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Environmental Flooding on Agricultural Activities in Gwer East LGA, Benue State

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Abstract

This study examines environmental flooding on agricultural activities in the Gwer-East Local Government Area, Benue State, Nigeria. The research focused on the causes and the effects of flooding on agricultural activities (food crop production and livestock rearing). The study adopted questionnaires, observation, and interviews to obtain primary data. Literature was thoroughly reviewed to obtain fundamental information, and descriptive statistics were employed to analyse and interpret the data sets. The Pearson correlation analysis revealed a significant relationship between agricultural production and flooding events (P-value = 0.043), negatively impacting agriculture. Flooding events decreased crop yield, while farmers achieved higher harvests outside flood years. The severity of flood impacts on the environment was extreme. Notable food crops cultivated include rice, maize, cassava, and groundnut, while common animals include poultry, pigs, cattle, and goats. The study recommends proper drainage, public education on flood hazards, river channel dredging, prohibition of farming along waterways, and construction of more dams to mitigate flooding effects on agricultural activities.

Keywords: ***agriculture activities, Benue, effects, environmental flooding, Gwer East***

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Introduction

Flooding is one of the most prevalent natural hazards with increasing frequency and intensity that has crippled the socioeconomic lives of many nations in most parts of the world (Uba, 2024; Rentschler et al., 2022; Driessen et al., 2016; Doocy et al., 2013). It occurs often in wetland areas where agricultural activities are remarkably destroyed (Islam, 2024; Schmidhuber and Tubiello, 2007). Floods are purely environmental hazards of meteorological phenomena, extensively induced by natural and anthropogenic factors that are often occurring across the globe (Echendu, 2023; Ujene and Oguike, 2020; Joy and Edet, 2018; Geo-science Australia, 2013). The phenomenon is an extreme weather event naturally caused by rising global temperatures, which results in heavy downpours, thermal expansion of the ocean, and glacier melt that perpetuates the rise in sea level, causing water to inundate coastal lands (Rentschler et al., 2022; Ebuzoeme, 2015). Developed and developing countries suffer from flooding (Baig et al., 2024). However, developed countries use state-of-the-art techniques tremendously to control and mitigate flood challenges. The impacts are worse in developing countries as a result of high vulnerability to extreme weather events triggered by climate change and feeble strategies for flood protection and control (Egbinola et al., 2015). Flooding disaster is predicated upon the nature and level of water volume involved, and it is the deadliest natural hazard in the world (Nema, 2010; Rana *et al.*, 2016; Peacock *et al.*, 2005).

The impacts of floods include the destruction of lives and properties, agricultural lands, and production, among others, thereby posing acute suffering to the affected communities (Mensah and Ahadzie, 2020; Amadi and Aleru, 2019). The significance of water for crop survival is not in doubt. Water is needed for general metabolism, growth, and photosynthesis in crops and primarily for absorption and transport of nutrients and metabolites (ICCDI, 2020). However, heavy rainfall in the form of floods threatens crop

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growth and the environment, and its aftermaths are always destructive. Topsoil, the most fertile part of the soil, including organic matter and other crop nutrients, gets washed away by floods and deposited over a considerable distance, resulting in the decline of soil fertility and sustainable usage (ICCDI, 2020).

Flooding worsens the problem of food security by destroying the environment, crops, farm settlements, livestock, and seedling stores (Aura et al., 2020). Besides, flooding reduces harvest, which affects the next planting season and the socioeconomic lives of victims, particularly in low- and middle-income countries (Echendu, 2022). Flooding causes farmlands to submerge, negatively affecting crop production and destroying plant and animal species. The impact is always severe, particularly in rural areas where agriculture is the chief employer of labour (Mfon et al., 2022). According to the Centre for Research on the Epidemiology of Disasters (CRED, 2013), 3646 floods were reported between 1970 and 2011. Of these floods, only 8% occurred during the 1970s; however, 15%, 27%, and 49% occurred during the 1980s, 1990s, and 2000s, respectively. Within these 32 years, the average annual global cost of flood damage attributed to natural disasters reached more than US$360 billion in 2011 (Giang, 2020; Guha-Sapir, 2012). Over the past 30 years, disaster events have caused an estimated $3.8 trillion loss in crops and livestock production, resulting in an average annual loss of $123 billion (FAO, 2023). The report of the Intergovernmental Panel on Climate Change in October 2020 offered insight into global flood risk exposure and its intersection with poverty, giving estimates that 23% of the world population is directly exposed to flood depths greater than 0.15 metres in a 1-in-100-year flood event, thus posing significant risks to lives and livelihoods (Rentschler, 2022).

In Nigeria, there exist reports of floods in many states during heavy downpours, and it has become a periodic event in increasing measure (Umar and Grey, 2022). Water released from the Cameroon dam flowed through the

Benue River, causing flooding in the state and into the Niger River on its way to the sea (Gbenga, 2022). The release of water from dams and poor drainage systems compounded the situation as about 1.5 million persons were displaced, with many casualties, and farmland, crops, and property worth millions of naira were lost to floods (Nkwunonwo, 2014). About 79 percent of Nigerian farmers were estimated to have been affected by the ravaging effects of drought and flooding in 2020, as a survey conducted in seven states of the country revealed (Abdulkareem, 2020). Given credence to this, Adadu et al. (2024) argued that flooding critically decreases agricultural productivity, input costs, and market opportunities, thus exacerbating financial strain on vulnerable households.

The 2022 Nigeria flood affected many parts of the country, where over 1.4 million people were displaced, more than 603 persons died, and over 2400 were injured. About 82,035 houses were damaged, and 332,327 hectares of land were affected (Oguntola, 2022). In 2012, Nigeria suffered a flood disaster causing a loss of ₦2.6 trillion, displaced 7 million people, damaged 597,476 houses, and killed 363 people. Nevertheless, the unprecedented 2022 flooding was the worst, as more than 200,000 houses and 266,000 acres of farmland were damaged due to the release of excess water from Cameroon's Lagdo dam in the middle of September (Onukwue, 2022).

Benue State is known for food production, but flood impacts have hampered agricultural yield, engendered food shortages, and caused a hike in food prices across the country. According to Yusuf (2022), farmers suffered monumental losses from the flood that destroyed thousands of hectares of rice farms across five local government areas of Benue State. The challenge of flooding has been a protracted issue affecting the people of Gwer-East Local Government Area in Benue State. Floods have caused significant damage to farmers' farmlands, crops, livestock, and income. Flooding has resulted in physical destruction, soil erosion, and reduced crop yields, leading to poor livelihoods. Floods destroyed homes and business activities and exposed

locals to communicable diseases. Climate change and inadequate drainage systems have led to repeated flooding events, posing significant threats to food availability, accessibility, and usability. The incidents have had colossal effects on the socio-economic well-being of the inhabitants of flood-prone areas, who took advantage of the fertile soil in the study area for agriculture and other purposes. Therefore, an in-depth assessment of flood disaster effects is crucial for managing flood-prone areas and minimising exposure to hazards at Gwer-East L.G.A. in Benue State.

Though other researchers have carried out related studies on the impact of floods on agriculture, the effects of floods on agricultural activities have received little or no attention in the study area where flood events are a concern. To bridge the knowledge gap, this study examines the environmental effects of flooding on agricultural activities in Gwer East Local Government Area, Benue State. The study focused on the causes and effects of flooding on agricultural activities in the study area. The study also enlightens the government and the general public on the impacts of flooding on agriculture. The paper suggests modalities to cushion the effects of flood disasters in agrarian environments as insurers draw Nigerian attention to NiMET's 2023 rainfall and flood forecast (Aneasoronye, 2023).

Hypothesis

1. There is no significant relationship between agricultural production and flooding in Gwer East Local Government Area.

Overview of the Study Area

Gwer East Local Government Area of Benue State, Nigeria, was created in 1976 out of Makurdi L.G.A. The Gwer River inspired the local government's name. The headquarters of the local government is Aliade. The wards include Akpachai, Aliade Town, Gbemacha, Ikyogbajir, Ikyonov, Mbabur, Mbaiase, Mbaikyu, Mbaikyaan, Mbalom, Mbasombo, Mbayom, Shough and Ugee (Gyanden et al., 2018). and the local government is one of the 23 local

government areas in Benue State (Kughur et al., 2018). Gwer East Local Government Area is situated approximately between Latitude 7°–8° N and Longitude 7°–8°E of the Greenwich Meridian (Ekhuemelo et al., 2017). It has an area of 2,294 km² and a population of 163,647 as of the 2006 census (NPC, 2006; FRN, 2007; Wikipedia, 2023). The local government has three districts, Yonov, Njiriv, and Ngyohov, and 14 council wards (Gyanden et al., 2018). The Gwer LGA is bounded by Makurdi LGA in the north, south by Obi and Konshisha LGA, east by Gwer West and Otukpo LGA, and west by Gboko and Tarka LGA. Ancha, et al., 2015). The Tiv ethnolinguistic group is the predominant population in the study area. The minority groups who are settlers are the Igbo, Idoma, and Egede. The study area lies within the southern Guinea savanna, and incessant vegetation clearing has worsened the flooding problem in Gwer East LGA. However, the vegetation of the area is more shrubs than trees. The climate is tropical and humid, with two distinct wet and dry seasons. The dry season is between November and March, while the wet season occurs between April and October. The annual rainfall ranges from 1200 to 2000 mm. The temperature is generally very high during the day, with a mean maximum and minimum daily temperature of 35°C and 21°C, respectively (Ancha et al., 2015). The map of Benue State showing Gwer East LGA and the map of Gwer East LGA showing the sampled communities are in Figures 1 and 2.

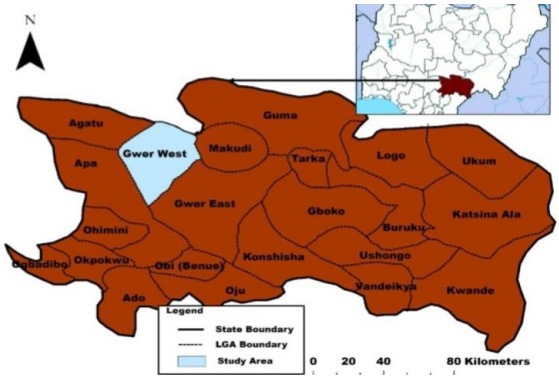

Fig. 1: Benue state showing Gwer East LGA (study area). Source: Egharevba (2024).

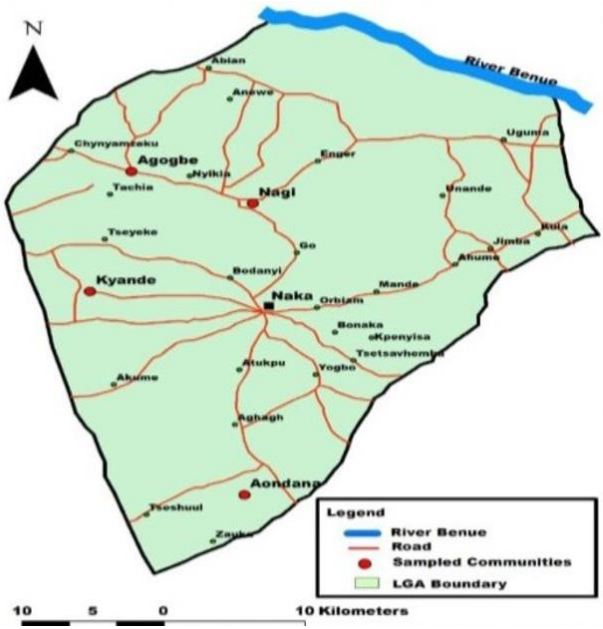

Fig. 2: Gwer East LGA. Source: Egharevba (2024).

Methodology

Research Methodology

Data Collection

The study employed both primary and secondary sources for data collection. Primary data include observation, questionnaires, and interviews, while secondary data include magazines, textbooks, journals, newspapers, seminar papers, web pages, and maps.

Sample Size and Sampling Technique

The population of Gwer-East Local Government Area as of 2006 was 163,647. Using a 3% growth rate, the population was projected to be 278598 in 2024, using the formula $P^n = po(1+r)^n$ (that is, the extrapolation method) (Yamani, 1967). The targeted respondents include males and females aged 18 years and above. Research assistants (3) were employed for the effective administration and collection of questionnaires. A sample size (399) was obtained for questionnaire administration using Slovin's formula. $N = N/1 + ne^2$ (Rilwani, 2005). Where n = number of samples, N = total population, and e = error tolerance. An additional 2% of the total sample size was added to make up for missing, unreturned questionnaires or biases while administering questionnaires. A cluster sampling technique was adopted to distribute 29 questionnaires per council ward among the 14 council wards in the study area since there was insufficient data on the population of the Gwer East Local Government area, ward by ward. The study retrieved 398 out of 406 questionnaires distributed, which were used for data analysis. With 98% of the questionnaires retrieved, the study sees the value as reasonable enough for a thorough representation of the entire population of Gwer East LGA for the relevant analysis in this study.

Data Analysis

The study adopted descriptive and statistical methods to analyse data, using a statistical package for social science (SPSS). The descriptive analysis includes tables and charts, while regression analysis was employed to test the stated hypothesis. The technique was used to determine the relationship between agricultural output (dependent variable) and flood (independent variable) in the study area. The variables were subjected to the seasons of the production (that is, during the flood year and after the flood year)..

Results and Discussion

Demographic and Socioeconomic Characteristics of Respondents

Table 1 shows the demographic and socioeconomic characteristics of the respondents. Generally, males were higher in number (72.6%) than the female factors (27.4%) that participated. It was observed that males appear to be at the forefront in the discussion of the flood menace in the study area. The respondents between the age bracket of 18 and 29 years accounted for 27.14%, while those between the ages of 30 and 41 years constituted 29.90%, which happened to be the highest among the entire age groups. Ages 42 to 53 represent 21.61% of the population, while 54 years and above make up the least at 13.82%. The outcome shows the impact of flooding on residents of all ages, including those who are young, middle-aged, and elderly. On the marital status of the respondents, 123 (30.90%) were single, 213 (53.52%) were married, 23 (5.78%) were divorced, 11 (4.5%) were widows/widowers, and 23 (5.8%) were not living with their husband but were not divorced. The finding implies that the most affected status in the study area is married people who received severe flood impacts of numerous property and agricultural losses that have affected their socio-economic lives. About 112 (28.14%) of the respondents attended tertiary institutions, 146 (36.68%) had secondary school certificates, and 58 (14.57%) ended up at the primary school level. The finding

revealed 82 (20.60%) of unschooled respondents. In terms of occupation, 225 (64.07%) of the participants were farmers, 96 (24.12%) of them engaged in business, 30 (7.54%) were civil servants, and 17 (4.27%) embarked on fish farming. Considering monthly income, residents earning less than #60,000 and above constituted the least (2.5%), while most participants were within the monthly income range of #19,000 to #28,000.

Table 1: Demographic characteristics of respondents

	Sex	Frequency	Percent
	Male	289	72.6
1	Female	109	27.4
	Total	398	100.0
	Age Below 18-29 30- 41 42-53 54 and above	109 119 86 55	(27.14%) (29.90%) (21.61%) (13.82%)
2	Marital Status		
	Single	123	30.9
	Married	213	53.5
3	Divorced	18	4.5
	Widow/widower	21	5.3
	Separated	23	5.8
	Total	398	100.0
	Educational Qualification		
	Non-formal education	82	20.6
	Primary	58	14.6
4	Secondary	146	36.7
	Tertiary	112	28.1
	Total	398	100.0
	Occupation		
	Farming	255	64.1
	Civil servant	96	24.1

	Sex	Frequency	Percent
5	Business	30	7.5
	Fishery	17	4.3
	Total	398	100.0
	Monthly Income		
	< #19,000	38	9.5
	#19,000-#28,000	198	49.7
	#29,000-#38,000	58	14.6
	#40,000-#49,000	44	11.1
	#50,000-#59,000	50	12.6
	#60,000 & above	10	2.5
	Total	398	100

Causes of Flood in the Study Area

The causes of flooding in Gwer East LGA are presented in Table 2. The study showed that 205 (51.5%) of the respondents attributed the cause of flooding to heavy downpours, followed by overflow of the Benue River and poor drainage systems, representing 100 (25.1%) and 45 (11.3%), respectively. Topography and poor infiltration attracted 19 (4.7%) respondents, while 16 (4.0%) affirmed that drainage blockage by solid wastes contributes to flooding events. Another identified factor that brings about flooding as indicated by 16 participants (3.3%), was dam collapse. From all indications, the results show that outside heavy rainfall, anthropogenic factors equally influence flooding challenges in an environment. The varying causes are predicated on the individual opinion on the prime factor of flooding in the study area.

Table 2: Causes of flooding in the study area

Causes	Respondents	Percentage (%)
Heavy rainfall	205	51.5

Causes	Respondents	Percentage (%)
Dam collapse	13	3.3
Topography and infiltration	19	4.7
Poor drainage system	45	11.3
Blocking of drainage with solid wastes	16	4.0
Overflow of river Benue	100	25.1
Total	398	100

Effects of Flood on the Environment

Figure 3 presents the respondent's perception of flood effects on the environment. The result revealed 100% of the respondents' agreement that flooding causes environmental challenges such as erosion, soil impoverishment, farmland destruction, water pollution, outbreaks of diseases, destruction of livestock, and financial loss in the Gwer East local government area. However, the severity of the flooding effects as perceived by the respondents ranges from not severe, fairly severe, severe, and extremely severe, as shown in Figure 3. The analysis showed respondents (75%) who affirmed that the flood impact was extremely severe. Those who agreed that the flood impact was severe were 23%, while 2% adjudged the flooding impact fairly severe. None of the respondents was neutral (kept quiet) on flood impact severity, which indicates a general concern among the people towards the flood menace in the study area.

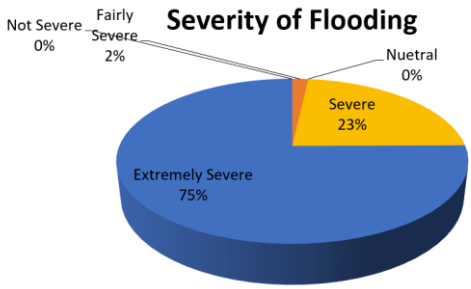

Fig. 3: Severity of flooding

Flooding effects on agricultural activities

The colossal flood effects on agricultural activities were enumerated by the respondents via questionnaire, which includes the destruction of farmlands, total crop loss, panic harvesting, rotting of tubers, destruction of livestock, decrease in crop yield, and financial loss of farmers. The impacts have significantly thrown the weight of acute hardship, particularly on peasant farmers who solely rely on farming for their livelihood. The submerging of farmlands and the displacement of the affected farmers, who were supposed to contribute to crop production, have effectuated food shortages in the study area and other locations that benefit from agricultural production in Gwer LGA, Benue State.

Farmlands affected by flood

The sizes of farmlands affected by flooding incidents are in Table 3. The study found 130 (25.1%) farmers with less than 1 hectare of farmland affected. Between 1.1 and 2 hectares of affected farmlands were recorded by 202 (50.8%) respondents, while 30 (7.5%) participants agreed that 2.1 and 3 ha of their farmlands were affected by flood events. The record of 3.1ha and above affected farmlands was attested to by 66 (16.6%) participants who lamented the acute hardship in the study area.

Table 3: Farmlands affected by flood

Sizes	Number of Respondents	Percentage (%)
<1ha	100	25.1
1.1-2ha	202	50.8
2.1ha -3ha	30	7.5
3.1ha and above	66	16.6
Total	398	100

Major food crops cultivated

Figure 4 presents the major food crops cultivated by farmers in the study area. It was observed that 146 respondents (36.7%) of the farmers cultivated rice, 55 (13.8%) of the respondents cultivated cassava, and 28 (7%) cultivated maize. It was also observed that 30 of the respondents, representing 8% of the participants, majored in groundnut, while 48 (12%) cultivated yam.

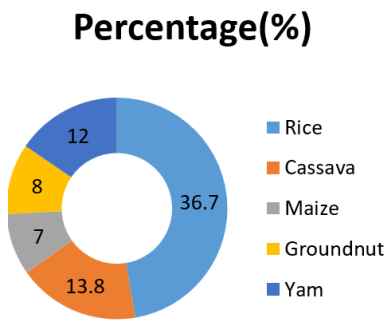

Fig. 4: Food crops cultivated

Crop Yield during Flood Year

Table 5 shows farmers' production during the flood year 2022, and the study found that farmers had low crop production. Farmers produced 81 bags of 5kg rice, 121 bags of 5kg maize, 51 bags of 5kg cassava, and 60 bags of 5kg groundnut. Farmers produced 52 bags of 10kg rice, 13 bags of 10kg maize, 3 bags of 10kg cassava, and 1 bag of 10kg groundnut during the flood year. The

farmers produced 13 bags of 25kg rice, 3 bags of 25kg maize, 1 bag of 25kg cassava, and 50 bags of 25kg groundnut. None of the farmers got 50kg of any crop produced.

Table 5: Crop yield during flood year

Unit of measurements in bags	Crops			
	Rice	Maize	Cassava	Groundnut
5kg	81	121	51	60
10kg	52	13	3	1
25kg	13	3	1	50
50kg	0	0	0	0
Total	146	137	55	111

Crop Yield after Flood Year

The study shows that farmers produced a high output during the flood year, producing 35.50 bags of 5kg rice, 41 bags of 5kg groundnut, 2 bags of 5kg cassava, and 5 bags of 5kg groundnut. They also produced 68 bags of 10kg rice, 55 bags of 10kg maize, 36 bags of 10kg cassava, and 27 bags of 10kg groundnut. After the flood year, 36 bags of 50kg rice and 6 bags of 50kg groundnut were produced, with none of the farmers producing up to 50 kg bags of maize and groundnut.

Table 4: Crop Yield after Flood Year

Quantity (Unit of Measurements in Bags)	Crops			
	Rice	Maize	Cassava	Groundnut
5kg	35.50	41	2	5
10kg	68	55	36	27
25kg	6	42	19	23
50kg	36	0	0	6
Total	145.5	138	57	61

Analytical Result

Relationship between Agricultural Crop Yield and Flood Event.

Table 6 depicts the total crop yield produced by farmers, measured in 5, 10, 25, and 50 kg bags. The findings showed variation in the quantity produced. However, to examine the significant relationship between crop yield and flooding events in the study area, crop yields were subjected to the seasons of production (during and after the flood year) to address the stated hypothesis. The deterministic relationship between crop yield and flood is in Table 6.

Table 6: Total crop yield during and after flood year

	Unit of Measurements in Bags	Crop Yields	
		During flood year(X)	After flood year(Y)
1	5kg	1340.00	391.25
2	10kg	682.50	1157.50
3	25kg	392.13	1818.75
4	50kg	.00	1812.50

Hypothesis 1

Table 7 shows the regression results of the significant relationship between agricultural output and flooding events in the study area, as stated in Hypothesis 1. The P-value of 0.043 was less than the maximum probability for significance of 0.05 (0.043< 0.05). Therefore, the study concludes a significant relationship between agricultural yield and flooding events in the study area. Agricultural yield was higher after the flood year than during the flood year. Since the P-value is positive, a unit increase in flood rate invariably results in a unit increase in the destruction of farm crops. The summary of Pearson's Product Moment Correlation analysis is in Table 7.

Table 7: Summary of Pearson product moment correlation result

Descriptive statistics			
	Mean	Std. deviation	N
FYR	603.6563	564.96749	4
AFYR	1295.0000	677.68986	4

Correlations			
		FYR	AFYR
FYR	Pearson Correlation	1	-.957*
	Sig. (2-tailed)		.043
	N	4	4
AFYR	Pearson Correlation	-.957*	1
	Sig. (2-tailed)	.043	
	N	4	4

**. Correlation is significant at the 0.05 level (2- tailed).*

Effect of flood on livestock rearing

The destroyed livestock by flood in the study area (Fig. 5) shows that 34.9% of the respondents lost their fowl (poultry) to flood, and 17.8% of respondents' goats were submerged. About 2.8% of the participants agreed they lost cattle to floods, followed by 8.5% that bolstered their loss of goats. These have affected the socioeconomic lives of locals in Gwer East LGA.

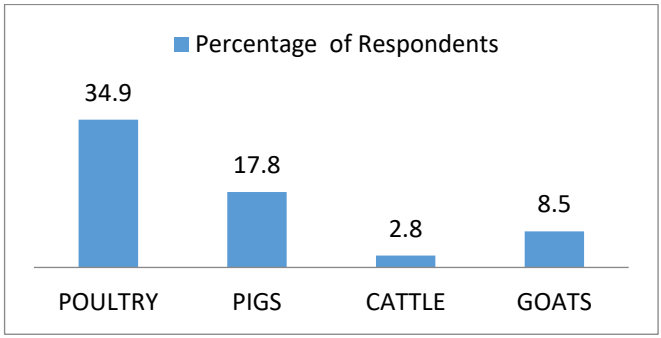

Fig 5: Livestock loss to flood

Estimated Loss in Naira in the Last major Flooding Year 2022.

Table 8 presents the respondents estimated loss in Naira to flooding in 2022. The result reveals that 271 (43%) farmers had a financial loss of #501,000 and above. It implies that most farmers experienced at least a loss above #501,000 in the last flood year, 2022. About 116 respondents experienced annual loss between #301,000- #500,000, and 6 persons claimed financial loss between #101,000- #300000. The least participants (5) agreed on a financial loss between #1,000-150,000. The incidents have drastically reduced farmers' income and posed economic hardship to the inhabitants as the prices of things generally are inflated almost daily.

Table 8: Estimated loss in naira in the last flooding experience from crop production

Amount	Estimated loss in Naira (#) by Farmers in the last flooding experience			
	1,000-150,000	151,000-300,000	301,000-500,000	501,000 and above
Number of Respondents	5	6	116	271
Percentage	1.3	1.5	29.1	68.1

Coping and Mitigation Strategies for Flood Effects on Farming Activities

Table 9 represents the controlling, coping, and mitigation strategies for flood impacts on farming activities. Exactly 135 of the respondents (38.4%) of farmers affirmed the early flood warning system as a way of controlling, coping, and mitigating flood impact on farming activities in the area. About 9 of the respondents (2.3%) of fishermen/women confirmed the early flood warning system as a way of controlling, coping, and mitigating flood impact on farming activities in the area. About 10.3% of civil servants suggested relocating the farmlands from flood-prone areas to safe areas to control, cope, and mitigate flood impacts on farming activities. From Table 4.9, 59 respondents (14.8%) of farmers recommended afforestation as a way of controlling, coping and mitigating flood impact on farming activities in the area, and about 30 of the respondents, representing 7.5% of businessmen/women, had the same suggestion on afforestation. While about 51 of the respondents, representing 12.8% of farmers, suggested efficient flood preparedness measures as ways of controlling, coping with, and mitigating flood impacts on farming activities in the area,

Table 9: Coping and mitigation strategies to flood effects on farming activities

What are the ways of controlling, coping and mitigating flood effects on farming activities in your area?	Occupational Status			
	Farmers	Civil servant	Businessmen/women	Fishermen/women
Early flood warning system	135	0	0	9
	(38.4%)	(0.0%)	(0.0%)	(2.3%)
Relocating Farmlands from flood prone area to safe area	0	41	0	0
	(0.0%)	(10.3%)	(0.0%)	(0.0%)
Afforestation	59	19	30	8
	14.8%	(4.8%)	(7.5%)	(2.0%)
Efficient flood prepared measures	51	36	0	0
	(12.8%)	(9.0%)	(0.0%)	(0.0%)

Discussion

Environmental flooding on agricultural activities was examined, and the study found that flooding events negatively impact farming activities and locals of all ages. However, the most affected in the study area are the married ones. The effects cut across the socioeconomic lives of the residents, and the severity was extreme (75%) in the study area. The identified causal factors of flooding in the Gwer-East Local Government Area include heavy downpours, dam collapse, overflow of the Benue River, poor drainage system, topography, poor water infiltration, and drainage blockage by solid wastes. Heavy rainfall and overflow of the Benue River contributed more to the causes of flooding in Gwer East L.G.A. However, unwholesome human activities like drainage blockage compound the effects of flooding to a large extent. The environmental challenges of flooding come with erosion burden, soil degradation, destruction of farmland, water contamination, crop and livestock destruction, outbreak of diseases, and financial loss of farmers. Floods disrupt farming activities, causing delays in planting seasons that impact crop growth and yield. Other effects of flooding include total crop loss, disrupted harvesting, rot of tubers, and a decline in crop yield. These, without a doubt, are threats to agricultural activities, the environment, and the total well-being of farmers.

Many farmlands were submerged, according to the respondents, and most farmers were displaced. The highest and the lowest sizes of farmlands affected by the flood menace are 1.1-2 ha (50.8%) and 1 ha (25%), respectively. Flooding has led to increased food prices, a hike in farmland rent, joblessness, and hardship. It has also increased costs for farmers, including crop replacement, soil rehabilitation, and livestock care. Malnutrition may occur as access to nutritious food is limited. The peasant farmers who rely on farming for a livelihood suffered more. The highest percentage (36.7%) of farmers in the Gwer East Local Government Area produced rice, while the least (7%) produced maize. Crop yield was higher outside flood years than

during flood years, and the Pearson correlation result shows a significant relationship between crop yield and flood events with a P-value of 0.043. The finding shows a positive relationship, which implies that a unit increase in flood events causes a unit increase in low crop yield. Therefore, there is a significant relationship between agricultural production and flood events.

Besides crop farming, residents who engaged in livestock were significantly affected. The livestock that drowned in floodwaters are in the descending order of fowl > pigs > goats > cattle with a corresponding value of 34.9%, 17.8%, 8.5%, and 2.8%, respectively. The trauma affected the productivity of the survivors due to the stress of relocating them to new locations, as the flood had destroyed their shelters. The nutritional value of feed has reduced, while some were spoilt due to floodwater contamination. On that note, residents' lives in Gwer East are at stake as contaminated water induces waterborne diseases such as E. coli, cholera, Salmonella, etc., which affect human health (Ali et al., 2025). Flooding events, particularly in 2022, affected farmers' income, as most farmers (43%) had a financial loss above #501,000. Flood-induced scarcity of food crops and livestock, and potential price hikes pose a significant threat to food security and sustainable development. Respondents are aware of flood mitigation measures like early warning, farm relocation from flood-prone areas, afforestation, and efficient preparedness, but the number of these options is either inadequate or not explored at all.

Limitations of the Study

The lack of data on the population of the Gwer East LGA community by the community is a limitation, as questionnaires were shared equally among the communities in the area. Some communities may be higher in numbers and size; however, selecting 29 households, ably represented by each household head across the study area, is reasonable enough to provide the necessary information for the research. This informed the researchers' choice of using a

multi-stage sampling technique for questionnaire administration. Due to insecurity, most people were unwilling to attend to the researchers initially but responded after much explanation, which prolonged the time for the study. Looking at the scope of the study, the study generalized the environmental flooding on agricultural activities in Gwer East LGA. However, it will be helpful to achieve sustainable development by examining the topography, drainage pattern, and weather system to guide farmers as the influence of climate change contributes immensely to flooding menace. Furthermore, due to time and financial constraints, the study focused on crop yield to affirm a significant relationship between flood and agricultural activities in the study area without considering the analysis of other factors like livestock yield or resilience in and outside flood years. These could also reveal the magnitude of flood effects on agricultural activities. The effects of flooding on agricultural activities are extensive, and researching all aspects of it is demanding, if not impossible. Therefore, the study recommends the following for further studies: (1) the influence of topography, drainage pattern, and climate change on the flooding menace on agricultural activities. (2) environmental effects of flooding on surface water quality (3) environmental impact of flooding on food crop production. These researches are significant for sustainable development, as agriculture remains a notable sector many rely on for their livelihood, mostly in developing countries like Nigeria.

Conclusion

The study examines environmental flooding in agricultural activities in Gwer-East Local Government Area, Benue State. Based on the research findings, the study concluded that flooding has negatively impacted agricultural activities, particularly food crops, in the Gwer-East Local Government Area of Benue State. The statistical finding shows a significant relationship between crop production and flooding events, as crop yield was

higher outside flood years than in the 2022 flood year. Highlighting that higher production is imminent outside flood years. These effects have cut across economic and physical factors, affecting the livelihood of farmers and food security for sustainable development in and beyond Gwer-East L.G.A. The study suggests that the government should construct proper drainage to mitigate the effects of flooding on agricultural activities. An awareness campaign should be organised to educate the general public on the inherent dangers of blocking waterways with refuse dumps and preparing their minds towards adaptive measures to cushion flood effects. Dredging along river channels is also necessary to widen the drainage system for a smooth flow along waterways. Farming along waterways should be prohibited to prevent crops and farmlands from submerging during flood events. The construction of more dams in the country could also curb flooding problems.

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