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## A systematic review of progress in food security research and implications for achievement of the UN's zero-hunger goal in Bangladesh

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# ENVIRONMENTAL RESEARCH FOOD SYSTEMS



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## A systematic review of progress in food security research and implications for achievement of the UN's zero-hunger goal in Bangladesh

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Supplementary material for this article is available [online](#)

### Abstract

Despite numerous policy initiatives to achieve food security, more than 2 billion people are food insecure across the world. Food security research can help addressing food insecurity effectively by summarizing the state of knowledge and providing future research direction to make sure no one is left behind. Yet, there are no comprehensive studies of food security research in Global South countries such as in Bangladesh, where nearly one-third of the population is food insecure. Here, this systematic review aims to identify the progress, gaps, and future research directions for food security in Bangladesh by investigating current research trends and the influence of socioeconomic and environmental drivers on food security and recommend policy interventions for achieving the zero-hunger goal of the Sustainable Development Goals (SDGs). We systematically reviewed articles both quantitatively and qualitatively and summarized the trends, methods, challenges, and opportunities of food security research in Bangladesh. Our findings reveal that longitudinal trends and inequality in food security across administrative and agroecological zones are underexplored. Moreover, most studies focused on the influence of socioeconomic drivers, with insufficient attention to environmental drivers, and none examined the causal relationships among them. The access and availability dimensions of food security are the most studied, while stability and utilization are the least addressed in food security research. Addressing these gaps is essential for establishing a sustainable food system that may help Bangladesh achieving the SDG target of ending hunger (SDG 2) and ensuring no one is left behind.

## 1. Introduction

The Sustainable Development Goals (SDGs) constitute the most recent global development agenda. The second of these 17 goals focuses on eradicating hunger, ensuring food security, improving nutrition and promoting sustainable agriculture (UN 2015, Hurduzeu *et al* 2022). Food security has been the major driver of social and environmental changes since the beginning of human history (Sassi 2018). At the 1996 World Food Summit, the Food and Agriculture Organization (FAO) defined food security as 'it exists when all people, at all times, have social, physical, and economic access to sufficient, safe, and nutritious food which meets their dietary needs and food preferences for an active and healthy life' (FAO 1996, p 2). Initially, the term referred to whether a country had access to enough food to provide the required dietary energy (Pinstrup-Andersen 2009). Later, the focus shifted from supplies at the national level to access at the household level (Maxwell and Smith 1992).

Despite numerous policy initiatives such as the Millennium Development Goals (MDGs) and the SDGs, the world is on the edge of a global food crisis (UN 2022, Wegren 2023). In 2022, around 2.4 billion (29.6%) people in the world were food insecure, of which 900 million (11.3%) were severely food insecure (FAO *et al* 2023, Kim *et al* 2023, Azimi and Rahman 2024). Thus, we see that the goal of zero-hunger is very challenging

(FSIN 2023, Peng *et al* 2023), and the world may not be moving in the right direction to reach it by 2030 (FAO *et al* 2023, Oluwole *et al* 2023). Furthermore, the growing world population, rising food prices, changing climate, and environmental stressors may significantly impact food security in the coming decades (IFPRI 2023, Otekunrin 2023).

Although Asia has improved food security, nearly half of the world's food insecure people (1.14 billion) lived in Asia in 2022 (FAO *et al* 2023, Odongkara 2024). Southern Asia has the highest numbers within Asia, with 809 million (40%) food insecure people (Sassi 2018, FAO *et al* 2023). Of the South Asian countries, Bangladesh has made remarkable improvements in food security since its independence in 1971 (WFP 2004, Alam *et al* 2018). In particular, it made highly commendable progress towards eradicating extreme poverty and hunger (Goal 1 of the MDGs), especially considering its large population and the natural hazards that have struck Bangladesh (Rahman 2017), including a famine in 1974, disastrous floods in 1987 and 1998, and cyclones in 1991 and 2008 (Shah *et al* 2022), which pushed many poor and marginalized people into food insecurity. Despite the significant production of food grains, challenges such as population growth and natural hazards (Alam *et al* 2018, Parven *et al* 2022), as well as Covid-19, have further increased food insecurity in Bangladesh (Mobarok *et al* 2021). Despite food security is given highest priority to achieve SDG 2 by 2030 (Hossain *et al* 2020), between 2020 and 2022, approximately 52.70 million people in Bangladesh, representing 31.1% of the population, faced food insecurity. Of the total, 18.70 million, equivalent to 11%, suffered from severe food insecurity (FAO *et al* 2023, Das *et al* 2024).

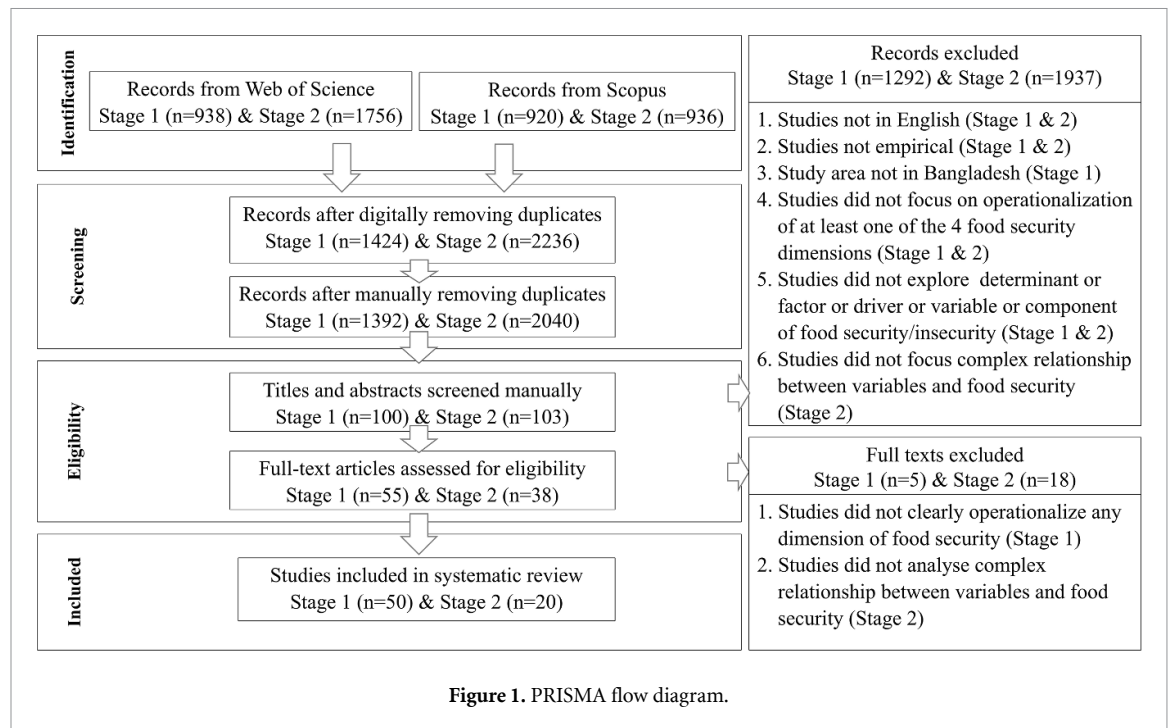
Considering the growing need of the population (171 million) for producing and securing food, previous research significantly focused on research around food production. Most empirical research on food security has focused on food production (yield) from the agricultural perspective and on the relationship between food security and socioeconomic or environmental factors such as health and education (Alam *et al* 2018), women's literacy (Harris-Fry *et al* 2015), migration (Romano and Traverso 2020), remittances (Shah *et al* 2022), microcredit (Bidisha *et al* 2017), natural hazards (Parven *et al* 2022, Shah *et al* 2022), and soil salinity (Szabo *et al* 2015, Lam *et al* 2022).

Though food security is one of the most densely researched, previous review studies did not systematically synthesized advancements, identified the gaps and provided future research direction in food security research in Bangladesh. Therefore, the scope of this study is to identify current food security research trends, investigate social and environmental influences on food security and provide research gaps and policy implications toward achieving the SDG zero-hunger goal. In particular, we investigated the extent to which socioeconomic and environmental variables that influence food security and their relationships are integrated into food security research. Social and environmental drivers such as climate change, land use change, population, governance, and conflicts impose challenges to food security from the local to the global scale (Hendrix and Brinkman 2013, Shah *et al* 2022). Thus, identifying and understanding these variables and their relationships are essential (Kopteva *et al* 2019). This understanding may help policymakers to mitigate the drivers of food insecurity (Wang *et al* 2021). For example, the causal relationships among social, and environmental variables and food security may prompt policymakers to formulate policies using a holistic social-environmental system approach to achieve food security (Roy *et al* 2024). We posed the following research questions:

1. What are the current trends in research on food security in Bangladesh?
2. To what extent have the social and environmental influences on food security been considered in the reviewed studies?
3. What are the research gaps and areas where food security research could be improved?
4. What are the implications of this research for the goal of zero-hunger by 2030?

## 2. Method

We conducted a systematic literature review of the research on food security to find, select, and synthesize all available literature (Kitchenham and Charters 2007, Turney 2022). We focused on studies that measured food security and analyzed the influence of social, economic, and environmental drivers on it. The review had two stages (figure 1). Stage 1 focused on Bangladesh, but it became clear that the social-environmental causes of food insecurity have not been studied adequately. So, we extended our review to countries across the globe in Stage 2. We followed the PRISMA (preferred reporting items for systematic reviews and meta-analysis) guidelines (Moher *et al* 2009), which are useful for articulating the objectives and research questions of a review (Tate and Douglas 2011). Figure 1 outlines the procedure.



## 2.1. Databases and search terms

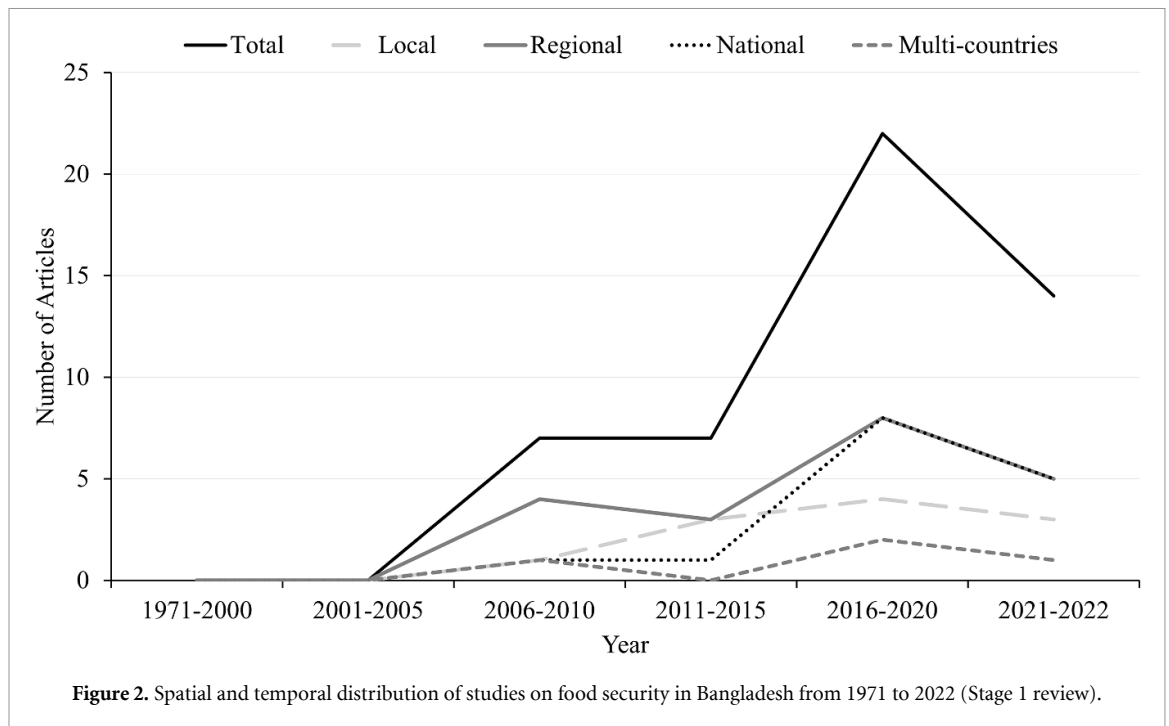
We searched the literature through the Web of Science (core collection) and Scopus. These are considered the main sources of data citation (Mongeon and Paul-hus 2016) and the most extensive research databases (Chadegani *et al* 2013). Generally, the Web of Science finds the most items in most journals, while Scopus has the fewest inconsistencies because it performs more checks on the content and quality of literature (Basak *et al* 2021, Adriaanse and Rensleigh 2013). Both databases were accessed between April and August 2022. The Stage 1 search covered research from 1971 to 2022 on food security in Bangladesh. Only peer-reviewed empirical articles published in English were considered. In both stages, we looked for articles that operationalized one or more food security dimensions: availability, access, utilization, and stability (Pinstруп-Andersen 2009, Ville *et al* 2019).

In Stage 1, the following search terms were used to screen titles, abstracts, and keywords: ('food security' OR 'food insecurity' OR hunger OR starvation OR 'food deprivation' OR 'food scarcity' OR 'food shortage' OR malnutrition OR 'food availability' OR 'food access' OR 'food utilization' OR 'food stability') AND (factor\* OR driver\* OR determinant\* OR indicator\* OR variable\* OR component\*). The initial screening (Stage 1) indicated that causal relationships had not been considered in Bangladesh's food security research. Thus, in Stage 2, we extended the search to other countries. Stage 2 used all the same search terms as Stage 1, plus terms for causal relationships (causality OR causation OR feedback\*).

## 2.2. Screening

The Stage 1 search returned 1858 articles (938 from the Web of Science and 920 from Scopus). Bibliographic details were imported to both EndNote and Microsoft Excel. Duplicates were removed digitally using EndNote and confirmed using Excel. This reduced the number of articles to 1424. The bibliographic details were also checked manually for false positives (Kwon *et al* 2015). This manual removal of duplicates reduced the number of articles to 1392. Finally, we manually screened the title, keywords, and abstract of each article for the criteria listed in figure 1. This reduced the number to 100, as most studies did not operationalize any food security dimensions. After examining the full text of 55 articles, we included 50 articles to review. The list of articles has been included in the supplementary information-1 (SI-1).

The Stage 2 search returned 2692 articles (1756 in the Web of Science and 936 in Scopus). After duplicate articles were digitally removed, 2236 remained. This was reduced to 2040 by manually removing duplicates. After screening titles, keywords, and abstracts we had 103 because most articles did not operationalize any of the food security dimensions or investigate causal relationships influencing food security. We ended up with 20 articles to review after examining the full text of 38 articles. These 20 articles (SI-2) measured food security using indicators and addressed causal relationships.



### 2.3. Qualitative and quantitative analysis

In both Stages 1 and 2, qualitative and quantitative analysis were conducted. First, the extracted bibliographic information from selected articles was organized under categories such as journal information, the scope of the study, methodology, food security aspects, and relationship type. Categories (fields) were added for research focus, findings, gaps, limitations, and policy implications. This was done to support both qualitative and quantitative analysis (Amin *et al* 2020). Second, categories were subdivided into subcategories. Major categories, such as the scope of the study, were subdivided into the study area, spatial (local, regional, national, and multi-countries), and temporal (weekly, monthly, yearly, and historical). The concept of food security has spatial and temporal dimensions (Hoddinott 1999). We categorized the scale of studies as national (covering the whole country) (Islam *et al* 2022), regional (carried out in multiple locations within the country) (Ahmad *et al* 2013), or local (carried out in a particular area of the country) (Munro *et al* 2014). Food security-related information was subdivided into food security dimensions (availability, access, utilization, and stability), measuring indicators, variables, and types of variables (social, economic and ecological). The social (e.g. age), economic (e.g. income) and ecological (e.g. rainfall) variables were considered in the analysis. Analysis was carried out using Microsoft Excel and RStudio.

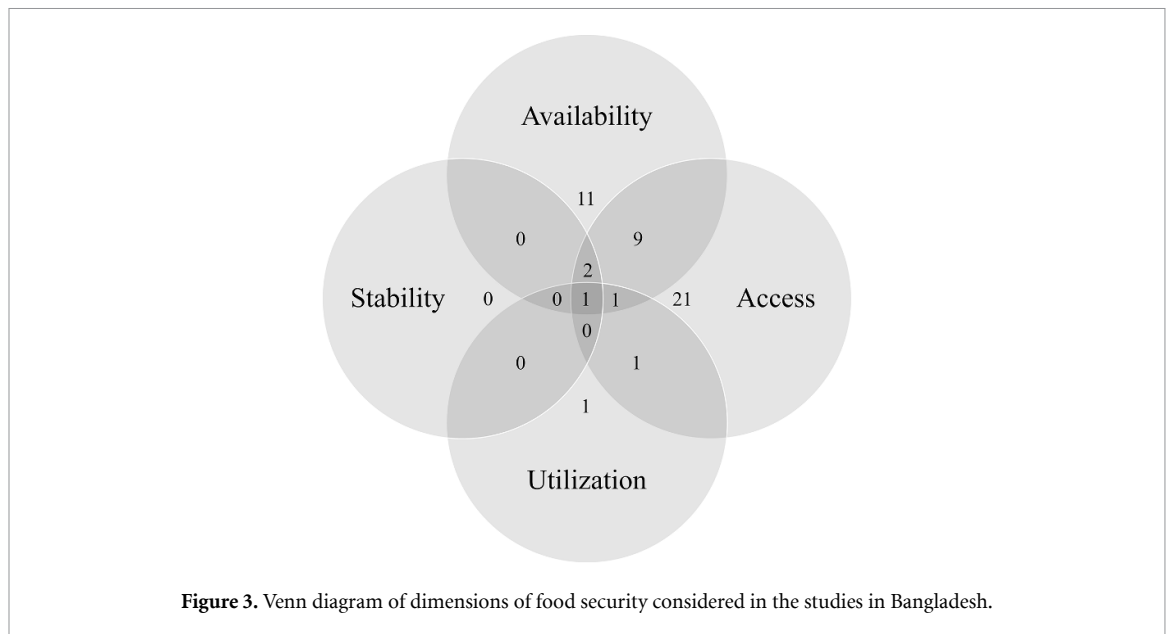
## 3. Results

### 3.1. Spatial and temporal scale of food security research

This section of the review focused on the 50 articles examining research on food security in Bangladesh (Stage 1). Of the 50 manuscripts, 49 were empirical research reports, and 1 was a book chapter. Figure 2 shows the spatial coverage of these articles. Most of them focused on the regional level (20), followed by national (15) and local (11). Four considered multiple countries.

We found no research on food security in Bangladesh between 1971 and 2005 that met our inclusion criteria. Some appeared after 2005, and there was a rapid increase after 2010. Most of the studies (29) were published between 2011 and 2020, and about half (14) were published in 2021 or 2022. Perhaps this was due to realizing the importance of food security during the Covid-19 pandemic. Most of the studies used cross-sectional data (30) as opposed to longitudinal data (18). We saw only one study that considered food security changes across both administrative and agroecological zones over time.

As mentioned, Stage 2 identified 20 articles that operationalized some food security dimensions and analyzed causal relationships between food security and social, economic, and environmental variables. Regarding spatial coverage, only two of these 20 articles focused on the local level, two on the regional level, eleven on the national level, and five on multiple countries. Of these latter, two were global, and three were regional (Sub-Saharan, East Africa, and South Asia). In terms of geographic distribution, studies on Africa were the greatest in number (10), followed by Asia (7) and North America (1). Of the seven studies on Asia,



three were conducted in China, two in India, one in Malaysia, and one covered South Asia. Most of the studies used longitudinal data (18) as opposed to cross-sectional data (2).

### 3.2. Current trends in research on food security

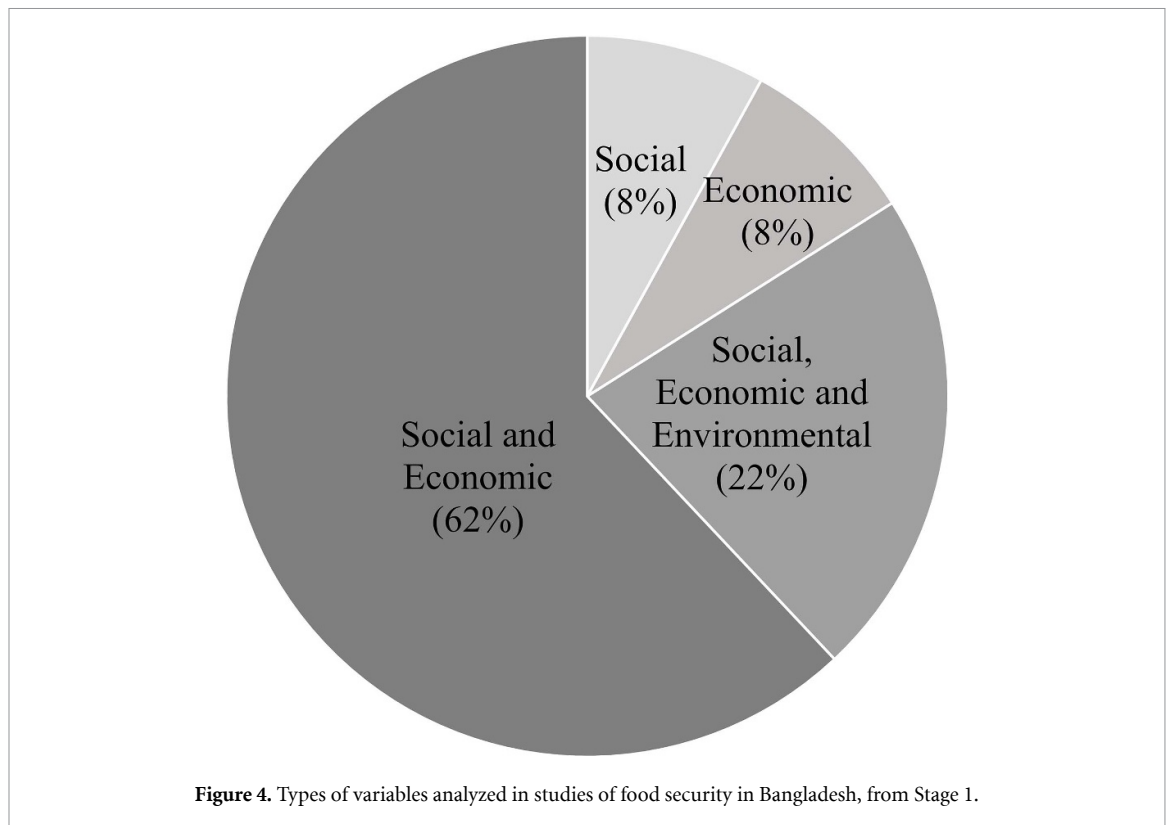
We find that research on food security in Bangladesh started in the early 70s and mostly focused on nutrition from the health science perspective. However, studies focused on measuring the dimensions of food security (e.g. availability, access, utilization, and stability) appeared after 2005. Most of these (39) focused on the influence of socioeconomic drivers or determinants; fewer (11) considered environmental drivers. For example, Alam *et al* (2018) found that the household head's education and agricultural land size influence household food security positively, and the household head's age and family size influence it negatively. Some studies focused on challenges to food security during the Covid-19 pandemic (5), the food security of women (5), climate impacts on food security (6), and seasonal challenges to food security (4). Only four discussed food security trends in Bangladesh (Rahman 2010, 2017, Soesbergen *et al* 2017, Hasan *et al* 2019). However, none explored inequality in food security.

#### 3.2.1. Dimensions, approaches, and measuring indicators of food security

Figure 3 shows the number of articles identified for each dimension of food security we studied. The most common is access (21), followed by availability (11), and then access plus availability (9). Three studies discussed three of the dimensions, and one study discussed all four. None of the studies discussed stability alone, but three discussed it alongside other dimensions.

The studies used various measures of food insecurity. The approach of the United States Agency for International Development (USAID) was the most common (14), followed by the FAO (8), the World Food Program (WFP) (5), the International Food Policy Research Institute (IFPRI) (4), and the World Bank (WB) (3). Many studies (e.g. Raihan *et al* 2018, Das *et al* 2020) used the USAID approach, which emphasizes perceived financial access to food on the Household Food Insecurity Access Scale (HFIAS). The FAO approach, such as calorie consumption (e.g. Soesbergen *et al* 2017) and lack of food access due to resource constraints (Ahmed *et al* 2021) often use the FIES (Food Insecurity Experience Scale) depending on the aim of the research. Some studies (Bidisha *et al* 2017, Romano and Traverso 2020) use the WFP's Food Consumption Score, which focuses on the frequency of consumption of different food groups with a given standard weight. The IFPRI approach (Szabo *et al* 2015) measures food insecurity by the percentage of total household expenditure that goes to food and by total daily calorie availability. The WB's Direct Calorie Intake method, which considers the total calorie intake of an individual, is also used (Hossain *et al* 2020); it is also used to measure poverty. Just three studies used the approach of the United States Department of Agriculture, which looks at the gap between required and actual food consumption (Bala and Hossain 2010). The approach of the Organization for Economic Cooperation and Development, which uses an equivalence scale (Islam *et al* 2016), was also used.

Different indicators measure the different dimensions of food security. Fourteen indicators were used in the Bangladesh food security studies, including household food supply, per capita calorie intake, per capita



food expenditure, and dietary diversity. Access was mainly measured by six indicators, while availability and utilization were measured by three and stability by two. The most frequent indicators of access were anxiety and uncertainty about household food supply, quality of food, and food intake (11 instances), per capita calorie intake (8), and per capita food expenditure (5). To measure availability, household calorie availability was used ten times, food production six times, and per capita consumption five times. Dietary diversity was used to measure utilization, and the cereal import dependency and self-sufficiency ratios were used to measure stability. See SI-3 for a full list.

### 3.2.2. Variables influencing food security in Bangladesh

The 50 studies on food security in Bangladesh used 451 different variables (figures 4 and 5). The influence of both social and economic variables was studied most (31 instances), followed by social, economic, and environmental variables (11). Four studies used social or economic variables only (figure 4). Environmental variables that affect food security mentioned in the articles we reviewed were farmland size (Parvez *et al* 2022), natural hazards (Shah *et al* 2022), salinity (Szabo *et al* 2015, Lam *et al* 2022), rainfall (Rahman 2017, Shah *et al* 2022), and agriculture land use (Rahman 2010, Chen and Lu 2018) (for a list, see SI-4 and SI-5). Of the social variables, the most common was the household head's education (28 instances), followed by family size (25), farm size (23), household gender (20), age (18), and income (15) (figure 5).

### 3.3. Methods used in the analysis of the effects of social and environmental variables in food security research

Of the studies we reviewed, 46 used quantitative, three used qualitative approaches (Ninno *et al* 2007, Munro *et al* 2014, Lam *et al* 2022), and one used a mixed approach (Parven *et al* 2022). Most of the studies (26) relied on secondary data collected from various sources (e.g. government and international agencies); 22 used primary data collected from interviews (15), questionnaire surveys (5), and telephone surveys (2). Only two studies (Islam *et al* 2016, Parven *et al* 2022) used both primary and secondary data. Primary data are limited to a specific locality, which may not represent a larger population (Farrukh *et al* 2020). Secondary data are more representative, generalizable, and cost-effective (Johnston 2014). Most of the quantitative studies (40) used regression modelling, such as binary logistic regression or multinomial logistic regression. Qualitative methods (e.g. interviews, focus group discussions) are rare in food security research (Lam *et al* 2022).

We found in Stage 1 that most studies on food security in Bangladesh (48) analyzed effects on food security from a correlational perspective. In Stage 2, we identified 19 studies that investigated causal relationships between social and environmental variables and food security. Vector autoregressive models

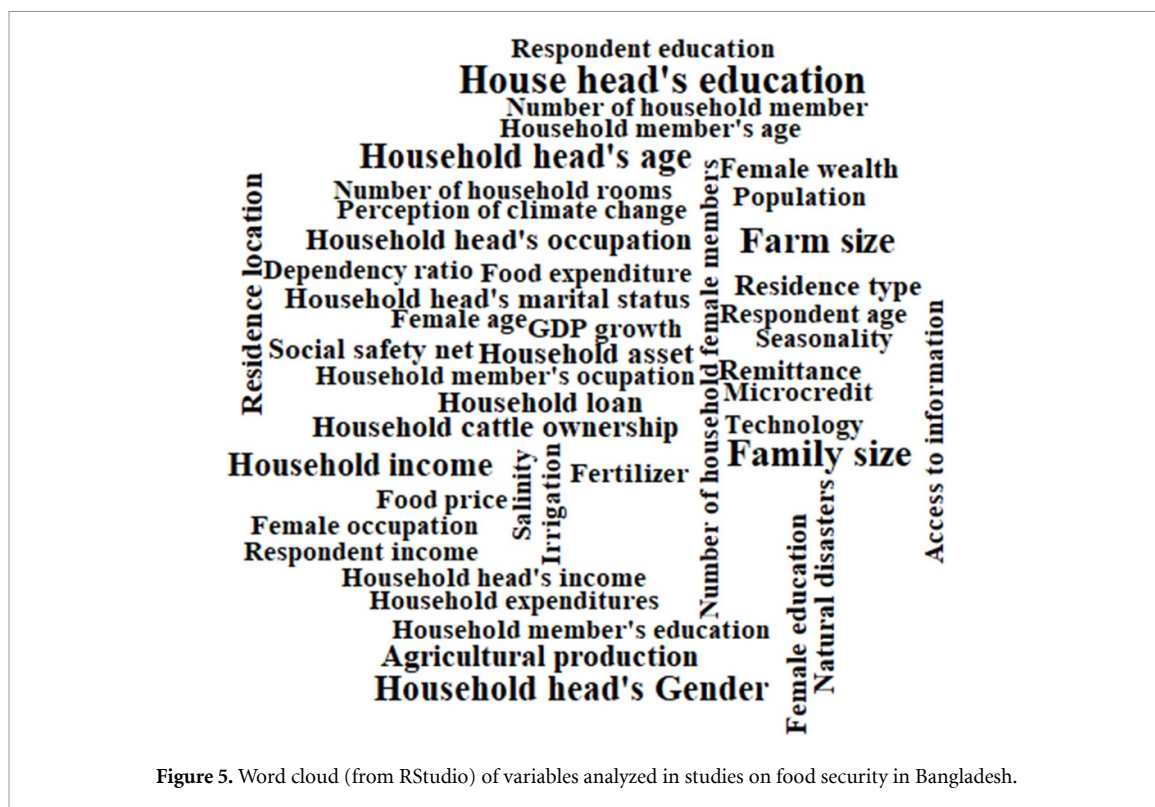


Figure 5. Word cloud (from RStudio) of variables analyzed in studies on food security in Bangladesh.

and the Granger causality test (Granger 1969) were the most common methods. These methods have been applied to time series data to analyze relationships between carbon dioxide emissions and agricultural production in Nigeria (Edoja *et al* 2016), between economic growth and nutrition intake (Ghosh 2018), and between price and food-grain production in India (Laha and Sinha 2021).

#### 4. Discussion

Our review identified numerous persistent knowledge gaps and methodological challenges in food security research.

##### 4.1. Knowledge gaps and methodological challenges in food security research

The geographic focus of most of the reviewed studies was local, regional, or national. Food security varies with location. Food security at a national level does not always match food security at the individual or household level (Islam 2017, Alam *et al* 2018). Although most food security research has focused on geographic location, the focus of the analysis on agroecological zones is rare. Only one study (Rahman 2017) analyzed food security (production of crops) across agroecological zones, finding that food availability is higher in the Karatoa floodplain and the Atrai basin and lower in the Ganges tidal floodplain. None of the studies explored inequality and agroecology-based food security in Bangladesh, considering availability (energy availability and deficiency), access, utilization, or stability dimensions. Food security varies across agroecological zones (Quddus 2009) and Agroecological characteristics (e.g. climate, soil, water) help farmers choose their cropping portfolio and thus significantly influence food security (Rahman 2017).

The research in Bangladesh mostly used cross-sectional data. Only a few studies used longitudinal data (Islam *et al* 2022). Cross-sectional data are collected simultaneously to provide a snapshot of a specific time point and thus cannot establish temporal order; longitudinal data have a temporal order, which can help establish causal relationships (Warner 2018) and identify temporal changes (Hermanowicz 2013). Das *et al* (2020) used a cross-sectional survey to identify causes of food insecurity, claiming that such a survey reduces recall bias, as the data are collected immediately. However, Harris-Fry *et al* (2015) acknowledged that their cross-sectional study could not assess bias among nonrespondents.

The access and availability dimensions of food security were considered more than the utilization and stability dimensions. In addition, the previous studies mostly utilized food production (mainly crops) instead of food energy and were deficient (Smith and Subandoro 2007) when analyzing food security. Other review studies (Roy *et al* 2019, Farrukh *et al* 2020) have also found that utilization and stability are less studied in Bangladesh. Availability of and access to food are significantly influenced by variables such as



climate change, agroecology, technology, and remittances (Regmi and Paudel 2016, Rahman 2017). However, availability at the national level does not ensure access at the individual or household level (Alam *et al* 2018). There is no doubt about the importance of these two dimensions—the amount of food available to people and their access to it. However, these measures do not capture people’s dietary needs or food preferences. The utilization dimension covers food allocation, consumption, and consequent nutritional status (Nicholson *et al* 2021), which is a precondition for a healthy life. Furthermore, one of the indicators (2.1.1) of SDG 2, the prevalence of undernutrition, developed by the FAO, is a quantifiable and universally accepted indicator (Juliana *et al* 2019), which could be measured using food energy consumption and deficiency at a population and household level (Smith and Subandoro 2007). So, the utilization dimension is important (Bashir and Schilizzi 2013) and can be a benchmark for household nutritional status (Walls *et al* 2016). To explore the status of nutritious food that meets peoples’ dietary requirements, the utilization dimension needs to be incorporated into future food security research.

The studies we reviewed used various approaches and indicators for the various dimensions of food security. The USAID’s HFIAS was the most common, followed by the FAO’s FIES. The HFIAS measures lack of access rather than shortage of supply, using questions about household anxiety and uncertainty about access to and quality and quantity of food (Das *et al* 2020). Thus, the HFIAS tries to capture both the severity and frequency of food insecurity, whereas the FIES measures the severity (Cafiero 2020). Although these scales are helpful for estimating food insecurity at national levels, they do not consider the distribution of food insecurity within a country (Broussard and Tandon 2016), and they exclude peoples’ diet quality and vulnerability, which are essential aspects of food security (Smith *et al* 2006). Although the FIES can capture the complexity of food security, FIES data are not available for all countries (Juliana *et al* 2019). Critics say the HFIAS is not free from respondent recall bias, as the questionnaire asks about the quality and quantity of food available to the respondent in the previous month (Haque *et al* 2017) and that the FIES has measurement errors and fails to calculate nutritional inadequacy and shocks such as the global food crisis in 2008 (Headey and Ecker 2013, Rahman 2017). The IFPRI approach, used in a few studies, measures the access and availability dimensions of household food security by two major indicators: household total food expenditure and household daily calorie availability, mainly focusing on cross-section analysis in the coastal area of Bangladesh (Szabo *et al* 2015).

#### 4.2. Opportunities for future food security research

Measuring food insecurity is complicated, and conceptualizing it is difficult without appropriate approaches and indicators (Vaitla *et al* 2017). Different measurement approaches and indicators could provide different results, which could confuse us regarding the policy initiatives needed to address food insecurity and achieve the SDGs’ goal of zero-hunger by 2030. So, it is crucial to identify the appropriate methodology and indicators. Calorie-based approaches (such as the IFPRI) are useful because they measure the quantity and quality of food at the household level. A comprehensive set of environmental variables (such as climatic events, temperature, rainfall, and land use change) should also be given attention, as they significantly influence food security (Arshad and Shafqat 2012) and are under-studied in food security research in Bangladesh (Rahman 2017). Food security varies with time and place (Islam 2017), and it is important to consider its variation over time across regional and agroecological levels to confirm that no one is left behind. Based on the synthesis of the systematic review, future food security research focuses on the following questions:

- (1) What are the current trends and drivers of food insecurity in Bangladesh?
- (2) How does the inequality of food insecurity vary across administrative (including sub-national) and agroecological zones over time?
- (3) What are the best approaches and indicators of food insecurity in Bangladesh, considering the local and sub-national context?
- (4) What are the social, economic, and environmental variables or the system that influence food security?
- (5) Can we identify the causes of food insecurity in Bangladesh?
- (6) What are the implications for reducing food insecurity and achieving the SDGs’ goal of zero-hunger by 2030?

The next major challenge is, therefore, the availability and accessibility of household-level socioeconomic data and environmental data to fill in these research gaps. For instance, the HIES datasets do not provide environmental data such as rainfall and temperature. In such cases, data can be extracted from other sources. Regular monitoring of food security status would also help with progress toward SDG target 2.1 (Wester *et al* 2023). Research needs to consider the causal influence of socioeconomic and environmental variables on food security from a system perspective to provide policy guidance to ensure food system sustainability.

Bangladesh formulated the National Food and Nutrition Security Policy (NFNSP) in 1997 and last updated in 2022. The goal of the policy is to improve the country's food and nutrition security level required to achieve relevant SDG goals by 2030 (FPMU 2020). Despite several global (e.g. SDGs) and local (e.g. NFNSP Action Plan) policy initiatives (Mannan 2003), and commendable progress in achieving MDGs (Hossain *et al* 2017), achieving the SDG zero-hunger goal by 2030 would be very challenging as about 31% (FAO *et al* 2023, Das *et al* 2024) of people in Bangladesh were food insecure in 2022. Identifying food security drivers can provide policy recommendations to achieve SDG 2 (Shah *et al* 2022). The research gaps identified in this study would create opportunities for future research that can provide policy implications to complement the goal of NFNSP which eventually expedite the progress towards zero-hunger goal (SDG2). Furthermore, the holistic approach of accounting for social and environmental variables and their relationships could be considered for future policies on food security in the context of global and local environmental changes.

Future studies can fill the identified research gaps and provide effective policy recommendations that will reduce the causes of food insecurity, which in turn will reduce hunger, improve nutrition, and ensure food security for all people in Bangladesh. In particular, an understanding of the causal relationship is needed for effective policy decisions (Hossain *et al* 2017) that can enable policymakers to detect and intervene in the causes of problems (Selerio *et al* 2021), which could effectively help to achieve the zero-hunger goal.

## 5. Conclusion

We systematically review the advancements and identify the research gaps in food security research in Bangladesh. We identified several knowledge gaps. First, there is a missing analysis or investigation of trends and inequality of food security consideration from a longitudinal perspective. Food security has rarely been analyzed across both administrative and agroecological zones to examine the inequality of food security across the country. Third, the causal relationship between social and environmental variables on food security has not been explored yet. Finally, we see no studies on the utilization and stability dimensions of food security.

Some limitations could have arisen during the literature search. First, our search of the Web of Science and Scopus databases was limited to studies that operationalized food security in terms of food availability, access, utilization, and stability. Although agricultural production is important in food availability (Slimane *et al* 2016), research that focused on agricultural production was not considered if it did not operationalize food security. Future studies should consider including this factor. Second, this study focused on literature published in English and may have excluded articles in other languages such as Chinese, and Indian literature due to limited knowledge of other languages. However, we reviewed articles published in Bangla (the corresponding author's native language) but did not find any mentionable and relevant information. In addition, our review mainly focused on peer-reviewed articles due to the rigorous process of the peer review system, credibility and acceptability in science and policy. In South Asia, work on food security exists in non-English grey literature as government or NGO reports (Farrukh *et al* 2020) and may contain valuable information. Despite these limitations, this systematic literature review points to knowledge gaps in current research on food security in Bangladesh.

We find that all the relevant aspects of food security have not yet been studied. Future research should close these gaps to help establish a sustainable food system that can move Bangladesh toward the UN's target of ending hunger and ensuring access by all people to sufficient, safe, and nutritious food all year round by 2030.

## Data availability statement


All data that support the findings of this study are included within the article (and any supplementary information files).

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