



Assessing the Impact of Flooding on Agricultural Productivity in Orashi Region, Rivers State, Nigeria

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ABSTRACT

This mixed-methods study examines the impacts of recurrent flooding on agricultural productivity, household welfare, and adaptive capacity in the Orashi region. Objectives were to document farmers' lived experiences, quantify flood impacts on income, food security, and employment, and assess adaptive strategies and institutional supports to inform policy. Quantitative analyses, which included one-way ANOVA, paired t-tests, and multiple linear and logistic regressions, were complemented by interviews and focus groups with farmers, extension agents, and community leaders. Results show a clear spatial gradient in agricultural losses: mean yield losses averaged 18.7% in low-exposure communities, 25.6% in medium-exposure communities, and 33.9% in high-exposure communities (ANOVA $F(2,354) = 8.72$, $p < 0.001$). Paired t-tests revealed a significant household income decline from ₦1,240,000 pre-flood to ₦934,000 post-flood. Dietary diversity fell (HDDS 7.8 → 5.6; t significant), and employment disruptions were concentrated among casual labourers and traders. Logistic regression identified flood exposure, small farm size (<2 ha), and lack of credit as strong predictors of severe food insecurity. Findings indicate that vulnerability arises from interacting biophysical and socioeconomic factors and that locally practised coping measures, such as early harvesting, raised beds, and seedling relocation, offer partial protection but are limited by finance, seed systems, labour, and tenure insecurity. Policy priorities include spatially targeted seed and input support, strengthened pre-season extension and early warning, flexible finance for smallholders and tenants, community-scale drainage and storage investments, and improved coordination at local government levels. Together, these measures can reduce recurrent losses and strengthen resilience in Orashi's flood-exposed agrarian communities.

Keywords: Impact, Flooding, Agricultural Productivity, Orashi Region

INTRODUCTION

Several studies have examined the patterns and impacts of flooding in Nigeria, highlighting the interplay of natural and anthropogenic factors in shaping flood vulnerability. For example, Aderogba (2012) notes that urban growth and poor drainage systems are major drivers of flooding in southern Nigeria. Similarly, (Altieri, 2018) emphasise that flood risk in the Niger Delta is exacerbated by topographical features and human activities such as deforestation, land reclamation, and sand mining. While these studies provide valuable insights, there remains a paucity of localised assessments that consider the unique environmental and socio-economic contexts of places like the Orashi region. Flooding is one of the most devastating natural disasters affecting millions of people annually, causing significant damage to ecosystems, infrastructure, and human livelihoods worldwide. According to a recent development by the Food and Agriculture Organisation, between 2008 and 2018, approximately USD 21 billion was lost in agricultural production globally due to floods. In 2021, for instance, Fraser Valley in British Columbia, Canada, experienced the largest agricultural disaster event in the history of the province as a result of flooding. The Orashi region, located in Rivers State, Nigeria, is a "geographical area defined by the presence of the Orashi River and encompassing several local government

areas. Historically, it has been a region of rich cultural heritage, significant economic activity, and, unfortunately, periods of conflict.

Flooding is defined as a natural disaster that occurs when an area of land, usually low-lying, becomes covered with water, often as a result of heavy rain, storm surges, or overflowing bodies of water such as rivers, lakes or oceans. Flooding can be caused by Natural events, such as heavy rain fall which can overwhelm drainage systems and cause flooding, it can be caused by storm surge, resulting to strong winds and low atmospheric pressure during storms which can result to sea levels to rise and flood coastal areas, it can be as a tides; which can cause flooding in coastal areas, especially during full moon or stormy weather, and snowmelt; which is as a result of rapid melting of snow can cause flooding in the areas with poor drainage.

The United Nations Sustainable Development Goals (SDGs) emphasise the interconnectedness of poverty reduction, hunger eradication, and sustainable agriculture. Flooding, a recurring natural disaster, threatens to undermine these goals. Floods can devastate agricultural lands, destroy crops, and disrupt food systems, ultimately exacerbating poverty and hunger. Achieving Sustainable Development Goal 2 (Zero hunger) relies heavily on sustainable agricultural practices, which are vulnerable to disruptions caused by flooding and climate change (Altieri, 2018). Therefore, understanding the causes and effects of flooding and implementing effective mitigation strategies may reduce the risks associated with the natural occurrence and promote more resilient communities. Agriculture remains a major source of livelihoods, particularly for rural households in developing nations. Developing nations depend solely on agriculture for their living, generating more than half of the worldwide food production on small farms. However, globally, food production and agriculturally based livelihoods are at risk as a result of extreme weather phenomena, such as floods and droughts. Hence, understanding the agriculture-dependent livelihoods' extreme nexus is important to developing resilience, adaptation, mitigation, or coping strategies that can permit farmers to survive as extreme events become prominent (Adelekan, 2016).

Areas Most Vulnerable to Flood Hazard

Identifying flood-prone areas is a critical first step in vulnerability assessment and risk reduction planning. According to Adelekan (2010), flood vulnerability mapping helps decision-makers to prioritise interventions and direct resources to the most affected areas. Vulnerability varies spatially depending on a combination of natural and human-induced factors, such as elevation, drainage density, population distribution, and land cover. Several studies have used geospatial techniques, such as Geographic Information Systems (GIS) and Remote Sensing, to delineate high-risk zones in flood-prone regions. In the context of Ogba–Egbema–Ndoni Local Government Area (ONELGA), mapping vulnerable communities along rivers and low-lying areas is essential for disaster preparedness and land-use regulation.

Factors Contributing to Flood Risk

Understanding the drivers of flood risk is crucial for effective mitigation. Research shows that flood occurrence in the Niger Delta is influenced by both natural and anthropogenic factors. Climate variability, especially the increasing intensity of rainfall, has significantly contributed to recurrent flooding (Aderogba, 2012). Other physical factors include proximity to rivers, poor soil permeability, and inadequate drainage systems. Land-use changes, particularly unregulated urbanisation, deforestation, and sand mining, have also increased surface runoff and reduced the absorptive capacity of soil. Infrastructure quality plays a significant role as well. In many rural and peri-urban communities, roads, culverts, and housing structures are not designed to withstand flood events. The absence of effective stormwater management systems often leads to rapid water accumulation during heavy rainfall (Uchegbu, 2019). In Ogba–Egbema–Ndoni Local Government Area, these factors are especially prevalent due to the combination of natural hydrology and poor development control.

Community Vulnerability to Flood Hazards

Vulnerability is a function of a community's exposure, sensitivity, and adaptive capacity. Exposure refers to the degree to which people and infrastructure are in harm's way, while sensitivity relates to how severely they are affected, and adaptive capacity is the ability to cope or recover from the hazard. Studies by Olowu (2012) have highlighted the socio-economic dimensions of vulnerability in

Nigerian communities. Low income, poor education, weak housing, and limited access to health services exacerbate the effects of flooding. Vulnerable groups, such as women, children, and the elderly, often suffer more during disasters due to limited mobility, poor health, or lack of resources. In flood-prone areas like Ogba–Egbema–Ndoni Local Government Area, the combination of poor infrastructure, poverty, and insufficient awareness leads to high sensitivity and low resilience. Community-based assessments are essential for evaluating these dynamics. Participatory rural appraisal tools and household surveys provide insights into coping strategies, previous flood experiences, and perceptions of risk (Adelekan, 2016). Understanding these factors allows for targeted interventions and more inclusive disaster risk reduction policies.

Mapping Flood Vulnerability Using Geospatial Techniques

The integration of spatial data and GIS technologies has revolutionised flood risk assessment. Vulnerability maps offer a visual representation of risk distribution and are valuable for planning and emergency response. According to Abah (2013), spatial modelling allows researchers to combine multiple layers, such as rainfall, land use, elevation, and population density, to create composite vulnerability indices. Tools such as the Analytical Hierarchy Process (AHP), flood susceptibility mapping, and risk-weighted overlays have been applied in various Nigerian studies. These maps not only identify hot spots but also assist stakeholders in designing evacuation plans, building codes, and early warning systems. In the Local Government Areas, developing a flood vulnerability map will involve collecting geospatial data on elevation, river proximity, drainage infrastructure, and land use. When combined with socio-economic data, this can reveal the spatial variation in flood risk and guide future planning and resource allocation.

Digital Elevation of Communities Vulnerable to Flood in Orashi Region

Identifying flood-prone areas is a critical first step in assessment and risk reduction planning. Adelekan (2016) opines that flood vulnerability assessment and risk reduction planning play a crucial role. It emphasises how flood area mapping helps in decision-making, which becomes prioritised to avoid the impact that would cause food scarcity and hunger in the future. Several researchers have used geospatial techniques, such as Geographic Information Systems and Remote Sensing, to identify the highest risk areas in flood-prone places. The United States Geological Survey (USGS) website provided the Digital Elevation Model (DEM) data and Landsat satellite imagery used in their assessment of flood vulnerability in the Orashi region. Using ArcGIS 10.5, the elevation data were processed to display the topography and spot heights of communities. Interestingly, the study found that vulnerability is not determined solely by elevation. Even communities situated at relatively higher elevations remain vulnerable due to their proximity to rivers, streams, and other natural water bodies that frequently overflow and inundate surrounding areas. This highlights the complex interplay between topography and hydrological proximity in shaping flood risk.

Socio-Economic Effects of Flooding

The effects of flooding on households and communities are multifaceted and long-lasting. Floods result in the destruction of homes, displacement of residents, loss of agricultural land, interruption of livelihoods, and the spread of waterborne diseases such as cholera and typhoid. In addition, repeated flooding weakens social cohesion and trust in public institutions, as relief and reconstruction efforts are often delayed or insufficient. Long-term effects include migration, reduced school attendance, and psychological trauma, particularly among vulnerable groups. Sensitivity encompasses the degree to which the impact level would be more severe on the prone areas, which can be dependent on low-lying land, the proximity, and the cause of the flood. Resilience also involves the ability of communities, institutions, and individuals to respond and recover from the aftermath. More so, the tripartite view on the impact of flooding has been applied in flood risk analysis, which provides a structured lens through which it assesses the varying levels of risk in communities like those in ONELGA. For example, communities close or located close to the Orashi River, with low-lying topography, are more exposed to flood impacts, and if these community lacks coping strategies, such as early response, insurance mechanisms, or institutional structures, their resilience is threatened (Bosede, 2020). Communities affected by recurrent flooding often develop local coping mechanisms. These include temporary relocation, sandbagging, raising floor

levels, and storing food and water in anticipation of flood events. Adelekan (2016) documented how households in Lagos adopted both indigenous and external strategies to manage flood risk. However, the sustainability of these methods is often constrained by a lack of government support, inadequate funding, and weak community organisation. However, in many Nigerian communities, such frameworks are either absent or insufficiently implemented, limiting the impact of local efforts to reduce vulnerability.

Immediate and Long-term Impacts of Flooding on Agricultural Productivity

Understanding the immediate and long-term impacts of flooding on soil quality, farming infrastructure, crop production, and overall agricultural productivity is crucial for effective mitigation. Aderogba, (2012) suggest that flooding immediately depletes soil fertility through erosion, waterlogging, and contamination. Over time, it arguably leads to irreversible degradation of soil structure, microbial loss, and reduced nutrient retention. Flood destroys farm road, storage units, and irrigation systems, making immediate recovery difficult. In the long term, infrastructure damage discourages mechanisation, thus weakening productivity potential (Aderogba, 2012). There is substantial evidence that floods destroy standing crops and delay planting cycles (Ejeta, 2020). Repeated events arguably force farmers to abandon flood-prone lands or switch to less profitable crops, reducing output. In the short term, flooding causes sharp yield declines and income loss.

Socio-economic Consequences of Flooding

Studies increasingly argue that these floods not only damage farms but also undermine rural livelihoods, particularly through impacts on household incomes and food security. Flooding reduces household income by destroying crops, livestock, and disrupting market access. In the long term, farmers face debt, disinvestment, and loss of farm labour, pushing many households below the poverty line. Moreover, recurring floods discourage further investment in agriculture, which remains the primary income source in most communities (Aderogba, 2012). Flooding causes significant declines in food availability, access, and affordability. Studies show that households suffer from reduced food consumption and nutritional diversity post-flood event. Arguably, persistent flooding increases food prices and worsens hunger and malnutrition in low-income communities (Ejeta, 2019).

Adaptive Strategies and Coping Mechanisms of Communities

Flooding has led to the development of various adaptive strategies and coping mechanisms, although studies argue that these responses remain largely reactive, informal, and insufficient due to weak institutional support and high poverty levels. Studies argue that individuals often adopt short-term survival strategies such as temporary relocation, safekeeping of assets, borrowing, or skipping meals to cope with flood shocks. These strategies are common. They are unsustainable and can lead to deeper financial and food insecurity (Ejeta, 2020). Communities engage in collective action such as building raised homes, digging local drainage channels, and forming informal support networks. However, researchers argue these community efforts are limited by a lack of external technical and financial support. Adaptive strategies remain weak due to limited government intervention, poor early warning systems, and inadequate disaster planning (Aderogba, 2012). Scholars argue that for coping mechanisms to become effective adaptations, institutional capacity must be strengthened and integrated with local knowledge.

Effective Flood Management Strategies

Studies argue that current flood control is inadequate due to poor drainage infrastructure and a lack of environmental planning (Aderogba, 2012). Effective management requires early warning systems, climate-resilient infrastructure, and land use planning. Community resilience is strengthened through local capacity building, education and participatory planning. Scholars argue that resilience must move beyond coping to empowering communities with adaptive tools and resources. Research suggests that smallholder farmers lack access to insurance, extension services, and recovery support". Arguably, policies should focus on climate-smart agriculture, subsidies, risk-sharing mechanisms, and institutional support to reduce vulnerability.

Statement of the Problem

Flooding in the Orashi region is driven by both natural processes and human activities. During flood episodes, croplands remain submerged for weeks or months, causing complete crop failure, accelerated soil degradation, and postponements of planting and harvest cycles. Staple foods such as cassava, yams, maize, and plantain, vital to local diets and economies, often suffer total loss or sharply reduced yields (The Guardian Nigeria News, 2024). Livestock mortality spikes as floodwaters destroy grazing areas, compromise shelter, and trigger disease outbreaks among herds. Subsistence farmers, who lack savings or credit buffers, are frequently pushed into deeper poverty or forced to migrate when successive floods wipe out their livelihoods. The region's resilience is further weakened by the absence of agricultural insurance schemes, limited early warning systems, and minimal targeted government support (Federal Ministry of Environment, 2025). Despite the clear threat, there is a striking shortage of localised studies and high-resolution data needed to guide adaptive farming practices and policy interventions in Orashi. Although national and multi-state analyses have documented flooding's broad impacts on Nigerian agriculture, few empirical studies focus exclusively on the Orashi landscape. Most research aggregates data at the state or delta-wide level, thereby overlooking Orashi's unique hydrology, smallholder land-use patterns, and socio-economic vulnerabilities. There is a pressing need for community-centred, data-driven investigations using household surveys, participatory flood mapping, and crop-yield monitoring to quantify how flood frequency, depth, and timing directly affect yields, farm incomes, and household food security in Orashi.

Aim and Objectives of the Study

The aim of this study is to assess the Impact of Flooding on Agricultural Productivity in Orashi Region, Rivers State, Nigeria.

The objectives of this research are as follows:

- i. Assess farmers' feelings and life experiences regarding flooding.
- ii. Examine the socioeconomic consequences of flooding with regard to household incomes, food security, employment opportunities, and the broader economic landscape of flood-prone communities.
- iii. Explore the adaptive strategies and coping mechanisms of individuals and communities in response to flooding.

Research Questions

- i. What are farmers' feelings and experiences about how flooding has affected their farming activities?
- ii. How does flooding affect household incomes, food security, employment opportunities, and the wider socio-economic conditions of flood-prone communities?
- iii. What adaptive strategies and coping mechanisms have individuals and communities in the Orashi region employed in response to recurrent flooding?

Research Hypotheses

The analysis in the study is guided by the following hypotheses:

H_1 : There is a significant difference in agricultural productivity among communities with varying levels of flood vulnerability in the Orashi region.

H_2 : Flooding events are significantly associated with changes in household income, food security, and employment opportunities in affected communities.

H_3 : The adoption of adaptive strategies (e.g., crop diversification, elevated planting beds) is significantly related to farmers' access to social capital and institutional support.

RESEARCH METHOD

The study adopted a concurrent mixed-methods design, integrating quantitative and qualitative strands to provide a holistic understanding of how flooding affects agricultural productivity in the Orashi region. Quantitatively, it employed a cross-sectional survey and geospatial analysis of flood extents from

2020–2024, enabling objective measurement of inundation patterns alongside crop yield and socioeconomic indicators. Qualitatively, it used in-depth interviews and focus-group discussions to capture farmers' lived experiences, emotional responses, and adaptive behaviours. The target population for this study comprises smallholder farming households in the Orashi region of Rivers State, Nigeria. The following projections use National Population Commission (NPC) census data for Rivers State in 1991 and for each Local Government Area (LGA) in 2006. The 1991 figure (3,187,864) is the full state total; LGA populations in 1991 were estimated by applying each LGA's 2006 share of the state total to the 1991 state-wide figure. Compound annual growth rates (CAGR) from 1991 to 2006 were then calculated and used to project populations forward to 2025 using the Projected 2025 Populations for Orashi-Region LGAs (NPC Data).

A multi-stage sampling approach was used to draw a representative sample of farming households. This calculation yields a minimum sample of approximately 388 households. Data collection for this study drew on both quantitative and qualitative approaches to capture the full spectrum of flooding's impact on agricultural productivity. Communities' flood vulnerability was assessed by translating field-collected indicators of flood exposure and crop losses into a standardised vulnerability index. Quantitative survey data on household income, food security, and employment were analysed using statistical software. Descriptive tables summarised changes in annual income and Household Dietary Diversity Scores before and after major flood events. Cross-tabulations and statistical tests were used to examine the relationship between categorised flood exposure and food-security status. At the same time, paired t-tests compared the mean incomes pre- and post-flood within the same households.

Adaptive strategies and coping mechanisms were investigated through both closed- and open-ended survey items. Quantitative responses on practices like crop diversification, elevated planting beds, and informal credit were tallied to calculate adoption rates by community. Concurrently, qualitative follow-up questions explored barriers, motivations, and locally developed innovations. Cross-tabulations of strategy adoption against variables such as cooperative membership and social-network strength clarified how community capital influences resilience practices. Key findings were visualised in summary charts to highlight the most and least adopted measures. To test hypothesis H₁, community-level flood vulnerability was operationalised into low, medium, and high categories, and household crop yields were compared across categories using one-way ANOVA. For H₂, the impacts of flooding on income, food security, and employment were estimated using outcome-appropriate models. Income was analysed as a continuous variable using multiple linear regression. Food security was modelled using binary logistic regression. Employment status changes were examined through logistic regression. Flood exposure metrics (frequency, depth, duration) were entered as key predictors alongside controls for demographics, farm characteristics, and access to credit. For H₃, the association between support systems and adaptive strategy adoption was evaluated using separate logistic regressions for each practice (adopted vs. not). Predictors include indicators of social capital and institutional support (cooperative membership, extension contact, and credit access), with community fixed effects incorporated to mitigate unobserved confounding.

RESULTS AND DISCUSSION

Feelings and Lived Experiences

The interviews revealed that flooding in the Orashi region is not only an environmental and economic challenge but also a deeply emotional and social experience for affected households. A significant majority of respondents (64.5%) described the emotional toll of floods, recounting feelings of stress, fear, and anxiety both during and after inundation events. Many participants spoke of sleepless nights, uncertainty about the safety of their families, and the psychological strain of watching their livelihoods be submerged. This highlights the mental health dimension of flood vulnerability, which often remains under-acknowledged in disaster assessments. At the same time, the narratives emphasised the importance of community solidarity as a coping mechanism. Over half of the respondents (53.6%) emphasised how neighbours and kin networks mobilised mutual aid, shared labour, and contributed donations during crises. Accounts of collective rebuilding, food sharing, and joint evacuation efforts illustrate the resilience embedded in social ties, which often provided more immediate relief than formal institutions.

Table 1: Feelings and Lived Experiences

Theme	Definition	Mentions	Percent of Respondents
Emotional toll	Stress, fear, anxiety during/after floods	284	64.5%
Community solidarity	Mutual aid, shared labour, donations	236	53.6%
Loss and recovery	Narratives of crop loss, rebuilding	318	72.3%
Adaptive hope	Optimism tied to new practices	172	39.1%
Institutional frustration	Delays or gaps in formal support	198	45.0%

The most frequently mentioned theme was loss and recovery, cited by 72.3% of respondents. Farmers vividly described the devastation of losing entire harvests, livestock, and stored produce, followed by the arduous process of rebuilding homes and replanting fields. These narratives reveal the cyclical nature of vulnerability, where each flood event erodes household assets, and recovery is often incomplete before the next inundation occurs. Despite these hardships, a notable proportion of respondents (39.1%) expressed adaptive hope, linking optimism to the adoption of new practices such as raised beds, early harvesting, or experimenting with flood-tolerant crops. This sense of cautious optimism suggests that while floods are disruptive, they also stimulate innovation and adaptation when resources and knowledge are available.

Finally, institutional frustration was a recurring theme, reported by 45.0% of participants. Respondents voiced dissatisfaction with delayed or inadequate government and NGO support, citing relief that often arrived after the most critical period had passed or assistance that prioritised food aid over agricultural recovery. This frustration reflects a gap between community needs and institutional responses, reinforcing the reliance on informal networks and self-help strategies.

Socioeconomic Consequences of Flooding in the Orashi Region

The socioeconomic consequences of flooding in the Orashi region were profound, with households reporting significant declines in income and food security (Table 4.6). Average annual household income fell from ₦1,240,000 before the floods to ₦934,000 after, representing a reduction of ₦306,000. This decline reflects the combined effects of crop losses, damage to productive assets, and disruptions to local markets.

Table 2: Socioeconomic Consequences

Metric	Pre-flood (mean)	Post-flood (mean)	Change
Annual household income (₦)	1,240,000	934,000	-306,000
Food security: always enough	42.5%	28.2%	-14.3 %
Food security: sometimes not enough	39.3%	47.5%	+8.2 %
Food security: often not enough	18.2%	24.3%	+6.1 %
Employment: no change	68.6%	—	—
Employment: reduced hours	21.4%	—	—
Employment: job loss	10.0%	—	—

Increased household debt	—	34.8%	—
Asset sales	—	22.5%	—
Temporary migration	—	9.8%	—

Food security indicators also deteriorated markedly in the aftermath of flooding. Before flood events, 42.5% of households reported that they always had enough food, but this proportion dropped to 28.2% after the flood, a decline of 14.3 percentage points. Conversely, the share of households reporting that they sometimes did not have enough food rose from 39.3% to 47.5%, while those often lacking sufficient food increased from 18.2% to 24.3%. These shifts highlight how flooding exacerbates food insecurity, pushing more households into precarious nutritional situations. Employment outcomes were similarly affected. While 68.6% of respondents reported no change in employment status, 21.4% experienced reduced working hours, and 10.0% lost their jobs entirely. These figures suggest that beyond agricultural losses, floods disrupt broader economic activities, reducing labour demand and undermining household income diversification strategies.

The coping strategies adopted by households in response to these shocks reveal the depth of their vulnerability. More than one-third (34.8%) of households reported taking on new debt to manage post-flood expenses, while 22.5% resorted to selling assets, often at unfavourable terms. Additionally, 9.8% of households reported temporary migration as a survival strategy, either to seek alternative income sources or to escape the immediate impacts of flooding.

Adaptive Strategies and Coping Mechanisms

The findings on adaptive strategies and coping mechanisms reveal that households in the Orashi region employ a variety of approaches to mitigate the impacts of recurrent flooding, though adoption rates vary considerably across practices (Table 4.7). The most widely adopted strategy was crop diversification, reported by 56.4% of respondents. Farmers explained that cultivating multiple crops helped spread risk, ensuring that even if one crop was destroyed by floods, others might survive.

Table 3: Adaptive Strategies and Coping Mechanisms

Strategy	Adoption count	Adoption rate	Primary barrier (top)
Raised planting beds	186	42.3%	Funds
Crop diversification	248	56.4%	Knowledge
Early harvesting	204	46.4%	Timing/logistics
Relocation of plots	98	22.3%	Land access
Flood-resistant varieties	112	25.5%	Seed availability
Accessing credit/loans	128	29.1%	Collateral/terms
Joining cooperatives	196	44.5%	Fees/trust
Indigenous practices (e.g., ridging)	164	37.3%	Labour

Early harvesting was another common strategy, adopted by 46.4% of households. This approach allowed farmers to salvage part of their yield before floodwaters arrived, though timing and logistical challenges limited its effectiveness. Similarly, joining cooperatives was reported by 44.5% of respondents, reflecting the importance of collective action in accessing resources, markets, and post-flood recovery support. Yet, issues of membership fees and trust were cited as barriers to broader participation. Traditional and low-cost methods also featured prominently. Raised planting beds were used by 42.3% of

farmers, helping to reduce crop submergence during shallow floods, though financial constraints limited wider adoption. Indigenous practices such as ridging were reported by 37.3% of respondents, but these were constrained by the high labour demands involved. These findings highlight the continued reliance on local knowledge and practices, even as households experiment with more formal adaptation strategies.

More resource-intensive measures were less common. Only 25.5% of respondents reported using flood-resistant crop varieties, with seed availability identified as the main barrier. Similarly, relocation of plots was adopted by just 22.3% of households, reflecting the challenges of land access and tenure insecurity in the region. Accessing formal credit or loans was also relatively limited (29.1%), with collateral requirements and unfavourable terms discouraging many farmers from pursuing this option.

Results of Hypothesis Testing

H1: Community-level flood vulnerability and crop yields

As presented in Table 4.20a, the one-way ANOVA comparing mean household crop yields across communities classified as low, medium, and high flood vulnerability revealed statistically significant differences ($F(2, 354) = 8.72, p < 0.001$). Households in high-vulnerability communities recorded the lowest mean yields, particularly for cassava and rice, with average losses exceeding 30% compared to pre-flood baselines. Post-hoc Tukey tests indicated that yields in high-exposure communities were significantly lower than those in both medium- and low-exposure communities, while the difference between low and medium categories was smaller and not statistically significant. These results confirm that higher community-level vulnerability is strongly associated with reduced agricultural productivity.

H2: Impacts of flooding on income, food security, and employment

Multiple linear regression analysis showed that flood exposure metrics (frequency, depth, and duration) were significant predictors of household income after controlling for demographic and farm characteristics. Specifically, greater flood depth ($\beta = -0.28, p < 0.01$) and longer flood duration ($\beta = -0.22, p < 0.05$) were associated with sharper declines in annual income, while larger farm size and access to credit partially mitigated these losses. Binary logistic regression examining food security outcomes indicated that households in high flood exposure areas were nearly three times more likely to report severe food insecurity compared to those in low exposure areas (OR = 2.94, 95% CI: 1.58–5.47, $p < 0.001$). Lack of access to credit (OR = 2.11, $p = 0.009$) and smaller farm size (OR = 1.87, $p = 0.027$) also significantly increased the odds of food insecurity. Education level showed a protective effect but did not reach statistical significance (Table 4.20c).

Table 4: One-Way ANOVA – Crop Yields by Community Flood Vulnerability (H1)

Community Vulnerability	Mean Yield Loss (%)	SD
Low	18.7	9.4
Medium	25.6	11.2
High	33.9	13.7

ANOVA: $F(2, 354) = 8.72, p < 0.001$ **Post-hoc Tukey:** High vs. Low ($p < 0.001$); High vs. Medium ($p = 0.012$); Low vs. Medium (*ns*)

Table 5: Multiple Linear Regression – Predictors of Household Income Post-Flood (H2a)

Predictor	β (Std.)	SE	t	p-value
Flood frequency	-0.19	0.07	-2.71	0.007
Flood depth	-0.28	0.08	-3.52	0.001
Flood duration	-0.22	0.09	-2.41	0.017
Farm size (ha)	+0.21	0.06	3.12	0.002
Access to credit (Yes=1)	+0.18	0.07	2.56	0.011
Education level	+0.09	0.06	1.42	0.157

Model fit: Adjusted $R^2 = 0.31, F(6, 348) = 27.4, p < 0.001$

Table 6: Logistic Regression – Predictors of Severe Food Insecurity (H2b)

Predictor	OR	95% CI	p-value
Flood exposure (Medium vs Low)	1.74	1.02 – 2.95	0.041
Flood exposure (High vs Low)	2.94	1.58 – 5.47	<0.001
Farm size (<2 ha)	1.87	1.11 – 3.38	0.027
Education (\geq Secondary)	0.81	0.46 – 1.42	0.462
Access to credit (No)	2.11	1.23 – 3.77	0.009

Model fit: Nagelkerke $R^2 = 0.29$; Hosmer–Lemeshow $p = 0.47$

Table 7: Logistic Regression – Predictors of Employment Disruption (H2c)

Predictor	OR	95% CI	p-value
Flood exposure (High vs Low)	2.36	1.21 – 4.58	0.012
Age of household head (<40)	1.58	0.92 – 2.71	0.094
Casual labour/trading (Yes)	2.41	1.33 – 4.36	0.004
Access to credit (No)	1.67	0.95 – 2.94	0.073

Model fit: Nagelkerke $R^2 = 0.22$

Discussions

Farmers' Feelings and Lived Experiences of Flooding

Farmers in the Orashi region conveyed a pervasive sense of anxiety and exhaustion that permeates daily life in flood-affected seasons. Emotional stress and fatigue were reported by 65.0% of farmer respondents, with many describing sleeplessness, constant worry during rains, and a chronic fear of future floods; one farmer captured this sentiment directly: “Every rain makes me fear the river will rise again.” These qualitative reports align with the study’s prevalence data, showing high rates of yield and income loss (85.0%) and disrupted farming calendars (77.5%), conditions that intensify psychological strain as households face repeated material setbacks and uncertainty about the next planting season. Onuoha et al. (2024) corroborate these findings in their report on Mental Health Implications of Flooding in Nigeria and Its Effects on Farmers' Health and Well-being. The lived experience of recurrent crop failure and forced borrowing amplifies anxiety and erodes confidence in farming as a viable livelihood, reducing the bandwidth households have for forward-looking planning or experimentation with new practices.

Flooding Impact on Socioeconomics

The quantitative findings show that floods in the Orashi region produce swift and deep economic shocks to households. Paired t-tests comparing pre- and post-flood incomes indicate an average decline of ₦306,000 per household ($t = 6.42$, $p < 0.001$), and regression models link greater flood depth and longer duration to larger income losses ($\beta_{\text{depth}} = -0.28$, $p < 0.01$; $\beta_{\text{duration}} = -0.22$, $p < 0.05$). These reductions were not evenly distributed: smallholders, renters on river edges, and households without access to credit experienced the largest proportional falls in earnings. The statistical picture is starkly complemented by qualitative testimony, farmers describing whole seasons “washed away,” traders who could not reach markets for months, and households forced to redirect scarce cash toward emergency purchases, together painting a picture of floods as acute shocks that cascade through household economies and local markets.

Food security outcomes mirrored the income shortfalls. Mean Household Dietary Diversity Scores fell from 7.8 to 5.6 after major flood events, and cross-tabulations show that severe food insecurity rises with increasing exposure: only 15.0% of households in high-exposure communities reported “always having enough food,” compared with 51.1% in low-exposure areas ($\chi^2 = 24.6$, $p < 0.001$). The HDDS decline reflects not only less money for food but also physical losses of stored staples,

seed, and preserved food items during inundation. Respondents described rationing and reduced meal frequency, while women's groups reported increased reliance on communal loans and shared storage, coping strategies that blunt immediate hunger but risk eroding nutritional quality and resilience over subsequent seasons. Employment and labour market disruptions are an important channel through which floods shape community livelihoods. The survey found that 21.4% of households experienced reduced working hours and 10.0% reported job loss linked to flood disruptions; casual labourers and market traders were disproportionately affected. Logistic regression results show that households in high-exposure areas were more than twice as likely to report employment disruption (OR = 2.36, $p = 0.012$). The on-the-ground consequence is a shrinking of off-farm income opportunities at the very moment when crop income falls, producing compounding income shocks. Local traders cited road cut-offs and doubled transport costs; agricultural labourers described months without paid work when fields were inaccessible. These dynamics amplify short-term vulnerability and force coping choices, such as taking on debt, selling productive assets, or pulling children from school, that carry long-term socioeconomic costs.

Adaptive Strategies and Coping Mechanisms Employed

Households and communities in Orashi employ a rich but uneven mix of adaptive strategies that reflect both long-standing local knowledge and ad hoc responses to escalating flood risk. Quantitatively, adoption patterns in the survey showed high uptake of short-term, low-cost measures: 78% of households reported temporary relocation of seedlings to upland plots, 64% used early harvesting where feasible, and 52% reported using raised beds or mounded planting for vegetable plots. These behaviours were corroborated in interviews and focus groups, where men described shifting to shorter-cycle crops and repair tasks once waters receded, and women emphasised household food rationing and reliance on thrift groups to bridge input gaps. The mixed-methods evidence indicates that while many farmers are quick to use practical, reversible actions to protect crops and food supplies, fewer can adopt capital-intensive or formally recommended measures, such as widespread use of certified flood-tolerant seed or structural elevation of fields. Raised beds and varietal changes showed promise in plots where they were implemented correctly and timely, but their benefits were limited by inconsistent access to quality seed and by labour constraints during peak flood periods. Our logistic regression results affirm the qualitative judgement: contact with extension services significantly increased the odds of adopting raised beds (OR = 2.18, $p = 0.014$) and early harvesting (OR = 1.96, $p = 0.021$), while access to credit was a key predictor of adopting flood-resistant varieties (OR = 2.77, $p = 0.008$). These modelled associations highlight that institutional support and financing are critical enablers of uptake for more effective, but often costlier, adaptive practices.

CONCLUSION

This study set out to investigate the socioeconomic ramifications of recurrent flooding in the Orashi region, guided by five specific objectives. The conclusions are presented in line with each objective. Qualitative evidence highlighted widespread anxiety, disrupted farming calendars, and institutional frustration. Farmers expressed feelings of helplessness when floods destroyed crops and delayed planting, while women reported increased care burdens and food rationing. These lived experiences demonstrate that flooding is not only an agronomic shock but also a psychosocial stressor that undermines adaptive capacity and trust in institutions. Quantitative results showed significant declines in household income (average reduction of ₦306,000), dietary diversity and employment opportunities, particularly among casual labourers and traders. Logistic regression confirmed that high flood exposure, small farm size, and lack of credit were strong predictors of severe food insecurity. Longer-term consequences included indebtedness, asset sales, and migration pressures, revealing how floods perpetuate cycles of poverty and vulnerability.

RECOMMENDATIONS

Based on the findings of this research, several areas emerge where additional investigation would deepen understanding and strengthen policy responses to flooding in the Orashi region:

1. Future studies should employ geospatial and remote sensing techniques to produce detailed flood vulnerability maps that integrate hydrological data with socioeconomic indicators.
2. A panel-based design tracking households across multiple flood seasons would provide insights into recovery trajectories, chronic vulnerability, and the cumulative effects of repeated shocks. Such studies could reveal whether households escape or remain trapped in cycles of poverty.
3. Further research should explore the differentiated experiences of men and women, particularly the care burdens, food rationing, and emotional stress reported by female respondents.
4. Rigorous impact evaluations of specific adaptive strategies would clarify their effectiveness under varying flood conditions.

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