



**EFFECTS OF FLOODING CAUSED BY GORONYO DAM ON RURAL FARM  
FAMILIES ALONG SOKOTO RIMA RIVER BASIN: 2010 EXPERIENCE**

**I. W. Tambari and A. K. Ango**

Department of Agricultural Extension and Rural Development, Faculty of  
Agriculture, Usmanu Danfodiyo University, Sokoto, Nigeria

**ABSTRACT**

This study examined the effects of flooding on the existence of the rural farm families along the upstream and downstream areas of the Sokoto Rima river basin. Structured questionnaire was used to solicit information from 160 randomly selected respondents. Descriptive and inferential statistics were used to analyze the data obtained. The findings of the study revealed that most of the respondents were married and were having large family size with 2-4 hectares of farmland. Also, majority of the farm families were affected by the flood and its effects were mostly felt by the females and underage children. Further majority of the respondents were of the view that the flooding caused a significant damage to their agricultural produce, livestock, livelihood materials and loss of lives. Chi-Square analysis indicated a significant relationship between coping strategies adopted by the farm families and effects of the flood. It is recommended that government should undertake a regular and frequent dredging of the Goronyo dam and its canals; which help in reducing the volume of water in the dam prior to onset of the rainy season and also farmers are advised not to build houses close to the river banks.

**Keywords:** Flooding; Farm families; Goronyo dam; Rima river basin

**INTRODUCTION**

Farming along the river plain which is popularly known as the Fadama land has been a tradition and a means of survival for majority of the rural populace along the Sokoto river basin. This is because the flood plains are moist throughout the year and as such it supports dry season farming. However, farming communities near the Fadama plains of Rima River in Sokoto are suffering from the sporadic cases of flood disasters, sometimes with devastating consequences to agricultural farming communities and agricultural activities. Other negative effects of the flooding include environmental degradation, soil fertility leaching and erosion of top soil (Olorunfemi *et al.*, 2009).

Despite the numerous measures and efforts of government in establishing National Emergency Management Agency (NEMA) to deal with sudden or emergency cases such as: flooding, fire infernos, heavy storm and accident, still so many farming communities and agricultural activities are suffering from the negative impact of flooding (NEMA, 2013). According to Olorunfemi *et al.* (2009) flooding has wide range of environmental effects not

only on coastal states and even the upland areas like Sokoto, Bauchi, Niger and Kwara States.

This suffering due to flooding of farmlands and communities gained its prominence probably, when several communities along the Fadama plains of Rima River in Sokoto State were destroyed by heavy floods in 2010 and which resulted to damaging and destroying lives and properties worth millions of naira (NEMA, 2010). According to Shehu (2011) the flood occurred because of the failure of Goronyo dam to utilize the excess water on its reservoir most especially during the dry season of the year. The unreleased reserved water from the dams formed a big river during the rainy season and instantly lead flood that washed away both upstream and downstream villages and farmlands. The consequences of the flood included destruction of food crops, farmlands, animals, communities, and sometimes loss of lives. These problems made some of the victims to formulate some coping strategies in order to survive.

Decline in agricultural practices brought about by low capita investment, low agricultural inputs and other farming incentives, low soil fertility, environmental and climatic conditions in addition to floods caused by dams and rainfall in the study area (John, 2005) leads some of the communities to find themselves in the situations of lack of enough food, and destruction of their homes and farmlands (FAO, 1993). As a result, some of the victims of such consequences decided to adopt some coping strategies that warrant their survival, such strategies include migration, serving as labourers, feeding on edible leaves etc. These factors among others prompted the interest of the researchers to dwell into investigating the effects of flood disaster on farming communities along the Fadama plains of Rima River in Sokoto State and the coping strategies adopted by the victims. In view of the above, this research found answer to the problems posed by high waters leading to flooding and destruction.

## **MATERIALS AND METHODS**

### **Study Area**

The study was carried out in Fadama plains of Sokoto Rima River in Sokoto State, Nigeria. Sokoto State falls within the Sudan Savannah ecological zone and is located between longitude 11° to 13° east and latitude 4° to 6° north. The state is however, situated at about 8 km north-west of the confluence of Sokoto Rima River. The Study area is bordered to the north with Niger Republic, Zamfara State to the east and Kebbi State to the south and west, with a total land mass of 28,232,375sq kilometers (Sokoto State Desk Diary, 2013). Sokoto State has a population of 3.6 million people (National Population Commission, 2006).

The rainfall of the study area is usually erratic and is associated with periodic drought. The duration of the rainfall is between May and October with the mean annual falls ranging between 500mm-1,300mm. The dry season starts normally from October and last up to April and may extend to May or June. The average annual temperatures of 28.3°C (87.9°F) was recorded (Rode, 2009). However the highest monthly temperature is about 43°C in April while the lowest mean monthly temperature occurs during the harmattan period between the months of December to February when the temperature could be as low as 15°C. Agricultural production accounts for a greater percentage (80%) of the total employment in the area (Bashir, 2010).



Figure 1: A map showing Sokoto Rima valley, Goronyo and Bakolori Dams

### Sampling Procedure and Sample Size

The target populations for this study constituted the farm families or communities along Sokoto Rima River Basin affected by flooding in the year 2010. The exploratory survey carried out revealed that the farming communities affected by the flood were located at different terrains of Fadama plains of Rima River in Sokoto State. However, eight different areas of the farming communities affected by the flood were purposively selected for this study due to the extent of damage done to the communities by the flood. The communities included Takakume, Birjingo, Taloka, Giyawa, Dumbiso, Lugu Kwargaba, Gidan Kwano and Gidan Kaurara all located in Goronyo, Wurno, Kware and Wamakko Local Government Areas of Sokoto State. From each of the communities, twenty respondents who were affected by the flood were randomly selected for the study, making 160 the total sample size of the study. The data obtained from the administered questionnaires were analyzed using frequencies, percentages and Chi-square statistics.

## RESULTS AND DISCUSSION

### Gender

Table 1 revealed that 62.5% of respondents were females and males (37.5%). This result implies that female community members suffered most from the flood because women and children who happened to be weak due to their gender and ages were allegedly reported to have suffered from previous flood disaster that leads to the submergence of many home, lands and farming communities along the Rima river flood plains.

### **Marital Status**

Findings in Table 1 revealed that half (50%) of the victims of the flood disaster were married, 33.8% were single while 11.2% and 5.0% were widowed and divorcees respectively. This finding indicates that there were more married persons affected by the flood compared to others. The findings of this study could be based on the findings of Ango *et al.* (2011) who posit that majority of farmers in Sokoto State were married because marriage is considered as a pride of the parents and a sign of responsibility.

### **Age**

As indicated in the findings in the Table, 26.3% of respondents were within the ages of 1-15 years, 25% were within the age ranges of 16-30 years and 46-60 years respectively and 18.7% were within the age bracket of 61 years and above while only (5%) of respondents were within the ages of 31-45 years. This implies that most of the victims of the flood disaster in the study area were the underage and aged people of the community. This finding is in agreement with NEMA (2012) reported that 33 states of Nigeria experienced flooding and most of the victims were the weak, aged and the underage members of the community.

### **Family Size**

Findings in Table 1 further revealed that 26.3% of respondents had 21 people and above in their household, 25% had 16-20 people in their household, 23.8% had 11-15 household members, and 18.7% and 6.3% respondents had family sizes of 2 - 5 people and 2-4 people in their households respectively. The findings revealed that respondents with household members of 21 people and above constitute the majority of the respondents. This finding is in line with Aliyu (2011) who discovered that the reason behind large family size could be attributed to the polygamous nature of Hausas, their dependence on family as a source of labour and their religious dictates.

### **Farm Size**

Findings in Table 1 further expressed that half (50.0%) of the respondents had a farm size of 2-5 hectares, 38.8% had a farm size of less than 1 hectare of farmland, while 7.5% and 3.7% of the respondents had 5-7 hectares and 8 hectares and above farmlands respectively. This finding implies that most of the respondents were peasant farmers that operate on small plots of farmland and as such the effect of the flooding was severe due to engulfing all their farmlands.

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Table 1: Respondents socio-economic characteristics (n = 160)

Variable	Percentage
Gender	37.5
Male	62.5
Female	
Marital Status	
Single	33.8
Married	50.0
Widow	5.0
Divorced	11.2
Age (Years)	
1-15	26.3
16-30	25.0
31-45	5.0
46-60	25.0
61 and above	18.7
Family Size (People)	
2-4	6.3
5-10	18.7
11-15	23.8
16-20	25.0
21 and above	26.3
Farm Size (ha)	
Less than 1	38.8
2-4	50.0
4-7	7.5
8 and above	3.8
Sources of Income	
Farming	48.8
Fishing	45.0
Trading	3.7
Marketing	2.5

Source: Field survey, 2013

### Season of Experiencing Flooding

The findings in Table 2 revealed that majority (95%) of the respondents expressed that flooding is generally experienced during the rainy season and only few (5%) were of the view that flooding is experienced in the dry season of the year. This implies that flooding normally occurred during the rainy season due to additional water from the rainfall. This finding however, is in line with Encarta Premium (2009) which highlighted that, flood occurs when more rain falls than the soil and vegetation can absorb, such heavy rains periodically caused rivers to overflow their banks, spilling into the surrounding flood plains; which can damage property and endanger the lives of people and animals.

## Causes of Flooding

The findings indicated that 38.8% of the flood victims confirmed that excessive rainfall was the actual root cause of flooding, 37.5% admitted that poor dam's management was the main cause of flooding in the area, 16.2% of the victims were of the view that abuse of the drainage structures in the urban areas were the actual cause of flooding while few (7.5%) of the respondent agreed that the flood was caused due to climate change (Table 2). This implies varying suggestions as to actual cause of the flooding in the study area.

Table 2: Seasons and causes of flooding in the study area (n = 160)

Variable	Percentage
Season of Flooding	
Rainy Season	95.0
Dry Season	5.0
Causes of Flooding	
Excessive rainfall	38.8
Abuse of drainage systems	16.2
Poor dams management	37.5
Climate change	7.5

Sources: Field Survey, 2013

## Damage Caused by Flooding

Table 3 revealed that majority (91.3%) of respondents were of the view that the flood caused a significant damage to their communities while only (8.7%) of respondents expressed that the flooding did not caused damage to their communities. These findings imply that the flood caused tremendous damage to the communities. Based on Sokoto-Rima River Basin Development Authority (2010) the gates of the Bakolori and Goronyo large scale dams were discharged purposely to remove the excess water, which released  $603\text{m}^3/\text{sec}$  in order to relieve the pressure from the dam. The emergency spill-way where the excess water passes eventually collapsed leading to unprecedented discharge of excess water from the dam. It is this overload water being discharged to the downstream and upstream of Rima River in addition to the heavy rains that destroyed and ravaged many villages and farm lands and caused the displacement of at least 25,000 to 35,000 people.

## Severity of Destruction Caused by Flood

As indicated in Table 3, 50% of the respondents confirmed the loss of agricultural farm produce, 33.8% of them expressed the loss of properties and 11.2% and 5.0% of respondents expressed the loss of human lives and livestock. These findings indicated that the victims of the disaster encountered the destruction of a lot of livelihood materials but the destruction was found to be more severe on the agricultural activities/produce, where most of Fadama lands in the flood plains of the Rima River were submerged by the flood. This result is in line with the Daily Trust report (2013) which reported that the 2010 flooding along the Sokoto Rima River succeeded in devastating many communities, leading

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to massive displacement of people from their villages and towns, washing away farmlands, loss of lives in many instances and exposing the victims to untold hardship.

Table 3: Distribution of Respondents based on awareness of and damage caused by the flood (n = 160)

Variable	Percentage
	Awareness of the damage
Yes	91.3
No	8.7
	Severity of the damage
Loss of life	5.0
Loss of property	33.8
Loss of agricultural produce	50.0
Loss of livestock	11.2

Sources: Field Survey, 2013

### Assistance Provided to the Flood Victims

Table 4 showed that majority (86.3%) of respondents received assistance from the government or other disaster relief organizations and 13.7% of the respondents were of the view that they were not provided with any assistance. This indicates that majority of the victims received relief materials as a means of ameliorating the effects of the flooding. The positive response of the respondents towards provision of relief materials can be related to the NEMA report (2013) that the relief materials based on its assessments of the cortex of damage were presented to the affected flood disaster victims.

### Forms of Assistance Provided

The findings in Table 4 indicated that majority (91.3%) of the flood victims in the study area received assistance in groups while only (8.7%) of them received relief materials individually. This means that the relief materials were provided to the flood victims in groups. This finding is in line with Vincent (2013) who reported that the National Emergency Management Agency (NEMA) has presented relief materials worth millions of naira to the Katsina State government for distribution to flood victims in the State.

### Materials Provided

Thirty percent of the flood victims were provided with food items, 25.0% of them collected clothing materials, and 22.55% were provided with housing materials and medication as relief materials to ameliorate the effects of the flooding (Table 4). This means that different kind of relief materials were provided to the victims of flood disaster by the donor agencies. This result is accordance with Nigeria Red Cross Society (2013) reported that following the continued suffering of victims of 2010 nationwide flood disaster across 33 states of Nigeria federation, the society provided food, non-food items and money for the affected victims.

### Donor Agencies

Table 4 also expressed that 28.7% of the flood victims in the study area confirmed to have gotten relief materials from the Federal Government, 26.3% of them were provided with relief materials by the State/Local Government, 23.7% and 21.3% of the flood disaster victims were provided with relief materials by NEMA and Red Cross Society respectively. This implies that the provision of relief materials to the victims who suffered from the flood damage and destructions received multiple interventions from government and non-governmental agencies.

Table 4: Distribution of respondents according to assistance received as a relief materials (n = 160)

Variable	Percentage
	Provision of relief materials
Yes	86.3
No	13.7
	Form of providing assistance
Individual	8.7
In groups	91.3
	Materials provided
Food commodities	30.0
Clothing materials	25.0
Housing materials	22.2
Medication	22.5
	Donor agencies
Federal government	28.7
State/Local Government	26.3
NEMA	23.7
Red Cross Society	21.3

Source: Field survey, 2013

### Coping Strategies Adopted by Flood Victims

The rural communities in the study area were faced with disaster due to flooding that engulfed and submerged their communities, farmlands, farm produce and even lives and animals were lost. This inferno made the community members to formulate a way of survival for themselves and the entire family. As indicated in Table 5, 37.5% of the respondents served as labourers to others in order to survive, 30.6% migrated to the cities and send proceeds to the family, 13.13% of the respondents feed on edible plant leaves and 11.25% survived through donations from relatives and neighbours while 7.5% rented food from others and paid back next season. The findings imply that as a result of destruction of farmland and farm produce by the flood, the victims formulate means of survival in addition to the relief materials provided by the donor agencies.



Table 5: Coping strategies adopted by the respondents (n = 160)

Variables	Percentage
Coping strategies	
Migration to the cities	30.6
Served as labourer	37.5
Donation from relatives and neighbours	11.25
Feed on edible plant leaves	13.13
Rent food from others	7.5

Source: Field survey, 2013

### Test of Research Hypotheses

**Hypothesis I:** There is no significant relationship between the socio-economic characteristics of the flood victims and the level of destruction caused by the flood.

The Chi-square analysis result in Table 6 revealed a high significant relationship between the socio-economic characteristics of the flood victims and levels of destruction caused by flood disaster in the study area ( $P < 0.001$ ). This indicates that the null hypothesis is hereby rejected, implying that the level of destruction caused by the flooding has relationship to the flood victim's socio-economic characteristics, because most of the people affected by the flood were the aged, underage and many farmlands and respondents economic attainments were destroyed.

**Hypothesis II:** There is no significant relationship between the magnitude of damage caused by flood and the coping strategies adopted by the victims.

The result of Chi-square analysis revealed a non-significant relationship ( $P < 0.05$ ) between the coping strategies adopted by the respondents and the magnitude of damage caused by the flood, implying that the respondents; due to their economic status adopt some coping strategies in order to survive. This could be because majority of the respondents are peasant farmers with low capital base and as such their produce in the year could not sustain them throughout the year. It was also ascertained that due to peasantry nature of their farming, and which resulted to low yield, most of the respondents migrate to the cities during the dry season in order to get more income for the family sustenance in the year. This finding therefore indicates that the null hypothesis is accepted.

Table 6: Test of Hypotheses

Variables	$\chi^2$ - Values	Df	P-values	Remark	Decision
Socio-economic characteristics of the victims and level of destruction by the flood	92.15	18	0.001*	S	Rejected
Magnitude of damage and coping strategies adopted by the victims.	73.10	24	0.23	NS	Accepted

\* $P < 0.05$ ; \*\* $P < 0.001$ ; S = significant at 5% significant level, NS = Not significant at 5% significant level, Df= degree of freedom,  $\chi^2$ -values = Chi-square value, P = probability values.

## CONCLUSION

Based on the objectives and hypotheses that guided this study, it is concluded that the flooding inflicted negative effects on the livelihood of the affected communities. The flooding in the study area was found to have been commonly caused by nature and man-made factors. The findings of the study revealed that majority of the flood victims in the study area were female and children who are weak and underage. The findings of the study also revealed that majority of the farming families affected by the flood were having 21 household members and above and most of them were married with 2-4 hectares of farmland.

Based on the findings of the study it is concluded that excessive rainfalls leading to the over flow of the river banks and breakage of the dams were the actual root cause of flooding in the area. The findings further revealed that affected community members were provided with relief materials to cushion the effect of the flooding and it was gathered that government and its parastatals were the sources of the relief materials provided to the community members and the common relief materials provided included food stuffs, clothing and building materials. The effects of the flooding made the affected community members in addition to the materials provided by donor agencies to formulate coping strategies in order to survive.

Government is advised to install tidal gauges in strategic flood locations for early warnings and alerts. The government is advised to be proactive, in providing relief materials immediately to the victims through establishing emergency offices in all the Local Government Areas of the States. Community members are advised to concentrate more in dry season farming and flood resisting crop varieties should be planted.

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