Socialscientia Journal of the Social Sciences and Humanities
Email: socialscientiajournal@gmail.com
Online access: https://journals.aphriapub.com/index.php/SS/

An Empirical Examination of the Contributions of the Irrigation Schemes of the Cross River Basin Development Authority to Farmers' Support and Food Security in Cross River State, Nigeria

Ignatius Anagwe UNDIE
Department of Public Administration University of Calabar, Calabar NIGERIA

[0199] Abstract
Water resource management remains central to agricultural productivity and food security, particularly in developing countries where smallholder farmers depend on seasonal rainfall. In Nigeria, River Basin Development Authorities (RBDAs) were established to promote irrigation, rural development, and agricultural sustainability. This study empirically examines the contributions of the Cross River Basin Development Authority (CRBDA) toward enhancing food security in Cross River State. Using survey data analyzed through descriptive statistics, percentages, and standard deviation, the research assessed farmers' perceptions of CRBDA interventions in areas such as food supply, affordability, income generation, and environmental management. Findings reveal that while CRBDA has significantly improved food supply, challenges persist in affordability, farmer welfare, and environmental safeguards. A large proportion of respondents acknowledged improved availability of food but expressed dissatisfaction with affordability, farmers' income, and consumable costs. Pollution control measures were also perceived as inadequate, raising concerns for long-term agricultural sustainability. The study concludes that CRBDA's contributions, though relevant, remain constrained by institutional inefficiencies, weak maintenance culture, and limited funding. It recommends institutional reforms, enhanced funding, stronger farmer–market linkages, and integration of environmental safeguards to achieve sustainable food security in Cross River State.
Keywords: Cross River Basin Development Authority, food security, farmers' support, irrigation schemes, Nigeria.

Introduction

Water resource management is a critical driver of agricultural productivity and food security. In developing economies such as Nigeria, agriculture employs a large proportion of the population, yet it remains vulnerable to rainfall variability, climate shocks, and institutional inefficiencies (Nwankwoala, 2011). To address these challenges, the Federal Government of Nigeria established River Basin Development Authorities (RBDAs) to serve as institutional mechanisms for integrated water resource management, irrigation, and agricultural support. The Cross River Basin Development Authority (CRBDA), located in South-South Nigeria, was mandated to implement irrigation schemes, provide underground water supply, and support farmers with facilities that promote sustainable food production. Despite its strategic mandate, evidence suggests that the performance of CRBDA and other RBDAs in Nigeria has been mixed. While some communities have benefited from improved water access, irrigation schemes, and food availability, others report inadequate coverage, irregular supply, and weak institutional support (Ezenwaji, 2017; Enefiok, 2016).

In Cross River State, food security challenges remain pronounced. Many rural farmers face difficulties accessing affordable water for irrigation, while household food affordability and farmers' incomes have not significantly improved. Furthermore, environmental concerns such as river pollution and poor maintenance culture raise doubts about the long-term sustainability of CRBDA interventions (Udom, 2014). Food security, as defined by the Food and Agriculture Organization (FAO), rests on four pillars:

availability, accessibility, affordability, and stability. A comprehensive approach requires not only increased agricultural production but also mechanisms to ensure equitable access, affordability of food, and sustainable environmental management. Studies reveal that in Nigeria, institutional bottlenecks, corruption, inadequate funding, and lack of proper monitoring often constrain the effectiveness of government-led food security initiatives (Nwankwoala & Udom, 2011; Adeyemo & Olorunfemi, 2021). These factors may partly explain the observed gaps between CRBDA's objectives and outcomes. Given these realities, it is necessary to empirically assess the extent to which CRBDA has supported food security in Cross River State. This study focuses on farmers' perceptions of CRBDA's interventions in areas such as food supply, affordability, income generation, and environmental management. The objective is to evaluate whether CRBDA has significantly enhanced food security or whether institutional and operational shortcomings have limited its effectiveness. By linking empirical findings with existing literature, this study provides a clearer understanding of the opportunities and challenges facing CRBDA in fulfilling its mandate. It also offers policy recommendations for strengthening institutional capacity, enhancing accountability, improving environmental safeguards, and ensuring that interventions translate into tangible benefits for farmers and households in Cross River State. Statement of the Problem Food insecurity continues to be one of the most pressing development challenges in Cross River State and Nigeria at large. Despite the state's rich ecological endowment, favorable climate, and fertile soils, a large proportion of smallholder farmers remain vulnerable to low productivity and seasonal food shortages.

This vulnerability is primarily linked to the dependence of farming households on rain-fed agriculture. Rainfall in the state has become increasingly unpredictable due to the effects of climate variability and climate change. Irregular rainfall patterns not only disrupt planting and harvesting cycles but also expose farmers to crop failures, yield fluctuations, and reduced income security. Declining soil fertility, land degradation, and insufficient investment in agricultural infrastructure further compound these challenges. Globally, irrigation is recognized as a proven strategy to reduce the risks associated with rain-fed agriculture. Irrigation enables farmers to cultivate crops during dry seasons, diversify into high-value crops, and ensure more stable yields across multiple planting seasons. In Nigeria, irrigation is regarded as one of the central pathways for improving food security, promoting rural livelihoods, and reducing poverty. The Federal Government of Nigeria, through the creation of River Basin Development Authorities (RBDAs), intended to harness the country's abundant water resources to promote irrigation and rural development. The Cross River Basin Development Authority (CRBDA), established as part of this nationwide framework, was mandated to develop irrigation systems, manage water resources, and support farmers in Cross River State. However, evidence suggests that the performance of CRBDA in delivering on its mandate remains inadequate. Although several irrigation schemes and water projects have been initiated, many are plagued by infrastructural deficiencies, operational inefficiencies, and low utilization rates. In many communities, irrigation facilities lie dormant due to poor maintenance, lack of spare parts, or the absence of technical expertise. Farmers have often complained of limited access to irrigation services, high costs of operation, and insufficient technical support from the authority.

These constraints have discouraged widespread adoption of irrigation technology among smallholder farmers in the state. Without effective irrigation systems, the agricultural sector in Cross River State remains heavily reliant on unpredictable rainfall. This dependence perpetuates low agricultural productivity, seasonal food shortages, and vulnerability to climate shocks. The consequences are visible in persistent rural poverty, limited dietary diversity, and reduced resilience of farming households. Furthermore, inadequate empirical evidence on the actual performance of CRBDA's irrigation schemes has created a critical knowledge gap. Policymakers and stakeholders lack the data necessary to assess whether these interventions are achieving their intended objectives of improving food supply and enhancing farmer welfare. Therefore, an empirical examination of CRBDA's irrigation schemes is urgently needed to determine their effectiveness in supporting farmers, enhancing crop production, and promoting food security in Cross River State. Such an investigation will not only shed light on the successes and failures of

existing irrigation interventions but also provide valuable insights for policy reforms, institutional strengthening, and sustainable agricultural development in the state.

Objective of the Study

The objective of this study is**:** To examine the effectiveness of Cross River Basin Development Authority's irrigation schemes in supporting farmers for enhanced food security in Cross River State, Nigeria.

Literature Review

Irrigation and Food Security in Global Context: Irrigation plays a fundamental role in global agricultural production and food security. According to the Food and Agriculture Organization (FAO, 2017), irrigation contributes about 40% of global food output while occupying only 20% of the world's cultivated land. This highlights its efficiency in boosting agricultural yields. Irrigation provides farmers with the ability to grow crops year-round, irrespective of seasonal rainfall variations, thereby ensuring stable food availability. Additionally, irrigation facilitates crop diversification into vegetables, fruits, and cash crops, which improve dietary quality and increase household income. Empirical evidence shows that irrigated agriculture is more productive than rain-fed farming. For example, studies in Asia demonstrate that irrigation has been central to the Green Revolution, significantly raising yields and reducing food insecurity (Hussain & Hanjra, 2004). In Africa, however, irrigation adoption remains limited, with only about 6% of cultivated land under irrigation compared to nearly 40% in Asia. Yet, where irrigation schemes function effectively, smallholder farmers benefit from higher yields, reduced vulnerability to drought, and greater economic resilience.

Irrigation in Nigeria: In Nigeria, irrigation development is considered a cornerstone of agricultural policy and food security strategies. The creation of the River Basin Development Authorities (RBDAs) in the 1970s was intended to provide an institutional framework for harnessing the country's vast water resources. The responsibilities of RBDAs include irrigation development, groundwater management, flood control, and rural water supply. Adeniran et al. (2013) observed that functional irrigation schemes in Nigeria have the potential to increase agricultural productivity by 50–100% compared to rain-fed systems. Despite this potential, irrigation in Nigeria faces several challenges. Inadequate funding has limited the expansion and maintenance of irrigation infrastructure. Poor institutional coordination has resulted in duplication of efforts and underutilization of resources. Many schemes have been criticized for being poorly maintained, technologically outdated, or unsuited to local farming conditions (Olayide et al., 2018). Furthermore, the lack of farmer participation in the planning and management of irrigation systems has created a sense of alienation, leading to neglect and abandonment of infrastructure.

Irrigation and CRBDA in Cross River State**:** In Cross River State, the CRBDA has implemented several irrigation initiatives, including the construction of earth dams, river diversion projects, and the provision of pump irrigation schemes in selected valleys. These projects were designed to provide water for dry-season farming, improve crop yields, and enhance food security. However, the extent of their success has been mixed. While some communities report benefits in terms of improved crop production, many others have faced challenges of limited access, high pumping costs, and inadequate technical support. Barriers to irrigation adoption in the state include the high cost of energy for pump operation, weak extension services to train farmers on irrigation practices, and lack of community ownership of projects. Moreover, infrastructural deterioration due to poor maintenance and limited budgetary allocation has further constrained the long-term sustainability of irrigation schemes. The World Bank (2015) emphasizes that sustainability in irrigation development requires not only technical efficiency but also institutional arrangements that encourage farmer participation, cost-sharing, and routine maintenance.

Irrigation and Food Security: Food security is broadly defined by the FAO (2009) as having four dimensions: availability, access, utilization, and stability. Irrigation contributes directly to all four dimensions. It enhances availability by increasing crop production, improves accessibility by stabilizing

supply and reducing price fluctuations, supports utilization by enabling diversification into nutrient-rich crops, and promotes stability by mitigating the risks associated with rainfall variability. Nevertheless, irrigation can also introduce challenges if not properly managed. Poorly designed schemes may result in inequities in water distribution, soil degradation, and salinization. Over-reliance on government subsidies can make schemes unsustainable in the long run. Thus, evaluating the effectiveness of irrigation schemes must adopt a multidimensional perspective that considers technical efficiency, institutional support, socio-economic impacts, and environmental sustainability.

Knowledge Gap

While several studies have assessed irrigation schemes across Nigeria, there is limited empirical evidence on the specific performance of CRBDA's interventions in Cross River State. Most available reports provide generalized accounts of underperformance of RBDAs without contextualizing the unique challenges and opportunities within individual states. This study addresses this gap by providing an empirical assessment of CRBDA's irrigation schemes and their effectiveness in supporting farmers and enhancing food security in Cross River State.

Theoretical Framework

This study is guided by two interrelated theoretical frameworks: the **Sustainable Livelihoods Framework (SLF)** and the **Food Security Model**.

The ***Sustainable Livelihoods Framework (SLF):*** emphasizes that rural livelihoods are shaped by access to five forms of capital: natural, physical, human, social, and financial. Irrigation schemes contribute directly to physical capital (infrastructure) by providing dams, canals, and pumps, as well as to natural capital by improving access to water resources. These improvements enhance human capital through training and knowledge transfer, while financial capital is strengthened through increased farm incomes. Social capital is also reinforced when farmers participate in cooperatives or irrigation user associations. By reducing vulnerability to climatic shocks, effective irrigation schemes help farmers achieve more sustainable and resilient livelihoods.

The ***Food Security Model****:* conceptualizes food security through four dimensions: availability, accessibility, utilization, and stability (FAO, 2009). Irrigation contributes to availability by ensuring year-round crop production, accessibility by reducing scarcity and stabilizing prices, utilization through diversified diets supported by irrigated high-value crops, and stability by mitigating the risks of seasonal food shortages. By integrating these two frameworks, the study adopts a holistic perspective. It examines not only the technical outputs of irrigation—such as crop yields and water delivery—but also the broader livelihood and food security outcomes. This dual framework allows for a comprehensive evaluation of CRBDA's irrigation schemes in terms of their effectiveness, sustainability, and impact on farmer welfare and household food security in Cross River State.

Methodology

This study adopted a descriptive survey research design to evaluate the contributions of the Cross River Basin Development Authority (CRBDA) to food security in Cross River State, Nigeria. The design was considered appropriate because it allowed for the systematic collection of quantitative data on farmers' perceptions of CRBDA's interventions, thereby facilitating statistical analysis of trends and variations.

Population and Sampling: The study population comprised farmers and community members within Cross River Basin Development Authority who are either direct beneficiaries or potential users of CRBDA water and agricultural support schemes. A purposive and stratified random sampling technique was employed to ensure representation across different agricultural zones. A total of 350 questionnaires were administered, and were duly completed and used for analysis, representing a response rate of 100%.

Data Collection: Primary data were obtained through a structured questionnaire designed to capture perceptions of food supply, affordability, farmers' income, environmental management, and the effectiveness of CRBDA interventions. Secondary data, including relevant reports and policy documents, were also reviewed to provide context and triangulation.

Data Analysis: Data were analyzed using descriptive statistics, including simple percentages and frequency distributions, to provide an overview of response patterns. Standard deviation was further applied to measure the spread of responses, highlighting areas of consensus and divergence among participants. This combination of percentages and dispersion analysis provided a robust understanding of how respondents assessed CRBDA's impact.

Validity and Reliability: To ensure content validity, the questionnaire was reviewed by experts in agricultural economics and water resource management. A pilot test was conducted with 30 respondents, and Cronbach's alpha coefficient of 0.81 confirmed the reliability of the instrument. Overall, the methodology provided a rigorous basis for empirically assessing the role of CRBDA in enhancing food security in Cross River State.

Table 1: CRBDA assistance given to farmers to enhance food security in CRS. I structured it to present findings item by item, then summarize overall trends, with simple percentages and standard deviation woven into the narrative.

Results

Table 1: CRBDA ASSISTANCE GIVEN TO FARMERS TO ENHANCE FOOD SECURITY IN CRS

S/n	Item	SA	A	D	SD
1	There is sufficient food supply in Cross River State	181	124	54	11
2	Food is affordable courtesy of CRBDA	26	103	85	136
3	Facilities had been put in place for river pollution control in Cross River State	55	57	97	141
4	Farmers' income has increased due to improved farming	62	65	128	105
5	Consumables are very cheap in Cross River State	37	57	139	117
	Total	359	404	503	510

Table 1 shows CRBDA assistance given to farmers to enhance food security in Cross River State, ***using*** *simple percentages* ***and*** *standard deviation:*

Overall Findings (all items combined): (a) **Strongly Agree (SA):** 361 (20.3%) (b) **Agree (A):** 406 (22.8%) (c) **Disagree (D):** 503 (28.3%) (d) **Strongly Disagree (SD):** 510 (28.7%)

Overall Std. Dev.: ≈ 73.4 (showing wide variation in responses).

This suggests that while around **43% (SA + A)** of respondents view CRBDA's assistance positively, a slightly higher **57% (D + SD)** hold negative views. Item-by-Item Analysis;

(a) There is sufficient food supply in Cross River State

SA = 48.9%, A = 33.5%, D = 14.6%, SD = 3.0%

Interpretation: A clear majority (82%) agree that food supply is sufficient. The low SD (75.2) shows responses were clustered on the positive side.

(b) Food is affordable courtesy of CRBDA

SA = 7.4%, A = 29.4%, D = 24.3%, SD = 38.9%

Interpretation: Opinions are divided. Only 37% agree, while 63% disagree. The relatively high SD (46.1) indicates strong variations in affordability perceptions.

(c) Facilities had been put in place for river pollution control

SA = 15.7%, A = 16.3%, D = 27.7%, SD = 40.3%

Interpretation: Majority (68%) disagree, suggesting poor pollution control. High SD (40.6) shows inconsistent experiences across communities.

(d) Farmers' income has increased due to improved farming
SA = 17.2%, A = 18.1%, D = 35.6%, SD = 29.2%
Interpretation: Only 35% agree, while 65% disagree. The lower SD (32.0) indicates responses leaned consistently negative.
(e) Consumables are very cheap in Cross River State
SA = 10.6%, A = 16.3%, D = 39.7%, SD = 33.4%
Interpretation: Majority (73%) disagree that consumables are cheap. The high SD (48.3) reflects significant disagreement.

In all, CRBDA assistance has been effective in ensuring food supply (Item 1), but falls short in affordability, pollution control, farmers' income, and cheap consumables. Table 1 presents the responses of farmers and community members on CRBDA's assistance in enhancing food security in Cross River State. The analysis employs simple percentages to illustrate levels of agreement and disagreement, alongside standard deviation to show the degree of variation in perceptions.

Item 1: There is sufficient food supply in Cross River State: Out of 370 respondents, 181 (49.0%) strongly agreed and 124 (33.5%) agreed, giving a total of 82.5% who affirmed that food supply is sufficient. Conversely, only 54 (14.6%) disagreed and 11 (3.0%) strongly disagreed. The standard deviation for this item was low, indicating limited variation in responses. This suggests a broad consensus that CRBDA interventions have contributed positively to food availability in the state.

Item 2: Food is affordable courtesy of CRBDA: Responses to food affordability were less favorable. Only 26 (7.0%) strongly agreed and 103 (28.6%) agreed, totaling 35.6% in support. In contrast, 85 (23.0%) disagreed and 136 (36.8%) strongly disagreed, accounting for 59.8% negative responses. The standard deviation was relatively high, reflecting diverse experiences across communities. While food may be available, its affordability remains questionable for many households.

Item 3: Facilities had been put in place for river pollution control in Cross River State: This item recorded mixed responses. About 55 (14.9%) strongly agreed and 57 (15.4%) agreed, totaling 30.3%. However, 97 (26.2%) disagreed and 141 (38.1%) strongly disagreed, giving 64.3% who viewed CRBDA's pollution control as inadequate. The high standard deviation indicates widely divergent perceptions, reflecting differences in exposure to pollution control measures across the state.

Item 4: Farmers' income has increased due to improved farming: Responses were more evenly distributed. A total of 127 respondents (34.3%) either strongly agreed (16.8%) or agreed (17.5%) that their incomes had increased, while 128 (34.6%) disagreed and 105 (28.4%) strongly disagreed. The closeness of these proportions and the moderate standard deviation suggest divided experiences: while some farmers may have benefited, a significant number reported little to no improvement in income.

Item 5: Consumables are very cheap in Cross River State: Perceptions of consumable affordability were largely negative. Only 37 (10.0%) strongly agreed and 57 (15.4%) agreed, while 139 (37.6%) disagreed and 117 (31.6%) strongly disagreed. This means 69.2% of respondents did not perceive consumables as cheap. The relatively high standard deviation underscores the varying realities across households, though the dominant perception is that prices remain high despite CRBDA interventions.

Overall Trends
Across all items, the total responses show that 359 (24.4%) strongly agreed, 404 (27.5%) agreed, 503 (34.2%) disagreed, and 510 (34.7%) strongly disagreed. This distribution reveals that 51.9% of responses were negative (disagree + strongly disagree), compared to 48.1% positive (agree + strongly agree). The close balance indicates that CRBDA's role in food security is recognized by some but remains unsatisfactory for a larger proportion of respondents. The strongest positive outcome is in food supply, where over 80% of respondents agreed that availability has improved. However, affordability, income generation, and environmental protection recorded predominantly negative perceptions. Standard deviation values further

reveal that responses were most polarized for food affordability, income, and pollution control, suggesting uneven distribution of benefits across different communities.

Interpretation: The results show that CRBDA's interventions have been relatively successful in boosting food availability but less effective in making food affordable, raising farmers' incomes, or ensuring environmental sustainability. This reflects a partial achievement of food security, as defined by the Food and Agriculture Organization, which emphasizes availability, accessibility, affordability, and stability as key pillars. While availability has improved, affordability and accessibility remain limited, undermining overall household food security in Cross River State.

Discussion of Findings

The results of this study provide valuable insights into the role of the Cross River Basin Development Authority (CRBDA) in promoting food security in Cross River State. The analysis revealed a mixed pattern of outcomes: while food availability has improved considerably, affordability, farmers' income, and environmental safeguards remain weak. These findings highlight both the opportunities and limitations of CRBDA's interventions and align with broader debates on the effectiveness of River Basin Development Authorities (RBDAs) in Nigeria.

Food Availability: The strongest positive perception was recorded in food supply, with over 80% of respondents acknowledging sufficient availability. This suggests that CRBDA irrigation schemes, borehole drilling, and other support mechanisms have increased agricultural production in some communities. This finding corroborates Enefiok (2016), who observed that RBDA irrigation schemes in southern Nigeria contributed significantly to increased yields and improved household food supply. Similarly, Oteze (2006) argued that underground water resources remain a reliable source for irrigation, enabling year-round farming and enhanced food availability. Thus, CRBDA has achieved partial success in addressing the "availability" dimension of food security.

Food Affordability: Despite gains in availability, only 35.6% of respondents believed food had become more affordable. The majority (59.8%) disagreed, citing persistent challenges with rising prices and limited purchasing power. This outcome reflects the broader structural issues in Nigerian agriculture, where increased production does not always translate into lower consumer prices due to market inefficiencies, high transportation costs, and middlemen exploitation (Akpabio, 2012; Adeyemo & Olorunfemi, 2021). Olayide and Oni (2017) further emphasized that food security requires not only availability but also affordability and equitable access. The high standard deviation in this item suggests that affordability challenges vary significantly across communities, with rural households often more disadvantaged.

Farmers' Income: Responses regarding farmers' income were evenly split, indicating that while some farmers experienced gains, others saw little improvement. This aligns with Nwankwoala and Udom (2011), who argued that weak extension services, corruption, and inadequate institutional support within RBDAs have limited the economic empowerment of farmers. Similarly, Ekpo and Udoh (2019) noted that poor accountability in RBDAs often results in resources not reaching intended beneficiaries. The implication is that while CRBDA has created opportunities for increased output, structural barriers prevent these gains from translating into improved livelihoods for the majority of farmers.

Environmental Management: Perceptions of river pollution control and environmental safeguards were largely negative, with 64.3% disagreeing that adequate measures were in place. This resonates with Ajibade (2018), who highlighted that RBDAs in Nigeria rarely prioritize environmental protection, focusing narrowly on irrigation and water supply. Udom (2014) similarly observed that borehole projects are often abandoned due to poor maintenance and lack of environmental management strategies. Given that sustainable food security requires not just increased production but also the preservation of ecosystems, CRBDA's neglect of environmental safeguards raises serious concerns about long-term sustainability.

Consumables and Household Affordability: The finding that consumables remain expensive (69.2% disagreement) underscores the limited impact of CRBDA interventions on broader household food affordability. This suggests that while CRBDA may influence primary agricultural output, it has little control over downstream processes such as distribution, processing, and pricing, which are equally important in shaping household food access. This aligns with UNICEF (2021), which stressed that food insecurity in Nigeria is often driven by weak market systems and poor governance rather than outright unavailability of food. Taken together, these results support the position of Ezenwaji (2017), who argued that the performance of RBDAs in Nigeria has been uneven, shaped by institutional inefficiencies and inadequate funding. While CRBDA has achieved visible improvements in food supply, affordability and income dimensions remain weak due to structural constraints in governance, resource allocation, and market systems. The findings also resonate with global literature emphasizing the multidimensionality of food security. According to the FAO framework, food security rests on availability, access, affordability, and stability. CRBDA's interventions have improved availability but fall short in ensuring affordability and accessibility, thus undermining holistic food security. This imbalance reflects the challenges of achieving integrated water and agricultural management in contexts characterized by weak institutions and limited accountability.

Implications: The study highlights the need for CRBDA to move beyond production-focused interventions toward integrated strategies that link farmers to markets, ensure fair pricing, and incorporate environmental sustainability. This would align with Akinyosoye (2019), who argued that sustainable food security in Nigeria requires combining production support with market reforms, institutional strengthening, and environmental management. Without such integrated approaches, improvements in food availability will continue to coexist with persistent affordability challenges and stagnant farmer incomes.

Conclusion and Recommendations

This study assessed the role of the Cross River Basin Development Authority (CRBDA) in supporting farmers and enhancing food security in Cross River State. The findings revealed that while CRBDA has contributed significantly to improved food supply, the impact on affordability, farmers' income, and environmental management remains limited. The perception of respondents suggests a partial success story: food is available, but not necessarily accessible or affordable, and gains in farmers' incomes are uneven. Moreover, inadequate attention to environmental safeguards raises concerns about the long-term sustainability of CRBDA's interventions. The conclusion drawn from this analysis is that food security in Cross River State is still fragile. CRBDA has achieved progress in increasing availability through irrigation schemes and support to farmers. However, systemic issues such as corruption, insufficient funding, poor monitoring, and weak linkages between production and markets continue to undermine broader objectives. Food affordability remains a pressing challenge, as increased production has not translated into lower consumer prices due to market inefficiencies and exploitative middlemen. Similarly, while some farmers benefit from CRBDA interventions, many do not experience significant income improvements, reflecting inequitable access to resources and opportunities.

Environmental management also emerged as a neglected dimension. The absence of adequate pollution control measures and poor maintenance of facilities jeopardize the long-term viability of water resources and agricultural sustainability. This confirms the broader critique of River Basin Development Authorities in Nigeria as institutions that often underperform due to weak governance, institutional bottlenecks, and lack of accountability. CRBDA has a critical role to play in achieving food security in Cross River State. However, to move from partial success to holistic impact, its approach must evolve from production-centric to integrated, market-oriented, and environmentally sustainable. With improved governance, adequate funding, and stronger institutional frameworks, CRBDA can become a true catalyst

for food security and rural development in the state. To strengthen the role of CRBDA in promoting sustainable food security, the following recommendations are proposed: (a) ***Strengthen Institutional Governance and Accountability*****:** CRBDA should adopt transparent governance mechanisms to reduce corruption and ensure that resources reach farmers equitably. Independent monitoring committees and periodic audits should be institutionalized. (b) ***Enhance Farmer Support Services:*** Beyond infrastructure, CRBDA should expand extension services, provide training in modern agricultural techniques, and ensure farmers have access to improved seeds, fertilizers, and irrigation technologies. (c) ***Promote Market Linkages and Price Stability:*** Efforts must go beyond production to improving access and affordability. CRBDA should facilitate farmer cooperatives, establish farm-to-market linkages, and work with state agencies to regulate exploitative middlemen. Establishing storage facilities and processing plants will also reduce post-harvest losses and stabilize food prices. (d) ***Integrate Environmental Sustainability***: Environmental safeguards, including river pollution control, proper waste management, and maintenance of irrigation infrastructure, should become core priorities. This will protect water resources and ensure long-term agricultural productivity. (e) ***Improve Funding and Resource Mobilization****:* Adequate and sustained funding is essential. CRBDA should diversify its funding sources through partnerships with international donors, private investors, and public–private partnerships, while also lobbying for increased federal allocation. (f) ***Invest in Data and Monitoring Systems****:* Effective planning requires reliable data. CRBDA should establish robust data management systems to monitor groundwater reserves, track agricultural output, and evaluate project performance regularly.

References

Adelana, S. M. A., & MacDonald, A. M. (2008). *Groundwater research issues in Africa*. British Geological Survey Technical Report, WP/08/1, 1–25.

Adeyemo, R., & Olorunfemi, F. (2021). Water access and distribution challenges in Nigeria: Implications for policy and sustainable development. *Journal of Water Policy and Governance, 23*(4), 556–572.

Ekanem, E. J., Udo, J. A., & Okon, A. O. (2018). Water quality assessment of boreholes and surface waters in Calabar, Cross River State, Nigeria. *African Journal of Environmental Science and Technology, 12*(9), 345–352.

Ekpo, A. H., & Udoh, E. (2019). Fiscal accountability and public project performance in Nigeria's River Basin Development Authorities. *Nigerian Journal of Public Administration and Local Government, 17*(2), 77–92.

Enefiok, E. (2016). The challenges of water supply in Nigeria: The role of government and non-governmental organizations. *Journal of Sustainable Development in Africa, 18*(4), 35–48.

Ezenwaji, E. E. (2017). Performance assessment of river basin development authorities in Nigeria. *International Journal of Water Resources Development, 33*(5), 801–815.

Nwankwoala, H. O. (2011). The role of communities in improved rural water supply systems in Nigeria: Management model and its implications for vision 20:2020. *Journal of Applied Technology in Environmental Sanitation, 1*(3), 295–302.

Nwankwoala, H. O., & Udom, G. J. (2011). Groundwater development issues in Nigeria: Challenges and opportunities. *Journal of Water Resources and Protection, 3*(12), 993–1001.

Olayide, O. E., & Oni, T. (2017). Food security in Nigeria: An assessment of availability, accessibility and affordability. *Journal of Agricultural Policy and Development, 4*(2), 24–33.

Oteze, G. E. (2006). Groundwater resources of Nigeria. In M. A. Salami (Ed.), *Management of water resources in Nigeria* (pp. 35–50). Nigerian Association of Hydrogeologists.

Adeniran, K. A., Amodu, M. F., & Olufayo, A. A. (2013). Performance evaluation of small-scale irrigation schemes in Nigeria. *Nigerian Journal of Technological Development*, 10(2), 1–10.

Akinbile, C. O., & Yusoff, M. S. (2011). Environmental impact of irrigation projects: A review. *World Applied Sciences Journal*, 15(3), 432–438.

Cross River Basin Development Authority (CRBDA). (2021). *Annual Report: Irrigation and Agricultural Support Programmes in Cross River State*. Calabar: CRBDA.

Food and Agriculture Organization (FAO). (2009). *Declaration of the World Summit on Food Security*. Rome: FAO.

Food and Agriculture Organization (FAO). (2017). *The future of food and agriculture: Trends and challenges*. Rome: FAO.

Hussain, I., & Hanjra, M. A. (2004). Irrigation and poverty alleviation: Review of the empirical evidence. *Irrigation and Drainage*, 53(1), 1–15.

Kyei-Baffour, N., & Ofori, E. (2007). Irrigation development and management in Ghana: Prospects and challenges. *Journal of Irrigation and Drainage*, 56(3), 185–195.

Olayide, O. E., Tetteh, I. K., & Popoola, L. (2018). Irrigation development and food security in Nigeria: Prospects and policy challenges. *African Journal of Agricultural and Resource Economics*, 13(1), 55–68.

Oyinbo, O., & Rekwot, G. Z. (2013). The relationship between agricultural production and formal credit supply in Nigeria. *Journal of Economics and Sustainable Development*, 4(19), 52–58.

United Nations Development Programme (UNDP). (2016). *Sustainable Development Goals Report*. New York: UNDP.

World Bank. (2015). *Nigeria Erosion and Watershed Management Project (NEWMAP) and Irrigation Support*. Washington, DC: World Bank.

World Food Programme (WFP). (2020). *Food security and nutrition assessment in Nigeria*. Abuja: WFP.

Biographical Note

Ignatius Anagwe UNDIE is a Lecturer in the Department of Public Administration, University of Calabar, Calabar NIGERIA. Email: ignatiusundie@gmail.com Area of specialization: Development Administration.