

## **Risk Perception of Floods on Farmlands in Kofar Kona, Zaria City, Kaduna State, Nigeria.**

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### **ABSTRACT**

*The paper examined risk perception of floods on farmlands in Kofar Kona, Zaria City, Kaduna state. The objectives set out were to identify the perceived causes of flooding in the study area, assess the perceived socio-economic effects of flooding on farmlands and determine the strategies used by farmers to mitigate the effects of by flooding in study area. A purposive method of data collection was used to obtain data for the study through the use of a structured questionnaire. A total of 115 copies of questionnaires were administered to farmers within the three (3) zones of the study area, with a response rate of 97 %. The Rank scoring method was used to assess respondents' perceptions of the severity of flooding in the study area. The data collected was analyzed using descriptive statistics. The results show that 49% of the respondents attributed flooding to natural factors such as rainfall characteristics and climate change; 46% agreed that floods were caused by human factors such as inappropriate disposal of refuse into water channels resulting in drainage blockage. Results also show that reduced farmland sizes ranked first with a mean value of 5.0 and is regarded by respondents as the most serious effect of flooding. However, evacuation of culverts and drainages before onset of rains ranked first with a mean value of 3.4 and is perceived as the most effective strategy to mitigating flood risk in the study area. The study affirms that farmlands and farm produce are greatly affected by floods in the study area while lives and properties of the residents are increasingly being threatened. The study therefore recommends tree planting and increased vegetation cover, provision of effective man-made water channels and construction of flood barriers along the boundaries of River Galma to minimize inundations of farmlands while encouraging proper waste disposal and management practices.*

**Keywords:** Floods, climate change, risk perception, farmlands, Kofar Kona.

### **1.0 INTRODUCTION**

Over the years, floods have led to severe loss of lives, properties and environmental resources such as vacant lands and agricultural farmlands due to heavy surface run-off (Adedokun and Adeweniyi, 2020). The alarming rate of flood occurrences in recent times has been attributed to climate change, global warming, poor drainage systems, poor urban planning and warning systems (Apan, 2010).

Extreme tidal conditions cause coastal flooding because of high tidal wave levels, storm surges and wave actions on adjoining coastal areas. Fluvial floods occur when the discharge from rivers exceed the capacity of the river channel to contain it, mostly due to high precipitation downpour, while pluvial flooding takes place when rainfall exceeds the capacity of land surfaces to absorb excess runoff water (Adedokun, 2014; Connelly *et*

*al.*, 2015). Excessive rainfall of high duration could also lead to dam burst and flooding.

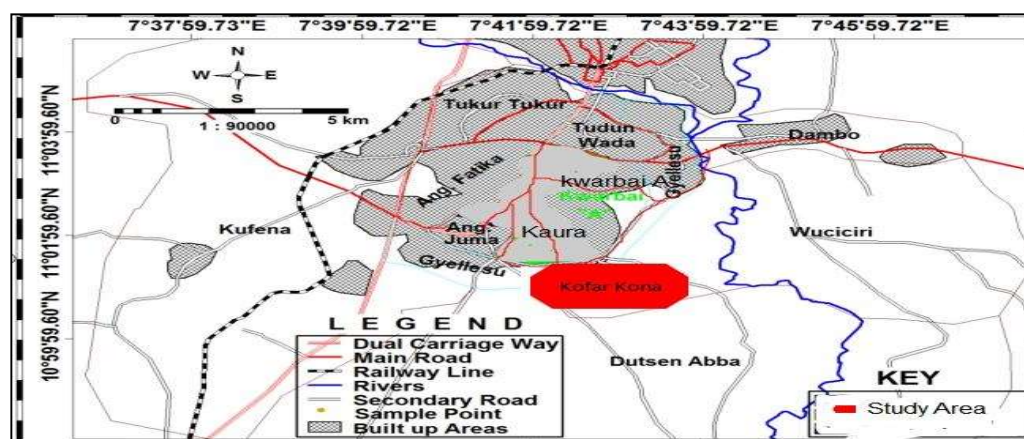
Flooding events are a frequent occurrence within the Kubanni and Galma flood plains (Etuonovbe, 2011). Although most of the flooding has been due to excessive rainfall, urban sprawling towards the Kubanni and Galma rivers has increased (Book, 2017) and have been found to exacerbate flooding. For example, sand filling of ponds within Zaria city and other traditional cities in northern Nigeria is a major activity in the study area which entails filling up of existing ponds with sand to reclaim the land for use in building construction and infrastructural development (Sulaiman, 2019). However, this paves the way for floods to prevail within Zaria city and other traditional cities in northern Nigeria (Sulaiman, 2019). Similarly, Bamidele *et al.*, (2019) assessed the impacts of tree planting program on the siltation of the Kubanni dam using GIS techniques. The results showed that the Kubanni reservoir had lost 44% of its installed storage capacity since 1973. The depletion of the storage capacity has implication for dam breach due to the weight

conducted at the international or national level. Researches such as Apan (2010); (Etuonovbe, 2011); Adedokun (2014); Joy and Edet (2018); Adedokun (2020) have essentially focused on the frequency of floods, identifying high and low-risk flood prone areas and identifying the crop species most affected by floods. However, studies have not been conducted to assess the effect of flooding on agricultural farmlands in the Kofar Kona axis of Zaria City. Thus, this study aims to assess the risk perception of floods on farmlands in Kofar Kona, Zaria City, Kaduna State. The objectives include identifying the perceived causes of flooding in the study area; assessing the perceived socio-economic effects of flooding on farmlands and determining the strategies used by farmers to mitigate the dangers posed by flooding in study area.

## 2.0 MATERIALS AND METHODS

### 2.1 Study Area

Zaria is located in the northern Guinea Savannah and lies at an altitude of about 600m above sea level. It is located between



**Figure 1:** Geographical Location of Study Area

*Source:* Extracted from Google, 2021

and over-loading of the sediments on the dam structure.

Available evidence shows that there are few researches on flood risk effect on farmlands

latitude 11°02'20"N to 11°07'23"N and longitude 7°07'30"E - 7°73'55"E (Figure 1). The Major relief features found within the city wall are the Madarkaci Inselberg and Banzazzau Hill. The Zaria traditional city is

characterized by the city wall called “Ganuwar *Amina*”, which is about 6-10m in height within a radius of 18.3km (Odufuwa, 2012). It is about 80km northeast of Kaduna State capital and about 130km to Kano (Joe, 2010). The study area is bordered to the East by Nagoyi layout, to the North by Kaura, to the South by Kofar Gayan extension, to the west by Bizara (Kawu, 2011).

The two distinct seasons in Zaria are the wet and dry seasons with rainfall ranging between 900mm-1200mm. The temperature is high around March and April ranging between 30°C to 37°C and drastically reduces between 15°C to 25°C between December and February (Book, 2017).

The drainage pattern of Zaria City is dendritic with mostly shallow rivers or large water channels conveying water out of the city. The major water channel that cuts across the city is known as Fadaman Sarki which flows southwards through Kaura and Amaru settlements and drains into river Galma, a tributary to river Kaduna (Jeb and Aggarwal, 2008). The soil in Zaria is greatly influenced by climatic conditions, the nature of rocks and human activities. The parent material that forms the soil in the area is granitic in origin. The soil retains the properties of the granite rocks which is light in colour, have moderate texture and have high clay contents. The major soil is tropical ferruginous type with ABCD horizons, moderate clay content, light in colour, pH value of 4 to 5 and high concentration of iron between the C and D horizons (Mele, 2015). The distinct soil characteristics favour the cultivation of maize, sugar cane, tomatoes, cotton, guinea corn, millet and soya beans.

Zaria belongs to the Savannah woodland vegetation belt comprising of tall grasses, scattered deciduous trees with umbrella shapes, thick hard bark and long taproots. The dominant trees are shear butter, locust bean trees, silk cotton, mango and baobab.

The dominant shrub is the *Isobelina doka*. The vegetation in Zaria is greatly influenced by human activities (Suleiman, 2019).

## 2.2 Methodology

Following a reconnaissance survey, a purposive method of selection of respondents was adopted for this study. This implies that only farmers met on their farms during the field survey were interviewed. A structured questionnaire comprising of both closed and open-ended questions was used. The population census document for 2006 was not used because it does not have ward population statistics. However, with a population projection of be 39,681 as at 2021 (using Mehta, 2004), sample selection as described by Mesa *et al.*, (2014) was used;

$$\frac{\text{Total Population of Study Area}}{100} \times 0.3\%$$

Therefore, a total of 119 copies of a questionnaire representing 0.3% of the entire population of the study (39,681) were administered to the farmers in the study area, with a response rate of 97 %. A total of 115 copies of the questionnaire were retrieved and use for the study. This number was adequate as it fell above the 75% recommended by Kelley *et al.*, (2003).

The data collected was analyzed using simple descriptive statistics such as frequencies, means and percentages. The Rank Scoring method was used to assess respondents' perceptions of the severity of flooding in the study area.

## 3.0 RESULTS AND DISCUSSIONS

### 3.1 Socio-economic characteristics

The socio-economic characteristics of respondents are presented in Table 1.

**Table 1:** Socioeconomic characteristics of respondents

<b>Gender</b>	<b>Frequency</b>	<b>Percentage%</b>
Male	86	74.8
Female	29	25.2
Total	115	100
<b>Age</b>	<b>Frequency</b>	<b>Percentages%</b>
<25 years	32	27.8
25 – 40 years	38	33.1
41 years and above	45	39.1
Total	115	100
<b>Level of education</b>	<b>Frequency</b>	<b>Percentage</b>
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
<b>Marital status</b>	<b>Frequency</b>	<b>Percentage</b>
Single	37	32.12
Married	45	39.13
Divorced	21	18.3
Widowed	12	10.43
Total	115	100
<b>Occupation</b>	<b>Frequency</b>	<b>Percentage</b>
Civil Servant	20	17.4
Business	46	40
Students	34	29.9
Others	15	13.1
Total	115	100

*Source: Field Survey, 2021*

The results show that the majority of respondents (75%) were males of various age categories; about 30% have acquired primary education and 23.5% have secondary education, which depicts a community with a low literacy level, hence vulnerable to flooding. This is in agreement with the work of Oyatayo *et al.*, (2016) whose study showed that majority of respondent in Donga Town were males which could be due to religious reasons as the study area is predominantly inhabited by Muslims. The marital status of the respondents indicates that 39% are married, 32% are single while 18% and 10% divorced and widowed respectively. This indicates a large dependent population, making them vulnerable to the effects of

flooding in the area. The occupational structure of the respondents shows that 40% are into business while 30% and 17% are students and civil servants respectively.

### **3.1.2 Perceived causes of flooding**

The perceived causes of flooding in the study area are presented in Table 2 and 3. The results from Table 2 show that major natural factors of flood generation in the study area are heavy rainfall (49%), climate change/increased warming (20%), extreme weather events (17.4%), fluvial processes

**Table 2:** Perceived natural causes

Perceived causes	Frequency	Percentage
Heavy downpour	56	48.7
Climate change/increased warming	23	20
Fluvial processes	11	9.6
Pluvial processes	8	5
Extreme weather events	20	17.4
Total	115	100

*Source: Field Survey, 2021***Table 3:** Floods are caused by human factors.

Causes	Frequency	Percentage
Dumping of refuse in water channels	53	46
Building on water course	43	37.4
Filling of ponds with debris	11	9.6
Diversion of water channel	8	7
Total	115	100

*Source: Field Survey, 2021*

(10%) and pluvial factors (5%). The result is in agreement with Magaji *et al.*, (2020), who carried out flood vulnerability assessments in unplanned settlements along the bank of River Kubanni, Zaria. The authors noted that majority of the respondents believed that intense rainfall is responsible for flooding in the study area. Results from Table 3 show that majority (46%) of the respondents agreed that floods were caused by human factors such as dumping of refuse in the water channel, 37.4% attributed it to erecting buildings on water courses, 10% attributed it to filling of ponds with debris while 7% attributed it to diversion of water channels.

### 3.1.3 Perceived socio economic effects of floods

The perceived socio economic effects of flooding in the study area are presented in Table 4.

The results show reduced farmland sizes ranked first with the highest mean score of ( $\bar{x} = 5.00$ ). This is followed by crop losses due to flooding with a mean score of ( $\bar{x} =$

4.20). The decline in soil fertility ranked 3<sup>rd</sup> with a mean score of ( $\bar{x} = 4.00$ ), building collapses ranked 4<sup>th</sup> with a mean value of ( $\bar{x} = 3.00$ ). The removal of soil top layer ranked 5<sup>th</sup> with a score value of ( $\bar{x} = 2.30$ ) while loss of life and properties ranked 6<sup>th</sup> with a mean score of ( $\bar{x} = 1.20$ ).

### 3.1.4 Strategies adopted by respondents to mitigate the effects of flooding

The statistics on strategies adopted by respondents in mitigating the effects of flooding in the study area are presented in Table 5.

The results indicate that evacuation of culverts and drainages before the onset of active rainy season ranked first with a mean score of ( $\bar{x} = 3.40$ ). This is followed by proper disposal of refuse with a mean score of ( $\bar{x} = 2.40$ ). The 3<sup>rd</sup> most used strategy is tree planting as barriers in the farmlands with

**Table 4:** Socio-economic effects of flooding in the study area

Perceived effects	Frequency	Percentage	Mean	Ranking
Reduced farmlands sizes	30	26	5.0	1
Removal of soil top layer	14	12	2.3	5
Building collapses	17	15	3.0	4
Crops losses	25	21	4.2	2
Loss of life and properties	7	7	1.2	6
Decline in soil fertility	22	19	4.0	3
<b>Total</b>	<b>115</b>	<b>100</b>		

*Source: Field Survey, 2021***Table 5:** Strategies adopted by respondents

Strategies	Frequency	Percentage	Mean	Ranking
Provision of flood warning systems	13	11.3	1.6	5
Provision of water reservoirs	11	10	1.4	6
Increasing flood defense system such as construction of flood barriers	14	12.1	1.8	4
Tree planting	16	14	2.0	3
Avoid erecting buildings on water channels	9	8	1.1	7
Evacuation of culverts and drainages before onset of active rainy season	27	23.5	3.4	1
Proper disposal of refuse	19	17	2.4	2
Avoid filling of ponds with debris	7	6.1	1.0	8
<b>Total</b>	<b>8</b>	<b>115</b>	<b>100</b>	

*Source: Field Survey, 2021*

a mean score of ( $\bar{x} = 2.00$ ). Increasing flood defense system such as the construction of flood barriers has a mean score of ( $\bar{x} = 1.80$ ) while avoiding filling of ponds with debris is the least used strategy employed by farmers to mitigate the effects of flooding in study area. The findings agree with Ibrahim and Abdullahi (2016), who found that structural measures such as check dams, levees, flood walls and adequate drainage systems help to checkmate incessant flooding.

#### 4. CONCLUSION AND RECOMMENDATIONS

The study examined risk perceptions of floods on farmlands in Kofar Kona, Zaria City, Kaduna state. The results from the study show that the major perceived natural causes of floods in the study area include heavy rainfall (49%) and climate change/increased warming (20%), while major human factors responsible for flooding are dumping of refuse in water channels (46%) and erecting

buildings on water courses 37.4%. The findings also show that the highest ranked perceived socio-economic effects of flooding in the study area are reduced farmland sizes ( $\bar{x} = 5.0$ ), crop losses ( $\bar{x} = 4.2$ ) and decline in soil fertility ( $\bar{x} = 4.0$ ). The study affirms that farmlands and farm produce are greatly affected by floods in the study area while lives and properties of the residents are increasingly being threatened. The study therefore recommends tree planting and increased vegetation cover, provision of effective man-made water channels and construction of flood barriers permanently along the boundaries of River Galma to minimize inundations of farmlands.

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