Bulgarian Journal of Agricultural Science, 32 (No 2) 2026, 461–469

Food security policy transformation: A bibliometric analysis and global overview

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Abstract

Hariputra, A., Sastryawanto, H., Siswati, E. & Rozci, F. (2026). Food security policy transformation: A bibliometric analysis and global overview. *Bulg. J. Agric. Sci., 32*(2), 461–469

This research aims to analyze global food security policy through a bibliometric approach, using data from scientific databases such as Dimensions and Scopus. The focus of the research is to identify trends, dominant topics, and relationships between topics in food security literature, published between 2015 and 2024. The bibliometric analysis method used utilized VOSviewer software to map the network and keyword density in the related literature. The results show that issues such as "global food security" and "food security challenges" dominate in the literature. Meanwhile, topics such as "diversification of children's diets" and the impact of food security policies on "carbon emissions" are rarely discussed, despite their important relevance in the context of global food security. This research is expected to provide useful insights in the development of policies that are more effective and responsive to food security challenges in the future.

Keywords: global food security; food security challenges; diversification of children's diets; carbon emissions

Introduction

Food security has become one of the most pressing global issues of the 21st century. This is due not only to the increase in the world's population, which is expected to reach 9.7 billion by 2050, but also to global economic instability, which further deteriorates agricultural conditions, affects food prices, and threatens the resilience and stability of food production in various regions. Food security, which refers to the ability of a country or community to ensure that all people have access to sufficient, safe and nutritious food, is an important basis for sustainable development and societal well-being. In this context, governments and international organizations have sought to formulate policies that can ensure food security amidst these challenges (Viana et al., 2022).

The complexity of this issue cannot be taken lightly. Factors, such as food distribution system, economic security, food security and nutrition, as well as international trade policies play an important role in determining the level of food security of a country. An efficient food distribution system is crucial to ensure that food can reach consumers in a timely manner and in good condition (Smith and Gregory, 2013). In addition, a country's economic resilience affects its ability to cope with food price fluctuations and economic crises that may affect food supply (FAO, 2020).

Food safety and nutrition are also important aspects that should not be ignored. The availability of nutritious and safe food is directly related to public health and productivity (Beddington et al., 2012). Countries must ensure that food produced and distributed meets safety standards, and can fulfill the nutritional needs of the population. International trade

policies also affect food security, through the regulation of food exports and imports, and their influence on global prices, which can affect the stability of domestic food supply (Tubiello and Fischer, 2007).

With increasing global uncertainties caused by food distribution systems, economic instability, food security and nutrition, the need for strong and sustainable food security policies is becoming more urgent. (Warsame et al., 2024). These uncertainties not only affect food access locally, but also have significant global impacts on economic stability and public health. Therefore, a comprehensive approach is needed to address this issue, including improvements in food distribution systems, strengthening economic resilience, and ensuring food safety and quality standards.

In addition, adaptive and innovative policies must be developed to deal with changing challenges. This includes strengthening international cooperation and developing long-term strategies that can address climate change, global market fluctuations, and food and nutrition security issues (Smith and Gregory, 2013; Beddington et al., 2012). Through these efforts, it is hoped that food security can be enhanced, providing far-reaching benefits for global welfare and the future sustainability of food systems.

Research methods

This study employs a literature review approach by utilizing secondary data, derived from scientific articles indexed in Dimensions and Scopus. The data collection covers the period from 2015 to 2024, focusing on articles relevant to the theme of food security strategies. The selection of the Dimensions and Scopus databases is based on their extensive coverage of high-quality, peer-reviewed scientific literature, ensuring a representative and reliable dataset for analysis. Dimensions provides access to a wide range of articles, while Scopus offers indexing and metadata information that supports comprehensive bibliometric analysis.

To analyze the data, this study uses VOSviewer software, a tool designed for network mapping and visualization in bibliometric analysis. The use of VOSviewer facilitates the identification of patterns and trends in scientific publications, including relationships between research topics, collaborations between institutions, and the evolution of key concepts in food security strategies.

The procedure in this study begins with collecting articles related to food security strategies from the Dimensions and Scopus databases published between 2015 and 2024. After the data is collected, mapping is conducted using VOSviewer to visualize networks from various aspects of research, such as co-authorship, co-citation, and co-occurrence of keywords. The inclusion criteria for selecting articles focus on their relevance to food security strategies, publication in peer-reviewed journals, and the availability of sufficient metadata for bibliometric analysis. Articles unrelated to the research theme or lacking adequate bibliometric metadata are excluded from the analysis. The next stage involves processing and analyzing the data with the help of VOSviewer to identify key trends, map research topics, and highlight areas requiring further attention in food security strategies.

It is important to note that there are some limitations to the bibliometric analysis used in this study. This method focuses on exploring patterns and relationships derived from available metadata, which may not capture the qualitative depth or context of individual studies. Additionally, the results are limited to data covered by Dimensions and Scopus, potentially excluding relevant research published in other platforms or languages. Nevertheless, the bibliometric approach is highly useful for providing an overview of the global research landscape, identifying collaboration networks, and mapping the evolution of research themes, making it highly relevant for analyzing food security policies.

With this approach, the study aims to make a significant contribution to understanding the global research landscape on food security strategies, while offering insights that can support the development of more effective and responsive policies to address future food security challenges.

Results and Discussion

The results of the literature review study related to food security strategies indexed in Dimensions from 2015-2024 show significant developments in the number of outputs and citations from year to year. This indicates that the topic of food security strategies is gaining more attention and relevance among researchers and academics. The increase in the number of publications and citations indicates that there is an increased interest and understanding of issues related to food security, as well as an urgent need to continue to study and develop effective strategies in facing global food security challenges. This increase may also indicate that research in this field is increasingly contributing to the development of policies and practices that can improve food security in various regions. The graph of the development of scientific research on food security is presented in Figure 1.

The categorization of issues related to food security strategies sourced from the Dimensions index, shows that the most discussed areas are agriculture, veterinary medicine, and food science, with a total of about 33.408 articles. This reflects a major focus on the technical and scientific aspects of food production, animal health, and innovations in food

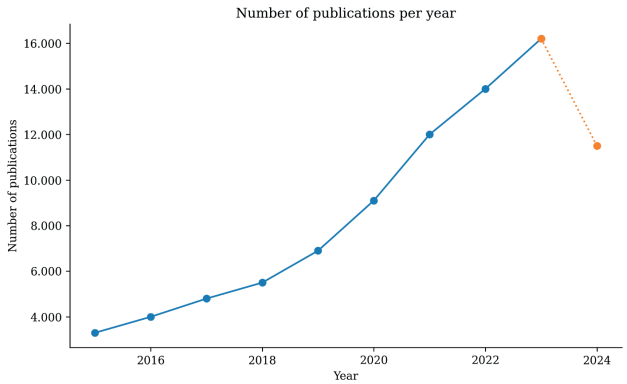

Fig. 1. Trend in the number of scientific research on Food Security strategies 2015–2024
Source: Authors' own elaboration

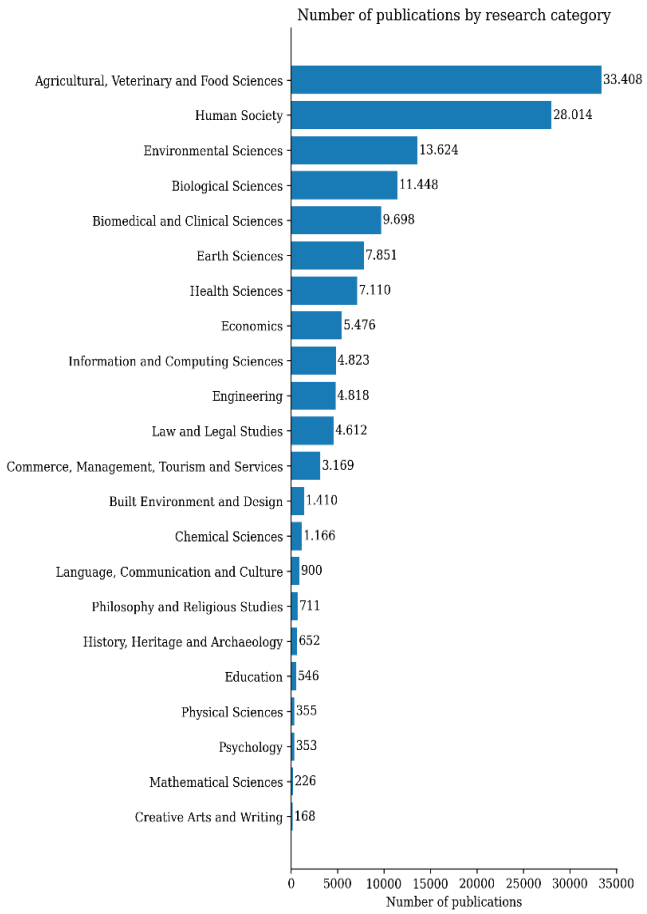

Fig. 2. Issues and number of scientific research on food security strategy in 2023–2024
Source: Authors' own elaboration

science to improve food security. This is followed by issues related to human society with around 28.014 articles, which explore the social, economic, and cultural impacts of food security strategies, including how policies affect people and food access. The third category is environmental science, with about 13.624 articles, which highlight the relationship between food security and environmental factors such as climate change and natural resource management. A graph of the issues and number of scientific studies is presented in Figure 2.

Countries around the world are currently experiencing a food crisis, caused by a combination of global and local factors. This food crisis is not just a matter of food scarcity, but also includes people's inability to access sufficient, safe and nutritious food. Disrupted economic stability and poor food distribution have worsened the food security situation in many regions. Economic instability can lead to sharp price fluctuations, reducing people's purchasing power and weakening their access to adequate and nutritious food. In addition, unequal food distribution, whether due to inadequate infrastructure, logistical bottlenecks or inappropriate policies, further exacerbates the food crisis. This results in an imbalance between areas that experience food surpluses and areas that experience shortages, so that many regions experience a significant decline in food availability. The countries that have conducted scientific research on food security are shown in Figure 3.

Figure 3 illustrates the geographical distribution of food security-related research, highlighting countries that play an important role in cross-country scientific collaboration. The United States, China and India emerge as the main centers of global research on this topic, and show very high levels of collaboration with other countries. These three countries are not only major contributors to the number of scientific publications, but also play a central role in driving research progress through international partnerships. This collaboration reflects the importance of global cooperation in addressing food security challenges, given the complexity of the issue involving economic, social and environmental aspects that cut across national boundaries.

As a country with many leading research institutions, the United States has a large capacity to conduct multidisciplinary research that supports food security policy, making it a center of global scientific collaboration. Research in the country often focuses on technological innovation, agricultural policy and the development of sustainable food systems. Researchers (Murkey et al., 2023), who conducted research in the United States on food security, advised the government to adjust food consumption patterns, especially for pregnant women, improve production efficiency, manage

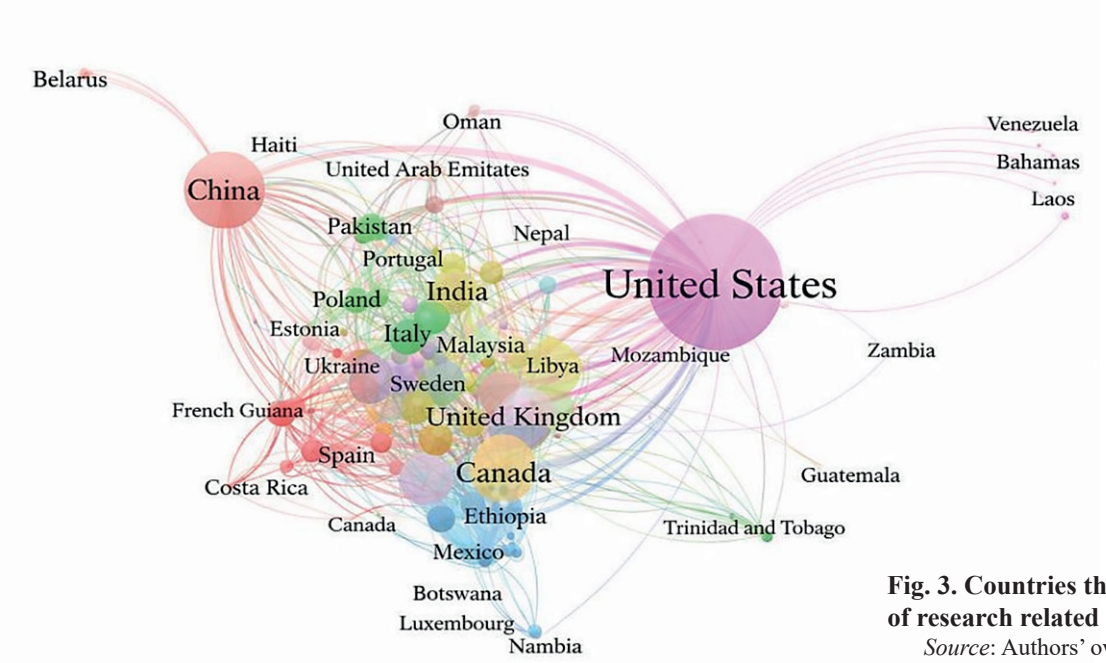

Fig. 3. Countries that conduct a lot of research related to food security
Source: Authors' own elaboration

food logistics, maintain price stability, implement effective distribution networks, and the role of technological advances to achieve food security. In addition, Arteaga and Wilde (2023) conducted research on the effect of the availability of school breakfast programs on food security among elementary school children, the results of his analysis found that access to the School Breakfast Program reduced the likelihood of low food insecurity, the impact of the School Breakfast Program not only on food security, but also on health outcomes this is also supported by research (Bartfeld and Ahn, 2011; Fletcher and Frisvold, 2017).

The United States and China hold important positions in global agricultural trade. However, economic and trade tensions between China and the United States, both in terms of the imposition of import tariffs on agricultural products and in the signing and implementation of trade agreements, have led to a sustained change in the global agricultural trade landscape, exacerbating gaps in efforts to achieve sustainable development goals around the world (Ma et al., 2024).

In fact, the country with the largest population in the world, China, is also leading the way in research related to food security. The main focus here is on domestic food production, resource management, and how government policies affect food availability in the country. The research of Liu and Zhou (2021) suggests that to ensure food security in China, a comprehensive approach involving four main steps is needed. First, strict protection of agricultural land should be prioritized, including maintaining the quality and quantity of land and preventing land conversion to non-agricultural uses. Second, the structure of agricultural production needs to be optimized while maintaining the total amount of food production and developing functional areas for grain production according to comparative advantages. Third, China should promote high-yielding varieties and comprehensive land consolidation, including the management of vacant and abandoned land to increase productivity. Finally, the development of modern and digitalized agriculture should be accelerated to improve the quality of agricultural products and global competitiveness, ensuring a more resilient and sustainable food system. Although both China and the United States face challenges in food security, the problems revealed in China are more prominent. The food security challenges facing China are similar to those experienced by many rapidly developing countries. First, there is insufficiency in the coordinated development of food production and environmental resource conservation. Second, there is an imbalance between the structure of food supply and the consumption patterns of the population. China is currently facing an anomaly characterized by the 'three highs'-high production, high stocks, and high imports. The surplus of wheat, rice, and corn contrasts sharply with a severe shortfall in soybean production, with soybean supply relying heavily on imports from countries such as Brazil, the United States, and Argentina (Tang et al., 2024).

India has significant food security challenges related to its large population and economic inequality. Research in India often focuses on strategies to increase food production, economic security and equitable distribution. In their study, Ritchie et al. (2018) argues that India is experiencing a food crisis, especially agricultural production at the farm level is still low compared to the global average, causing losses during harvest and distribution. Subramanian et al. (2023) focuses on Food security and nutrition are crucial for poor people in developing countries, especially India. In their research (Subramanian et al., 2023) suggested policies to expand modern fish markets, especially in urban areas, to meet people's nutritional needs. Further research of Kang et al. (2024) explored the risk factors of income decline or job loss and time trends in food security indicators in Asia Pacific countries. The research suggests the need for long-term social protection programs, implemented for vulnerable groups (urban, women, daily wage workers, or running a small trade or owning a small business), and continuous monitoring of food security is needed.

Figure 4 shows a network of scientific collaborations that highlights the relationships between institutions active in food security-related research. Johns Hopkins University appears to play a central role in this network, showing a high frequency and intensity of collaboration with other institutions around the world.

This network not only includes institutions at the national level, but also involves extensive international cooperation. This shows that research on food security is a global issue that requires collaboration across borders to produce more comprehensive and effective solutions.

Other institutions visible in the network may serve as important partners, contributing to different aspects of the research such as data analysis, agricultural technology development or food policy. The presence of Johns Hopkins University as the center of collaboration also indicates that they may have significant resources in terms of knowledge, expertise, and funding, making them an invaluable partner in this food security research.

The collaboration shown in this figure reflects the importance of synergy between different entities to face the increasingly complex challenges of food security in the era of globalization. It also underscores how academic institutions, governments and international organizations can work together to create greater impact in the research and implementation of food security solutions.

Figure 5 shows the relationships between various themes or research topics related to food security strategies based on data from Dimensions and Scopus. This network map helps identify how certain themes are interrelated and integrated in research.

Global food security can be linked to nutrition screening, suggesting that research often addresses how policy interventions can improve access to and quality of nutrition. For example, policy programs designed to increase people's access to nutritious food, such as healthy food subsidies, improving

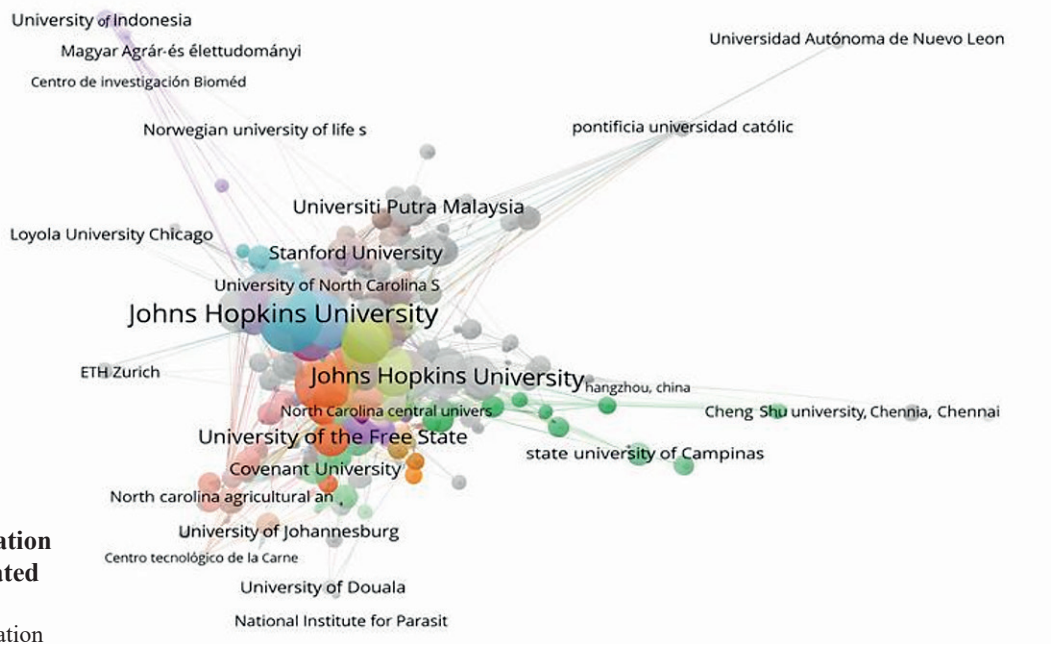

Fig. 4. Scientific collaboration between institutions related to food security
Source: Authors' own elaboration

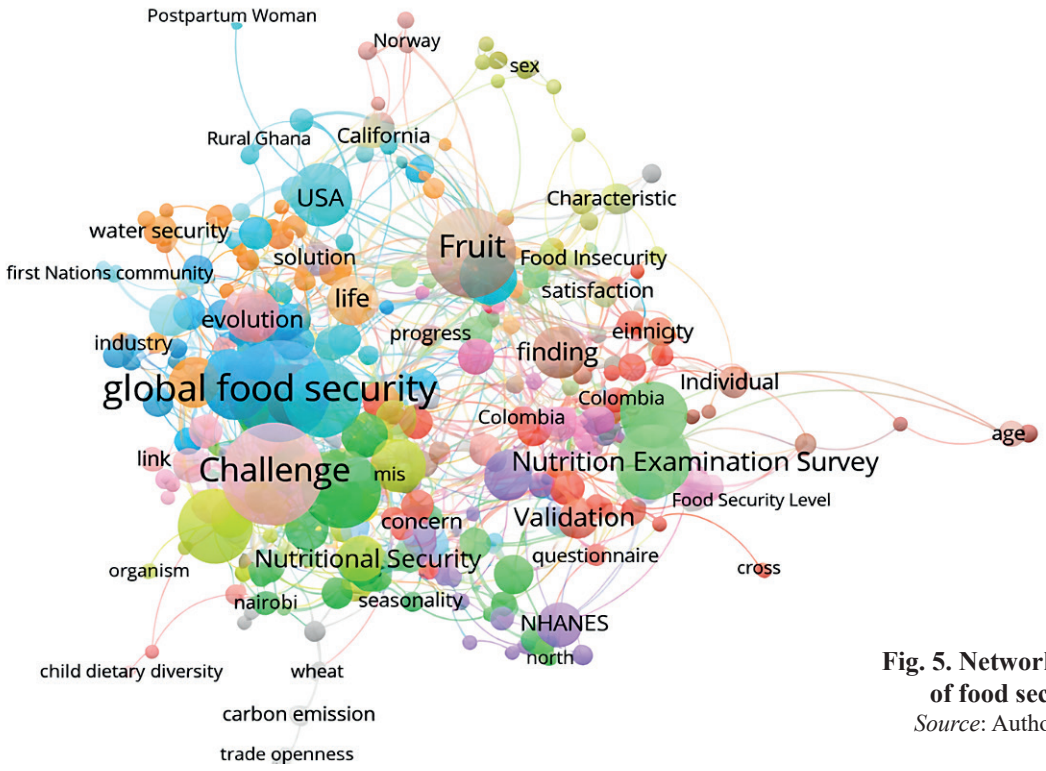

Fig. 5. Network map on the theme of food security strategies
Source: Authors' own elaboration

the quality of food distribution, or educating people on the importance of a balanced diet, are often the main focus of efforts to improve food security. The research of Smith et al. (2013) states that by providing essential nutrients, especially in the intermediate age period (1-6 years), animal-sourced foods can help ensure normal physical and cognitive development. Well-nourished and educated children can grow into healthy young adults who are able to realize their full potential and earn higher incomes, in the process improving the well-being of their families, communities and society. This is in line with the research of Frongillo (2024), which states that conceptualize nutritional security as something that has 2 important components: a healthy diet the nutritional content of foods consumed) and nutritional status a physiological assessment of the adequacy of nutrient intake). So it is important for children aged 1-6 years to be nutritionally adequate. An important first step in advancing work on food security and nutrition is national and international collaboration and partnerships. However, to fully address the gaps, nutrition practitioners and scientists must understand the nature of existing research and collaboratively build on that foundation to develop better tools and terminology for nutrition screening and assessment (Cuenca et al., 2024).

In addition, the research also examines how food security depends not only on the availability of food, but also on its accessibility, stability and utilization within households. In this regard, policies that promote food diversification, reduce food waste and improve local farming systems are also seen as important steps towards achieving sustainable food security. Research often links these aspects to the achievement of sustainable development targets (SDGs), especially in reducing hunger and malnutrition globally (Zou et al., 2023).

Furthermore, Figure 5 also explains the many challenges that exist in meeting the food security of a region, researched by Howe-Burris et al. (2022), that food insecurity is not just a nutritional and socioeconomic issue, but is part of a multidimensional and complex experience. Moreover, rural communities face unique challenges such as an aging population and subsequent high rates of chronic diseases, higher poverty rates, less access to transportation, physical isolation, and longer distances to food stores and assistance (Piontak and Schulman, 2014; Valliant et al., 2022). To improve quality of life and address food insecurity among rural elderly, governments need to adopt policies to prevent and reduce chronic diseases and increase opportunities for social interactions that reduce feelings of loneliness (Howe-Burris et al., 2022).

Figure 6 is a map of research updates from the last 6 years (2018–2023). Many studies have discussed global food security, nutrition screening, and challenges that require solutions for food security in a region.

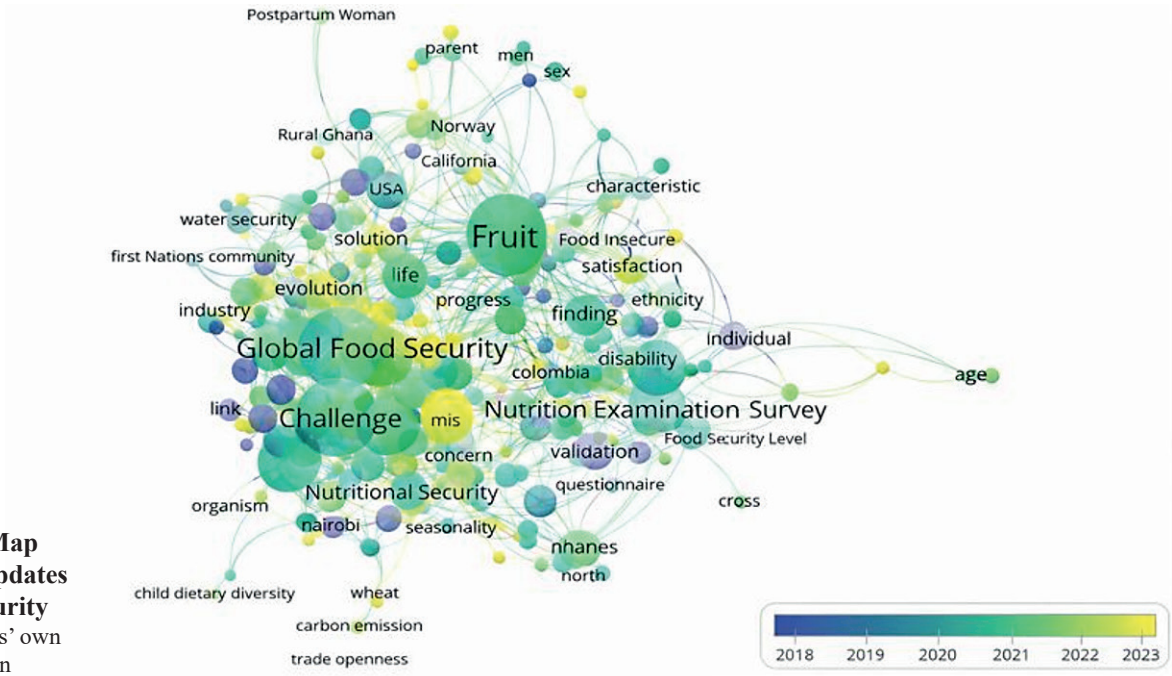

Figure 6. Map of research updates on food security
Source: Authors' own elaboration

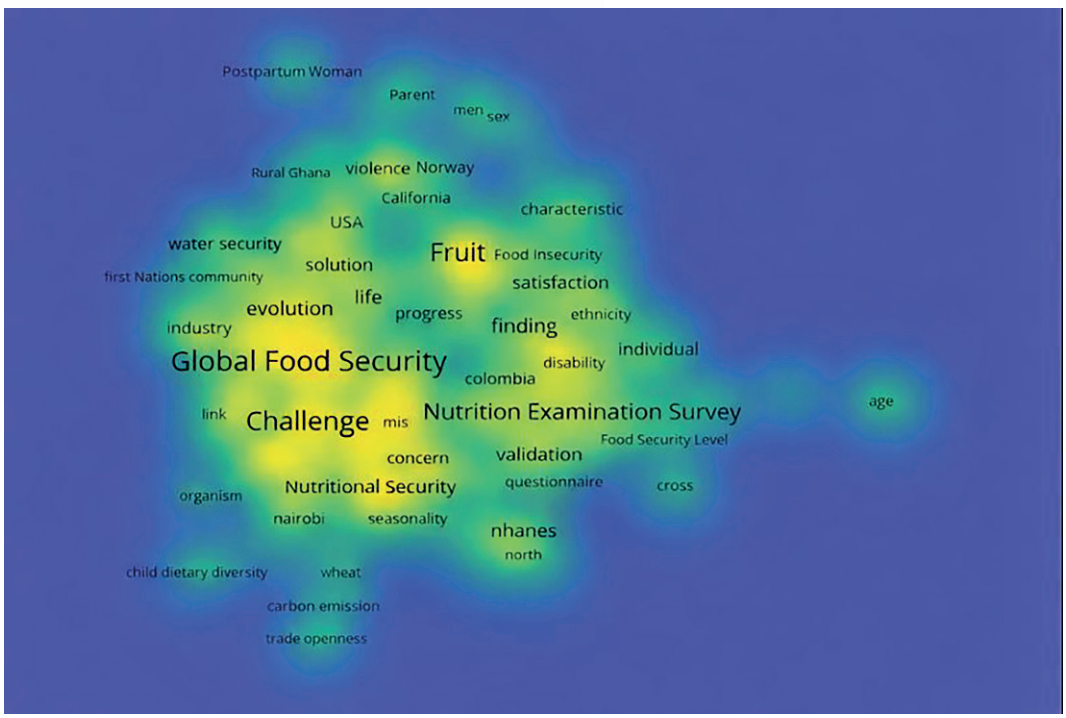

Figure 7. Density map of food security strategies
Source: Authors' own elaboration

While there have been many studies on global food security, nutrition screening, and the challenges that require solutions for a region's food security in the last six years (2018–2023), there are still not many studies that address the effects of food security policies on carbon emissions or food security specifically for young children, especially related to dietary diversity for young children. Research by (Dinku et al., 2020) shows that obesity prevention interventions targeting children are still very limited and many are less effective. A comprehensive and multifaceted approach

is needed to better address children's diets.

Effective nutrition policies should include improving household nutrition security and supporting healthy growth, as well as reducing overconsumption of foods that are low in nutrients. In addition, it is important to protect children from the marketing of energy-dense, nutrient-poor foods and sugary drinks that contribute to obesity. Policies should also focus on reducing physical inactivity, which is increasing (Bird et al., 2019). By addressing all these aspects, it is hoped that nutrition policies can be more effective in supporting children's food security and health, as well as reducing the negative impacts that may arise from unhealthy eating habits.

Figure 7 is the result of a bibliometric analysis using VOSviewer that visualizes the density of keywords in the literature related to global food security. The yellow color in the figure indicates areas of high density, where keywords such as "global food security," "challenge," and "nutritional security" appear frequently and are closely related. Green indicates medium density, while blue and purple indicate low density. The results of this analysis illustrate that global food security and related challenges are dominant themes in the literature. Some less frequently occurring topics, such as "child dietary diversity" and the impact of food security policies on "carbon emissions", are seen in low-density areas, suggesting that these topics are less frequently discussed or have little connection to the main topics in research related to global food security. This visualization helps to identify the most frequently discussed topics and the relationships between them in the literature.

Conclusions

The results of this bibliometric analysis show a significant increase in the number of studies related to food security over the period 2015–2024, signaling growing attention to this issue at the global level. However, there are some topics that have received less attention, such as diversification of children's diets and the impact of food security policies on carbon emissions, which are important to consider in future food security policies. The study also emphasizes the importance of international collaboration in food security research, given the global and complex nature of the challenges faced. Therefore, the development of adaptive and evidence-based policies is becoming increasingly urgent to deal with changing global dynamics, such as economic instability and food market fluctuations. Thus, this research is expected to contribute to the improvement of global food security through the development of more holistic and integrated strategies.

References

Arteaga, I. & Wilde, P. E. (2023). Measuring Food Security in the United States for More Than 25 years: History, Methods, Findings, and Opportunities. *Journal of the Academy of Nutrition and Dietetics*, *123*(10), S5 – S19. https://doi.org/10.1016/j.jand.2023.01.007.

Bartfeld, J. S. & Ahn, H. M. (2011). The school breakfast program strengthens household food security among low-income households with elementary school children. *Journal of Nutrition*, *141*(3), 470 – 475. https://doi.org/10.3945/jn.110.130823.

Beddington, J., Asaduzzaman, M., Clark, M., Fernández, A., Guillou, M., Jahn, M., Erda, L., Mamo, T., Bo, N. & Nobre, C. (2012). Achieving food security in the face of climate change. *Final Report from the Commission on Sustainable Agriculture and Climate Change*. https://ccafs.cgiar.org/sites/default/files/assets/docs/climate_food_commission-final-mar2012.pdf.

Bird, P. K., Pickett, K. E., Graham, H., Faresjö, T., Jaddoe, V. W. V., Ludvigsson, J., Raat, H., Seguin, L., Wijtzes, A. I. & McGrath, J. J. (2019). Income inequality and social gradients in children's height: A comparison of cohort studies from five high-income countries. *BMJ Paediatrics Open*, *3*(1), 1 – 8. https://doi.org/10.1136/bmjpo-2019-000568.

Cuenca, M. H., Proaño, G. V., McDermid, J. M., Badreldin El Shikieri, A., Steeves, E. A., Carrillo-Alvarez, E., Fracassi, P., Garelick, D. S., Brewer, J., Kazimierczuk, F. K. & Steiber, A. (2024). Advancing Nutrition and Dietetics Research in Global Food and Nutrition Security: A Roundtable Meeting Report. *Journal of the Academy of Nutrition and Dietetics*, *124*(1), 102 – 122. https://doi.org/10.1016/j.jand.2023.09.022.

Dinku, A. M., Mekonnen, T. C. & Adilu, G. S. (2020). Child dietary diversity and food (in) security as a potential correlate of child anthropometric indices in the context of urban food system in the case of north-central Ethiopia. *Journal of Health, Population and Nutrition*, *39*(1), 1 – 11. https://doi.org/10.1186/s41043-020-00219-6.

FAO. (2020). *The State of Food Security and Nutrition in the World 2020*. Food and Agriculture Organization of the United Nations. https://openknowledge.fao.org/server/api/core/bitstreams/9a0fca06-5c5b-4bd5-89eb-5dbec0f27274/content.

Fletcher, J. M. & Frisvold, D. E. (2017). The Relationship between the School Breakfast Program and Food Insecurity. *Journal of Consumer Affairs*, *51*(3), 481 – 500. https://doi.org/10.1111/joca.12163.

Frongillo, E. A. (2024). Developing methods and measures for assessing and monitoring nutrition security. *American Journal of Clinical Nutrition*, *119*(6), 1381 – 1382. https://doi.org/10.1016/j.ajcnut.2024.04.017.

Howe-Burris, M., Giroux, S., Waldman, K., DeBruicker Valliant, J., Babb, A., Czebotar, K., Fobi, D., Stafford, P. & Knudsen, D. C. (2022). The Interactions of Food Security, Health, and Loneliness among Rural Older Adults before and after the Onset of COVID-19. In: *Nutrients, 14* (23). https://doi.org/10.3390/nu14235076.

Kang, Y., Prihartono, I., Kim, S., Kim, S., Lee, S., Spadoni, R., McCormack, J. & Wetzler, E. (2024). Spatial and temporal trends in food security during the COVID-19 pandemic in Asia

Pacific countries: India, Indonesia, Myanmar, and Vietnam. *Nutrition Research and Practice*, *18*(1), 149 – 164. https://doi.org/10.4162/nrp.2024.18.1.149.

Liu, Y. & Zhou, Y. (2021). Reflections on China's food security and land use policy under rapid urbanization. *Land Use Policy*, *109*(April), 105699. https://doi.org/10.1016/j.landusepol.2021.105699.

Ma, W., Li, C., Kou, J., Wang, X., Yang, H., Xue, B. & Gou, X. (2024). The Sino-US trade friction would exacerbate global inequalities in achieving SDGs. *Journal of Cleaner Production*, *446*, 141218. https://doi.org/https://doi.org/10.1016/j.jclepro.2024.141218.

Murkey, J. A., Gaston, S. A., Payne, C. W., Jackson, W. B. & Jackson, C. L. (2023). Food security status and cardiometabolic health among pregnant women in the United States. *Frontiers in Global Women's Health*, *4*(February), 1 – 9. https://doi.org/10.3389/fgwh.2023.1286142.

Piontak, J. R. & Schulman, M. D. (2014). Food Insecurity in Rural America. *Contexts*, *13*(3), 75 – 77. https://doi.org/10.1177/1536504214545766.

Ritchie, H., Reay, D. & Higgins, P. (2018). Sustainable food security in India-Domestic production and macronutrient availability. *PLoS ONE*, *13*(3), 1 – 17. https://doi.org/10.1371/journal.pone.0193766.

Smith, J., Sones, K., Grace, D., MacMillan, S., Tarawali, S. & Herrero, M. (2013). Beyond milk, meat and eggs: The role of livestock in food and nutrition security. *Animal Frontiers*, *3*(1), 6 – 13. https://doi.org/10.2527/af.2013-0002.

Smith, P. & Gregory, P. J. (2013). Climate change and sustainable food production. *The Proceedings of the Nutrition Society*, *72*(1), 21 – 28. https://doi.org/10.1017/S0029665112002832.

Subramanian, K., Bavinck, M., Scholtens, J., Hapke, H. M. & Jyotishi, A. (2023). How Seafood Wholesale Markets Matter for Urban Food Security: Evidence from Chennai, India. *European Journal of Development Research*, *35*(3), 579 – 601. https://doi.org/10.1057/s41287-022-00519-z.

Tang, C., Xie, X., Wei, G., Pan, L. & Qi, Z. (2024). Exploring the Evolutionary Characteristics of Food Security in China and the United States from a Multidimensional Perspective. *Foods*, *13*(14), 2272. https://doi.org/10.3390/foods13142272.

Tubiello, F. N. & Fischer, G. (2007). Reducing climate change impacts on agriculture: Global and regional effects of mitigation, 2000-2080. *Technological Forecasting and Social Change*, *74*(7), 1030 – 1056. https://doi.org/https://doi.org/10.1016/j.techfore.2006.05.027.

Valliant, J. C. D., Burris, M. E., Czebotar, K., Stafford, P. B., Giroux, S. A., Babb, A., Waldman, K. & Knudsen, D. C. (2022). Navigating Food Insecurity as a Rural Older Adult: The Importance of Congregate Meal Sites, Social Networks and Transportation Services. *Journal of Hunger & Environmental Nutrition*, *17*(5), 593 – 614. https://doi.org/10.1080/19320248.2021.1977208.

Viana, C. M., Freire, D., Abrantes, P., Rocha, J. & Pereira, P. (2022). Agricultural land systems importance for supporting food security and sustainable development goals: A systematic review. *Science of the Total Environment*, *806.* https://doi.org/10.1016/j.scitotenv.2021.150718.

Warsame, A. A., Abdukadir Sheik-Ali, I., Hassan, A. A. & Sarkodie, S. A. (2024). The nexus between climate change, conflicts and food security in Somalia: empirical evidence from time-varying Granger causality. *Cogent Food and Agriculture*, *10*(1). https://doi.org/10.1080/23311932.2024.2347713.

Zou, X., Zhang, J., Cheng, T., Guo, Y., Zhang, L., Han, X., Liu, C., Wan, Y., Ye, X., Cao, X., Song, C., Zhao, G. & Xiang, D. (2023). New strategies to address world food security and elimination of malnutrition: future role of coarse cereals in human health. *Frontiers in Plant Science*, *14*, 1301445. https://doi.org/10.3389/fpls.2023.1301445.

Received: **October, 01, 2024**; *Approved*: **December, 09, 2024**; *Published*: **April, 2026**