jotaf Journal of Tekirdag Agricultural Faculty
Tekirdağ Ziraat Fakültesi Dergisi

Eylül/September 2024, 21(4)
Başvuru/Received: 20/10/23
Kabul/Accepted: 28/12/23
DOI: 10.33462/jotaf.1378829

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http://jotaf.nku.edu.tr/

ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

Effect of Flood on Poverty Status: Evidence from Sugar cane Farmers in Kwara State and Osun State of Nigeria

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Abstract

In Nigeria, sugarcane is a prominent crop and the primary crop used to produce sugar. However, floods have been a major tragedy that has troubled Nigeria's small-scale farmers. The bulk of rural poor people are these small-scale farmers, and as poverty rates have been rising over time, corrective action is required. This study was therefore carried out to assess the poverty status of sugar cane farming households (affected by flood, and unaffected by flood) in Kwara/Osun State of Nigeria. The study employed two-stage sampling technique to select 120 sugarcane farming households in the study area. Descriptive statistics, the Flood Loss Estimation, Logit Regression and Foster Greer Thorbecke (FGT) are the empirical analytical tools employed to analyze the data collected for the study. The results of the poverty index analysis revealed that 46 percent of the respondents are relatively poor, the poverty depth was 0.16 which implies that 16 percent were below the poverty line and the poverty severity was 0.07 which implies that 7 percent of the respondents were severely poor. Also, it revealed that flood shocks, gender, household size, household income, access to credit and membership to social organization were significant determinants of poverty. The study then came to the conclusion that many coping mechanisms people employ are corrosive because they have detrimental long-term implications on the sustainability of household subsistence. For future risk assessments and flood mitigation, the study advises using a holistic strategy and adept models. The remedies outlined in this paper would help the government, private sector, and sugar cane farmers economically.

Keywords: Coping strategy, Disaster, Environmental impact, Farming households, Mitigation

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Atıf/Citation: Adewale, E. T., Akinsola, G., Ayinde, O. (202x). Effect of flood on poverty status: Evidence from sugar cane farmers in Kwara State and Osun State of Nigeria. *Journal of Tekirdağ Agricultural Faculty,* 21(4): 942-953.

*The study was summarized from Bachelor's degree Project

1. Introduction

Africa's most populous country is Nigeria. The agricultural industry is comparable to a factory operating in atmospheric circumstances (Simsek and Cakmak, 2010). In Nigeria, the agricultural industry is crucial, and raising living standards is the main objective of the country's agricultural production plan. Small-scale farmers make up the majority of the rural poor, nonetheless, the rate of poverty has been increasing over time, necessitating intervention (Yaro, 2004; McCusker, 2006). Thus, targeting rural farmers could help reduce poverty in Nigeria. The nation is plagued by poverty, which has been worse since the late 1990s (Chimobi, 2010). According to estimates, 168 million Nigerians, or about 100 million people, live on less than $1 a day, and according to the United Nations Human Development Index, Nigeria was ranked 142 out of 175 countries in 2010 (World Bank Report, 2008). In 2010, 60.9% of Nigerians lived in absolute poverty, up from 54.7% in 2004 (World Bank Report, 2008). The situation is even worse in the North-Western and North-Eastern regions of the nation, where staggering poverty rates of 77.7% and 76.3 percent, respectively, are reported (World Bank Report, 2008).

Another important element is income inequality, which increased from 0.429% in 2004 to 0.447% in 2010 (Adenuga et al., 2014). In many low-income nations in Sub-Saharan Africa, including Nigeria, there is a high level of income disparity (World Bank Report, 2005). As a result, the atmosphere for economic growth and development has not been favorable.

Additionally, compared to urban poverty, rural poverty is more pervasive, severe, and deeper (Chaudhry et al., 2006). Due to a lack of commercial and industrial facilities or the resources required to build them, rural poverty is made worse by the lack of opportunities for employment and income generation (Adenuga et al., 2014). From a theoretical standpoint the rural parts of a region or country are located outside of the densely populated areas of towns, cities, and sub-urban villages, and their residents are largely involved in agriculture and the most fundamental components of secondary and tertiary activity (Adebayo, 1998).

Sugarcane is a significant crop grown in Nigeria (Wada et al., 2017). The main crop used to manufacture sugar is called sugar cane (*Sacchrum officinarium* L.), a perennial grass belonging to the Gramineae family. It is discovered that sugar cane is a necessary crop in sectors where the by-products are utilized for medications, pharmaceuticals, confectionary and beverages, electricity, and motor fuels. However, there are numerous issues with this crop's cultivation in Nigeria and other Northern African nations, including biotic and abiotic issues as well as social and environmental ones (including flooding) (Anonymous 2018; Anonymous, 2019). Lack of adequate funding, a lack of market investment, higher transportation and production costs for hauling harvested sugar cane to the mills, biotic and abiotic stresses, low building capacity, a lack of associations for sugar cane farmers and technologists, a shortage of regulatory structures, macro- and micro-environmental conditions, an absence of national and indigenous collaboration groups, and a lack of legislative capacity to enact the law are additional obstacles to the growth in sugar cane production in Nigeria. To overcome these issues and enhance sugar cane production, those involved in the sugar cane business in these nations are urged to start proactive efforts. The link between rural and urban is similar to development, (Gedik and Yilmaz, 2023).

Major and annoyance flooding episodes have increased across the country in recent years (Modupe et al., 2023). In terms of impact size and geographic scope, the flood of 2012 was regarded as the worst flood in modern times. It was proceeded by the historic-scale floods of 2017 and 2018. The federal, state, and local governments of Nigeria are compelled to look for solutions to enhance the holistic vulnerability of the communities as a result of the repeated destruction caused by flooding (Babatolu, 2014). Because of elements like climate change and some human-caused environmental impacts, there is no doubt that rainfall is extremely high (Solihu et al., 2022). According to a surveillance assessment conducted in several regions of Nigeria, heavy rains and the ensuing flooding also ruined agricultural products worth billions of naira. However, floods are not a new occurrence in the nation, and they may sometimes be incredibly destructive. In Nigeria's highly susceptible to flooding locations, floods significantly reduce a farmland's topsoil (Etuonovbe, 2011).

Kwara State and Osun State are two of Nigeria's most severely hit regions. The functioning of the Jebba and Kanji hydroelectric projects, as well as drainage from the reservoirs, control the River Niger's flow system beneath the Jebba dam in Kwara State (Adeniyi, 1973). The yearly "white floods" phenomenon, which typically start in July and climax in September, no longer follows the same pattern or regularity because it now happens approximately every four years, causing the dam to overrun its shoreline. The flooding events have a variety of

repercussions on rural residents since they not only lose money on their investments but also struggle to feed themselves, which has an impact on their way of life (Oyekale, 2008).

The presence of rivers ensured access to and from the coast by the sea, water supply, crop irrigation, and the production of electricity. Landscapes are harmed structurally and environmentally by flooding (Philips et al., 2004; Rehman et al., 2019).

Flooding could have both negative and positive effects. A number of farmers have suffered serious consequences as a result of the terrible incident, which has increased poverty levels in both rural and some urban areas. Nevertheless, this catastrophe causes more harm than good, leaving the majority of impacted households destitute and poor. Nigeria is still one of the world's poorest nations, therefore it's critical to think about effective coping mechanisms (Sanchez-Martinez, 2014). Therefore, the actual objectives of this study are to: examine the effect of flood on sugar cane farmers; assess the poverty status of the affected and unaffected sugar cane farmers; identify the factors determining their poverty status; and determine the suitable coping strategies.

2. Materials and Methods

2.1. Study area

The study was conducted in Kwara State and in Osun States of Nigeria. One of the two largest sugar cane hubs in Nigeria is Kwara State, which is located in an area with excellent soil for growing sugar cane. The river valley is advantageous for the production of sugar cane in the sugar cane hubs. Kwara State is located at 80,301°N and 50,001°E North central region of Nigeria. It has a total population of 2.37 million people (National Population Commission, 2006). It shares local boundary with Osun, Oyo, Ondo, Kogi, Ekiti, and Niger States and international boundary with Benin Republic. There are 16 known Local Government Areas in Kwara State among which Ilorin Local Government is one.

Osun State is located 7°30'N 4°30'E/7.500°N 4.500°E of South West part of the country. The Capital is Osogbo and has the total land mass of 9,251km^2 (3,572sq mi). It has a total population of 3,416,959 with 30 local government areas and head-quarters. Both states have rich and diversified agricultural products, including sugar cane, rice, yams, beans, cassava, potatoes, maize, Soy beans, sorghum, millet, and coco-yams, and they share a common boundary (Oyekale, 2012).

2.2. Sources of data

Through the use of structured surveys and interviews, the study used primary data from respondents. Primary information about the respondents' socioeconomic traits, farmer welfare, and farm characteristics was gathered and used for analysis.

2.3. Sampling technique

The data for this investigation were gathered using a two-stage sampling procedure. The households that grow sugar cane were the target ecology. The villages that does not produce sugarcane or where sugarcane is not grown in the target ecology were eliminated from a list of all the villages in the hubs, leaving just the villages where sugarcane is grown in the target ecology. The remaining communities were then divided into two classes (strata) based on criteria such as flood experience. Both agricultural households affected by flooding and farming families not affected by flooding are listed here. Villages with a very small number of sugarcane plantations were not taken into consideration due to the high intensity of the field operations. Two-stage sampling technique was used to select 120 sugarcane farming households in the study area. The first stage involved selection of six sugar cane producing villages in each state that is; three affected sugar cane producing villages and three unaffected sugar cane producing villages, in each state. The second stage involved random selection of ten farming households in each sampled village. Thus, a total of 120 sugarcane farming households were sampled and administered questionnaire for the study.

2.4. Method of data collection

Data was gathered utilizing questionnaire schedules regarding the experience of households that grow sugar cane during floods. A focus group discussion and a household survey questionnaire were used to deliver the questionnaire, which asked questions about the socioeconomic and demographic traits, as well as the level of poverty in each of the sugarcane farming homes.

2.5. Method of data analysis

For this study, a variety of empirical analytical methods and instruments were used. The demographic and socioeconomic features of the respondents were explained using descriptive statistics, such as percentages, frequencies, and means. Foster- Greer Thorbecke (FGT) was used for poverty analysis among the respondents and it is written as equation 1.

$$P_\alpha(y,z) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right). \quad \text{(Eq. 1)}$$

Flood Loss Estimation Model was used to determine the effect of flood on the poverty status of the Sugarcane farmers. Logit Regression model was used to analyze the factors determining the poverty status and Descriptive Statistics was used to analyze the coping strategies employed after the flooding event. For estimating flood losses, a grid-based mathematical model was employed. It makes use of the identical uniform grid network as the hydraulic model. The flood loss estimates model calculates damages in both rural and urban areas using flood loss equations (Guetchine, 2013). Through stage-damage functions, the calculated maximum flood water depth is fed into the loss calculations. For specific water depth conditions, these functions are used to determine the unit damage percentage to any object (be it a building or a crop). In this work, the standard stage-damage functions developed by Dutta et al. (2003) for the calculation of rural and urban damages are applied.

In this study, the degree of flood damage is evaluated. The damage to the agricultural sector includes damage to crops and vegetables in any grid cell(I,j) in ₦, $AD(I,j)$ is estimated based on Equations (1)-(2):

Damage to crops and vegetable-$AD(I,j) = D_m\,(I,j,k) \times CRP_a(i,j,k) \times L(k)$ (Eq. 2)

$$D_m = CP_k \times Y_k \times DC_k(i,j) \quad \text{(Eq. 3)}$$

Where; $AD(I,j)$ = Agricultural damage (₦)

n = Total number of crops

(I,j)= Grid cell

$D_m\,(I,j,k)$ = Damage to crop type k per unit area (₦ m^{-2})

$CRP_a(i,j,k)$= Total area of cultivation of crop type k (m^2)

$L(k)$= Loss factor for crop type k depending on the time period of the year (%)

CP_k= The estimated cost per unit weight of crop type k (₦ kg^{-1})

Y_k= The normal year yield of crop type k per unit area (kg m^{-3})

DC_k= The stage-damage function for crop type k (%)

The total damage to farmland infrastructure in any grid cell (I,j) in ₦, $D_f t\,(i,j)$, is estimated as follows;

Damage to farm-land infrastructure - $D_f t\,(i,j) = TA\,(i,j) \times C_f t\,(i,j)$ (Eq. 4)

Where; $D_f t\,(i,j)$= Damage to farmland infrastructure (₦)

$TA\,(i,j)$ = Total farm area occupy by the infrastructure (m^2)

$EC_f t$ = The estimated cost of complete replacement of farm infrastructure (₦ m^{-2})

$C_f t$ = The stage-damage function (%)

Logit Regression Model which is a binary regression model was used to determine the factors influencing the poverty status of the respondents. It was found that Logit regression was suitable for this study owing to its unique ability to account for both categorical and dichotomous dependent variables. According to Pampel, (2000), the model equation is given as:

$$Logit(E[Y]) = Logit(P) = XT\beta \quad \text{(Eq. 5)}$$

Where

$Logit(E[Y])$= the binary response/dependent variable

$Logit(P)$ = the natural log of the odds of success

XT= the explanatory/independent variables

β = the regression co-efficient

Y = poverty status

The dependent variable was a dichotomous variable depicting the respondent' poverty status and takes the value of 1 if the respondent was poor and 0 if the respondent was not poor. The independent variables were the socio-economic factors. The hypothesized independent variables were:

X1 = Gender (Female/ Male)

X2 = Age (years)

X3 = Marital status (Married/ Single/ Widowed/Divorced)

X4 = Education level (Primary/ Secondary/ Tertiary/ No formal education)

X5 = Farming experience (years)

X6 = Household size (number)

X7 = Experience of flood shock (dummy; 1= affected, 0 = otherwise)

X8 = Farm income (₦)

X9 = Farm land ownership status (dummy; 1 = owned, 0 = otherwise)

X10 = Access to credit (dummy; 1 = yes, 0 = otherwise)

The Foster-Greer-Thorbecke (FGT) model was used to analyze the poverty status of the sugar cane farmers. FGT poverty index was used to measure the poverty status among the rural farming households and is given as:

$$P_\alpha (y, z) = {}^1/_2 = \sum_{i=1}^{q} \left(\frac{z-yi}{z}\right) \quad \text{(Eq. 6)}$$

Where n= total number of households in population

q= number of poor households

z= the poverty line for the household

yi= household income

α= poverty aversion parameter and it takes on value 0, 1, 2

$(\frac{z-yi}{z})$ = proportion shortfall in income below the poverty line

Determining the poverty index

When α= 0 in FGT, the expression become

$$P_\alpha(\frac{1}{n})q = (\frac{1}{n}) \quad \text{(Eq. 7)}$$

This is called incidence of poverty or headcount index, which measures the proportion of the population that is poor i.e falls below the poverty line (Aseel, 2017).

When α= 1 in FGT, the expression becomes:

$$P_1 = {}^1/_2 = \sum_{i=1}^{q} \left(\frac{z-yi}{z}\right) \quad \text{(Eq. 8)}$$

This is called poverty depth or poverty gap index, which measures the extent to which individuals fall below the poverty line as a proportion of the poverty line.

When α= 2 in FGT, the expression becomes:

$$P_2 = {}^1/_2 = \sum_{i=1}^{q} \left(\frac{z-yi}{z}\right)^2 \quad \text{(Eq. 9)}$$

This is called poverty severity index which measures the squares of the poverty gaps relative to the poverty line. To aid in cross-country comparisons, in 2008 the World Bank revised its international poverty line to $1.25/day at 2005-based purchasing-power parity and according to the report of the National Bureau of Statistics, this will help to design holistic policy in poverty alleviation, (Ravallion et al., 2009; NBS, 2013).

Construction of poverty line: Using the two-third mean per-capital income as the benchmark, which was used from the studies conducted by (Igbalajobi, et al., 2013), it was done to divide the respondents into poor and non-poor categories. Households are considered poor if their mean per-capital income is below the poverty line, whereas non-poor households are those whose mean per-capital income is above the benchmark.

Per-capital income (PCI) = Income/Household size

Total per-capital income (TPCI) = Summation of PCI

Mean TPCI = $\frac{TPCI}{Totalnumberof Households}$ = MTPCI

Poverty Line (PL) = $^2/_3$ x MTPCI (Igbalajobi, et al., 2013).

3. Results and Discussion

3.1. Socioeconomic and Demographic Characteristics of the Sugarcane Farming Households

Table 1 gives a summary of the socioeconomic characteristics of the sugarcane farming households in the study area. The modal age is 36-40years. The result indicates that most of the respondents were still in their active age. This helps in increasing production through adoption of modern technologies and coping strategies for farming.

3.1.2 Distribution of respondents by gender

The study reveals that only 6% of the farmers are female while 94% farmers are male. This implies that the sugar cane farming in the study area is dominated by males. This result agreed with Olutunmise and Ajibefun, (2019) but in contrast to the study conducted by Ehinmowo et al. (2017). About 83% of the respondents are married. This was consistent with the research by Ehinmowo et al. (2017), which suggests that they are responsible enough to care for their families. This may also be the case given how strongly encouraged early marriage is in the research area. The largest number of people per household was 25, with an average household size of 8 people. Due to the vast family systems that are prevalent there and the demand for family work, the study area has a rather high family size. Only 48% of the respondents had tertiary education, while up to 27% had no formal education at all. About 63.33% of the farmers had farming experience between 1-5years, 28.33% had farming experience between 6-10years, and 4.17% had farming experience between 11-15years while 0.83% had more than 20years of farming experience. This implies that majority of the respondents were experienced farmers. Years of farming experience of a farmer contributes to his ability to manage his holding efficiency through trial and error. Thus, the higher the experience of a farmer, the higher the adoption rate of new technology will be.

Among the homes growing sugarcane, just 42% claimed membership in a farmers' group. The research area had a low average level of association membership among sugarcane farmers. The ineffectiveness of the associations, according to several farmers, has prevented them from joining any organization. The respondents, or about 48% of them, had access to non-agricultural income. Trading, motorcycle transportation, and other non-agricultural sources of income are available. Approximately 21% of those surveyed had access to credit. This suggests that the sugarcane growers in the study area have extremely limited access to formal loans. The survey also revealed that only a very small portion of loans sought were really used to finance farm operations, with some likely going toward home consumption.

Table 2 reveals the cost of damage by the flood, the income before the flood and after the flood. The income class was grouped based on their respective income. High income class represents those farmers with annual income of more than ₦500000, while the medium of the middle class are those with income between ₦100000 and ₦500000 and those with less than ₦100000 were classified as low income class (Igbalajobi et al., 2013). The result shows that the average cost of damage stood at ₦124893.35. The average income before damage was ₦1468741.36 and after flood was ₦1022847.51. The net loss as a result of flood is ₦445,893.85.

Table 1. Socioeconomic and Demographic Characteristics of the Respondents

Age (years)	Affected Frequency	Percentage (%)	Non-Affected Frequency	Percentage (%)	Pooled Frequency	Percentage (%)
<21	2	2.94	1	1.92	3	2.50
21-25	8	11.76	5	9.62	13	10.83
26-30	4	5.88	8	15.38	12	10
31-35	20	29.41	9	17.31	29	24.17
36-40	23	33.82	13	25	36	30
>40	11	16.18	16	30.77	27	22.50
Total	68	100	52	100	120	100
Gender						
Male	64	94.03	49	94.23	112	94.12
Female	4	5.97	3	5.77	7	5.88
Total	67	100	52	100	119	100
Marital status						
Single	8	15.38	7	10.29	15	12.50
Married	39	75	60	88.24	99	82.50
Divorced	5	9.62	1	1.47	6	5
Total	52	100	68	100	120	100
Household Size						
≤5	11	16.18	4	7.69	15	12.50
6-10	53	77.94	46	88.64	99	82.50
Above 10	4	5.88	2	3.85	6	5
Total	68	100	52	100	120	100
Education						
No Formal Education	13	19.12	19	36.54	32	26.67
Primary Education	1	1.47	3	5.77	4	3.33
Secondary Education	15	22.06	11	21.15	26	21.67
Tertiary Education	39	57.35	19	36.54	58	48.33
Total	68	100	52	100	120	100
Experience						
1-5	42	61.76	34	65.38	76	63.33
6-10	18	26.47	16	30.77	34	28.33
11-15	3	4.41	2	3.85	5	4.17
16-20	4	5.88	-	-	4	3.33
Above 20	1	1.47	-	-	1	0.83
Total	68	100	52	100	120	100

Source: Field Survey, (2019)

Table 2. Damage/Loss incurred by the respondents

Income class	Income before flood (₦)	Damage by flood (₦/ha)	Income after flood (₦/ha)
High	2125768.95	165280.55	1753320.69
Medium	906457.30	146234.20	623384.47
Low	150303.25	56720.22	32476.29
Average	1468741.36	124893.35	1022847.51

Source: Field Survey, (2019).

3.1.3 Analysis of poverty status of the respondents using FGT Poverty Index

Table 3. Summary of the Poverty Indices for the Respondents in the Study Area.

Poverty	Index
P_0	0.46
P_1	0.16
P_2	0.07

Source: Field Survey, 2019.

A proper assessment of poverty must include the measurement of the poverty line as well as three fundamental components, which are the head count ratio or poverty incidence (P_0), depth or gap of poverty (P_1), and severity or intensity (P_2) of poverty, as indicated in *Table 3 above*. The extent to which the household's or an individual's per-capita income is below the poverty line reflects this. The 120 respondents' combined per capita income was ₦9940909, and the mean per capita income was ₦6904.09. The median per capita income of the household, which was ₦46025.03, was used to calculate the poverty line. However, a household's income that is below the poverty line is considered to be poor, but a household's income that is exactly above the poverty line is considered to be non-poor.

As a result, the head count ratio or poverty incidence (P_0) was 0.46 with a poverty line of ₦46025.03. This suggests that 46% of the respondents in the research area were relatively poor and living below the poverty line. This was consistent with the findings of Ehinmowo et al. (2017). The poverty level or gap (P_1) was 0.16. This value shows that 16% of the respondents fell below the poverty line and needed to increase their income in order to reach the poverty line. In other words, a typical low-income sugarcane farmer would need to earn 16% of the poverty level in order to escape poverty. Severity or intensity of poverty (P_2) was 0.07. According to the data in the table above, this value indicates that 7% of the respondents in the study were extremely poor.

Table 4: Factors Affecting Poverty Status of Respondents using Probit Regression Model

Explanatory Variables	Coefficients	Marginal Effects	Standard Error	z	$P > \|z\|$
Experience of flood shock	0.107**	0.021	0.011	2.06	0.039
Age(years)	-0.036***	-0.007	0.003	-2.45	0.014
Gender	0.631	0.127	0.101	1.26	0.208
Years of schooling	-0.008	-0.002	0.007	-0.22	0.823
Household size	0.104**	1.423	0.699	2.04	0.057
Access to credit	0.212	0.039	0.071	0.56	0.576
Sugar cane farm income	-0.001**	-7.91^{-06}	0	-2.02	0.044
Organization membership	2.102	0.427	0.076	5.6	0
Constant	0.59	-	0.942	0.63	0.531

Note: ***' **' * indicates significance levels at 1% , 5%, 10% respectively; Number of observation= 120; Pseudo R^2=0.187, Log likelihood = -93.305, Prob> chi^2 = 0, Wald chi^2 (7) = 40.23; Dependent variable (Poor=0 and Non poor=1)
Source: Field Survey, 2019.

To determine the association between certain socioeconomic features of the respondents and their level of poverty, the Logit regression analysis was used. The coefficient and odd ratio value of the experience of flood shock are shown in *Table 4*, and they are positive and significant at the 5% level. The outcome suggests that as flood shock increases, there is a greater chance that study participants may become destitute. Additionally, at a 1% level of significance, the respondents' age coefficient is adversely significant. This suggests that the likelihood of becoming poor will decrease by 0.7% for every unit increase in respondents' age. The coefficient of agricultural income is shown in the table as negative and significant at the 5% level. It suggests that the likelihood of becoming will drop by 0.1% for every unit rise in farm income. This suggests that a rise in agricultural revenue will lessen the likelihood of poverty. The outcomes from Olutunmise and Ajibefun (2019) and this result concur. The likely

cause is that, as Shiferaw and Holden (1998) and Igbalajobi et al. (2013) also noted, farmers with greater money and assets are more likely to adopt innovative farming techniques.

A 5% level of significance was used to determine the significance of household size. The findings suggest that when household size increases, there is a greater chance that the respondents would become impoverished. This can be due to a rise in household members' needs and efforts to improve the family's standard of life.

At the 1% level of significance, the coefficient of social organization membership was similarly positive and significant. The findings suggested that a growth in social organization membership would increase the respondents' likelihood of being impoverished. In the study area, social capital is anticipated to have an impact on poverty. Other estimated variables were discovered not to have a substantial impact on respondents' participation choices.

Table 5: Factors that predispose the respondents to Flood

Predisposing Factors	Affected Frequency	Percent (%)	Pooled Frequency	Percent (%)
Time of planting	44	36.67	76	63.33
Inadequate government assistance	53	44.17	67	55.83
Inadequate finance authority assistance	55	45.83	65	54.17
Insufficient fund	52	43.33	68	56.67

Source: Field Survey, 2019

From *Table 5*, result shows that 36.67% of the respondents claimed that time of planting predisposes them to flood, about 44.17% of the respondents claimed that inadequate government assistance predisposed them and about 45.83% claimed that inadequate financial authority support predisposed them to flood. The result indicates that most of the affected respondents were predisposed by a factor or two.

Table 6: Control measures adopted by the respondents

Control Measures	Affected Frequency	Percent (%)	Pooled Frequency	Percent (%)
Seeking help from friends and relatives	50	41.67	70	58.33
Involvement in non-farming activities	45	37.50	75	62.50
Purchasing food on credit	46	38.33	74	61.67
Others	4	3.33	116	96.67

Source: Field Survey, 2019.

Table 6 shows the control measures adopted by the respondents. About 42% of the affected respondents claimed that they seek help from family and friends. Also, 37.5% of the respondents claimed that they engage in one non-farming activity or the other in order to survive, 38.3% of the respondents purchased food on credit while 3.33% adopted other forms of coping strategies such as selling of farm asset, personal belongings among others. The findings, which concurred with that of (Opondo, 2013; Olutunmise and Ajibefun, 2019) on the use of corrosive coping techniques against flood, showed that the majority of the flood-affected respondents used one or more erosive control measures to mitigate the impact of the flood on their agricultural enterprise.

People's agency, resourcefulness, and capacity to occasionally provide a hand to one another both individually and collectively in order to achieve their fundamental demands are referred to as coping mechanisms (Wisner et al., 2003). They emerge from an understanding of the possibility of an event happening and pre-existing structures of reaction. They aim to maintain not only their own existence but also other human requirements like getting honor and respect as well as the coherence of the family, household, and society. It was confirmed in the area that some of the respondents purchased necessities on debt and paid it back when they sold their farm products at the end of the growing season.

Another frequent method by which agricultural households in the study area cope with the effects of poverty is borrowing money from cooperatives. According to the respondents, the majority of farmers got credit or loans from the cooperative society at the beginning of the season and paid them back at the end of the production season

in cash or kind. Because they are more susceptible to uncertainty and risk than other industries, such as producers of sugarcane, tree crops (particularly cocoa), arable crop farmers find it difficult to borrow money from commercial banks and occasionally from cooperative societies. Children were being transferred from private to public schools, and the local farms were being sold off. Even though there is poverty in the neighborhood, once people see the benefit of their chosen course of action, they employ a variety of techniques to cope with poverty syndrome.

Integrated disaster control measure.

• Capacity building including research and knowledge management.
• Preparedness to deal with any disaster.
• Prevention of danger or threat of any disaster.
• Prompt response to any threatening disaster situation or disaster.
• Assessing the severity or magnitude of effects of any disaster.
• Evacuation, rescue and relief.
• Rehabilitation and reconstruction *(National Policy on Disaster Management (NPDM))*

4. Conclusions

The study investigates the effect of flood on sugar cane farming households across Nigeria, using the lower river Niger basin area in Kwara State, and some sugar cane producing villages in Osun State as case of study. The outcome indicates that the poverty incidence (P_0) was 0.46, indicating that 46% of respondents in the research area were moderately poor and lived below the poverty line. The poverty depth (P_1) was 0.16, which also shows that 16% of the respondents were below the poverty line and will consequently need an increase in their income to do so. In other words, a typical low-income sugarcane farmer would need to earn 16% of the poverty level in order to escape poverty. The final measure of poverty (P_2) was 0.07. This number indicates that 7% of study respondents were extremely impoverished. Even though sugarcane is one of the crucial commodities that can help reduce poverty, the majority of farmers still struggle to make ends meet. The analytically most likely causes of poverty were emphasized as being flood shocks, gender, household size, not having access to finance, and membership in social organizations. These factors were also potential contributors to poverty. While the respondents' age, years of education, and farm income were statistically related to their lack of poverty. This means that women should be given the opportunity and the capacity to work in agriculture. It will be more facile to embrace new technology and coping mechanisms if more people have education, as 48% of the respondents claim to have. Increased loan availability or subsidies for agricultural supplies can help farmers earn more money relative to their outlays. For maximum efficacy, government initiatives to encourage the adoption of contemporary technologies should be combined with support services including education and training, extension services, credit, and market accessibility. The government should make news concerning climate change accessible so that farmers can plan their planting schedule and be protected from calamities brought on by climate change. The government ought to make available information on flood forecasting as well. In order to minimize human activities that exacerbate flood impacts in the River Niger basin, we advise an integrated watershed management policy for environmental preservation.

The policy should concentrate on increasing food production and environmental sustainability through land use afforestation, soil erosion control, and water management systems (which should include dams to control the flow of rivers and gather floodwater for agricultural, household, and industrial use). This will significantly reduce the number of fatalities caused by floods and other natural calamities (Opondo, 2013).

Ethical Statement

There is no need to obtain permission from the ethics committee for this study.

Conflicts of Interest

We declare that there is no conflict of interest between us as the article authors.

Authorship Contribution Statement

Concept: Akinsola G.O., Ayinde O.E., Adewale E.T.; Design: Adewale E.T.; Data Collection or Processing: Adewale E.T.; Statistical Analyses: Adewale E.T.; Literature Search: Adewale E.T.; Writing, Review and Editing: Adewale E.T., Ayinde O.E., Akinsola G.O.

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