Harnessing Higher Education to Integrate Technology into Pursuit of Food and Nutrition Security in Nigeria

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Abstract. This paper examines the potential of higher education in Nigeria to promote innovations in agricultural productivity, capacity building, food processing, distribution systems and consumption towards realization of SDG2. The paper explains that precision technology, biotechnology, mobile digital applications, and digital education platforms can improve yields, enhance food preservation and increase awareness of nutrition. In addition, economic empowerment for farmers and reduction in food waste are avenues of increasing food supply. Some of the barriers to advancements in technologies are poor infrastructure, lack of funds, cultural resistance and limited digital access in rural areas. Relying on review of related literature, the paper concludes that Nigeria can achieve SDG2 by leveraging higher education to promote the integration of digital technologies into local food systems, to optimise food production, reduce postharvest losses and promote nutrition education that will improve food consumption. Therefore, community empowerment through relevant aspects of higher education is recommended.

Keywords: Higher education in development; Technology adoption; SDG 2.

1 Introduction

The food and nutrition challenges currently plaguing Nigeria include malnutrition and micro-nutrient deficiencies, widespread food insecurity, rising food prices,

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poverty, environmental challenges resulting from climate change and the effects of COVID19 (Ezeama, et al, 2021; Adesoye & Adepoju, 2020; Onime & Tamuno, 2021; Kehinde & Favour, 2020; Adedokun, 2021). Attainment of the sustainable development goals (SDGs) plays an important role in uprooting development problems, the root cause of food and nutrition challenges in Nigeria. SDG2 targets achieving zero hunger by the year 2030 globally. However, in 2022, about 148 million under 5 children globally were stunted, 45 million suffered muscle wasting and 37 million are overweight despite all global effort to curb malnutrition (SDG Report, 2023). To achieve the goal in Nigeria, there is need for combined efforts aimed at addressing both immediate food insecurity and its structural causes (Adedokun, 2021).

Agbigbe, (2022), stated that producing food in abundance in Nigeria can prevent hunger and result in unprecedented economic growth. Zero hunger amplifies attainment of food security, improved nutrition, end hunger in rural areas, encourage sustainable agriculture, empower small scale farmers especially women and ensure healthy lifestyle by 2030 (Agbigbe, 2022).

Food sustainability has been connected to sustainable agriculture and the factors that can critically affect this are fertile land, energy, fertilizers, water, favourable climate conditions (Khan et al, 2021) and Nutrition education (Yolcuoğlu & Kızıltan). Technology can help to modernize food and nutrition systems by enhancing agricultural productivity and improving food preservation. According to Ya'u & Yakubu (2022) adoption of digital technology tools creates an access to information on inputs, weather, soil condition, processing and storage resources, markets and finance, food surveillance and consumption requirements. Akpabio et al, 2025 supported the success of some e-agricultural practices, such as the World Food Programme's Building Blocks initiative; FARMS - a financial and agricultural risk management system; AgriDigital - which focuses on supply chain management in agriculture; and AgUnity, a platform that helps small-scale farmers plan trade activities and track daily routines as highlighted by Sylvester, (2019) and how they are proof that technology can transform food and nutrition systems.

The major objective of this paper was to explore how integrating Technology into Food and Nutrition can facilitate the attainment of the SDG goal 2 in Nigeria. It also explores the contribution of higher education in Nigeria to capacity building, research and innovation in achieving sustainable agriculture. To achieve these, published literature search was done using Google Scholar and elicit.org, which is database site for peer reviewed research publications.

2 State of food and nutrition in Nigeria

Most of the nutritional indices of Nigeria are below global averages with a stunting rate of 37% which is the second highest in the world and prevalence of Non-communicable as a result of poor Intake of foods and dietary components (Ene-

Obong et al, 2020). A recent assessment by WFP (2024) noted that 33 million Nigerians faced acute food insecurity from June – August (known as lean season) 2024. This signifies a rise by 7 million people when compared to the number of people affected during the same period in 2024. Another issue linked to food insecurity is food wastage usually caused by inadequate infrastructure (post-harvest losses), pests and diseases, transportation constraints and policy gaps which eventually leads to hike in food prices (food inflation), exacerbated poverty and environmental degradation (Nnoli et al. 2024). It may therefore be safe to state that these may likely lead to malnutrition which is one of Nigeria's most serious public health challenges, especially among children under five and women of reproductive age (Muhammad et al. 2017; UNICEF 2023). According to the 2021 National Food Consumption and Micro-nutrient Survey, about 37% of children under five are stunted, while 19% are wasted, which signifies chronic and acute malnutrition respectively (UNICEF, 2023). Micro-nutrient deficiencies, including iron, vitamin A, and iodine, are also widespread due to poor consumption of a wide variety of foods including low consumption of fortified foods, fruits and vegetables UNICEF 2023.

Studies have shown high prevalence of food insecurity among households in Nigeria due to poor access to nutritious and affordable food (Ilori et al, 2024; Ibukun & Adebayo, 2021). This have been linked to several factors such as poverty and low income, rising inflation and hike in food prices, communal conflicts, insecurity caused by insurgencies and terrorism, geographical location and impact of climate change, etc. (Akpoghelie et al, 2024; Ogbolu et al, 2024; Akpabio et al., 2025).

3 Higher education as a driver of food and nutrition security

Higher education institutions (HEIs) play a pivotal role in addressing food and nutrition security challenges through education, research, and community outreach. In Nigeria, universities have long contributed to agriculture by training experts and extending knowledge to farmers. The government even established specialized agricultural universities with the primary objective of tackling the nation's food security problems. Nigerian universities are actively involved in agricultural research, development, and extension services, although inadequate facilities have sometimes limited their impact. Globally, universities are recognized as powerful drivers of innovation and capacity-building for sustainable food systems (Okola, 2010). They produce skilled graduates who can implement food security programs and advance agricultural value chains, and they conduct research that informs policy and practice. For example, a survey in Saudi Arabia found that faculty perceive their universities' role in promoting sustainable food security to be very high, especially through education, awareness, and supportive policies. Likewise, a Southeast Asian policy brief emphasizes the need for strong tertiary

agricultural education, research, and extension to meet SDGs advocating for universities to encourage critical thinking, multi-disciplinary research, and evidence-based decision-making in food and agriculture (Abunasser, AlAli, & Al-Qahtani, 2022).

In essence, HEIs serve as catalysts for improving food availability, sustainable agriculture, and nutrition education at local and global scales. By integrating food security and nutrition into curricula and campus initiatives, universities help raise awareness and prepare future leaders to make more sustainable dietary and agricultural choices. This alignment of higher education with zero-hunger objectives underscores the strategic importance of HEIs in the fight against hunger and malnutrition.

University research often drives innovative practices in sustainable agriculture, exemplified by advanced techniques such as controlled-environment crop cultivation to improve productivity. Many HEIs are leveraging digital transformation to enhance food and nutrition systems. Universities frequently host research centres and innovation hubs that develop new agricultural technologies and data-driven tools. For instance, the Federal University of Agriculture Abeokuta (FUNAAB) in Nigeria operates an extension and media resource centre (AMREC) which has been "reaching out with proven solutions to farmers, food processors, industries and other stakeholders across the South Western States of Nigeria" (Arowopoju, 2024). Through such outreach, universities transfer technologies like improved crop varieties, better food preservation methods, and climate-smart farming practices into the hands of local communities. Academic researchers are also creating digital applications to solve food-system problems. A notable case is a professor at FUNAAB who developed a mobile app called Plant Doctor that uses artificial intelligence for automated plant disease diagnosis, helping farmers detect crop diseases early and curb losses. Innovations like Plant Doctor demonstrate how university-led R&D can directly support farmers with modern tools, thereby improving yields and food security. Additionally, HEIs are embracing digital education platforms to broaden access to knowledge in agriculture and nutrition. E-learning modules, online courses, and virtual training allow universities to train not only enrolled students but also extension workers and community members in best practices.

Empowering agricultural professionals through continuous learning and coaching has been shown to boost innovation – when researchers and staff receive adequate learning opportunities and training, their confidence and ability to drive agricultural innovation increases significantly. This capacity-building effect underscores why universities invest in digital skills development (e.g. remote workshops, simulation labs, and agri-tech MOOCs) for their staff and students. Universities also form partnerships to expand their digital reach and resources. At the global level, leading institutions are prioritizing digital agriculture: for example, Wageningen University & Research's partnership with the UN Food and Agriculture Organization explicitly emphasizes digital agriculture and AI as key

areas for transforming agrifood systems. In Africa, a new partnership between the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM, a network of 175 universities) and CABI is developing joint e-learning platforms and digital tools to strengthen agricultural education and research, with the aim of producing a new generation of tech-savvy agricultural professionals. In summary, the digital capacities of HEIs – from research outputs (like decision-support apps and biotech innovations) to ICT-enabled education and extension – are increasingly vital for modernizing food production, improving nutrition outcomes, and building resilient food systems

4 Role of technology in advancing food and nutrition security

The peculiar challenges facing food production in this century are climate change, natural resource degradation and astronomical growth in population which have added immense pressure on the already existing agricultural systems, making it extremely necessary to introduce innovations that will help ensure food security and environmental sustainability (Guebsi, Mami, & Chokmani, 2024). Advancements in agricultural technology have been of immense assistance in helping farmers tackle some of these challenges in advanced countries thereby enhancing efficiency, productivity and sustainability. If properly applied and integrated into Nigeria's agricultural systems will pave the way for increased food production and processing on one hand and increase food supply in the communities.

One of these advancements is Precision farming. This type of farming has been proven to increase agricultural productivity and reduced the adverse effects on the environment through cutting-edge technology (Karunathilake et al, 2023). Precision agriculture generally and smart irrigation, in particular, enables farmers save scarce resources without depriving the crops of the needed moisture to thrive optimally (Bwambale et al, 2022). Smart irrigation is the application of the right amount of water, at the right time, at the right place that involves the use of monitoring and control strategies for optimum irrigation scheduling while taking into consideration the changing weather patterns, variation in soil moisture conditions and the physiological conditions of the plant.

Another important advancement in agricultural technology is the Unmanned Aerial Vehicles (UAVs) also known as drones. According to Guebsi et al, 2024, drones can help boost agricultural productivity through precise crop monitoring, targeted input application and high-resolution data collection. Drones have the ability to detect early crop stress, do plant health mapping and optimize input management. All these result in optimization of resource use, reduce its impact on the environment and increasing the resilience of agricultural systems especially in the face of climate change. In addition to these technologies, Mohammed et al. (2025) identified different types of smart sensors used in precision agriculture,

including weather and environmental sensors for real-time climate monitoring; crop health sensors for detecting diseases, pests, and stress factors; automated irrigation systems for precise water management and soil sensors for monitoring moisture, nutrient levels, and soil health.

Other challenges confronting the food industry in most developing economies like Nigeria are inefficiencies in supply chains, a lack of transparency, traceability issues, and insecurity. (Akinbamini et al, 2025). The supplies of farm products after harvest to retail level constitute the supply chain management and findings have revealed that Information technology (IT) play an important role in putting together and streamlining the supply chains and supply chain management in full (Abdulsalam, 2022). Evidence abound that technologies like Radio-frequency identification (RFID), GPS, Data recorder, block chain are used in conjunction with IT in tracking and tracing the products right from the field to the consumer (Abdulsalam, 2022). RFID is usually used in the food industries to track inventory to ensure that the goods sent out reaches its intended destinations.

Food preservation techniques which are innovative and sustainable have become important because it enhances food quality and safety while reducing environmental impact (Lisboa et al, 2024). It is important to use the right technology to match the specific type of food while optimizing the process for its needs (Gazda & Glibowski, 2024). Consumers have raised concerns about the use of food preservation techniques used in the food industry. Research have shown that they prefer the application of mild preservation techniques such as modified atmosphere packaging, irradiation, mild heating, high pressure, pulsed electric fields, pulsed white light, ultrasound, cold plasma, sous vide, ultraviolet radiation and the use of natural antimicrobial systems to the traditional food spoilage control processes (Madhu et al 2019; Lisboa et al, 2024; Gazda & Glibowski, 2024). Specifically, ultrasonication pasteurizes and preserves foods by making many enzymes and microorganisms inactive at very low temperature condition and this process improves food quality, stability and safety (Madhu et al 2019). Cold plasma uses ionized gas to sterilize food surfaces reducing microorganisms without applying heat; pulsed white light technology uses intense and short pulses of electricity to deactivate microorganisms; while high pressure processing uses extremely high pressure to deactivate microorganisms and enzymes in food (Lisboa et al, 2024).

Biotechnology is also one of the technologies that have been used as a major transformation tool by offering innovative solutions for sustainable agriculture. Biotechnology is the technological application in biology, which majorly involves the transfer of genetic material containing a specific trait from one crop/organism to another with the objective of improving crop productivity and resistance to various biotic and abiotic stresses (Das et al, 2023). It is a promising tool for improving the health of the soil and cycling nutrients in the food crop in sustainable agriculture (Das et al, 2023; Yadav et al., 2021). It has been used to

improve crop yield and nutritional content without affecting the environment (Yadav et al., 2021).

Genetic engineering for yield improvement is a biotechnological intervention that has led to significant improvement in crop productivity (Khan, 2024a). It works by creating crops that have modified genes associated with photosynthetic efficiency, stress tolerance and nutrient use efficiency (Limenie & Alehegn, 2025) Another biotechnology intervention is the CRISPR-Cas9 system which is a gene editing technique that improves pest, disease, and abiotic stress resistance thereby producing genetically modified crops (GMOs) (Akram et al, 2025). Biotechnology can also be used to enhance the nutritional value of a crop through bio fortification - genetic modification of crops to increase their nutrient content (Khan, 2024). Furthermore, the soil health can be improved by adding microorganisms with specific components to promote plant growth, suppress plant pathogens, and enhance soil structure and fertility (Das et al, 2023).

Digital platforms are important in delivering educational knowledge on food and nutrition especially in a country like Nigeria where the traditional method of creating awareness might be faced with some challenges that are logistic in nature. These digital platforms are usually more accessible and cost effective (Bonina et al., 2021) because of the increase in the populations with access to mobile phones. Some of these platforms include mobile applications, e-learning systems, social media, and web-based portals (Bonina et al., 2021; Oganah-Ikujenyo & Okezue, 2023). Ojo et al (2025), has also investigated how AI powered platforms can encourage adherence to evidence-based guidelines for balanced diets, appropriate nutrient intake and the prevention of diet-related non-communicable diseases. ICT tools such as gamified applications, interactive platforms and adaptive learning systems, has been established to offer innovative avenues to enhancing and promoting healthy eating behaviours in children (Omotunde et al, 2024). Also, Social media platforms such as WhatsApp, YouTube, Instagram and Facebook has gained popularity for nutrition education campaigns, even among pregnant women (Musa & Joseph 2023). These platforms are low-cost, highly accessible, and capable of overcoming barriers related to literacy through the use of multimedia tools such as videos and voice notes. Higher education can promote all these possibilities.

5 Higher education-led innovations for improving food choices and dietary habits

HEIs around the world offer successful models of leading technological solutions for food systems and nutrition education. One illustrative example from Nigeria is the *PlantDoctor* innovation from FUNAAB, which directly addresses an on-the-ground need (plant disease diagnosis) using AI-driven technology to support farmers and reduce crop losses. Nigerian universities also engage in community-

based nutrition education through their departments of nutrition, dietetics, and home economics deploying students and faculty to conduct nutrition clinics, school programs, and public health campaigns (though such efforts are often documented in project reports more than in literature).(Abunasser, AlAli, & Al-Qahtani, 2022).

Internationally, the land-grant university model (pioneered in the United States) showcases how higher education can integrate teaching, research, and extension to boost agricultural productivity and community nutrition. Land-grant institutions have historically developed improved farming practices and brought them to farmers through extension, significantly enhancing food security and rural livelihoods a concept now emulated in other regions. Another contemporary case is the partnership between Wageningen University & Research (Netherlands) and FAO, which has been heralded as a model for science-driven innovation in food systems. (Abunasser, AlAli, & Al-Qahtani, 2022). Their collaboration (renewed in 2025) focuses on sustainable agrifood solutions and has already delivered notable outcomes for example, block chain applications to support climate-smart agriculture, digital tools for monitoring child nutrition and labour in supply chains, and joint research on improving diets. This shows how combining academic excellence with international organizational support can yield high-impact innovations for food safety, supply chain efficiency, and nutrition monitoring.

Additionally, multi-institution networks amplify the reach of any single university's innovation. The RUFORUM network in Africa, for instance, connects universities across 40 countries to share research, develop agri-tech curricula, and scale up innovations that improve food security and climate resilience. Such collaborations are producing experiential learning opportunities (like regional innovation labs and start-up incubators for agriculture) and co-designed curricula in areas like sustainable farming and food technology. (Abunasser, AlAli, & Al-Qahtani, 2022). These case studies collectively underscore that when universities are empowered and well-resourced, they can spearhead meaningful technological advances in food systems – from precision farming techniques and climate-resilient crops to digital nutrition education platforms – thereby strengthening food and nutrition security at scale. Each successful model reinforces the argument that investing in higher education's capacity is a strategic pathway to achieving Zero Hunger and sustainable food systems.

Global nutrition practices and innovations have yielded valuable results and significant lessons. According to Nordhagen et al, 2019, lessons learnt from nutrition-sensitive agriculture program implemented in four African countries include the importance of carefully sequencing interventions, considering community impacts when designing research, retaining flexibility in implementation, allowing for considerable time for cross-sector integration and coordination, In nutrition and agricultural innovations and practices, lessons shows that progress in nutrition and agricultural sector is dependent on other sectors; the different pathways from agriculture as a source of food production

and livelihood, to nutrition outcomes do not operate in isolation rather they overlap and interact; policies needs to be put into action to get positive results (Gillespie et al, 2019). They also opined that the definition of success/goals of agriculture and nutrition should be evaluated based on the premise that improving diets for all household members is a more logical, reasonable and achievable goal than addressing stunting in children (Gillespie et al, 2019).

Mobile applications and digital tools have been used to transformed agriculture in diverse ways. Mobile apps gives farmers access to information such as weather updates, crop prices, best farming practices, pest management techniques, which are vital in taking decisions that will encourage productivity and better crop yields (Kamal & Bablu, 2023; Singh et al, 2023). Farmers have been empowered with digital financial tools which gives them access to loans, insurance and other financial tools that helps to fortify their financial resilience (Kumar & Kumari, 2024). Digital tools have reshaped agriculture extension service which is the gap between laboratories and land. Agriculture and Home Economics extension workers can pass down information and knowledge through text messages, audio and video content thereby helping farmers in adopting to modern agricultural practices and technologies (Kamal & Bablu, 2023). Mobile applications and web-based platforms have helped in the spread of agricultural knowledge by empowering farmers with up-to-date farm practice (Singh et al, 2023). Kamal & Bablu, 2023 listed other impacts of mobile app such as facilitating direct connection between farmers and consumers thereby eliminating the middlemen; allowing farmers get better money value for their products; financial services such as mobile banking and digital payment solutions and tools for farm management enabling farmers to monitor water usage and fertilizer application.

HEIs, research institutes and professional associations in food and nutrition play a pivotal role in capacity building. Current literature have shown the potentials of tertiary education institutions in Nigeria to significantly contribute to achieving SDG 2 (zero hunger) by driving capacity building, research and integrating technology into food and nutrition systems (Jideani, 2020). By integrating technology into food and nutrition systems, tertiary institutions can transform food production and processing, reduce postharvest losses and greatly improve nutrition outcomes in Nigeria. Through ICT and e-learning, higher institutions can leverage digital platforms to train food professionals and disseminate food and nutrition knowledge widely to create awareness beyond the classroom to their immediate communities. All these can be harnessed through partnering with organizations like FAO, WHO (FAO, 2025) and other organizations or foundations with biases towards food, nutrition and agricultural development. An example of such partnership in research and capacity building in higher education exist in Wageningen University & Research, Netherlands and FAO since 2021 that focuses on advancing sustainable agrifood systems through innovation and science (FAO, 2025).

In Nigeria, some HEIs are noted for playing significant roles in relation to food and nutrition security (Table 1). Apart from partnership, HEIs can provide outreach to rural farmers through demonstration farms, workshops and mobile advisory services. Federal University of Agriculture, Abeokuta, University of Ibadan and Ahmadu Bello University, Zaria have history of agricultural extension programmes that have span over several decades (Ogbonyomi et al., 2021). Students can be empowered to venture into start-ups in agritech and encouraged to develop solutions in food preservation, precision farming and nutrition education applications. In addition, higher education in Nigeria have provided the platforms for technology driven nutrition research where post graduate students conduct research on nutritional status, dietary diversity, food fortification, nutrition policies and interventions, etc. (Abubakar, 2024; Maziya-Dixon et al., 2021).

Table 1. Selected HEIs involved in food and nutrition training and research

Category	Institutions
Universities	Federal University of Agriculture, Abeokuta; Ahmadu Bello University; University of Nigeria Nsukka; Federal University of Technology, Minna; University of Calabar; Joseph Sarwuan Tarka University, Makurdi; University of Ibadan, Ibadan; Obafemi Awolowo University, Ile-Ife; University of Maiduguri; Michael Okpara University of Agriculture, Umudike; Ladoke Akintola University of Technology, Ogbomoso; Rivers State University of Science and Technology, Port Harcourt; Federal University of Technology, Yola; University of Uyo, Uyo; Kogi State University, Anyigba, Babcock University, Illishan-Remo; Imo State University, Owerri; Bells University of Technology, Ota; Ebonyi State University, Abakaliki; University of Ilorin, Ilorin; Federal University of Technology, Akure; Enugu State University of Science and Technology. Covenant University, Ota. Kwara State University, Malete; Federal University of Technology, Owerri; Delta State University, Abraka
Polytechnics	Yaba College of Technology, Lagos; Federal Polytechnic, Ilaro; Idah ; federal Polytechnic, Idah; Ibadan Polytechnic, Ibadan, etc.
Research Institutes	International Institute of Tropical Agriculture, Ibadan; Federal Institute of Industrial Research (FIIRO), Oshodi, Lagos; Nigeria stored products research institute (NSPRI), Ilorin; Cocoa Research Institute, Ibadan
Professional Associations/ Societies	Nutrition Society of Nigeria (NSN); Nigerian Institute of Food Science & Technology NIFST); Home Economics Professional Association of Nigeria (HEPAN).

Therefore, for agricultural innovation to be successful in Nigeria, key players should be empowered with intellectual and technical capacity through e-learning, organizational training, and coaching (Mwadzingeni et al, 2025). In Nigeria, efforts are being made to build nutrition-sensitive agriculture (NSA) and Adeyemi et al, 2022, after studying the initial capacity development efforts revealed that structured training programs are essential in integrating nutrition into agriculture. Again, it is important to identify and address competency deficits among agricultural extension workers. Agwu et al, 2023, reported significant gaps and suggested the need for curriculum reform and training programs to equip extension workers with skills required to support farmers effectively. Capacity development is an important channel for scaling Agricultural innovations. Developing capacity is often hindered by focusing only on end users and individuals and not including organizational, cooperation and enabling environment levels (Woltering et al, 2024). Training and sundry activities should be carried out at all capacity development levels to achieve sustainable scaling of technological innovations.

6 Impact of integrating technology into food and nutrition on achievement of SDG 2

Integrating technology into food and nutrition systems is important if SDG 2 is to be achieved as it will help to increase productivity, reduce postharvest waste, improve food distribution, and eliminate the influence of the middlemen among others (Oruma et al. 2021; Akpabio et al. 2025). Innovative Technology such as artificial intelligence, remote sensors, agriculture precision, and intelligent farming, social media and block chain technology can provide solutions to challenges faced by the Agricultural sector (Vărzaru, 2024). These technologies will help in data analysis, crop monitoring, soil moisture monitoring, fostering communication among farmers, producers, distributors, and consumers thereby improving sustainable practices (Vărzaru, 2024) and HEIs can be the drivers of this.

As the world population grows to over 7.9 billion, the need for a sustainable and efficient food production system increases (Ibrahim et al, 2023). With the use of modern tools such as precision farming, automated machinery, smart irrigation systems, vertical farming technologies, supply chain optimization, block chain in food traceability, technology and innovation are playing a crucial role in transforming agriculture to help address the growing challenge of food insecurity (Ibrahim et al, 2023). Farmers can now grow more food, use resources more efficiently, and reduce post-harvest losses as a result, technology is not only improving food availability but also supporting the overall goal of achieving food security for all. Technology can help to reduce malnutrition. This can be achieved through nanobiofortification, a technology that enriches crops with essential nutrients in the form of nanoparticles (Lata et al, 2025). Studies have shown that

nutritional deficiencies that leads to malnutrition influences a variety of causal diseases, immune system disorders, decline of physical growth, mental development, and learning capacity (Ene-Obong et al. 2020; Nnubia et al. 2023) and nanotechnology is one of the sustainable solution to this problem Lata et al, 2025). Digital platforms and mobile applications are being used by more people to get nutrition information. The Internet, social media, health apps, and other digital tools have given the public opportunities to learn about the importance of proper nutrition and offer practical strategies for adopting healthy eating patterns (Hijriyati et al, 2024). These technological tools can provide dietary recommendations based on personal needs, track nutrient intake and raise nutrition awareness thereby addressing the issues of malnutrition.

One way technology in agriculture is beneficial to farmers is by yield increase and farm profitability. Mechanized farming have been found to yield a higher net profit than the traditional farming methods. The reason been that agricultural machinery is associated with improved soil cultivation, water supply, crop index, reduced loss and overall improved resource efficiency (Ahmed & Miller, 2023). Digital technologies can improve farmers' economic benefits by lowering labour and input cost, boost crop yields, and enhance product quality (Geng et al, 2024). According to research, adoption of digital technology has greatly improved the well-being of players in the food industry which basically is measured using productivity and income (Abdul-Majid et al, 2024). Farmers can also use digital communication tools to gain direct access to expanded market thereby selling their good at fairer prices (Nnanna et al, 2025). In addition, the expansion of the digital economy into the rural communities will encourage agricultural development thereby enhancing productivity, sustainability and contributing to overall community development (Qi & You, 2024).

Advancements in precision agriculture have greatly improved environmental sustainability (Nnanna et al, 2025). Getahun et al., (2025) observed that precision agriculture helps to manage the soil by preventing nutrient runoff and ground water contamination. Internet of Things-Based smart precision farming makes; use of real-time monitoring, data-driven decision-making, and automation to optimize water by checking out the moisture need of plants and applying water only where it's necessary (Dutta et al, 2025). Adopting technological innovation in agriculture has shown the potential to reduce greenhouse gas emissions through improved crop and livestock management practices (Yeboah, 2023). Precision agriculture promote carbon sequestration and energy conservation through techniques such as cover cropping, conservation tillage, crop rotation. These techniques improves soil health and boost carbon storage so lessen greenhouse gas emissions (Getahun et al, 2025).

7 Conclusions and recommendations

Integrating technology into local food and nutrition systems in Nigeria presents an opportunity to address Nigeria's persistent challenges of malnutrition, food insecurity, poor agricultural productivity and environmental degradation. Globally, precision farming, smart irrigation, biotechnology, and digital education platforms have been instrumental to boosting agricultural efficiency, improving dietary choices and promoting sustainability through efficient resource use. These tools offer significant economic benefits to farmers and enhance food quality. For Nigeria to realize these benefits and make progress towards SDG2, it should embrace these advanced technologies and apply them throughout the food chain.

In its efforts to do so, the Country should leverage the affordances of higher education. Federal and state government agencies at all levels should create enabling policies that integrate agricultural technology into national development plans and invest in rural infrastructure. Higher education policy persons should intentionally promote the inclusion of content on food and nutrition in higher education curricula, to enhance the capacity of graduates to ensure food security and good nutrition at the household level. Empowerment of communities and local organizations through relevant aspects of higher education is recommended. This will ensure that technology is not only a tool for improving productivity but also long-term food security, improved nutrition, and sustainable development across the country.

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