Food Security as Right: Enhancing Nutrition Governance through Artificial Intelligence for Justice and Sustainability

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Food Security as a Right: Enhancing Nutrition Governance through Artificial Intelligence for Justice and Sustainability

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Abstract

This paper discusses how Artificial Intelligence (AI) can be harnessed to foster the right to food security. The paper observes that AI and other technologies provide effective solutions towards bolstering global food security. It examines the specific application of AI in the pursuit of the human right to food security. Due to its potential to promote food security, the paper asserts that it is imperative to adopt AI towards enhancing nutrition governance for justice and sustainability. The paper examines how this ideal can be actualised in order to foster food security as a human right for development.

1.0 Introduction

Food security is a fundamental human right. It has been observed that the human right to food security is attained when every person has access to enough, safe, affordable and nutritious food for normal growth and development, and an active and healthy life[1]. In addition, it has been pointed out that food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life[2]. According to the Food and Agriculture Organization of the United Nations (FAO), food security involves: *physical availability* of sufficient quantities of food of appropriate quality[3]; *accessibility* wherein all individuals have adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet[4]; *utilization* of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met[5]; and *stability* where there is continuous supply of food and where adverse conditions including climatic events, economic factors and political instability are addressed(Emphasis added)[6].

The right to food security is enshrined at the global level under the *International Covenant on Economic, Social and Cultural Rights*[7] which recognizes the right of everyone to an adequate standard of living for

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[1] World Food Programme., 'Food security – what it means and why it matters' Available at https://www.wfp.org/stories/food-security-what-it-means-and-why-it-matters#:~:text=Jean%2DBaptiste%20Joire-,What%20is%20food%20security?,threatens%20people's%20lives%20or%20livelihoods. (Accessed on 27/04/2026)

[2] World Bank Group., 'What is Food Security?' https://www.worldbank.org/en/topic/agriculture/brief/food-security-update/what-is-food-security (Accessed on 27/04/2026)

[3] Food and Agriculture Organization of the United Nations., 'Food Security' Available at https://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf (Accessed on 27/04/2026)

[4] Ibid

[5] Ibid

[6] Ibid

[7] United Nations General Assembly, *International Covenant on Economic, Social and Cultural Rights*, 16 December 1966, United Nations, Treaty Series, vol. 993, p. 3.

themselves and their families, including *adequate food*, clothing and housing, and to the continuous improvement of living conditions (emphasis added)[8]. Further, at a national level, the *Constitution of Kenya*[9] also recognizes the right of every person to be free from hunger, and to have adequate food of acceptable quality[10]. According to the Office of the United Nations High Commissioner for Human Rights (OHCHR), the right to food security involves availability, accessibility, affordability, adequacy, and sustainability of food for all persons at all times[11].

It has been argued that achieving food security is a moral imperative towards ensuring that all people have equal and unrestricted access to food for their health and development[12]. Achieving the right to food security ensures that every person has permanent and unrestricted access to sufficient, safe, healthy, and nutritious food at affordable prices, now and in the future, so that people can meet their basic needs and lead active, healthy and productive lives[13]. However, attaining food security remains an elusive dream for millions of people all over the world. The World Food Programme (WFP) observes that millions of people globally are experiencing acute levels of food insecurity[14]. In addition, FAO points out that achieving food security remains a challenge globally with millions of people facing food insecurity, hunger and malnutrition especially in developing countries[15]. Failure to achieve global food security has been linked to several challenges including poverty, conflicts, climate shocks and poor agricultural and food production policies[16]. In light of these challenges, it has been pointed out that it is imperative to build stable, affordable, resilient and sustainable food systems towards achieving food security for justice and development[17].

This paper discusses how Artificial Intelligence (AI) can be harnessed to foster the right to food security. The paper observes that AI and other technologies provide effective solutions towards bolstering global food security. It examines the specific application of AI in the pursuit of the human right to food security. Due to its potential to promote food security, the paper asserts that it is imperative to adopt AI towards enhancing nutrition governance for justice and sustainability. The paper examines how this ideal can be actualised in order to foster food security as a human right for development.

2.0 Artificial Intelligence and Food Security: Promises and Pitfalls

With millions of people all over the world facing severe levels of hunger and food insecurity, technology has emerged as a powerful tool towards fostering the human right to food security for justice and sustainability. For example, it has been observed that by embracing technology, it is possible to boost food

[8] Ibid, Article 11 (1)
[9] Constitution of Kenya.,2010., Government Printer, Nairobi
[10] Ibid., Article 43 (1) (c)
[11] Office of the United Nations High Commissioner for Human Rights., 'OHCHR and the right to food' Available at https://www.ohchr.org/en/food (Accessed on 27/04/2026)
[12] World Food Programme., 'Food security – what it means and why it matters' Op Cit
[13] Development and Food and Nutrition Securty., Available at https://fecongd.org/pdf/DevelopmentFoodAndNutritionSecurity_FrameWork.pdf (Accessed on 27/04/2026)
[14] World Food Programme., 'Food security – what it means and why it matters' Op Cit
[15] Food and Agriculture Organization of the United Nations., 'The State of Food Security and Nutrition in the World 2024- 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms' Available at https://openknowledge.fao.org/server/api/core/bitstreams/d5be2ffc-f191-411c-9fee-bb7374111576d/content (Accessed on 27/04/2026)
[16] Ibid
[17] What is Food Security and How Does it Affect the World?., Available at https://www.technoserve.org/blog/what-is-food-security-how-affect-world/ (Accessed on 27/04/2026)

security by increasing yields, reducing agricultural exposure to environmental shocks including droughts and floods, producing more nutritious crops, reducing human labour requirements, and promoting long-term sustainability and stability of agriculture and food production[18]. Modern technologies are improving agriculture and food production through genetic modification of crops, improvement of soil fertility and sustainable irrigation practices towards food security[19]. In addition, it has been observed that post-harvest and agro-processing technologies are ensuring food accessibility, biofortification technologies are making food more nutritious, and climate-smart solutions including precision agriculture are enabling farmers to optimize resources, reduce waste, increase yields and enhance resilience to climate change[20]. [21]. In addition to modern technologies, it has been pointed out that embracing indigenous agri-technologies including crop rotation, agroforestry, use of drought- and heat-resistant crops, integrated pest control systems, water harvesting and irrigation can foster high-yielding, climate resilient, and adaptive agricultural practices especially in Africa and the Global South towards food security[22].

Technology therefore provides vital solutions towards food security. In particular, harnessing AI is vital towards meeting the food security and nutrition targets stipulated under Sustainable Development Goal (SDG) 2[23]. It has been observed that AI can transform and improve global food security by bolstering agricultural and food production, optimizing global, regional and national food supply chains, and ensuring the resilience of food systems to risks such as climate change and pests due to its predictive capabilities[24]. AI is being widely adopted all over the world towards improving food security. For example, AI and modern technologies are strengthening precision agriculture. According to FAO, precision agriculture is a data-driven approach to farm management that can improve productivity and yields, thereby increasing the overall profitability of farming[25]. It has been observed that precision agriculture leverages modern data-driven technologies including GPS-guided equipment, satellite imagery, drones, and data analytics to optimise crop production through precise input application[26]. Through this, it is possible to optimize the use of resources including water, fertilizers and pesticides towards improving yields, ensuring sustainability and reducing the environmental impacts of agriculture and food production[27]. It has been observed that

[18] Ruzzante. S., 'Adoption of Agricultural Technology in the Developing World: A Meta-Analysis of the Empirical Literature' *World Development*., Volume 146, October 2021

[19] United Nations Trade and Development., 'The Role of Science, Technology and Innovation in Ensuring Food Security by 2030' Available at https://unctad.org/system/files/official-document/dtlstict2017d5_en.pdf (Accessed on 27/04/2026)

[20] Ibid

[21] Ibid

[22] Climate Champions. 'How Regenerative Agriculture Can Increase Africa's Food Production.' Available at https://climatechampions.unfccc.int/call-to-action-for-climate-resilient-sustainable-food-systemsinafrica/ (Accessed on 27/04/2026)

[23] United Nations Trade and Development., 'The Role of Science, Technology and Innovation in Ensuring Food Security by 2030' Op Cit

[24] United Nations University., 'Artificial Intelligence Can Transform Global Food Security and Climate Action' Available at https://unu.edu/article/artificial-intelligence-can-transform-global-food-security-and-climate-action#:~:text=Land%20use%20decisions%20will%20benefit,impending%20climate%20shocks%20and%20disasters. (Accessed on 27/04/2026)

[25] Food and Agriculture Organization of the United Nations., 'Precision Agriculture for Smallholder Farmers' Available at https://www.fao.org/family-farming/detail/en/c/1738176/ (Accessed on 27/04/2026)

[26] Introduction to Precision Farming., Available at https://cropnuts.com/introduction-to-precision-farming/ (Accessed on 27/04/2026)

[27] Ibid

AI tools and systems including remote sensors, satellite imagery and weather forecasts are enabling farmers to use real-time data for more timely, effective and accurate decision-making[28].

In addition, AI is improving global food security through the development of climate-resilient crop varieties[29]. By analyzing vast amounts of data, AI is enabling genetic modification of crops leading to the development of high yielding and climate-resilient crop varieties[30]. It has been observed that genetic modification of plant and crop varieties can be used for nutrient fortification, tolerance to drought, herbicides, diseases, or pests, and for higher yields towards food security[31]. In addition, AI has led to the development of early warning systems that are enhancing efforts towards food security. For example, it has been observed that machine learning tools collect and analyze vast amounts of data providing valuable predictions that can enable decision-makers to anticipate and effectively address risks such as droughts, pest outbreaks and conflicts[32]. AI can also optimize food supply chains ensuring food availability, accessibility and stability[33]. For instance, by collecting and analyzing data on food production, demand and distribution, AI tools and systems can enhance access to markets, reduce post-harvest losses and determine more efficient distribution routes thus minimizing food waste and emissions from transportation[34].'

AI therefore provides vital solutions towards fostering the human right to food security. However, it has been observed that the digital divide between the Global North and the Global South limits the capacity of developing countries to harness and apply AI towards improving their food systems[35]. In particular, since AI systems rely on high quality data and adequate digital infrastructure, adopting this technology may be a challenge in food-insecure regions of the world which also face challenges such as poverty, inadequate digital infrastructure and under-investments in technology[36]. In addition, it has been argued that biased and incomplete data sets can undermine sound decision-making amplifying food security challenges against vulnerable populations[37].

Harnessing its benefits while addressing risks and challenges is therefore necessary towards utilising AI in the quest for food security.

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[28] Center for Strategic & International Studies., 'AI & Global Food Security: A Focus on Precision Agriculture' Available at https://www.csis.org/analysis/ai-global-food-security-focus-precision-agriculture (Accessed on 27/04/2026)

[29] United Nations Trade and Development., 'The Role of Science, Technology and Innovation in Ensuring Food Security by 2030' Op Cit

[30] Ibid

[31] Ibid

[32] Center for Strategic & International Studies., 'AI & Global Food Security: A Focus on Early Warning Systems' Available at https://www.csis.org/analysis/ai-and-global-food-security-focus-early-warning-systems#:~:text=First%2C%20AI%20can%20improve%20the,predictive%20tasks%20with%20greater%20accuracy. (Accessed on 27/04/2026)

[33] United Nations Trade and Development., 'The Role of Science, Technology and Innovation in Ensuring Food Security by 2030' Op Cit

[34] Ibid

[35] United Nations Trade and Development., 'The Role of Science, Technology and Innovation in Ensuring Food Security by 2030' Op Cit

[36] Ibid

[37] Ibid

3.0 Enhancing Nutrition Governance through Artificial Intelligence towards Food Security

AI is a valuable technology that can accelerate progress towards global food security. With millions of people all over the world facing severe levels of hunger and food insecurity, it has been observed that harnessing AI can enhance global food security by boosting agriculture and food production, strengthening food supply and value chains and detecting threats such as climate change and pests thus enabling sound decision-making by farmers and policy makers[38].

It is therefore imperative to adopt AI towards enhancing nutrition governance and achieving food security. At its core, nutrition governance covers policies, institutions and processes that ensure food and nutrition security across societies[39]. It has been observed that nutrition governance focuses on bolstering and linking key sectors including agriculture, health and finance towards improving food security and nutrition outcomes[40].

AI can enhance nutrition governance and food security by boosting agriculture and food production[41]. Further, it has been observed that AI can strengthen nutrition governance by supporting decision-makers in formulating policies for food security, nutrition and sustainable agriculture[42]. In addition, since sound nutrition governance requires multisectoral coordination, AI can enable sound decision-making on issues such as investments in agriculture and food production, research in food and nutrition and governance of agri-food systems towards food and nutrition security[43]. Further, AI tools and models including machine learning can improve health outcomes including through dietary assessments and malnutrition prediction towards sound nutrition governance[44].

It is therefore imperative to adopt AI towards bolstering global food and nutrition security. In particular, there is need to support the capacity of developing countries to utilise AI and other technologies including through technology development and transfer in order to accelerate progress towards global food security and nutrition targets stipulated under SDG 2[45]. Further, addressing risks and challenges in AI through human oversight, greater transparency and use of accurate, inclusive and non-biased data sets can ensure that AI is ethically and appropriately harnessed towards achieving global food and nutrition security[46].

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[38] Food and Agriculture Organization of the United Nations., 'AI can be a game-changing solution for farmers: FAO Innovation Chief' Available at https://www.fao.org/newsroom/detail/ai-can-be-a-game-changing-solution-for-farmers--fao-innovation-chief/en (Accessed on 28/04/2026)

[39] Strengthening Nutrition Governance: Insights and Lessons from the Global Programme on Food and Nutrition Security, Enhanced Resilience., Available at https://www.giz.de/en/downloads/giz2025-en-strengthening-nutrition-governance-insights-lessons.pdf (Accessed on 28/04/2026)

[40] Ibid

[41] Food and Agriculture Organization of the United Nations., 'AI in charge" of policymaking and agrifood systems governance: utopia, exodus, or an opportunity?' Available at https://www.fao.org/policy-support/news/detail/ai-in-charge--of-policymaking-and-agrifood-systems-governance--utopia--exodus--or-an-opportunity/en#:~:text=AI%20will%20control%20investments%2C%20optimize,governance%20and%20weakened%20stakeholder%20capacities. (Accessed on 28/04/2026)

[42] Ibid

[43] Ibid

[44] Sosa-Holwerda. A et al., 'The Role of Artificial Intelligence in Nutrition Research: A Scoping Review' Available at https://pmc.ncbi.nlm.nih.gov/articles/PMC11243505/ (Accessed on 28/04/2026)

[45] United Nations Trade and Development., 'The Role of Science, Technology and Innovation in Ensuring Food Security by 2030' Op Cit

[46] Ibid

4.0 Conclusion

Fostering food security is fundamental towards upholding the human right to food for justice and sustainability. With millions of people all over the world facing severe levels of hunger and food insecurity, AI and other modern technologies have emerged as vital solutions towards achieving food and nutrition security. Harnessing AI is therefore key towards improving nutrition governance and realising food security as a right for justice and sustainability.

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