Book of Proceedings, 14th Nigeria Association of Hydrological Sciences Conference (Okitipupa 2024) held at Olusegun Agagu University of Science and Technology, Okitipupa, Ondo State, Nigeria, November 5 - 8, 2024

EFFECTS OF FLOOD RISK ON AGRICULTURAL FARMLANDS IN KOFAR KONA ZARIA, KADUNA STATE, NIGERIA

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Abstract

The study examined the effects of flood risk on Agricultural Farmlands in Kofar Kona area of Zaria, Kaduna State, Nigeria. It identifies both natural and human-induced causes of flooding, such as heavy rainfall, poor drainage systems and blockage of water culverts. Data was collected using Kobo collect tool. A total of 120 copies of questionnaire were used as sample size for the study but only 115 copies were retrieved. Result showed that the most significant natural cause of flooding in the area is heavy rainfall as indicated by 51%. The findings reveal significant impacts on agricultural productivity, including the loss of farmland, soil nutrients, and agricultural produce, which contributes to food insecurity and economic losses in the region. The study also identifies coping strategies used by local farmers, such as early warning systems and the construction of flood barriers. Recommendations include the integration of digital early warning systems, improved drainage infrastructure and sustainable agricultural practices to mitigate the impact of flooding on farmlands. This research fills a gap in the literature by specifically assessing flooding's effects on farmlands in the Kofar Kona area and offers practical recommendations for policy and planning.

Keywords: Floods, Farmlands, Agriculture, Kofar Kona & Zaria.

1. Introduction

Over the years, floods have led to severe loss of lives and properties of man,the loss is not only restricted to humans personal property or lives, it also involves loss in environmental resources, vacant lands and agricultural farmlands due to heavy surface runoff (Ebuzoeme, 2015).Flood is an overflowing or irruption of a great body of water over land not usually submerged (Oxford English Dictionary).It is an extreme weather event naturally caused by rising global temperature which results in heavy downpour, thermal expansion of the ocean and glacier melt, which in turn result in rise in sea level, thereby causing salt water to inundate coastal lands. Flooding is the most common of all environmental hazards and it regularly claims over 20,000 lives per year and adversely affects around 75 million people world-wide (Angela, 2011).

Over the years, floods have led to heavy loss of lives and properties, these alarming rate of flood occurrence have rose a sounding alarm to intellectuals, governments and nongovernmental organizations to address the high frequency of flood occurrence which they describe as a damaging phenomenon (Apan 2010) The alarming rate of flood occurrence in recent times have been attributed to global warming and poor drainage systems, poor urban planning, poor warning systems these can lead to the high frequency of flood occurrence (Apan and Keogh, 2010).

To the best of our knowledge, there is a lack or empirical studies specifically examining the effect of flooding on Agricultural Farmlands in Kofar Kona, Zaria, Kaduna State. This gap in literature is significant because it limits our understanding on how floods affect Agricultural Farmlands in Zaria, this study tends to fill the gap in literature. The following objectives were set to guide this study.

i. What are the causes of flooding in Kofar Kona area of Zaria?
ii. What are the effects of flooding on farmlands in Kofar Kona area of Zaria?
iii. What are the coping strategies used by farmers to curb flooding and its effects in Kofar Kona area of Zaria?

1.1. Study Area

Kofar Kona is located in Zaria city on the North Central Plateau about 600m above sea level in the northern guinea Savannah. It is located between latitude $11^{0}02^{I}20^{II}$ N to $11^{0}07^{I}23^{II}$N equator and Longitude $7^{0}07^{I}30^{II}$E and $7^{0}73^{I}55^{II}$E Greenwich meantime. The town is located at a distance of about 962Km from the Atlantic Ocean. It is about 80Km North East of Kaduna state capital and about 130KM to Kano (Joe, 2010). Climate of Zaria city can be classified using the Koppen classification of climate as tropical wet and dry climate or continental type of climate. Rainfall is between 900mm-1200mm depending on the annual variations of rainfall. The rainfall type is mostly convectional type, mostly in the evenings or late in the night. The temperature is high around the months of March and April about 30^{0}C to 37^{0}C and drastically reduces between 15^{0}C to 25^{0}C between December and February (Bashir, 2012). The drainage pattern of Zaria City is Dendentric in nature, mostly shallow rivers or large water channels convey water out of the city. The major water channel that cuts across the city is known as FadamanSarki which flows south-wards through Kaura and Amaru settlements which later drain to river Saye, a tributary to River Galma. (Bashir, 2012).

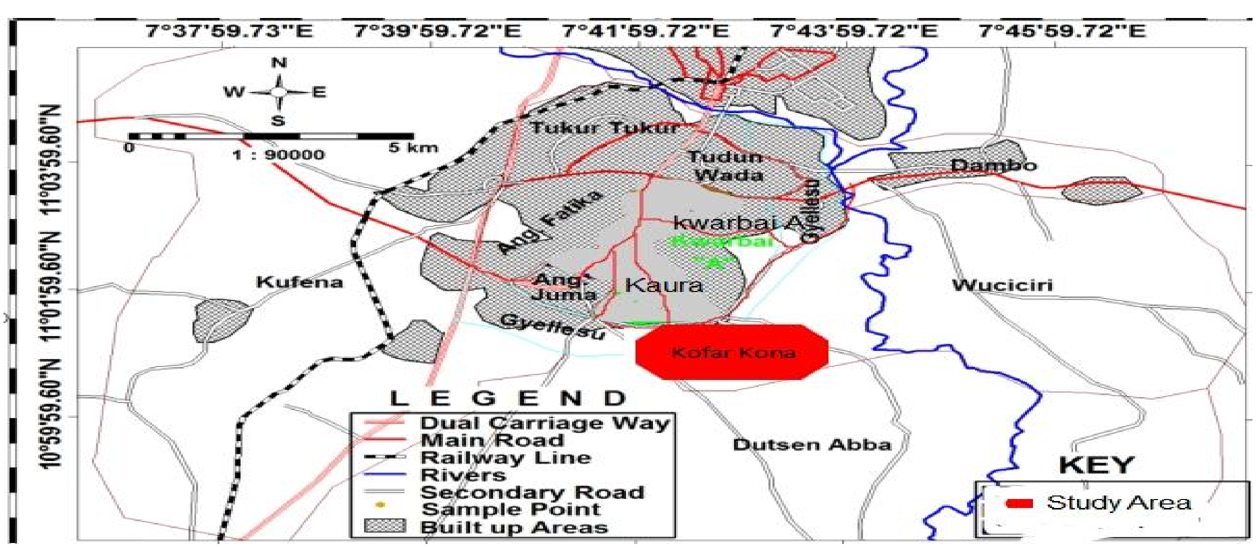

Figure 1: Zaria City Showing the Study Area Extracted from Google Map,2024

2. Materials and Methods

The population of this study are residents that lives close or are in the vicinity of the identified farmlands that are being affected by floods in the study area of Zaria Local Government, Kaduna State. The farmers and residents are in the better position to provide the necessary information needed for this study. A purposive sampling technique was adopted for this study. These would make the targeted population to be easily assessed. 204 respondents were sampled using predictive sample size. 120 respondents were selected from the study area and they are the basis for the information used for this study.The data would be collected through questionnaire and which will be administered to respondents in the study area. The study area is being divided into three (3) zones, this is to ease the distribution of questionnaire in the study area. The zones are Kofar Kona Zone, GidanKano Zone andKuara-Galma River Confluence.

Descriptive data conceptualization using simple percentages would also be adopted for this study. The data collected were analysed using simple descriptive analysis such as percentages, chars, Histograms and ratios. The main purpose for the use of Charts and percentage ratio is to reduce the different set of numbers to a common and simple base so as to ease understanding.

RESULTS AND DISCUSSION

Table 1 Socio demographic Characteristics of Respondents

Gender	**Frequency**	**Percentage%**
Male	86	74.8
Female	29	25.2
Total	115	100
Age	Frequency	Percentages%
<25 years	32	27.8
25 – 40 years	38	33.1
41 years and above	45	39.1
Total	115	100
Education level	Frequency	Percentage
Higher Institution	15	13
Secondary School	27	23.5
Primary	34	29.6
Tsangaya	10	8.7
Non Formal	29	25.2
Total	115	100
Status	Frequency	Percentage

Single	37	32.12
Married	45	39.13
Divorced	21	18.3
Widowed	12	10.43
Total	115	100
Occupation	Frequency	Percentage
Civil Servant	20	17.4
Business	46	40
Students	34	29.9
Others	15	13.1
Total	115	100

Source: Authors analysis, 2024

Causes of Floods in the study area

Table 2: Causes of Flooding in the study area.

	Causes	SA	A	D	SD
	Natural Factors				
1	Heavy Rainfall	23	36	29	27
2	High Temperature	10	14	48	41
3	Siltation and Sedimentation	18	16	36	45
4	Inadequate Dredging of River Channels	25	38	21	31
5	Poor Infiltration of Water in Soil	10	9	45	51
	Human Factors				
1	Building on along River Course	56	43	11	8
2	Blockage water of Culverts	61	34	13	7
3	Dumping of Refuse in Culverts	47	39	12	17
4	Filling of ponds with debris	51	37	9	18
5	Road Construction	54	33	15	13

Source: Author’s Analysis, 2024

Table 2, the most significant causes of flooding in Kofar Kona are natural factors, particularly heavy rainfall, which 51% of respondents agreed or strongly agreed was a major contributor. Recent studies support these findings, showing that extreme rainfall events have become more frequent due to climate change, exacerbating flood risks in urban and rural areas (Eze&Ogbu, 2023). Additionally, human-induced factors such as poor drainage systems (55.1% agreement) and blocked culverts (82.6% agreement) were also significant contributors. This aligns with the findings by Idris and Mohammed (2022), who highlighted that inadequate urban planning and lack of proper drainage maintenance are critical factors increasing the vulnerability of areas like Kofar Kona to flooding.

Table3: Effects of Floods in the Study Area

	Effect of Floods	SA	A	D	SD
	Physical				
1	Loss of Agricultural farmlands	58	43	9	5
2	Loss of Agricultural Produce	61	34	13	7
3	Loss of Soil Nutrients	52	39	8	16
4	Loss of Arable Lands	55	41	12	7
5	Pests and Diseases	49	38	15	13
	Socio economic				
1	Loss in agricultural farm produce	63	30	10	12
2	Loss in revenue	58	30	10	12
3	Social Displacement and Migration	60	37	14	6
4	Leads to food insecurity	62	36	7	10
5	Increased Diseases	59	40	11	5

Source: Author's Analysis, 2024

Table 3 highlights the direct impacts of flooding on agricultural farmlands, with 88.7% of respondents agreeing that flooding leads to the loss of farmland. This is consistent with recent research by Usman et al. (2022), which reported widespread destruction of farmland and crops due to flooding in Northern Nigeria. Loss of soil nutrients, identified by 79% of respondents, is another critical effect of flooding. According to Musa and Danjuma (2023), flooding leads to significant soil erosion, which removes the topsoil and depletes essential nutrients required for crop growth. This degradation results in lower agricultural productivity, particularly for crops such as maize, tomatoes, and millet, which are extensively cultivated in Kofar Kona.

The table also indicates that flooding has severe socio-economic impacts, particularly the loss of agricultural produce and revenue. A majority of respondents (82.6%) indicated that flooding leads to the loss of farm produce, corroborating findings by Yusuf et al. (2023), who found that recent floods caused significant losses of crops like rice, vegetables, and legumes in Nigeria's North-Central region. Similarly, 76.5% of respondents agreed that flooding results in a loss of revenue due to reduced marketable surplus and increased costs for replanting.

Table 4 Mitigation Strategies

	Mitigation Strategies	SA	A	D	SD
1	Introduction of Early Warning System	37	42	15	21
2	Construction of water reservoirs	41	37	14	13
3	Construction of Flood Barriers	37	42	15	21
4	Planting of barrier Trees	39	40	14	22
5	Increasing Flood Defense Systems	39	28	26	22

Source: Author's Analysis, 2024

Table 4.4 explores potential mitigation strategies to address flooding in Kofar Kona. Most respondents (68.7%) emphasized the importance of early warning systems as an effective measure to reduce flood risks. This perspective is supported by recent literature that suggests the integration of digital and community-based early warning systems could significantly minimize flood impacts (Olawale et al., 2022). The construction of water reservoirs and flood barriers also received considerable support (68% and 68.7% agreement, respectively). A study by Adeyemi et al. (2023) suggests that infrastructure-based solutions, including levees, reservoirs, and retention ponds, are crucial for managing flood risks in flood-prone regions like Kofar Kona.

Environmental measures such as planting barrier trees and enhancing flood defenses were less favored by respondents, but they remain important. Recent studies suggest that combining both structural and non-structural approaches, such as agroforestry and reforestation, can offer sustainable flood mitigation (Alabi&Afolabi, 2022).

Conclusion and Recommendations

The effect of floods on agricultural farmlands and farm produce is pronounced in the study area. However, urgent attention is needed to mitigate the rate of impact of floods on farmlands. This study noted that water channels have significant impact on flood occurrence in the study area.
Based on the aforementioned findings the following were recommended:

1. Relevant stakeholders should develop and implement digital and community-based early warning systems to provide timely alerts about potential flooding, enabling farmers and residents to take preventive actions.
2. There is need to upgrade and maintain the existing drainage systems, particularly clearing blocked culverts and ensuring proper dredging of river channels, to enhance the city's capacity to manage heavy rainfall and surface runoff.
3. Farmers should be encouraged to adopt sustainable agricultural practices, such as agroforestry and contour farming to reduce soil erosion and improve water infiltration.
4. Government should construct additional flood barriers, retention ponds, and water reservoirs to control floodwaters and protect agricultural farmlands from damage.
5. Government and relevant stakeholders should conduct regular community awareness programs on flood risks, mitigation strategies and sustainable land management to empower residents and farmers to take proactive measures against flooding.

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