Turkish Journal of Agricultural Engineering Research

Turk J Agr Eng Res *(TURKAGER)*

https://dergipark.org.tr/en/pub/turkager
https://doi.org/10.46592/turkager.1348187

ISSN: 2717-8420
2023, 4(2), 317-326

Review Article

Agriculture: A Pathway to Create a Sustainable Economy in Nigeria

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Article Info

Received: 22.08.2023 **Accepted:** 13.11.2023 **Published:** 31.12.2023

ABSTRACT

Agriculture has emerged as a critical sector for constructing a long-term economy that balances economic growth, social well-being, and environmental stewardship. This report examines the relationship between sustainable agricultural practices, economic development, and environmental protection to create a sustainable economy through agriculture. It emphasizes the critical significance of sustainable agriculture in generating economic prosperity. It explores how organic farming, agroecology, and precision agriculture improve production, maximize resource usage, and minimize input costs. These approaches not only promote agricultural output but also help to improve food security, farmer income, and rural livelihoods. It explains how sustainable agricultural techniques safeguard natural resources, soil fertility, water quality, and biodiversity. Sustainable agriculture guarantees the long-term sustainability of farming systems by protecting the environment, mitigating the effects of climate change, and lowering the risk of environmental damage. It explores how sustainable agriculture fosters entrepreneurship, value chain development, and market connections, resulting in job creation, income production, and rural economic regeneration. It emphasizes the significance of supportive policies, financial access, and market-oriented initiatives in unlocking the economic potential of sustainable agriculture.

Keywords: *Agroecology, Precision agriculture, Value chain development, Biodiversity*

To cite: Olabinjo OO and Opatola SB (2023). Agriculture: A pathway to create a sustainable economy in Nigeria. *Turkish Journal of Agricultural Engineering Research (TURKAGER), 4(2): 317-326. https://doi.org/10.46592/turkager.1348187*

INTRODUCTION

Agriculture is a multifaceted field encompassing various activities such as soil cultivation, crop production, and livestock rearing. Additionally, it includes the

subsequent processes of product preparation and marketing (Foley *et al.*, 2011). Agriculture is critical to providing the fundamental demands of the world's rising population and guaranteeing food security. According to the World Bank (2021), agriculture employs around 26% of the global workforce and supports the livelihoods of billions of people globally. Agriculture entails various, such as land preparation, planting, irrigation, fertilization, pest control, harvesting, and post-harvest processing.

Agriculture plays a vital role in the global economy, supplying millions of people with food, raw materials, and employment. However, traditional agricultural techniques have resulted in environmental degradation, resource depletion, and social issues. As a result, there is a rising awareness of the need to develop a sustainable economy through agriculture that incorporates environmental stewardship, economic viability, and social well-being. Creating a sustainable economy through agriculture is a vital component of attaining global sustainability, according to the United Nations' Sustainable Development Goals (SDGs). SDG 2, "Zero Hunger," encourages sustainable agriculture techniques to provide food security; SDG 8, "Decent Work and Economic Growth," on the other hand, highlights agriculture's role in promoting inclusive and sustainable economic growth. In addition, SDG 12, "Responsible Consumption and Production," emphasizes the importance of transforming agricultural systems into more sustainable and efficient practices. Agricultural sustainability refers to the capacity of farming techniques and strategies to fulfil current and future societal demands while retaining economic viability. It entails the responsible management of agricultural resources, the reduction of negative environmental consequences, and the long-term profitability and resilience of agricultural companies. This paper is therefore aimed at the investigation and analysis of the potentials of sustainable agriculture practices and its contribution to the creation of a resilient and prosperous economy.

Economy

The economy refers to the comprehensive framework involving producing, distributing, and consuming goods and services within a designated geographical area. This encompasses endeavors related to the generation of revenue and the establishment of financial prosperity. Economies can be classified into traditional, command, market, or mixed systems based on their respective approaches to producing and distributing goods and services. The economy also indicates a particular region's fiscal well-being and stability (Samuelson and Nordhaus, 2010). It involves the production of goods and services, the allocation of resources, the distribution of income, and the exchange of goods and services through various markets. An economy's key elements include production factors such as labor, capital, land, and entrepreneurship. These factors are combined in different ways to produce goods and services. Economic activities are often categorized into sectors, such as agriculture, manufacturing, services, and finance, each contributing to the overall functioning of the economy.

A sustainable economy is an economic system that aims to meet the needs of the present generation without compromising the ability of future generations to meet their own needs (WCED, 1987). It entails striking a balance between economic

growth, social well-being, and environmental stewardship to ensure long-term prosperity and resilience.

Economy of Nigeria

Nigeria's economy is a middle-income, diversified economy with rising industrial, finance, service, communications, technology, and entertainment industries. In terms of nominal GDP (gross domestic product), it is the world's 31st largest economy, the largest in Africa, and the 27th largest in purchasing power parity. Nigeria's economy primarily relies on oil, which provides for around 90% of exports and 25% of government revenue. On the other hand, the Government has been attempting to diversify the economy by encouraging other industries like agriculture, manufacturing, and tourism. The Nigerian economy has been gradually rising with real GDP growth averaging 6% per year between 2005 and 2014. However, due to a drop in oil prices, growth slowed to 2.3% in 2015 (World Bank, 2021). The Nigerian economy is confronted with several challenges, including, a high unemployment rate (23.1% in 2022), Poverty (40% of the population live below the national poverty line), Corruption, infrastructure deficit and Insecurity. Despite these challenges, Nigeria's economy can expand significantly in the following years. The country boasts a vast and growing population, a young labor force, and a variety of natural resources. Nigeria GDP annual growth rate for July 2020 till July 2023 is as shown in Figure 1.

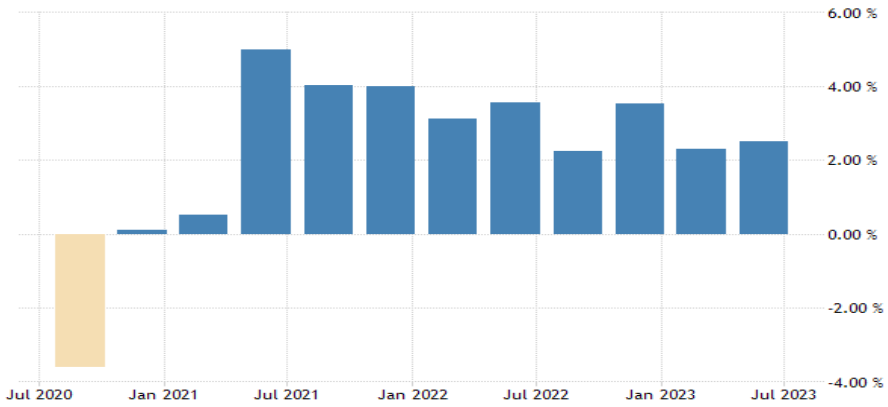

Figure 1. *Nigeria's GDP annual growth rate.*

Challenges in the Current Agricultural System of Nigeria

The current agricultural system faces several challenges that threaten its sustainability and long-term viability. The challenges facing the current agricultural system, including soil degradation, water pollution, deforestation, loss of biodiversity, climate change, and market distortions (Foley *et al.*, 2011). These issues have led to decreased crop productivity and overall instability in the agricultural economy. It was also highlighted that agricultural practices contribute significantly to global greenhouse gas emissions (Tilman *et al.*, 2017).

Sustainable Agriculture and Economic Development

Sustainable agriculture is critical to economic growth because it promotes ecologically responsible practices, increases production, and fosters long-term economic viability. Incorporating sustainable farming practices into economic development initiatives can have far-reaching consequences for rural and urban

communities (UNEP, 2019). In addition, sustainable agriculture encourages environmental responsibility and the conservation of natural resources. Soil conservation, water management, and biodiversity protection protect natural ecosystems and aid agriculture in the long run. Sustainable agriculture promotes the long-term viability of agricultural production systems by keeping soil fertility, conserving water resources, and protecting biodiversity.

The adoption of sustainable agriculture methods also helps to improve rural economies. Sustainable agriculture creates job possibilities and encourages rural entrepreneurship by diversifying agricultural operations and boosting value addition along the agricultural value chain. For example, establishing processing facilities, farmer cooperatives, and local marketplaces promotes revenue creation and economic activity in rural regions (World Bank, 2021).

Also, sustainable agriculture corresponds with customer demands for environmentally friendly and ethically produced food. Farmers and agribusinesses may benefit from the increased demand for organic and ecologically friendly products. Farmers may reach premium markets and obtain better prices for their goods by adhering to sustainable practices and satisfying market demands, resulting in improved revenue and profitability (FAO, 2020). Sustainable agriculture also helps local economies to be more resilient in the face of climate change and market changes. Crop diversification and climate-resilient strategies, for example, assist farmers in adapting to changing climatic circumstances, lowering their exposure to crop failures and revenue shocks. This resilience enhances local economies and promotes rural communities' overall stability and sustainability (IFAD, 2019). Effective policy and institutional frameworks are required to realize the promise of sustainable agriculture for economic growth. Through favorable regulations, access to funding, research and extension services, and market connections, governments must establish an enabling environment that promotes sustainable agriculture practices. Strengthening agricultural institutions and encouraging knowledge exchange among stakeholders helps to further integrate sustainable agriculture into economic development initiatives (World Bank, 2021).

Furthermore, agricultural sustainability highlights the necessity of market-oriented techniques and the development of value chains. It entails strengthening ties between producers, processors, distributors, and consumers to provide fair prices, market access, and income stability for farmers. Agricultural sustainability can contribute to poverty reduction, job creation, and general economic growth by expanding market possibilities and encouraging rural entrepreneurship (FAO, 2019).

Case Studies: Sustainable Agriculture Initiatives Driving Economic Development

1. Ogun State Anchor Borrowers' Program (ABP): The Ogun State Government launched the ABP to support small-scale farmers in the state. Farmers receive access to credit, improved seeds, fertilizers, and technical support through this program. It has helped increase agricultural productivity, enhance food security, and improve the livelihoods of farmers in the state.

2. Songhai Farm, Rivers State: The Songhai Farm in Rivers State is a model for sustainable agriculture and entrepreneurship. It integrates multiple agricultural activities, including organic farming, aquaculture, livestock rearing, and waste

recycling. The farm provides training and mentorship to farmers and agripreneurs, promoting sustainable practices and economic development in the region.

3. Lafiagi Fish Farm, Kwara State: The Lafiagi Fish Farm is a successful sustainable aquaculture project in Kwara State. It focuses on fish production using environmentally friendly and economically viable methods. The farm utilizes integrated fish farming systems, such as fishponds and vegetable cultivation, creating a sustainable and profitable enterprise.

4. Niji Farms, Oyo State: Niji Farms is an agribusiness enterprise specializing in poultry production in Oyo State. The farm implements sustainable practices, including organic feed production, waste management, and energy conservation. It has created employment opportunities, improved rural livelihoods, and contributed to the local economy.

5. Jos Green Centre, Plateau State: The Jos Green Centre is an agroecology training and demonstration farm in Plateau State. It focuses on promoting sustainable agriculture practices among smallholder farmers. The center provides training on agroecology principles, organic farming techniques, and value chain development, enabling farmers to adopt sustainable practices and access better markets.

Policy and Institutional Frameworks for Promoting Sustainable Agriculture and Economic Growth in Nigeria

Policy and institutional frameworks are critical in promoting sustainable agriculture and accelerating economic growth. They foster an atmosphere conducive to adopting sustainable practices, allow market access, and ensure the efficient execution of agricultural policy. Here are a few examples of policy and institutional frameworks that support sustainable agricultural and economic growth:

1. National Agriculture Policy: Many nations, including Nigeria, have adopted national agriculture policies that promote sustainable agriculture and give a road map for its implementation. These policies establish goals, objectives, and action plans for long-term agricultural growth, including research and extension services, market access, input supply, and environmental protection.

2. Ministry of Agriculture and Rural Development: The Ministry of Agriculture and Rural Development, or its equivalent, is responsible for developing and enforcing agricultural policy. It oversees agricultural operations, especially sustainable agriculture programs, by providing leadership, coordination, and monitoring. The ministry works with other government agencies, research institutions, and stakeholders to promote sustainable practices, assist farmers, and assure agricultural sector growth.

3. Research and Extension Services: Agricultural research institutions and extension services are important in promoting sustainable agriculture. They do research to create new agricultural techniques, better varieties, and long-term production systems. Extension services communicate this information to farmers by offering training, technical advice, ‘and assistance in implementing sustainable practices.

4. Financial Institutions and Access to Finance: Collaboration between financial institutions and agricultural stakeholders is critical for sustainable agriculture. Credit, grants, and other financial services are customized to the unique needs of

farmers and agribusinesses involved in sustainable agriculture. Farmers may use this financing to invest in sustainable methods, buy inputs, and expand their enterprises.

5. Market Linkages and Value Chain Development: Effective market connections and value chain development are critical for the economic viability of sustainable agricultural efforts. Governments and agricultural agencies collaborate to build market infrastructure, promote fair trade practices, and foster the growth of value-added processing and marketing businesses. Farmers will be able to access markets, command fair prices for their goods, and capture greater value along the agricultural value chain.

6. Environmental Regulations and Standards: Strong environmental laws and standards are essential for sustainable agriculture. Government enact and enforce regulations to conserve natural resources, prevent pollution, and encourage ecologically friendly farming methods. Compliance with these standards supports soil, water, and biodiversity protection, resulting in long-term sustainability and economic growth.

7. Farmer Organizations and Cooperatives: Farmer groups and cooperatives are important in advocating for farmers' interests in sustainable agriculture. They give farmers a unified voice, enable access to inputs, markets, and financial services, and encourage information exchange and capacity building among its members.

These policy and institutional frameworks offer the essential support, coordination, and resources to promote sustainable agricultural and economic success. Collaboration between government agencies, research institutions, financial institutions, farmer groups, and other stakeholders is essential for successful implementation. These frameworks contribute to adopting sustainable practices, increased productivity, and overall expansion of the agriculture sector by establishing an enabling environment.

Sustainable Agriculture: A pathway towards a Sustainable Economy

Sustainable agriculture is a holistic approach to farming that addresses the environmental, social, and economic challenges of conventional agriculture. It recognizes the interdependence between agriculture and the broader ecosystem, seeking to promote long-term sustainability and resilience. We can pave the way towards a sustainable economy that balances economic growth with environmental stewardship and social well-being by adopting sustainable agricultural practices.

Technological innovations used for Sustainable Agriculture in Nigeria

Using technologies such as precision agriculture, which involves using advanced technologies to optimize crop yields and efficiency (Zhang *et al,.* 2016), can minimize environmental impacts while maximizing productivity and profitability. The following are some of the innovations:

1. Precision Agriculture: Precision agriculture involves the use of technologies such as Global Positioning System (GPS), Geographic Information System (GIS), and remote sensing to optimize farm management practices. It enables farmers to precisely apply inputs like fertilizers, water, and pesticides, reducing wastage and environmental impact while maximizing crop yields (Fountas *et al.,* 2015; Zhang *et al.,* 2018). Precision agriculture also allows for real-time monitoring of crop

health and growth, facilitating early detection of diseases or nutrient deficiencies. Adopting precision farming practices that maximize resource usage, decrease waste, and boost output is also part of sustainable agriculture. This method allows farmers to increase efficiency, reduce environmental impact, and increase economic returns.

2. Controlled Environment Agriculture: Controlled environment agriculture (CEA) involves growing crops in controlled environments such as greenhouses, vertical farms, or aquaponics systems. These systems precisely control temperature, humidity, light, and nutrient levels, optimizing crop growth and reducing the need for chemical inputs (Jensen and Malter, 2019). CEA allows for year-round production, conserves water, and minimizes the use of pesticides, making it an environmentally sustainable approach.

3. Vertical Farming: Vertical farming is a form of CEA that involves growing crops in vertically stacked layers or towers, often indoors. Vertical farming maximizes land productivity by utilizing vertical space while reducing the need for extensive land use (Despommier, 2013). It can be integrated into urban areas, minimizing transportation distances and promoting local food production. Vertical farming enables efficient resource use, such as water recirculation and energy-efficient LED lighting systems.

4. Robotics and Automation: Robotics and automation technologies are revolutionizing various aspects of sustainable agriculture. Automated systems can perform tasks like planting, harvesting, and crop monitoring with precision and efficiency (Kusumaningtyas *et al.,* 2019). This reduces labor requirements and enhances productivity while minimizing human error. Drones equipped with sensors and cameras are also used for crop monitoring, disease detection, and pesticide application, providing real-time data for informed decision-making.

5. Internet of Things (IoT): IoT technology connects devices, sensors, and equipment on the farm, enabling real-time data collection and analysis. IoT-based systems can monitor soil moisture, temperature, and nutrient levels, allowing farmers to optimize irrigation and nutrient management (Zhang *et al.,* 2020). This promotes resource efficiency, reduces water and fertilizer waste, and improves crop health. IoT technology also facilitates remote monitoring and control of farm operations, enhancing productivity and reducing operational costs.

6. Genetic Engineering and Biotechnology: Genetic engineering and biotechnology contribute to sustainable agriculture by developing crop varieties with improved traits, such as pest resistance, drought tolerance, and enhanced nutritional content (Tester and Langridge, 2010). Biotechnology techniques like genetic modification and genome editing can reduce reliance on chemical pesticides and fertilizers, reducing environmental impact and improving resource efficiency.

7. Agroecological techniques that highlight the incorporation of ecological principles into farming systems must be promoted. Agroecology focuses on crop diversification, reducing external inputs, and improving ecosystem services to increase production while avoiding negative environmental consequences (Pretty *et al.,* 2018). Agroecology emphasizes incorporating ecological concepts and social factors into agricultural operations to improve economic viability, rural livelihoods, and food security. Agroecological methods attempt to maximize resource utilization, minimize dependency on external inputs, and increase production in a sustainable and economically feasible way by implementing ecological concepts such

as biodiversity protection, nutrient cycling, and natural pest management. Organic farming, agroforestry, and integrated crop-livestock systems have demonstrated the potential for increased yields, lower production costs, and increased market value for organic and sustainably produced goods (De Ponti *et al.*, 2012).

8. Adopting climate-smart strategies to meet the problems brought by climate change is part of sustainable agriculture. These activities include drought-tolerant crop varieties, water-efficient irrigation systems, and soil management approaches that boost carbon sequestration and resistance to extreme weather events (Lobell *et al.*, 2014).

9. Sustainable value chains encompass the entire manufacturing process, from inputs and production methods to processing, distribution, and consumption. It entails encouraging fair trade, assisting local and small-scale farmers, and building transparent and equitable market systems that pay farmers a reasonable price for their products (Gustafson *et al.*, 2020).

CONCLUSION

A sustainable economy built on agriculture promotes environmental sustainability by reducing the negative impacts of farming practices on ecosystems. It focuses on soil conservation, water management, biodiversity preservation, and the responsible use of resources. By protecting natural resources and minimizing pollution, sustainable agriculture contributes to the long-term viability of our ecosystems and the resilience of agricultural systems. Economically, sustainable agriculture offers numerous benefits. It improves the profitability and resilience of farmers by reducing input costs, enhancing market opportunities, and tapping into growing consumer demand for sustainably produced food. Sustainable practices also contribute to stable food prices, reduce the risk of market shocks, and promote economic stability in the agricultural sector. Transition to a sustainable economy through agriculture requires collective efforts from various stakeholders. Governments, international organizations, farmers, consumers, and the private sector must collaborate to promote sustainable agricultural policies, provide financial support, and invest in research and innovation. Education and awareness programs are also essential to foster a culture of sustainability and promote the adoption of sustainable practices. Through the collective commitment to sustainability, we can create a resilient and prosperous economy that benefits both people and the planet. Finally, developing a sustainable economy via agriculture is critical for solving the complex difficulties that our world faces. We can promote environmental sustainability, economic viability, and social well-being in agriculture using agro ecological concepts, precision farming techniques, climate-smart practices, and sustainable value chains. We can strive toward a future in which agriculture contributes to a sustainable and resilient global economy by integrating policy support, stakeholder engagement, and technology developments.

The following are recommendations to ensure the creation of sustainable economy through agriculture

1. Sustainable Farming Practices: Encouraging and supporting sustainable farming practices is essential for the long-term viability of agriculture. This includes

promoting organic farming, agroforestry, and permaculture techniques that minimize the use of synthetic inputs, conserve natural resources, and promote biodiversity. Governments and agricultural organizations can provide incentives and technical support to farmers who adopt sustainable practices.

2. Investment in Agricultural Technology: Embracing technological innovations in agriculture can significantly enhance productivity and sustainability. This includes the adoption of precision farming techniques, use of advanced machinery and equipment, and leveraging data-driven insights for efficient resource management. Additionally, investment in research and development for biotechnology and genetic engineering can lead to the development of resilient crop varieties that are better adapted to changing environmental conditions.

3. Market Diversification and Value-Added Products: Encouraging diversification of agricultural products and promoting value addition can contribute to a more resilient and sustainable agricultural economy. Farmers can be supported in diversifying their crops or livestock to reduce dependency on a single commodity. Furthermore, promoting the development of value-added products such as organic food products, herbal supplements, or bio-based materials can create new economic opportunities within the agricultural sector.

4. Access to Finance and Infrastructure: Ensuring that farmers have access to affordable credit, insurance services, and modern infrastructure such as irrigation systems, storage facilities, and transportation networks is crucial for building a sustainable agricultural economy. Financial institutions and governments can design tailored financial products for smallholder farmers and invest in rural infrastructure development to improve market access and reduce post-harvest losses.

5. Education and Training: Investing in education and training programs for farmers is essential for enhancing their skills, knowledge, and capacity to adopt sustainable agricultural practices. This includes providing extension services, vocational training, and educational resources on topics such as soil health management, water conservation, integrated pest management, and climate-smart agriculture.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no conflict of interest.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

The authors confirm contribution to the papers as follows:
Oyebola Odunayo Olabinjo: Writing (original draft, Review, Editing, Visualization):
Stephen Boluwatife Opatola: Investigation.

ETHICS COMMITTEE DECISION

This article does not require any ethical committee decision.

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