# Environmental Management Strategies for Sustainable Food Security in Rural Communities in Rivers State, Nigeria.

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**DOI:** https://dx.doi.org/10.47772/IJRISS.2024.809011

**Received: 13 August 2024; Accepted: 21 August 2024; Published: 26 September 2024**

## ABSTRACT

The study examined environmental management strategies for sustainable food security in rural communities in Rivers State. The design of the study was descriptive survey design. The population of the study comprised 450 farmers in Bodo, Elele and Omoku communities in Rivers State. The study used the entire population of 450 farmers due to its manageability. The instrument for data collection was a structured questionnaire developed by the researcher which was validated by experts and its reliability was tested and obtained an index of 0.81. The analysis of data was done using mean statistics. The study revealed that environmental challenges have a huge impact on agricultural productivity and food security in numerous areas except for the access to farming inputs in these communities. It also revealed that environmental management strategies such as restoration techniques, efficient water management systems, climate-resilient farming practices, pest management strategies, education and training for farmers as well as proper waste management are much effective in enhancing sustainable food security in these communities. It was concluded that implementing environmental management strategies is imperative for achieving a resilient and sustainable food system, which is essential for the well-being of communities in Rivers State and the nation. The researchers therefore recommend amongst others that Government, with help from extension agencies, should organize workshops, training sessions, and demonstration farms to educate farmers on modern agricultural techniques and environmental conservation methods.

**Keywords:** Food Security, Sustainability, Environmental Management Strategies, Rural communities.

## INTRODUCTION

Rivers State, located in the Niger Delta region of Nigeria, is characterized by its rich biodiversity and significant agricultural potential. However, the region faces numerous environmental challenges that affect food security. Sustainable food security refers to the availability, accessibility, and utilization of food in a manner that meets present needs without compromising the ability of future generations to meet their own. In the rural communities of Rivers State, achieving sustainable food security is intricately linked to effective environmental management strategies. These strategies encompass a range of practices aimed at conserving natural resources, reducing environmental degradation, and promoting agricultural productivity.

The primary environmental challenges in Rivers State include soil degradation, deforestation, water pollution, and climate change (Baridoma & Afen, 2024). Soil degradation, caused by unsustainable farming practices and industrial activities, reduces agricultural productivity. Deforestation, driven by logging and land conversion for agriculture, leads to loss of biodiversity and disrupts ecological balance. Water pollution from oil spills, industrial waste, and agricultural runoff contaminates water sources, affecting both human health and agricultural productivity. Climate change exacerbates these issues by altering weather patterns, leading to unpredictable rainfall and increased frequency of extreme weather events. These environmental challenges undermine the ability of rural communities to produce sufficient, nutritious food.

Environmental management strategies are crucial in mitigating these challenges and ensuring sustainable food security. These strategies include the adoption of sustainable agricultural practices, reforestation, water resource

management, and climate change adaptation measures. Sustainable agricultural practices, such as crop rotation, agroforestry, and organic farming, help restore soil fertility, reduce dependence on chemical inputs, and enhance biodiversity (Yusriadi & Cahaya, 2022). Reforestation efforts aim to restore degraded forests, improve carbon sequestration, and protect watersheds. Effective water resource management ensures the availability of clean water for irrigation and domestic use, while minimizing pollution. Climate change adaptation measures, such as the development of resilient crop varieties and improved irrigation systems, help farmers cope with changing environmental conditions.

In the rural communities of Bodo, Elele, and Omoku, these environmental management strategies are particularly relevant. Bodo, a community deeply rooted in fish farming and crop cultivation, faces significant environmental challenges such as oil pollution, which affects both land and water resources. Despite these challenges, the community continues to innovate sustainable agricultural practices to maintain food security. Elele, known for its diverse agricultural activities including crop farming and livestock rearing, has seen government interventions aimed at improving infrastructure, such as the Elele-Omoku road project. These developments are critical in enhancing market access for agricultural produce, thereby promoting food security (Marketforce Africa, 2024). Omoku, another agricultural hub, is characterized by its extensive cassava and plantain production. The community's focus on sustainable farming practices is crucial in mitigating the adverse effects of environmental degradation and ensuring long-term food security (Peoples Gazette, 2024).

## Statement of Problem

Rivers State, despite its rich biodiversity and substantial agricultural potential, faces significant environmental challenges that threaten sustainable food security in its rural communities. Bodo, Elele, and Omoku are particularly affected, each experiencing unique yet interconnected issues that highlight the need for targeted environmental management strategies. In Bodo, the pervasive problem of oil pollution has severely degraded both land and water resources. This contamination not only reduces the agricultural productivity of crops and fish farms but also poses serious health risks to the local population. The traditional reliance on these resources for livelihood underscores the urgent need for effective environmental management to restore and sustain food security in the community. Elele, known for its diverse agricultural activities including crop farming and livestock rearing, faces challenges related to soil degradation and deforestation. Unsustainable farming practices and industrial activities have contributed to soil erosion and nutrient loss, reducing crop yields.

The deforestation driven by logging and agricultural expansion disrupts the ecological balance and biodiversity. Infrastructure improvements, such as the Elele-Omoku road, are crucial, but they must be complemented by sustainable agricultural practices to ensure long-term food security. Omoku, with its extensive cassava and plantain production, contends with water pollution and climate change impacts. Industrial waste and agricultural runoff contaminate water sources, affecting both irrigation and drinking water. Climate change further exacerbates these issues by causing unpredictable rainfall patterns and extreme weather events, which disrupt agricultural cycles and reduce productivity. Sustainable farming practices and effective water resource management are essential to mitigate these challenges and ensure food security for the community. Given these pressing environmental challenges, there is a critical need for a comprehensive study on environmental management strategies to achieve sustainable food security in these communities.

## Objectives

The objectives of this study are as follows:

1. To evaluate the impact of environmental challenges on agricultural productivity and food security in rural communities in Rivers State.
2. To identify effective environmental management strategies that can be implemented to enhance sustainable food security in rural communities in Rivers State.

## Research Questions

The following research questions guided the study:

1. What is the impact of environmental challenges on agricultural productivity and food security in the rural communities in Rivers State?
2. What are the effective environmental management strategies that can be implemented to enhance sustainable food security in rural communities in Rivers State?

# LITERATURE REVIEW

### Sustainable Livelihoods Framework (SLF)

The Sustainable Livelihoods Framework (SLF) propounded by Robert Chambers and Gordon Conway 1992 provides a comprehensive approach to understanding and addressing the multifaceted nature of poverty and food insecurity in rural communities. It emphasizes the importance of various assets—human, natural, financial, social, and physical—and how these assets interact to support sustainable livelihoods (Chambers & Conway 1992). The framework is particularly relevant for this study for several reasons:

i. Holistic Analysis of Environmental Challenges: The SLF enables a detailed examination of how environmental challenges such as soil degradation, deforestation, water pollution, and climate change affect the different assets critical for sustainable livelihoods. By analyzing the interplay between these factors, the study can identify the most significant barriers to food security in Bodo, Elele, and Omoku.

ii. Identification of Sustainable Practices: Using the SLF, the study can explore sustainable agricultural practices that enhance natural and human assets. For example, practices like crop rotation, agroforestry, and organic farming can be evaluated for their potential to improve soil health, increase biodiversity, and boost agricultural productivity, thereby contributing to food security.

iii. Development of Context-Specific Strategies: The SLF emphasizes the importance of context-specific strategies tailored to the unique conditions of each community. Applying this framework, the study can develop environmental management strategies that address the specific challenges and leverage the strengths of Bodo, Elele, and Omoku. This ensures that recommendations are both practical and effective in enhancing sustainable food security.

iv. Enhancing Community Resilience: The SLF highlights the role of social and physical assets in building community resilience. The study can investigate how strengthening community networks, improving infrastructure, and fostering social cohesion can help rural populations better cope with environmental shocks and stresses. This holistic approach ensures that the strategies proposed are robust and sustainable in the long term.

### Sustainable Food Security

Sustainable food security is a multifaceted concept that ensures all people have consistent access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life, without compromising the ability of future generations to meet their food needs (Capone, R., Bilali, H. E., Debs, P., Cardone, G. & Driouech, N. 2014)). This concept encompasses four critical dimensions: availability, accessibility, utilization and stability of food. Availability refers to the presence of adequate food supplies produced domestically or imported. Accessibility pertains to the economic and physical ability of individuals to acquire food, influenced by factors like income, market prices, and infrastructure. Utilization involves the proper biological use of food, which includes aspects of nutrition, food safety and the body's ability to absorb nutrients. Stability refers to the consistency of food supply over time, ensuring that individual can always meet their dietary needs (Pangaribowo, E. H., Gerber, N. & Torero, M. 2013).

Achieving sustainable food security requires a holistic approach that integrates various strategies to address environmental, economic, and social challenges. Environmental management is crucial, as sustainable agricultural practices, such as crop rotation, agroforestry, and organic farming, help maintain soil fertility, reduce dependence on chemical inputs, and enhance biodiversity (Adomako & Ampadu, 2015). Water resource management ensures the availability of clean water for irrigation and domestic use, while reforestation efforts restore degraded forests, improve carbon sequestration, and protect watersheds. Addressing climate change

through adaptation measures, such as developing resilient crop varieties and improving irrigation systems, helps mitigate the impacts of unpredictable weather patterns and extreme weather events.

Economic strategies are equally important, including improving market access, supporting smallholder farmers, and enhancing rural infrastructure. Social strategies involve education, capacity building, and fostering community resilience. For instance, Raidimi and Kabiti (2019) stated that educating farmers on sustainable practices and improving their access to technology and financial resources can enhance agricultural productivity and food security. Additionally, strengthening social networks and community organizations can help build collective resilience against environmental and economic shocks.

**Need for Sustainable Food Security in Rural Communities in Rivers State.**

Sustainable food security is crucial for the well-being and development of rural communities and the broader Nigerian society. This need is underpinned by several key factors. Food security is integral to economic stability. In Rivers State, agriculture is a primary livelihood for many rural communities. Ensuring that these communities can produce sufficient food sustainably helps to stabilize their incomes and reduces poverty levels (Amaechi, 2018). Sustainable agricultural practices, such as crop rotation, organic farming, and efficient water use, can enhance productivity while preserving the environment. This, in turn, creates a more stable economic base for these communities and contributes to the overall economy. Rural communities in Rivers State often face challenges related to malnutrition and food scarcity. Sustainable food security ensures a consistent and adequate supply of nutritious food, which is essential for the health and development of individuals, particularly children. Proper nutrition supports cognitive development, enhances productivity, and reduces healthcare costs by preventing diet-related diseases (Scarmeas, Anastasiou & Yannakoulia, 2018).

Sustainable food security practices are also vital for environmental conservation. Traditional farming methods can lead to soil degradation, deforestation, and water pollution. Adopting sustainable practices helps to mitigate these environmental impacts (Adebayo & Ojo, 2012). For instance, agroforestry, conservation tillage, and integrated pest management promote biodiversity, improve soil health, and ensure the long-term viability of agricultural lands. Food insecurity can lead to social unrest and conflict. In Nigeria, where many rural areas are already vulnerable, ensuring food security can help maintain social stability. Providing a reliable food supply, communities are less likely to experience the stress and tensions that can lead to conflicts. When rural populations are stable and self-sufficient, there is less pressure on urban areas, reducing the risk of urban overpopulation and associated social problems.

According to Wudil, A. H., Ali, A., Aderinoye-Abdulwahab, S., Raza, H. A., Mehmood, H. Z. and Sannoh, A. B. (2023), to achieve sustainable food security, there must be supportive policies and infrastructure in place. This includes investment in agricultural research, rural infrastructure such as roads and storage facilities, and education on sustainable farming techniques. Government policies should also aim to support smallholder farmers through subsidies, access to credit, and fair market conditions. Sustainable food security is also a critical component of climate change mitigation. Agriculture is both a contributor to and a victim of climate change. Adopting sustainable practices, such as reducing greenhouse gas emissions from farming activities and increasing carbon sequestration through agroforestry, rural communities can help mitigate climate change. This not only benefits the environment but also ensures that agriculture can continue to be a viable livelihood in the face of changing climatic conditions.

**Environmental Management Strategies**

Environmental management strategies are essential for mitigating the impacts of human activities on the environment and ensuring sustainable development. These strategies involve a range of practices designed to protect and enhance the natural environment while meeting the needs of current and future generations. Integrated Environmental Management (IEM) is a holistic approach that considers environmental, social, and economic factors in decision-making (Ahmed, 2016). This strategy involves cross-sectoral coordination and collaboration among different stakeholders to address complex environmental issues. It emphasizes the integration of environmental considerations into all stages of planning and development, from project conception to implementation and monitoring (Mashi, Oghenejabor & Inkani, 2019). Sustainable resource management

focuses on the efficient use and conservation of natural resources such as water, soil, and minerals. This strategy aims to balance resource extraction with the need for conservation to ensure that resources remain available for future generations.

Techniques include implementing sustainable agricultural practices, promoting recycling and reuse, and adopting conservation methods in forestry and fisheries (Doro, Ehosioke & Aizebeokhai, 2020). According to Nadeem and Hameed (2008), Environmental Impact Assessment (EIA) is a systematic process used to evaluate the potential environmental effects of proposed projects before they are carried out. The EIA process involves assessing the potential impacts on air, water, soil, and ecosystems, and proposing mitigation measures to reduce adverse effects. This strategy helps in making informed decisions and ensuring that projects comply with environmental regulations (Orubebe, 2019). ISO 14001 is an international standard for Environmental Management Systems (EMS) that provides a framework for organizations to manage their environmental responsibilities (Morrow & Rondinelli, 2002). Implementing ISO 14001 helps organizations systematically reduce their environmental footprint through improved practices, compliance with regulations, and continuous improvement. This standard is widely recognized and helps organizations demonstrate their commitment to environmental stewardship (Ojo, Oladinrin, & Obi, 2021).

Pollution prevention involves strategies and practices aimed at reducing or eliminating the production of pollutants at their source. This includes adopting cleaner technologies, improving process efficiency, and minimizing waste generation. Focusing on preventing pollution rather than merely controlling it, organizations and communities can reduce their environmental impact and improve overall sustainability (Amokaye, 2012). Effective environmental management also requires the active involvement of communities and stakeholders. Engaging local communities in environmental decision-making processes and providing education on environmental issues can enhance public awareness and foster collaborative efforts. Community-driven initiatives and grassroots organizations play a vital role in implementing and sustaining environmental management strategies (Nwanaji-Enwerem, O., Baccarelli, A. A., Curwin, B. D., Zota, A. R. & Nwanaji-Enwerem, J. C. 2022).

**Environmental Management Strategies for Sustainable Food Security in Rural Communities in Rivers State.**

Environmental management strategies play a crucial role in enhancing sustainable food security, particularly in rural communities and the broader Nigerian society. These strategies help address the complex interplay between environmental health and food production, ensuring long-term food security and environmental sustainability. Some of the strategies includes:

**Sustainable Agriculture:** This practice is essential for maintaining food security in rural areas. Techniques such as crop rotation, agroforestry, and organic farming reduce soil degradation, conserve water, and enhance soil fertility. These practices not only boost agricultural productivity but also protect natural resources, which is vital for sustaining food supplies in the long term (Amaechi, 2018). Promoting sustainable farming practices such as crop rotation, organic farming and agroforestry to maintain soil fertility and reduce environmental degradation can help sustain food security. Effective sustainable agriculture helps mitigate the impacts of environmental degradation on food security.

**Biodiversity Conservation:** Preserving natural habitats, reducing environmental degradation and promoting biodiversity these strategies ensure that ecosystems continue to provide essential services such as pollination, water purification, and soil fertility, which are crucial for agricultural productivity (Ogundipe, Obi & Ogundipe, 2020).

**Climate Change Adaptation**: Climate change poses significant challenges to food security, including altered rainfall patterns and increased frequency of extreme weather events. Environmental management strategies that focus on climate change adaptation—such as developing drought-resistant crop varieties, improving irrigation systems, and promoting climate-smart agriculture—help rural communities adapt to these changes and safeguard their food sources (Ajiola & Ilesanmi, 2017).

**Managing pollution and waste** is vital for ensuring that agricultural lands remain productive. Strategies to control agricultural runoff, manage chemical use, and reduce pollution from industrial activities prevent soil and water contamination. Effective waste management practices, including recycling and composting, also contribute to soil health and reduce the negative impacts on food production (Abdulsalami, 2020).

**Government policies and strong institutional frameworks** are necessary to implement and sustain environmental management strategies. Government policies that incentivize sustainable practices, provide technical support, and ensure access to resources are crucial. Institutional support, including research and extension services, helps farmers adopt best practices and technologies that enhance both environmental health and food security (Abubakar, Mutalib & Abubakar, 2019). Engaging local communities in environmental management and food security initiatives is essential for successful implementation. **Education and awareness programmes** help communities understand the benefits of sustainable practices and motivate them to participate actively. Grassroots involvement ensures that strategies are tailored to local needs and conditions, enhancing their effectiveness and sustainability (Amaechi, 2018).

## METHODOLOGY

The study is a descriptive survey design because the researchers intend to sample the opinions of the respondents on environmental management strategies for sustainable food security in rural communities in Rivers State. The population comprises 450 farmers in the three selected communities in the State and a sample size of 450 respondents was gotten via the total enumeration sampling technique where the entirety of the population was selected for the study. Self-structured questionnaire was employed for the collection of data, which was duly validated and tested for its reliability given at 0.81. Mean statistics was the statistical tools used in answering the research questions.

## RESULT

**Research Question 1:** What is the impact of environmental challenges on agricultural productivity and food security in the rural communities in Rivers State?

Table 1: Mean analysis of responses on the impact of environmental challenges on agricultural productivity and food security in the rural communities in Rivers State

| S/N | Items | SA | A | D | SD | $\bar{x}$ | Remark |
|---|---|---|---|---|---|---|---|
| 1 | The quality of soil in our community has deteriorated due to environmental pollution, affecting crop yields. | 186 | 119 | 97 | 48 | 2.98 | Agree |
| 2 | Contaminated water sources in our area have led to a decrease in agricultural productivity. | 199 | 148 | 75 | 28 | 3.15 | Agree |
| 3 | Changes in weather patterns have made farming less predictable and reduced overall food production. | 167 | 195 | 68 | 20 | 3.13 | Agree |
| 4 | There has been an increase in crop pests and diseases due to environmental changes, impacting food security. | 171 | 228 | 43 | 8 | 3.25 | Agree |
| 5 | Environmental challenges have made it more difficult to access necessary farming inputs (e.g., seeds, fertilizers). | 93 | 109 | 148 | 100 | 2.43 | Disagree |
| 6 | Environmental degradation has negatively impacted our livelihoods and food security in the community. | 208 | 199 | 40 | 3 | 3.36 | Agree |
| | **Grand Mean** | | | | | **3.05** | |

Data in the table above revealed the mean statistics of the responses on the impact of environmental challenges on agricultural productivity and food security in the rural communities of Bodo, Elele, and Omoku in Rivers State. From the analysis done, all the items except for item 5 were agreed with and this is because their respective mean scores were above the criterion-mean score of 2.50. With this, it can therefore be deduced that environmental challenges have a huge amount of impact on agricultural productivity and food security in numerous areas except for the access to farming inputs in these communities. This was concurred with by the grand mean which was given as 3.05.

**Research Question 2:** What are the effective environmental management strategies that can be implemented to enhance sustainable food security in rural communities in Rivers State?

Table 2: Mean analysis of responses on the effective environmental management strategies that can be implemented to enhance sustainable food security in rural communities in Rivers State

| S/N | Items | SA | A | D | SD | $\bar{x}$ | Remark |
|---|---|---|---|---|---|---|---|
| 1 | Implementing sustainable agricultural practices (e.g., organic farming, crop rotation) can significantly improve agricultural productivity in our community. | 188 | 172 | 65 | 25 | 3.16 | Agree |
| 2 | Developing efficient water management systems (e.g., rainwater harvesting, irrigation) is essential for enhancing food security. | 209 | 198 | 39 | 4 | 3.36 | Agree |
| 3 | Adopting climate-resilient farming practices (e.g., drought-resistant crops, agroforestry) can help mitigate the impact of climate change on agriculture. | 176 | 188 | 76 | 10 | 3.18 | Agree |
| 4 | Utilizing integrated pest management strategies (e.g., biological control, natural pesticides) to conserve biodiversity can effectively reduce crop losses and improve food security. | 154 | 163 | 129 | 4 | 3.04 | Agree |
| 5 | Providing education and training to farmers on sustainable agricultural practices is crucial for achieving long-term food security. | 206 | 227 | 17 | 0 | 3.42 | Agree |
| 6 | Implementing proper waste management practices (e.g., composting, recycling) can enhance soil fertility and support sustainable agriculture. | 204 | 239 | 0 | 7 | 3.42 | Agree |
| | **Grand Mean** | | | | | **3.26** | |

Data in the table above revealed the mean statistics of the responses on the effective environmental management strategies that can be implemented to enhance sustainable food security in Bodo, Elele, and Omoku in Rivers State. From the analysis done, all the items were agreed with and this is because their respective mean scores were above the criterion-mean score of 2.50. With this, it can therefore be deduced that environmental management strategies such as sustainable agricultural practices, efficient water management systems, climate-resilient farming practices, pest management strategies, education and training for farmers as well as proper waste management are more effective in enhancing sustainable food security in these communities. This was concurred with by the grand mean which was given as 3.26.

## DISCUSSION

From the analysis done in Table 1, it was revealed therein that environmental challenges have a huge amount of impact on agricultural productivity and food security in numerous areas except for the access to farming inputs

in these communities. This goes to show that the prevalence of environmental challenges has a dire effect in the rate of sustaining food security in the nation if not managed properly. This therefore calls for the adequate need for robust and efficient strategies that can bring about a firm and secure form of food security for all and sundry in the nation. This was further supported by Adomako and Ampadu (2015) who posited that achieving sustainable food security requires a holistic approach that integrates various strategies to address environmental, economic, and social challenges. The implication of this is that, with the right measures adopted towards environmental sustainability, food security is bound to be achieved in a great extent.

From the analysis done in Table 2, it was revealed therein that environmental management strategies such as sustainable agricultural practices, efficient water management systems, climate-resilient farming practices, pest management strategies, education and training for farmers as well as proper waste management are much effective in enhancing sustainable food security in these communities. This goes to show that adequate environmental management strategies can further help in bringing about the high promotion of food security in the nation. This was furthered by Amaechi (2018) who connotes that these strategies help address the complex interplay between environmental health and food production, ensuring long-term food security and environmental sustainability. The implication of this is that there is the need for adequate implementation of environmental management strategies for the good yield of agricultural productivity that inherently brings about improved food security in the society.

## CONCLUSION

This study highlights the significant impact of environmental challenges on agricultural productivity and food security, emphasizing the critical need for effective management strategies. The findings suggest that while access to farming inputs may not be severely affected, the broader environmental issues pose a substantial threat to sustaining food security. Also, the analysis underscores the effectiveness of various environmental management strategies, including restoration techniques, efficient water management, climate-resilient farming, pest management, farmer education, and proper waste management. The study therefore underscores the importance of adopting robust and efficient environmental management strategies to enhance agricultural productivity and secure food security. Implementing these strategies is imperative for achieving a resilient and sustainable food system, which is essential for the well-being of communities in Rivers State and the nation as a whole.

## RECOMMENDATIONS

Based on the foregoing, the following recommendations were made:

1. Local communities, Non Governmental Organizations, and international organizations should develop and execute comprehensive environmental management programmes that will address key issues such as soil degradation, water scarcity, and climate change.
2. Agricultural extension agencies, should organize workshops, training sessions, and demonstration farms to educate farmers on modern agricultural techniques and environmental conservation methods.
3. Government, NGOs, and international organizations should support the development of local agro-processing industries to add value to agricultural products, create jobs, and stimulate economic growth in rural areas.

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