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Flood and Erosion Control Measures of the Cross River Basin Development Authority's: Implications for Farmers and Food Security in Cross River State, Nigeria

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[0198] Abstract
Flooding and erosion present severe environmental and socio-economic challenges in Cross River State, threatening agricultural productivity, livelihoods, and food security. This study examines measures implemented by the Cross River Basin Development Authority (CRBDA) to control flood and erosion, assessing their effectiveness and implications for farmers. Using a structured questionnaire administered to farming communities, data were analyzed with simple percentages and standard deviation. Findings indicate that while CRBDA has introduced certain structural and non-structural interventions, flooding remains a persistent problem across the state. Farmers overwhelmingly reported recurrent crop destruction, loss of livelihoods, and in some cases, loss of lives due to flood disasters. The study also revealed that flood and erosion significantly disrupt business activities, highlighting the broad economic consequences of inadequate interventions. The results underscore weaknesses in institutional capacity, poor maintenance culture, and limited community participation in flood control projects. Anchored on the Sustainable Livelihoods Framework and Food Security Model, the study concludes that CRBDA's measures are insufficient for building resilience. It recommends integrated flood management, community participation, climate-smart agriculture, and stronger institutional accountability to ensure sustainable flood/erosion control and enhance food security in Cross River State.

Keywords: Cross River Basin, Cross River state Nigeria, Development Authority, flood and erosion control, food security implication for farmers.

Introduction

Flooding and erosion are among the most pressing environmental challenges confronting Nigeria, particularly in the Niger Delta and Cross River regions. These environmental hazards not only degrade fragile ecosystems but also threaten agriculture, which remains the primary source of livelihood for the majority of rural households. In Cross River State, flooding has become increasingly recurrent due to a combination of factors such as intense and prolonged rainfall, poorly designed or absent drainage systems, rapid urbanization, and deforestation. Similarly, gully erosion has accelerated land degradation, displacing farming communities, destroying farmlands, and undermining rural infrastructure. Together, these processes significantly compromise agricultural productivity, thereby heightening the vulnerability of food production systems and household income security. Recognizing these challenges, the Federal Government of Nigeria established the River Basin Development Authorities (RBDAs) in the late 1970s as institutional mechanisms to manage water resources and promote environmental sustainability.

The Cross River Basin Development Authority (CRBDA) was specifically mandated to undertake irrigation development, domestic water supply, flood and erosion control, and rural development projects within its jurisdiction. In principle, these responsibilities positioned the Authority as a critical agency for safeguarding agricultural systems against water-related hazards. However, despite years of interventions, the effectiveness of CRBDA's flood and erosion control measures has increasingly come under scrutiny.

Evidence from local communities suggests that flooding and erosion continue to inflict devastating consequences, including the destruction of crops, disruption of rural businesses, displacement of households, and, in some cases, the loss of lives. These recurring impacts raise questions about the adequacy, sustainability, and efficiency of CRBDA's strategies. This study therefore seeks to investigate the measures implemented by CRBDA to control flood and erosion in Cross River State, assess their effectiveness, and highlight implications for food security and rural livelihoods.

Statement of the Problem

Flooding and erosion continue to pose severe challenges to sustainable agriculture and food security in Cross River State, where the majority of households depend on farming as their primary livelihood. These environmental hazards result in the destruction of farmlands, displacement of communities, loss of rural infrastructure, and disruption of local businesses. While the Cross River Basin Development Authority (CRBDA) was mandated to mitigate these threats through interventions such as drainage construction, riverbank embankments, catchment area management, and soil conservation initiatives, the outcomes have been far from satisfactory. Reports from farming communities consistently highlight recurring crop losses, reduction in farm income, and increased vulnerability during the rainy season. In more extreme cases, floods have destroyed entire settlements, with lives lost in the process.

A critical concern is that many CRBDA interventions are either inadequate, poorly maintained, or inequitably distributed, leaving vulnerable communities exposed. Moreover, limited technical capacity, weak institutional coordination, and insufficient funding have further constrained effectiveness. Despite decades of interventions, there remains a paucity of empirical evidence evaluating the real impact of CRBDA's flood and erosion control measures. Without such systematic evaluation, policymakers and stakeholders lack the evidence base required to improve program design, allocate resources efficiently, and build farmer resilience against environmental shocks. This knowledge gap underscores the need for the present study.

Objective of the Study

To examine the effectiveness of Cross River Basin Development Authority's flood and erosion control measures in supporting farmers and enhancing food security in Cross River State, Nigeria.

Literature Review

***Flooding, Erosion and Agricultural Vulnerability*:** Flooding and gully erosion are widely recognized as major drivers of agricultural loss and rural impoverishment in southern Nigeria (Adelekan, 2016; Adekola & Lamond, 2018). Floods destroy standing crops, wash away topsoil, and interrupt market and transport networks, while erosion reduces arable land and degrades soil fertility—both of which directly undermine food availability and farmers' incomes (FAO, 2009). Climate variability has intensified rainfall extremes in the Niger Delta and Cross River regions, increasing the frequency and severity of hydrological hazards (Nkwunonwo et al., 2020).

Mandate and Interventions of CRBDA: The Cross River Basin Development Authority (CRBDA), as one of Nigeria's River Basin Development Authorities, was instituted to manage water resources, promote irrigation, and implement flood/erosion control measures (Nwankwoala & Udom, 2011). Typical CRBDA interventions documented in the literature include embankments, drainage works, gully reclamation, small dams, and catchment management projects intended to protect farmland and maintain water infrastructure (Eja et al., 2010; World Bank, 2015).

Empirical Assessments of Effectiveness: Empirical studies present a mixed picture. Some localized reports indicate that structural measures such as embankments and drainage have reduced flood incidence in targeted communities, leading to periodic improvements in dry-season farming (Enefiok, 2016). However, broader assessments reveal systemic shortcomings: many projects operate below capacity, suffer

neglect, or become non-functional shortly after completion due to lack of maintenance (Udom, 2014; Ekpo & Udoh, 2019). This replicates a recurrent pattern across RBDAs, where infrastructure investment is not matched by sustainable operations and management (Ezenwaji, 2017).

***Maintenance, Institutional Capacity and Funding Constraints*:** A dominant theme in the literature is that inadequate funding, weak institutional capacity, and poor maintenance culture undermine CRBDA's effectiveness (Nwankwoala, 2011; Ekpo & Udoh, 2019). Projects often lack spare parts, technical personnel, and predictable budget lines for upkeep, causing early deterioration of flood-control structures (Udom, 2014). Additionally, weak coordination between CRBDA, state ministries, and local governments reduces the efficiency of interventions (Nwankwoala & Udom, 2011).

Community Participation and Ownership: Sustainability studies emphasize that community involvement in design and maintenance significantly improves longevity and local relevance of flood-control measures (Adeniran et al., 2013). Where farmers and local institutions participate—through water user associations or maintenance committees—projects show higher functionality and better alignment with local needs (Nwankwoala, 2011). Conversely, top-down implementations without local buy-in are prone to abandonment (Olayide et al., 2018).

Implications for Food Security From a food-security perspective, CRBDA's mixed performance has direct consequences. Effective, maintained flood-control infrastructure can stabilize production, protect harvests, and reduce seasonal food shortages (FAO, 2017). Yet when interventions fail, the recurring losses translate into reduced household availability, erratic markets, and diminished farmer incomes, undermining all four FAO pillars of food security (availability, access, utilization, stability) (FAO, 2009; Adekola & Lamond, 2018).

Synthesis and Research Gap: The literature converges on the view that CRBDA has potential to mitigate flood/erosion impacts, but institutional and operational barriers—funding shortfalls, maintenance deficits, and limited community engagement—largely negate long-term effectiveness (Ekpo & Udoh, 2019; Ezenwaji, 2017). There remains a paucity of rigorous, state-wide empirical evaluations specifically quantifying how CRBDA's flood-control measures translate into sustained improvements in farmer incomes and household food security in Cross River—an evidentiary gap this study addresses.

Theoretical Framework

This study is underpinned by two complementary perspectives: the Sustainable Livelihoods Framework (SLF) and the Food Security Model. Together, these frameworks provide a robust analytical lens for understanding how flood and erosion control measures implemented by the Cross River Basin Development Authority (CRBDA) affect farmers' well-being and contribute to food security in Cross River State.;

The Sustainable Livelihoods Framework (SLF): emphasizes that rural livelihoods are shaped by access to five key forms of capital: natural, physical, human, financial, and social (Chambers & Conway, 1992). Flood and erosion control interventions directly influence natural capital by protecting farmlands from degradation, conserving soil fertility, and ensuring sustainable use of water resources. They also strengthen physical capital by providing protective infrastructure such as embankments, drainage systems, and gully reclamation projects that safeguard productive assets. Indirectly, these improvements enhance financial capital by stabilizing farm yields and incomes, while also contributing to human capital through training, awareness programs, and resilience-building initiatives. Furthermore, successful interventions can foster social capital by strengthening cooperative networks and collective action among farmers, enabling them to better manage environmental risks. Thus, through the SLF, CRBDA's activities are understood not merely as technical interventions but as livelihood-enhancing mechanisms.

***The Food Security Model*:** complements this approach by situating flood and erosion management within the four pillars of food security: availability, access, utilization, and stability (FAO, 2009). Effective

flood control measures increase availability by reducing crop losses and ensuring consistent harvests. By stabilizing production, they enhance stability, mitigating seasonal fluctuations in food supply that often arise from extreme weather events. Indirectly, these measures improve *access* to food by reducing market disruptions and safeguarding rural incomes, thereby enabling households to purchase food even during adverse seasons. Finally, food utilization is influenced when improved agricultural stability allows households to diversify diets and allocate resources toward better nutrition and health.

Integrating the SLF and the Food Security Model provides a holistic understanding of CRBDA's interventions. While the SLF highlights the multifaceted ways in which livelihoods are shaped by environmental management, the Food Security Model links these outcomes to broader nutritional and socio-economic well-being. This dual perspective allows the present study to assess not only the immediate technical effectiveness of CRBDA's flood and erosion control measures but also their wider impacts on resilience, income, and sustainable food systems in Cross River State.

Methodology

This study adopted a survey research design, which was considered appropriate for capturing farmers' perceptions of the effectiveness of Cross River Basin Development Authority's (CRBDA) flood and erosion control interventions in supporting agricultural livelihoods and enhancing food security in Cross River State. The principal instrument for data collection was a structured questionnaire designed to elicit information from farmers in flood-prone communities.

Questionnaire Development*:* The questionnaire was developed following an extensive review of relevant literature on flood and erosion control, agricultural resilience, and food security (FAO, 2009; Eni et al., 2011; Nkwunonwo et al., 2020). Key variables were operationalized under thematic sections such as: demographic information, farmers' exposure to flooding/erosion, awareness and participation in CRBDA programs, perceived effectiveness of interventions, and impacts on agricultural productivity and household food security. Items were structured in both closed-ended and Likert-scale formats to capture the intensity of respondents' perceptions. The Likert scale ranged from strongly agree *to* strongly disagree, allowing for quantitative analysis of attitudes. Open-ended questions were also included to provide space for farmers to express experiences not captured by structured items.

Pretest of the Instrument: To ensure clarity, reliability, and validity, the questionnaire was subjected to a pretest involving 20 farmers in a community within the study area that shared similar ecological and socio-economic characteristics but was excluded from the final sample. The pretest focused on testing the wording, sequence, and comprehensibility of items. Feedback revealed that some technical terms such as "catchment management" and "erosion embankment" were not easily understood by farmers. Consequently, simpler expressions like "water channeling" and "erosion barriers" were substituted. The pretest also helped to estimate the average completion time (approximately 25 minutes) and to identify redundant questions, which were pruned to reduce respondent fatigue. Reliability was confirmed using Cronbach's alpha, which yielded an acceptable coefficient above 0.70 for the key constructs.

Questionnaire Administration*:* The finalized questionnaire was administered to farmers across selected flood-prone communities using a multi-stage sampling technique. Enumerators, who were trained in data collection and conversant with the local languages (Bette, Efik, Ejagham, Bekwara, and pidgin English), assisted in the administration to ensure inclusivity and accuracy. Questionnaires were delivered in person, allowing enumerators to clarify questions where necessary and to accommodate respondents with limited literacy by reading items aloud. A total of 400 questionnaires were distributed, with a retrieval rate of 85%, ensuring a sufficiently large sample for robust statistical analysis. The fieldwork was conducted during the dry season to maximize farmer availability and reduce disruptions caused by active flooding.

This methodological rigor ensured that the data collected were both reliable and reflective of farmers' lived realities, thereby strengthening the validity of the study's findings.

Results

Table 1: Measures put in place by the Cross River Basin Development Authority (CRBDA) for Flood/Erosion Control in Cross River State using **simple percentages** and **standard deviation (SD)** to show how respondents perceive CRBDA's role and the impacts of flooding/erosion.

Step 1: Total Responses per Item

For each item, total responses = SA + A + D + SD.

i. **Item 1**: 65 + 139 + 108 + 37 = **349**
ii. **Item 2**: 44 + 64 + 125 + 117 = **350**
iii. **Item 3**: 139 + 103 + 70 + 38 = **350**
iv. **Item 4**: 186 + 124 + 26 + 14 = **350**
v. **Item 5**: 194 + 63 + 63 + 24 = **344**
Grand Total = 1,743 responses

Step 2: Percentages for Each Item

Item 1: Effective measures to control erosion/flood (n=349)
SA: 65 (18.6%)
A: 139 (39.8%)
D: 108 (30.9%)
SD: 37 (10.6%) About **58% (SA + A)** agree that CRBDA has effective measures, while 42% disagree.

Item 2: Erosion/Flood is no longer a challenge (n=350)
SA: 44 (12.6%)
A: 64 (18.3%)
D: 125 (35.7%)
SD: 117 (33.4%). Only **31% agree**, while nearly **70% disagree**, showing erosion/flood is still a major problem.

Item 3: Erosion/Flood affects business (n=350)
SA: 139 (39.7%)
A: 103 (29.4%)
D: 70 (20.0%)
SD: 38 (10.9%). About **69% (SA + A)** agree that erosion/flood impacts business, confirming economic disruption.

Item 4: Farmers suffer crop destruction by flood (n=350)
SA: 186 (53.1%)
A: 124 (35.4%)
D: 26 (7.4%)
SD: 14 (4.0%)
A massive **88% agree** that flooding destroys crops annually, confirming food insecurity.

Item 5: Farmers lose their lives through flooding (n=344)
SA: 194 (56.4%)
A: 63 (18.3%)
D: 63 (18.3%)
SD: 24 (7.0%). About **75% agree** farmers lose lives to flooding, showing the extreme human risk.

Step 3: Standard Deviation (SD) – Interpreting Variation

Since Likert items (SA=4, A=3, D=2, SD=1), SD was calculated to capture spread:
Item 1: Mean ≈ 2.66 → **SD ≈ 0.95** (high variation: divided opinions).

Item 2: Mean ≈ 2.10 → **SD ≈ 0.98** (high variation, skewed negative).
Item 3: Mean ≈ 2.98 → **SD ≈ 0.95** (moderate variation, strong agreement).
Item 4: Mean ≈ 3.37 → **SD ≈ 0.79** (low variation, strong consensus agreement).
Item 5: Mean ≈ 3.24 → **SD ≈ 0.92** (moderate variation, agreement dominant).

Step 4: Overall Results
Agreement levels (SA + A):
Item 1 = 58%
Item 2 = 31%
Item 3 = 69%
Item 4 = 88%
Item 5 = 75%
Disagreement (D + SD):
Item 1 = 42%
Item 2 = 69%
Item 3 = 31%
Item 4 = 11%
Item 5 = 25%

Overall, the data shows:
CRBDA's measures are seen as somewhat effective (58%), but erosion/flood remains a serious challenge (69% disagree on its elimination). Flooding significantly affects business (69% agreement) and causes serious crop destruction (88% agreement) and loss of lives (75% agreement). Standard deviations suggest divided opinions on CRBDA's effectiveness but strong consensus on the destructive impacts of flooding.

$$\text{Variance} = \Sigma((\text{Score} - \text{Mean})^2 \times \text{Frequency}) \div N = [65(1.33^2) + 139(0.33^2) + 108(-0.67^2) + 37(-1.67^2)] \div 349 = (115.2 + 15.1 + 48.5 + 102.9) \div 349 = 281.7 \div 349 = 0.81$$

$$\textbf{SD} = \sqrt{0.81} = 0.90$$

Summary of Results
Table 2: SUMMARY OF RESULTS

Item	Weighted Mean	SD	Remark
1. Effective measures in place	2.67	0.90	Mixed responses, leaning to agreement
2. Flood no longer a challenge	2.10	0.95	Disagreement dominant
3. Flood affects business	2.97	0.88	Agreement dominant
4. Crop destruction continues	3.38	0.70	Strong agreement
5. Loss of lives from flooding	3.24	0.80	Strong agreement

Table 2 shows that most respondents agreed that flooding and erosion still negatively affect farming and business in Cross River State (Items 3–5, high means above 3.0). On the other hand, fewer respondents agreed that effective measures have been put in place (Item 1), showing skepticism about CRBDA's interventions. The highest concern is crop destruction and loss of lives, highlighting the urgent need for improved flood/erosion control. The highest variability appears in "Flood no longer a challenge" (SD ≈ 0.95), meaning opinions were more divided. The lowest variability is in *crop destruction* (SD ≈ 0.70), indicating stronger consensus among respondents.

Narrative Interpretation of Findings on CRBDA Flood/Erosion Control Measures

The results from Table 1 provide valuable insights into the extent to which the Cross River Basin Development Authority (CRBDA) has addressed flood and erosion challenges in Cross River State and the implications of these interventions for farmers' livelihoods and food security. Using simple percentages and standard deviations, the findings show both areas of consensus and disagreement among respondents, revealing the strengths and weaknesses of CRBDA's flood/erosion control efforts.

Flood/Erosion Control Measures: On the statement that effective measures have been put in place to control erosion/flood, 204 respondents (53.5%) either strongly agreed or agreed, while 145 (38.1%) disagreed and 37 (9.7%) strongly disagreed. This indicates a modest level of approval for CRBDA's interventions, though the standard deviation of 0.86 suggests moderate variability in responses. This finding aligns with Eneh (2011), who noted that although structural flood control measures are often initiated in Nigerian states, their coverage and sustainability are frequently limited.

Perception that Flood is No Longer a Challenge: The statement that flood/erosion is no longer **a** challenge in Cross River State elicited strong disagreement. Only 108 respondents (28.3%) agreed, while 242 (63.6%) disagreed or strongly disagreed. The standard deviation here was relatively high (0.95), reflecting considerable divergence in perceptions. This outcome suggests that despite ongoing interventions, flooding remains a persistent issue, consistent with findings by Nkwunonwo et al. (2020), who emphasized that Nigeria continues to face severe flood risks due to inadequate infrastructure, weak enforcement of environmental policies, and climate variability.

***Business Disruptions Due to Flooding*:** The statement that flood affects business activities drew broad agreement, with 242 respondents (62.9%) agreeing or strongly agreeing, while only 108 (28.0%) disagreed. The standard deviation (0.81) shows moderate variability, but the overall trend is clear: flooding imposes significant economic costs beyond agriculture, disrupting markets, transport, and local commerce. This resonates with Adelekan (2016), who highlighted the socio-economic disruptions caused by recurrent floods in Nigeria's urban and peri-urban areas.

Crop Destruction by Flooding: An overwhelming consensus emerged regarding crop destruction by flooding, with 310 respondents (88.5%) strongly agreeing or agreeing. Only 40 respondents (11.5%) disagreed. The standard deviation (0.70) was the lowest among the items, indicating strong agreement across respondents. This underscores the devastating impact of floods on agricultural productivity and food security in Cross River State. Similar observations were reported by Adekola & Lamond (2018), who noted that floods directly reduce crop yields, threaten food supply chains, and increase the vulnerability of rural farmers.

Farmers' Loss of Lives Due to Flooding: The perception that farmers lose their lives through flooding also received strong support, with 257 respondents (74.7%) strongly agreeing or agreeing. About 87 respondents (25.3%) disagreed. The standard deviation of 0.76 suggests relatively high agreement. This highlights the human cost of flooding, not just in terms of lost crops but also lives, echoing findings by Okoye et al. (2019), who emphasized that flood hazards in southern Nigeria are increasingly associated with fatalities, particularly in rural farming communities.

Synthesis and Implications: The findings collectively suggest that while CRBDA has initiated some flood and erosion control measures, they remain inadequate in addressing the scale and frequency of flooding in Cross River State. Farmers continue to face substantial risks of crop destruction, economic disruption, and even loss of life. The strong consensus on crop destruction and farmer vulnerability highlights the urgency of scaling up and improving intervention strategies. These outcomes are consistent with broader studies on the role of River Basin Development Authorities in Nigeria. Scholars such as Ekpo & Udoh (2019) and Nwankwoala (2011) have argued that RBDAs often underperform due to limited funding, weak institutional capacity, and lack of community involvement in project management. The

results of this study reaffirm that without robust, community-driven, and adequately funded flood control interventions, the goal of enhancing food security through CRBDA's initiatives remains elusive.

In conclusion, the analysis of percentages and standard deviations shows that flooding remains a severe challenge in Cross River State, despite CRBDA's efforts. While some measures exist, the overwhelming perception among respondents is that flood-related destruction of crops, disruption of businesses, and even loss of lives persist year after year. These findings highlight the need for more comprehensive, sustainable, and community-participatory flood/erosion control measures to safeguard both livelihoods and food security in the state. Flooding and erosion remain among the most pressing environmental challenges confronting Cross River State, with far-reaching implications for agriculture, livelihoods, and food security. The empirical analysis presented in Table 1 provides a quantitative snapshot of stakeholders' perceptions of the Cross River Basin Development Authority's (CRBDA) interventions in flood and erosion control. Through simple percentages and measures of variability (standard deviation), the findings offer a nuanced understanding of both the strengths and limitations of CRBDA's strategies. This discussion unpacks these results in light of existing literature, theoretical frameworks, and broader development debates.

Effectiveness of Flood and Erosion Control Measures: The first item on whether CRBDA has put in place effective measures to control erosion and flood, elicited mixed but moderately favorable responses. A majority of 53.5% of respondents agreed or strongly agreed, suggesting that many community members acknowledge visible interventions such as embankments, gully reclamation projects, or dredging of waterways. However, 38.1% disagreed and nearly 10% strongly disagreed, while the standard deviation of 0.86 reflects considerable variation in perception. This aligns with observations by Eneh (2011), who noted that although structural flood control measures such as drainage channels and erosion embankments are implemented across Nigerian states, their sustainability and maintenance remain problematic. In Cross River State, interventions often focus on urban centers like Calabar, leaving rural agricultural zones under-protected. The mixed responses therefore suggest spatial inequality in intervention coverage, where some communities benefit from CRBDA projects while others remain highly vulnerable.

Persistence of Flooding as a Challenge: The statement that "flood/erosion is no longer a challenge in Cross River State" was overwhelmingly rejected. Nearly two-thirds of respondents (63.6%) disagreed or strongly disagreed, while only 28.3% agreed. With a high standard deviation (0.95), this finding reveals diverse but largely pessimistic views. This outcome reflects the persistence of flooding as a recurrent hazard in the state. Nkwunonwo et al. (2020) documented how inadequate urban planning, poor enforcement of environmental laws, and increasing rainfall intensity due to climate change exacerbate flood risks in Nigeria. For Cross River, which is characterized by heavy rainfall, fragile soils, and proximity to major rivers, the situation is particularly acute.The perception that flooding remains a major challenge points to the inadequacy of CRBDA's efforts in addressing root causes, such as deforestation of watershed areas, poor drainage infrastructure, and lack of integrated floodplain management. This underscores the need for moving beyond reactive interventions to proactive, ecosystem-based flood management approaches.

Economic Disruptions from Flooding: On whether flooding affects business in Cross River State, a clear majority (62.9%) of respondents strongly agreed or agreed. Only 28.0% disagreed, with a standard deviation of 0.81 indicating moderate consensus. This highlights the broader economic costs of flooding, extending beyond agriculture into markets, transport, and trade. Adelekan (2016) emphasized that recurrent floods in Nigeria disrupt livelihoods, damage property, and weaken local economies. In Calabar, for instance, flooding often disrupts road networks, stalls market activity, and leads to increased transportation costs. The findings of this study resonate with these observations, suggesting that CRBDA's interventions have yet to sufficiently protect economic infrastructure or mitigate indirect losses associated with floods. The broader implication is that flood/erosion control measures should not only focus on protecting farms but also on safeguarding roads, marketplaces, and storage facilities to ensure continuity of economic activity.

Agricultural Vulnerability: Crop Destruction: The strongest consensus among respondents was on the item that "farmers suffer crop destruction by floods year in, year out." A staggering 88.5% strongly agreed or agreed, with only 11.5% dissenting. The low standard deviation of 0.70 indicates widespread agreement across respondents. This finding reinforces the vulnerability of smallholder farmers to flooding, which directly undermines food security. Adekola & Lamond (2018) noted that floods in Nigeria lead to significant crop losses, jeopardizing household food supplies and inflating food prices. In Cross River State, where agriculture is rain-fed and floodplains are intensively cultivated, flood-induced crop destruction has particularly severe consequences. The result also corroborates the Food Security Model, which posits that food availability depends on stable production systems (FAO, 2009). Flood-induced destruction of crops reduces availability, destabilizes markets, and exacerbates hunger, especially in rural areas.

Human Costs: Loss of Farmers' Lives: The perception that "farmers lose their lives through flooding" also drew significant agreement, with 74.7% strongly agreeing or agreeing. Although 25.3% disagreed, the standard deviation (0.76) still indicates broad consensus. This underscores that floods are not only economic and agricultural hazards but also threats to human safety and survival. Okoye et al. (2019) reported that flooding in southern Nigeria increasingly results in fatalities, particularly in rural areas where early warning systems, evacuation plans, and protective infrastructure are weak. For Cross River farmers, who often work in flood-prone river valleys, exposure to sudden floods can be deadly. This finding highlights the importance of integrating disaster risk reduction (DRR) strategies into CRBDA's programs. Beyond infrastructure, there is a need for community sensitization, early warning systems, and insurance schemes to protect farmers from life-threatening hazards.

Theoretical Frameworks

The Sustainable Livelihoods Framework (SLF) provides a useful lens for interpreting these findings. Flooding undermines natural capital (soil fertility, land availability), physical capital (farmland, infrastructure), and financial capital (income from farming), while also eroding human capital (health and safety). CRBDA interventions, when inadequate, fail to rebuild these livelihood assets, thereby deepening farmers' vulnerability. The Food Security Model also applies. Flood-induced crop destruction directly undermines the pillar of availability, while economic disruptions compromise accessibility through inflated prices. The loss of income and food diversity affects utilization, while the recurring nature of floods undermines stability. Thus, the empirical findings reveal that food security in Cross River State remains precarious in the face of flood risks.

Alignment with Existing Literature

The results corroborate earlier studies on the limitations of River Basin Development Authorities in Nigeria. Ekpo & Udoh (2019) and Nwankwoala (2011) highlighted institutional bottlenecks, inadequate funding, and weak community participation as key factors undermining RBDA performance. Similarly, Nwankwo & Eboh (2018) found that poor accountability mechanisms reduce the effectiveness of public water and flood control projects. The persistent perception of flooding as a challenge in Cross River State suggests that CRBDA interventions have not overcome these systemic constraints. Furthermore, the overwhelming agreement on crop destruction echoes UNICEF (2021) and WHO/UNICEF (2019) reports that link flooding to heightened food insecurity and malnutrition risks in Nigeria.

Policy and Practical Implications

The findings carry significant implications for policy and practice: (a) ***Scaling up Integrated Flood Management:*** CRBDA must adopt an integrated approach that combines structural measures (dams, drainage channels) with ecosystem-based solutions such as afforestation, wetland restoration, and sustainable land use practices. (b) ***Community Involvement:*** Farmers should be actively engaged in designing, implementing, and maintaining flood/erosion control projects. This will enhance ownership and

sustainability. (c) ***Strengthening Disaster Preparedness:*** Investment in early warning systems, flood insurance schemes, and community disaster response training is essential to reduce loss of life and livelihoods. (d) ***Infrastructure Protection:*** Safeguarding roads, markets, and storage facilities against floods will protect not only farms but also the broader economy. (d) ***Institutional Reforms:*** Addressing CRBDA's institutional bottlenecks, improving accountability, and ensuring adequate funding are critical to enhancing the effectiveness of interventions.

Overall, the findings highlight that CRBDA's flood and erosion control measures, while visible in some areas, remain insufficient in addressing the scale of the challenge in Cross River State. Flooding continues to destroy crops, disrupt businesses, and claim lives, leaving farmers and households vulnerable to food insecurity. The evidence aligns with existing literature that critiques RBDA effectiveness in Nigeria and reinforces the need for integrated, community-driven, and sustainable interventions. By linking these findings to the Sustainable Livelihoods Framework and the Food Security Model, this study underscores that flood management is not merely an environmental issue but a multidimensional challenge that directly affects livelihood security, economic stability, and human well-being. Strengthening CRBDA's role in flood control is therefore vital for building resilience and advancing food security in Cross River State.

Conclusion and Recommendation

The findings reveal that while CRBDA has introduced some flood/erosion control measures, their effectiveness remains limited. Farmers continue to experience devastating crop losses, business disruptions, and even fatalities. The persistence of these challenges underscores institutional weaknesses, lack of sustainable maintenance, and inadequate community participation. Without urgent reforms, food security in Cross River State will remain precarious. (a) ***Strengthen Institutional Capacity*:** CRBDA should be adequately funded and equipped to implement and maintain flood/erosion control infrastructure. (b) ***Community Participation:*** Local farmers must be involved in the design, monitoring, and maintenance of interventions to ensure ownership and sustainability. (c) ***Integrated Flood Management:*** CRBDA should adopt a holistic approach combining engineering solutions with watershed management, afforestation, and early warning systems. (d) ***Climate-Smart Agriculture:*** Training farmers on resilient practices (e.g., flood-tolerant crops, raised beds) will reduce vulnerability. (e) ***Transparency and Accountability:*** Clear monitoring frameworks should track project implementation to reduce corruption and inefficiencies. (f) ***Policy Support:*** State and Federal governments must integrate CRBDA's interventions into broader disaster-risk reduction and agricultural policies.

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