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Empowering agriculture: A holistic approach to combat food insecurity in Africa

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Abstract

This research offers an in-depth examination of the factors contributing to food insecurity in developing regions, focusing on Africa. It presents a multifaceted approach to address these challenges. The study investigates the effects of gender disparities, natural disasters, climate change, and the transition from agriculture to oil production on food security. Additionally, the research underscores the crucial role of governments in delivering essential infrastructure, education, and effective monitoring systems to enforce environmental regulations. The significance of social networks, farmer collaboration, and innovative strategies such as crop rotation, mechanized farming systems, and agrobiotechnology in enhancing agricultural output and achieving food security is also highlighted. By integrating these various elements, the research provides a novel and comprehensive perspective on addressing food insecurity, emphasizing the need for cooperation among governments, the agricultural sector, and communities in developing regions to foster sustainable development and improve the quality of life for millions of people.

Keywords: Food insecurity; Agriculture; Sustainable development; Social networks; Agricultural mechanization; Climate change

1. Promoting Sustainable Food Security in Nigeria

Addressing food insecurity in Nigeria is crucial to achieving the Sustainable Development Goal of zero hunger. Identifying the country's underlying causes of food insecurity is essential for devising practical solutions. Nigerians often perceive locally produced goods as inferior to imported ones, which has led to a preference for international foods [1-3]. The growth of the oil industry and its massive revenues have diverted attention and resources away from agriculture, contributing to the decline of local food production. To promote sustainable food security, Nigeria must tackle the challenges stemming from its socio-political climate, including economic stagnation, civil conflict, a decreasing workforce, gender inequality, inadequate education and healthcare, and weak governance [4-6]. These factors have collectively resulted in reduced access to food for many Nigerians. A key issue to address is the limited availability of arable land, as Nigeria's growing population may eventually outstrip the land's capacity to support its inhabitants [7-9]. Moreover, as the middle-income population in emerging countries increases, the demand for meat rises. This demand necessitates additional land for livestock production, intensifying competition for land and further straining grain and soybean prices, supplies, and reserves. Focusing on sustainable agricultural practices, resource management, and reducing reliance on imports will ensure food security in Nigeria while aligning with the Sustainable Development Goals.

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1.1. Addressing Gender Disparities in Food Security

Gender disparities are significant in food insecurity, impacting the issue's causes and consequences. Women and girls constitute a substantial portion of the world's chronically hungry population. Despite being primarily responsible for cooking and childcare, women often face discrimination in employment and education, which limits their ability to contribute to food security[10-12]. The growing dominance of agribusiness further exacerbates this situation. Addressing gender inequality is crucial to tackling food insecurity, as it disproportionately affects women and girls who are denied access to work or are unable to work. Women's vulnerability becomes even more apparent during food crises, with female-headed households being more susceptible to hunger and economic hardship than male-headed households in many regions. This vulnerability is particularly pronounced for widowed mothers and their families[13-15]. To achieve food security and contribute to Sustainable Development Goals, women must have equal access to land for agricultural production, food processing, distribution, and marketing. Unfortunately, women typically have less access to agricultural resources, inputs, and services than men. Research suggests that if women had the same access to productive resources as men, agricultural yields could increase by 10-30%, and agricultural output in developing countries could rise by 2.5-4%[16-18]. This increase in output could significantly reduce food insecurity in these nations. By addressing gender inequality and improving women's access to agricultural resources, food security can be more readily achieved. As women's opportunities increase, poverty declines, and nutrition improves. In conflict-affected areas, such as northeastern Nigeria, where the Boko Haram insurgency has disrupted agriculture and livelihoods, addressing gender disparities becomes even more critical to ensuring food security and achieving sustainable development.

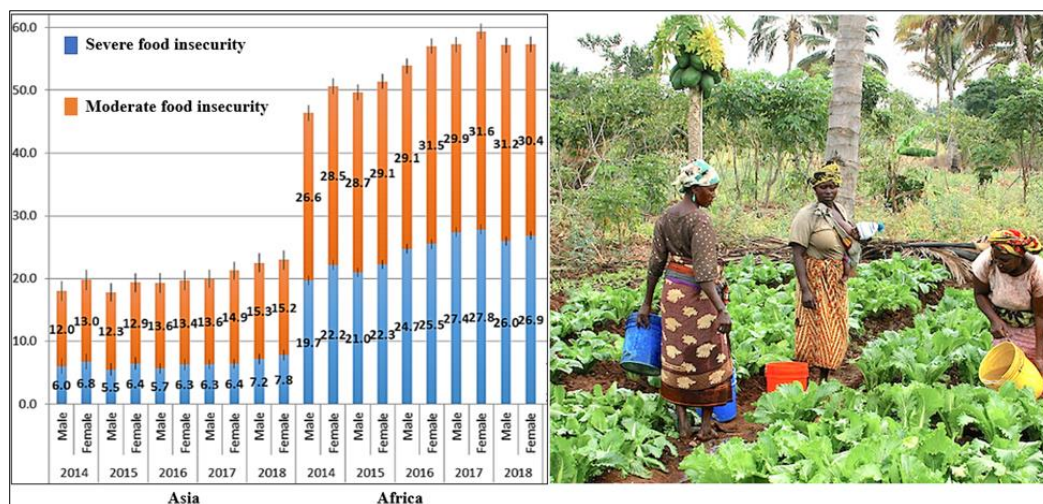


Figure 1 Gender differences in bolstering food production and food security

2. Addressing the Impact of Natural Disasters and Climate Change on Food Security

Developed countries are the primary contributors to greenhouse gas emissions, while developing countries bear the brunt of climate change impacts. In these countries, climate change affects agricultural production, distribution, and food availability, with people in disadvantaged and rural areas particularly vulnerable due to their geographical location and limited adaptive capacity. Despite technological advancements improving food supplies in developed nations, food crop production depends mainly on temperature and weather conditions. Natural disasters and climate change exacerbate food insecurity in developing countries[19-21].

The effects of droughts, floods, and landslides are especially severe in regions where agriculture relies heavily on rainfall. Excessive rains and floods have significantly contributed to recent increases in food prices. At the same time, droughts and landslides continue to pose severe threats to food supplies. For instance, in 2007, floods in Gombe, Nigeria, destroyed approximately 1,000 farms, resulting in massive losses of critical indigenous crops. Such events can lead to substantial infrastructure disruptions, food supply losses, and increased food costs[21-23]. According to the Famine Early Warning Systems Network's Nigeria Food Security Outlook (2013), Nigeria experienced unprecedented rainfall between July and October 2012, causing widespread flooding that displaced 2.8 million people. Affected households struggled to restore their living standards, resulting in increased food insecurity due to inadequate food supplies and high prices. To address the impact of natural disasters and climate change on food security and align with the Sustainable Development Goals is essential to enhance adaptive capacity, promote sustainable agricultural practices,

and invest in disaster risk reduction measures. By doing so, communities can better cope with the challenges posed by climate change and natural disasters, ensuring food security and resilience in the face of growing environmental threats.

3. Special Program for Food Security and Related Initiatives

The Special Program for Food Security (SPFS) is a government-led project in an African country supported by the Food and Agriculture Organization (FAO). The program aims to increase food production and accessibility and improve farmers' harvests by providing information on innovative and affordable agricultural techniques. Implemented in 109 farming communities across Nigeria's four government zones, the initiative is expected to enhance crop yields significantly. Root and Tuber Expansion Program: Funded by the International Fund for Agricultural Development (IFAD), this program helps develop farmers' skills, particularly in advanced production methods for cassava root and tuber products.

Fadama Development Project: Established by the Nigerian government and funded by various international organizations, the Fadama Project encourages farmers to engage in year-round farming activities. The project's operations include infrastructure development, extensive irrigation, farmer capacity building, and environmental awareness. Community-based Rural Development and Agriculture Programs: These programs encompass various development plans and initiatives, such as the "farm settlement" and "return to land" schemes. By making agricultural equipment more accessible and offering incentives, these initiatives aim to generate greater public interest in agriculture. Infrastructure Provision: The government has initiated infrastructure projects, including the construction of new access roads and maintenance of existing ones in rural areas, rural electrification, and provision of tools, fertilizers, and seeds to farmers. Farmers can adopt mechanized farming practices and reduce post-harvest losses through leasing or purchasing agricultural machinery, such as harvesters, tractors, and storage facilities.



Figure 2 Some governments and NGOs are trying to feed people experiencing poverty, and school students

International Center for Soil Fertility and Agricultural Development (ICSFDAD): Established in collaboration with the United States, the Nigerian government created the ICSFDAD to investigate factors affecting agricultural output in Nigeria. The center conducts assessments of various soil types from different regions to determine the optimal fertilizer for each farmer's specific soil type. Policy Instruments: These refer to directives and tools for implementing policy, such as banning the import of certain agricultural products that can be produced locally in sufficient quantities. The ban has been effective in supporting the agriculture and livestock sectors. Other policy instruments include subsidizing farmers' use of fertilizers, providing additional funds to the State Agricultural Bank to offer soft loans to farmers, and encouraging commercial banks to extend soft loans to farmers, thereby increasing funding for the sector.

4. Food security measures in Nigeria

Indeed, increased food production alone is not sufficient to guarantee food security. Even with an adequate food supply, people who are hungry and impoverished will continue to face food security challenges if they cannot afford it. Accessibility and stability are crucial factors that must be addressed alongside food production. Therefore, efforts to combat food insecurity must focus on increasing food availability and ensuring people can afford and access it. Nigeria is fortunate to possess vast, fertile farmlands, a favourable climate, and a population with a strong agricultural heritage. However, the question remains: Can Nigeria achieve its goal of food security, and is increasing agricultural productivity the sole solution? A comprehensive approach involving promoting science and technology, enhancing farmers' capacity,

facilitating market access, and adopting good governance is essential. There are four key strategies to ensure food security, encompassing economic, social, ecological, and technical aspects:

- Economic strategies involve improving income distribution, creating employment opportunities, and ensuring that food is affordable for all population segments. This can be achieved through targeted subsidies, social safety nets, and investments in rural infrastructure.
- Social strategies: Focusing on reducing poverty, promoting gender equality, and providing education and healthcare can help address the underlying social issues contributing to food insecurity. Empowering communities and fostering social cohesion are also essential in building resilience against food crises.
- Ecological strategies: Sustainable agricultural practices, such as agroforestry, conservation agriculture, and organic farming, can help protect the environment and ensure long-term food security. Additionally, efforts should be made to reduce food waste and promote efficient use of natural resources.
- Technical strategies: Advancements in agricultural technology and the dissemination of knowledge can significantly improve productivity and reduce post-harvest losses. Investing in research and development, promoting innovation, and providing training and extension services for farmers are key to achieving technical progress in agriculture.

By integrating these four strategies, Nigeria can work towards achieving food security and ensuring that its population has consistent and reliable access to affordable, nutritious food.

4.1. Social Approach and Technological Strategies

Social Networks and Organized Farmer Cooperation: Establishing networks and collaborations is crucial for significantly improving smallholder farmers' livelihoods. These platforms enable skill-building, helping vulnerable farmers manage risks and protect the group's most disadvantaged farmers' interests. For farmers and other social groups, these networks serve as a valuable resource for enhancing capacities and gaining access to credit lines, inputs, markets, and other resources. **Accessible Education:** Education is vital for increasing productivity across industries. Nigerian farmers, particularly in rural areas, suffer from inadequate education due to a lack of interest and availability. Governments should provide educational opportunities for low-income citizens in both urban and rural areas, equipping them with technical skills and the ability to utilize agricultural equipment effectively.



Figure 3 Food Security in Social and technological plan

Infrastructure Provision: Even in developed urban areas, the absence of essential amenities such as access roads, electricity, and potable water can have a significant negative economic impact. Ensuring access to these necessities is vital, as farm equipment depends on electricity for energy storage facilities, and roads and transportation systems enable farmers to reach markets, boosting their economy. **Crop Rotation, Combination, and Diversification:** These strategies are essential for improving the quality and yield of agricultural output. This approach enhances soil nutrients and can potentially control pests and diseases. Promoting these methods among farmers is necessary.

Irrigation Scheme: Studies have shown that irrigated farms in dry savannah agroecological zones produce more than non-irrigated farms in the same area. This strategy is generally effective throughout northern Africa. Support for Mechanized Farming Systems: Agricultural mechanization is essential for increasing production by utilizing equipment, machinery, and tools. While some large-scale farmers employ mechanized agricultural techniques, smallholder farmers should be encouraged to do the same. The Nigerian government must collaborate with various public and private entities and financial institutions to achieve widespread agricultural mechanization. Agro-biotechnology: Despite unresolved safety concerns, agricultural biotechnology that produces genetically modified food holds significant potential for addressing global food security. As a recent example of scientific and technological achievement, it remains crucial for the future of sustainable agriculture.

5. Discussion

Food insecurity is a global issue but is more prevalent in developing regions like Africa. The African continent is fortunate to have abundant human resources and fertile land for agriculture. Historically, African nations have thrived in this sector. However, the discovery of oil in the oil-rich Niger Delta region shifted the focus away from agriculture's benefits as the prospect of generating substantial revenue from oil wells became more appealing. Regrettably, the population suffers from famine, malnutrition, and deficiency diseases due to alleged corruption and mismanagement of oil resources. Improving domestic food security remains a priority, but various factors, including inadequate storage, hinder progress. There is a need to create an enabling environment by promoting employment within the agricultural sector and providing credit lines that serve as platforms for the most vulnerable individuals involved in the economy, focusing on addressing rural challenges. In addition to governments providing essential infrastructure like access roads and electricity and expanding educational opportunities to enhance farmer capabilities, social networking and collaboration among farmers offer them a collective voice. Oil spills and industrial effluents are significant sources of soil, water, and environmental pollution, reducing agricultural output. Governments should establish effective monitoring systems to enforce regulations against careless waste disposal. Ultimately, to achieve agricultural productivity, it is crucial to adopt and implement a comprehensive approach that addresses the various challenges the agricultural sector faces, from infrastructure and education to environmental protection and social support networks.

6. Conclusion

In conclusion, this research has provided a comprehensive analysis of the factors contributing to food insecurity in developing regions like Africa, emphasizing the importance of a multifaceted approach to address these challenges. The study highlights the need to shift focus back to agriculture and ensure sustainable and efficient utilization of available resources. By promoting employment, providing credit lines, and fostering social networks and collaboration among farmers, we can create an enabling environment that empowers the most vulnerable individuals in the agricultural sector. The research emphasizes the critical role of governments in providing essential infrastructure, such as access roads and electricity, and expanding educational opportunities to enhance farmer capabilities. Additionally, effective monitoring systems must be established to enforce regulations against environmental pollution resulting from oil spills and industrial effluents.

Innovative strategies, including crop rotation, crop combination, crop diversification, and adopting mechanized farming systems, can further enhance agricultural output. Moreover, the research suggests that exploring agro-biotechnology while addressing safety concerns could potentially contribute to addressing global food security challenges. By synthesizing these various aspects, the research presents a novel and holistic perspective on tackling food insecurity, emphasizing the importance of collaboration between governments, the agricultural sector, and communities in developing regions. Through such a comprehensive approach, we can ensure food security for all, promoting sustainable development and improving the quality of life for millions of people.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest.

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