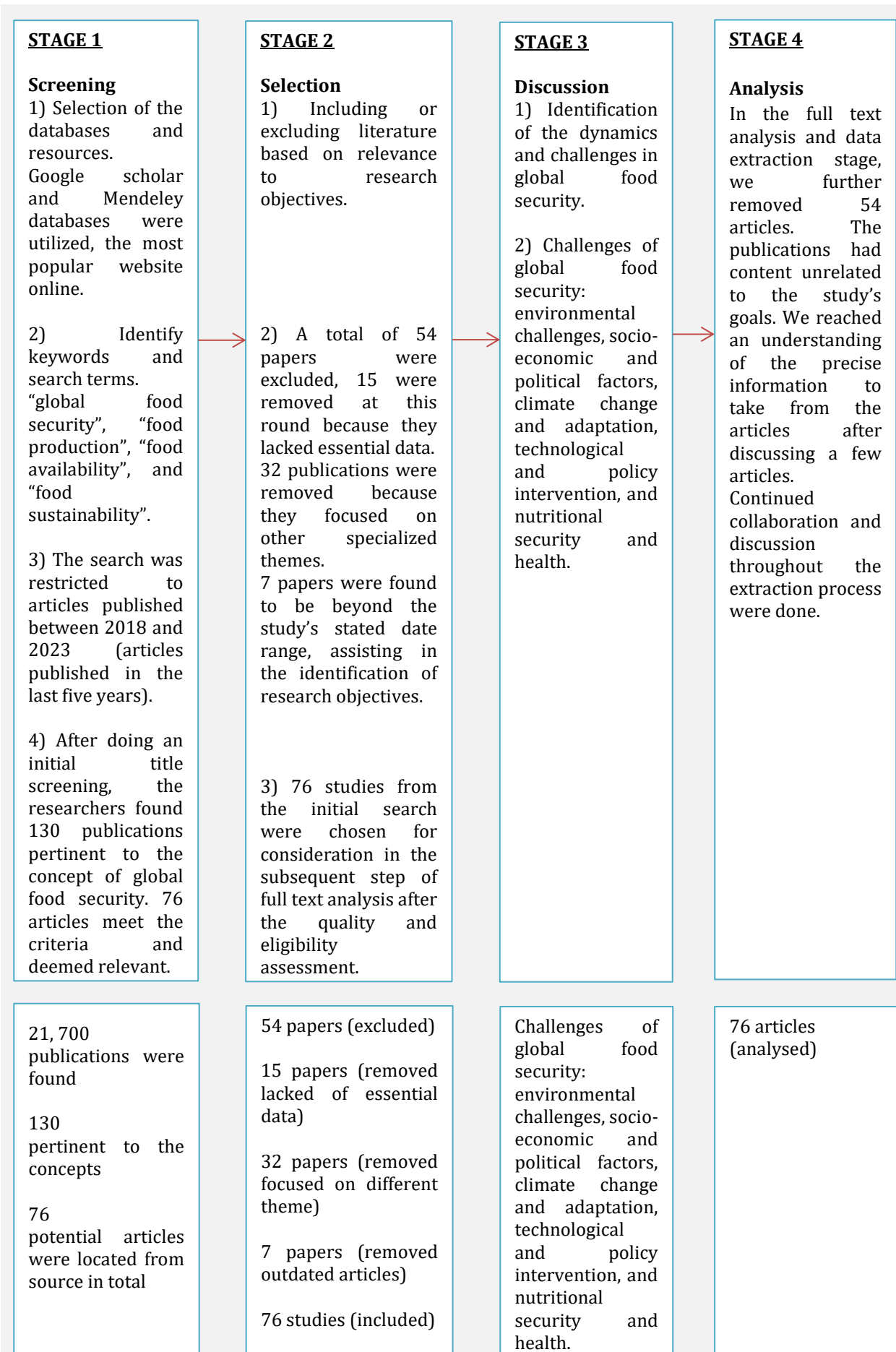


Figure 1. Outlining process of screening, selection, and analysis of literature.

2.3. Screening for Inclusion

To ensure a comprehensive review, abstracts of the 130 papers were carefully examined for their relevance to the systematic review of global food security issues. Only peer-reviewed publications from 2018 to 2023 were included. Seventy-six articles meeting inclusion criteria and deemed relevant based on abstracts were further assessed for quality by obtaining and analyzing their full texts.

2.4. Quality and Eligibility Assessment

Full-text articles from reputable academic journals and websites were evaluated for eligibility and quality, with a focus on trustworthy and credible sources. Articles lacking accurate scientific identification of the research objective or unrelated specialized themes were excluded. After careful reading and analysis, 54 papers were excluded, 15 lacked essential data, 32 focused on different themes, and 7 were outside the study's specified date range. The remaining 76 studies from the initial search proceeded to the next step of full-text analysis.

2.5. Data Extraction and Analysis

The reviewers extracted specific quotes related to research gap explanations from each article during the full-text analysis and data extraction stage. Fifty-four articles with content unrelated to the study's goals were subsequently removed. Through ongoing collaboration and discussion, the reviewers reached a clear understanding of the information to be extracted from the articles.

3. Results and Discussion

3.1. Dynamics of Global Food Security

Global food security, defined as a state where all individuals have access to sufficient, safe, and nutritious food for an active and healthy life, faces numerous challenges. These challenges are exacerbated by factors such as climate change, population growth, economic shocks, and pandemics. This systematic review of literature explores the dynamics and determinants of global food security, focusing on how these factors interact to shape food availability, access, utilization, and stability. The review integrates perspectives from multiple authors, presenting a comprehensive understanding of the intricate challenges and potential solutions to achieving global food security.

3.1.1. Climate Change and Food Security

Climate change significantly impacts global food security by inducing shocks such as droughts, floods, and extreme heat, which disrupt food production and access, particularly in developing countries with limited resources to adapt (Agrawal *et al.*, 2023). These events pose a threat to the stability of food supplies, highlighting the need for robust adaptive strategies (Duchenne-Moutien and Neetoo, 2021). Climate change exacerbates soil erosion, water scarcity, and reduces agricultural productivity, making it crucial to develop sustainable agricultural practices to mitigate these effects (Newell *et al.*, 2019; Rhodes, 2014; Setsoafia *et al.*, 2022). Additionally, temperature increases have already led to reduced global maize and wheat yields, with future climate changes potentially increasing vulnerability (Hansen, 2022).

3.1.2. Population Growth and Food Demand

The global population is projected to reach 9.7 billion by 2050, significantly increasing the demand for food (Sekaran *et al.*, 2021). This surge in population necessitates a 70% increase in food production, posing a challenge to current agricultural systems (Cole *et al.*, 2018). Smallholder farmers and landless families in low- and middle-income countries are particularly vulnerable to food insecurity due to their limited capacity to scale up production (Sekaran *et al.*, 2021). Moreover, the shift toward animal protein consumption further strains resources and impacts food production dynamics (How *et al.*, 2020). The increasing global population and changing dietary patterns also emphasize the need for sustainable intensive farming to meet demand without environmental harm (Fróna *et al.*, 2019).

3.1.3. Economic Shocks and Food Systems

Economic shocks, such as those induced by the COVID-19 pandemic, have disrupted food availability, accessibility, and consumption patterns worldwide (Boyacı-Gündüz *et al.*, 2021; Fadillah *et al.*, 2021; Wang and Do, 2023). The pandemic exposed the fragility of food systems, leading to reduced domestic production, food shortages, and increased prices, particularly affecting countries with low per capita income (Boyacı-Gündüz *et al.*, 2021; Yulianti *et al.*, 2021). These disruptions highlight the need for resilient and adaptive food systems capable of withstanding global crises (Béné, 2020; Farcas *et al.*, 2020). Moreover, projections indicate that increased food insecurity rates across the U.S. and globally are expected due to the pandemic (Gundersen *et al.*, 2021).

3.1.4. Global Trade and Food Security

Global food security is heavily influenced by international trade networks. With approximately 80% of people living in net food-importing countries, disruptions in global trade can have severe implications for food availability (UN.ESCAP, 2018). The reliance on a few key suppliers in regions like Asia-Pacific has increased vulnerability to supply chain disruptions, underscoring the importance of diversifying sources and building resilient trade networks (Barthel *et al.*, 2019). The dynamics of global food trade practices often lead to asymmetrical flows of food commodities, reducing options for achieving food security and diminishing national sovereignty (Barthel *et al.*, 2019).

3.1.5. Sustainable Agricultural Practices

Adopting sustainable agricultural practices (SAPs) is crucial for enhancing food security in the face of climate change and resource limitations (Setsoafia *et al.*, 2022). These practices include improved seed varieties, soil and water conservation techniques, and agroecological approaches that enhance productivity while protecting the environment (Kookana *et al.*, 2020; Schoor *et al.*, 2023). Long-term support for research and development in agriculture is necessary to innovate and implement these practices effectively (Kaini, 2020; Joshi *et al.*, 2023). Implementing SAPs can significantly impact farm income and food security, particularly in developing countries (Setsoafia *et al.*, 2022).

3.1.6. Food Security and Nutrition

Food security is not only about availability but also about access, utilization, and stability. Ensuring reliable and consistent food sources is essential for an active and healthy life, along with the resources needed to acquire food (McKay *et al.*, 2019; Wahbeh *et al.*, 2022). The interconnections between food security and other Sustainable Development Goals (SDGs) emphasize the need for integrated policies that address both hunger and malnutrition (Fróna *et al.*, 2019; Gil *et al.*, 2019). Despite efforts to increase food availability and accessibility, many in marginalized societies remain malnourished and impoverished, indicating persistent food security issues (Samkange *et al.*, 2021).

3.1.7. Vulnerability of Food Systems

The vulnerability of food systems to external shocks such as climate change, economic crises, and conflicts highlights the need for coordinated research and policy efforts (Mehrabi *et al.*, 2022; Ouko and Odiwuor, 2023). These efforts should aim to design resilient food systems capable of withstanding and recovering from such shocks (Kogan *et al.*, 2019; Tanyanyiwa, 2021). Urbanization also plays a critical role, as it can either strain agricultural resources or, if managed well, enhance agricultural productivity and sustainability (Tripathi and Kaini, 2023; Wang *et al.*, 2021). The impact of urbanization on agriculture and water resources is a key factor influencing global food security (Kookana *et al.*, 2020).

3.1.8. Policy and Governance

Effective governance and policy interventions are crucial for addressing the multifaceted determinants of food security (Bangira, 2018; Rahman *et al.*, 2022). Policies should focus on improving agricultural productivity, ensuring equitable distribution of resources, and supporting vulnerable populations (Gunaratne *et al.*, 2021; Samkange *et al.*, 2021). Collaborative actions at local, national, and global levels are essential to tackle core challenges such as affordability, availability, and quality of food (How *et al.*, 2020). Additionally, government policies favoring industry and service sectors over agriculture can negatively impact food security, highlighting the need for balanced and supportive agricultural policies (Gunaratne *et al.*, 2021). Addressing global food security requires a holistic and integrated approach that considers the interplay of climate change, population dynamics, economic shocks, and sustainable agricultural practices. The insights from various studies highlight the complexity of achieving food security and underscore the need for resilient, adaptive, and sustainable food systems. Collaborative efforts, innovative practices, and effective policies are essential to overcome the challenges and ensure that food security is maintained for all populations, especially the most vulnerable.

3.2. Challenges of Global Food Security

Global food security continues to be a pressing concern, confronted with a range of obstacles exacerbated by the increasing population, climate fluctuations, socio-economic gaps, and geopolitical uncertainties. This comprehensive literature review explores the diverse factors influencing food security on a global scale. The examination underscores the intricate relationships among environmental pressures, economic conditions, policy structures, and technological progressions. Through the integration of findings from multiple research works, this review seeks to offer a thorough comprehension of the present status and potential strategies for achieving global food security.

3.2.1. Environmental Challenges

Food production systems are heavily influenced by environmental stressors such as climate change, land degradation, and water scarcity. These issues are exacerbated by unpredictable weather patterns, soil degradation, and loss of biodiversity (Bangira, 2018; Tacoli, 2019). Climate change, in particular, disrupts agricultural yield and income growth, posing significant threats to food security (UN.ESCAP, 2018; Raza *et al.*, 2019). Erratic rainfall patterns and climate-induced droughts further threaten food security, emphasizing the need for diversified and resilient agricultural systems (Tanyanyiwa, 2021). To address these challenges, adaptive strategies focusing on water-efficient practices and improved nutrient management are crucial (Malhi *et al.*, 2021).

3.2.2. Socio-Economic and Political Factors

Socio-economic disparities and political instability significantly impact food security. Rapid urbanization, competition for arable land, and socio-economic inequalities contribute to food insecurity (Ouko and Odiwuor, 2023; Shcherbakova and Shcherbakov, 2018). Additionally, geopolitical conflicts and governance failures exacerbate food insecurity, particularly in regions like Sub-Saharan Africa, where food systems are fragile (El Bilali *et al.*, 2019; Mehrabi *et al.*, 2022). The COVID-19 pandemic has further highlighted these vulnerabilities, with market closures and supply chain disruptions leading to increased food insecurity (Béné, 2020; Tripathi and Kaini, 2023).

3.2.3. Agricultural Productivity and Resource Management

The sustainability of food production is challenged by critical resource constraints such as water scarcity and soil degradation (Rhodes, 2014; Drammeh *et al.*, 2019). Smallholder farmers face obstacles like low farm gate prices and limited profitability, which hinder food security and income generation (Giller, 2020). Strategies to improve agricultural productivity include sustainable resource management, investment in agricultural research and biotechnology, and adoption of advanced technologies (Farcas *et al.*, 2020; Pu and Zhong, 2020).

3.2.4. Food Waste and Supply Chain Disruptions

Food wastage and supply chain disruptions contribute significantly to global food insecurity. Issues such as natural disasters, logistics delays, and price variations disrupt food supplies and lead to wastage (Daszkiewicz, 2022; Joshi *et al.*, 2023). The loss of domestic production capability in countries reliant on food imports further compounds these challenges (Barthel *et al.*, 2019). Addressing these issues requires enhancing resilience in food systems and promoting fair trade practices (Gunaratne *et al.*, 2021).

3.2.5. Climate Change and Adaptation

Climate change poses a substantial risk to global food security by affecting crop yields and increasing the prevalence of foodborne diseases (Duchenne-Moutien and Neetoo, 2021). Rising temperatures and altered precipitation patterns exacerbate threats to food security, particularly in vulnerable regions (Newell *et al.*, 2019). Effective adaptation strategies include climate-smart agriculture and policies that balance increasing agricultural production with mitigating climate change (Hansen, 2022).

3.2.6. Technological and Policy Interventions

Technological advancements and policy interventions play crucial roles in addressing food security challenges. Enhancing food system resilience through innovations in agricultural practices and improved communication and collaboration among local growers are essential (Schanbacher and Cavendish, 2023; Schoor *et al.*, 2023). Additionally, policies aimed at supporting small-scale food producers and ensuring the right to food are vital (Gunaratne *et al.*, 2021).

3.2.7. Nutritional Security and Health

Ensuring nutritional security involves addressing issues of malnutrition and food quality. Rising food prices in developing countries can lead to inadequate nutrition, particularly affecting vulnerable populations like children (Drammeh *et al.*, 2019; Kogan *et al.*, 2019).

Strategies to enhance food system resilience include integrating gender equity, social justice, and regionalized food distribution networks (Schipanski *et al.*, 2016). Global food security faces multifaceted challenges that require coordinated efforts across various sectors. Addressing these challenges involves environmental conservation, socio-economic reforms, technological innovation, and robust policy interventions. By integrating sustainable practices, enhancing resilience, and promoting equitable food systems, it is possible to ensure food security for all in the face of evolving global challenges.

4. Conclusion

Global food security is a complicated issue affected by various factors like climate change, population growth, economic shocks, and geopolitical instability. These factors interact to affect food availability, access, utilization, and stability. Climate change worsens food insecurity through events like droughts and floods, while population growth increases the need for more food. Economic crises, like those seen in the COVID-19 pandemic, show how vulnerable food systems can be, and global trade relationships make food security even more complex. To tackle these challenges and create a strong global food system that can provide enough safe and nutritious food for everyone, sustainable farming methods, and effective policies are crucial.

5. Recommendations

To effectively address global food security challenges, it is important to take a comprehensive approach that focuses on sustainable farming practices, strong policy frameworks, and innovative technologies.

Governments and international organizations should prioritize climate-smart agriculture and invest in research to improve crop resilience and productivity. Policies need to support small-scale farmers, ensure fair distribution of resources, and promote gender equality and social justice in food systems. It is also vital to improve supply chain management and reduce food waste to enhance food system resilience.

Collaboration at local, national, and global levels is crucial to establishing a sustainable and fair food system that can withstand environmental and economic uncertainties, ensuring food security for all, especially the most vulnerable populations. These recommendations, drawn from articles, are intended to inform future actions and policy decisions in the critical realm of global food security.

Declarations

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