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Floods and Meal Frequency: The Situation in Anambra and Imo States, Southeastern Region of Nigeria

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Abstract: *The study analysed the effects of flooding on household meal frequency in agrarian communities of Anambra and Imo States in the Southeastern region of Nigeria. The study was questionnaire-based and descriptive statistics was used to analyse the normal (before flooding) meal frequency and the after-flood meal frequency of female-headed and male-headed households in order to capture the influence of flooding on households' daily meal frequency. The results show that flooding caused a 60.8% reduction in the number of households with the apparent standard meal frequency of thrice daily (three square meal) and increased households that ate twice daily to 23.5%, invariably leading to malnutrition. Additionally, there was an observed gender-based disparity in the proportions of households affected with the female-headed households affected the most as it recorded the largest percentage of households that were forced to eat once or twice daily after flood events. The reasons for the reduction in daily meal frequency after flooding have been associated with destruction of farmlands, disruption of livelihood sources, seasonal displacement and hike in food prices. Efforts to facilitate access to food by flood victims and off-farm income are recommended to curb the effects of flooding.*

Keyword: *flooding, meal frequency, female-headed household, Anambra, Imo, south eastern Nigeria*

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I. Introduction

Floods have been reported as one of the most recurrent and disastrous global natural hazards (UN-Water, 2011; Odufuwa et al., 2012; Akukwe and Ogbodo, 2015). The worldwide rise in flood circumstances has caused displacement of people, loss of properties and human lives, stream pollution, destruction of roads and other infrastructure etc (Klijn, 2009; Speranza, 2010; Etuonovbe, 2011; Nzeadibe et al., 2011; Olorunfemi, 2011; Xiao et al., 2013; Adewuyi and Olofin, 2014; Ajaero and Mozie, 2014; Mallakpour and Villarini, 2015). Nigeria is not an exception as several devastating floods had been recorded (Adeloye and Rustum, 2011; Olajuyigbe, et al., 2012; Akukwe and Ogbodo, 2015) with that of the year 2012 reported as the most devastating in the last forty (40) years (UN-OCHA, 2012; Ojigi et al., 2013).

The August-October 2012 floods in Nigeria pushed rivers over their banks and submerged hundreds of kilometres of urban and rural lands (Ojigi et al., 2013) with an estimate of over 7,705,378 Nigerians affected by the floods leaving 2,157,419 persons internally displaced (IDPs). Additionally, over 90% of the 36 States of the country were affected between July and October, 2012 with 363 deaths and more than 618,000 damaged houses (UN-OCHA, 2012). Farmlands were immensely destroyed resulting to food insecurity in parts of the country (FEWS NET, 2012; FEWS NET, 2013) including Anambra and Imo States (in south eastern region) which have comparative advantage in the production of cassava, sweet potatoes and yam.

Empirical studies suggest that flooding affects food security negatively (FAO, 2008; Sidi, 2012; Ismail and Mustaquim, 2013; Muriadi and Wljaya, 2014; Ramakrishna et al., 2014; Zakari et al., 2014; Otomofa et al., 2015; Ikani, 2016; Ajaero, 2017; Akukwe et al., 2018). Flooding affects food security by decreasing food production (Xiao et al., 2013; Ejikeme et al., 2015; Mallakpour and Villarini, 2015; Ikani, 2016); destroying roads used to transport food (Ajaero and Mozie, 2014; Otomofa et al., 2015); affecting quantity and quality of food eaten as well as number of times food is eaten (Akukwe et al., 2018). Thus, this study focused on testing the robustness of the findings that flooding affects meal frequency by disaggregating households' daily meal frequency before and after flooding episodes in Anambra and Imo States in Southeastern Nigeria.

II. Study Area

Location

Southeastern Nigeria comprises five States *viz*; Abia, Anambra, Ebonyi, Enugu and Imo. It is located between latitudes 4° 20′ to 7° 10′ north of the equator and longitudes 6° 35′ to 8° 25′ east of the Greenwich

Meridian with a land size of about 28,983km^2. The region is bounded by Benue and Kogi States in the north, by Rivers State in the south, by Cross River State in the east and to the west by Delta state (Figure 1). Two States namely; Anambra and Imo States have been selected for this study because they were the severely affected States in the region by the most devastating floods in Nigeria in 2012. Anambra State is located between latitudes 5˚40′ and 6˚46′ north of the equator and longitudes 6˚35′ and 7˚21′ east of the Greenwich meridian with a spatial extent of about 4,816km^2. Imo State lies between latitude 5˚10′N to 5˚25′N and longitude 6˚35′E to 7˚23′E of the Greenwich meridian with a total land area of about 5,183sqkm (National Population Commission, 2010) (Figure 2).

Climate

Southeastern Nigeria lies within tropical wet-and-dry climate or Aw climate based on Koppen's climate classification. It usually experiences an average of eight months of rainfall and four months of dry season. The two major seasons experienced in this region are; the rainy season (March to October) and the dry season (November to February). Mean annual rainfall is between 1800mm and 2000mm. It experiences high temperatures all year round with an average value of 27˚C while the average relative humidity ranges between 60-70% and 80-90% in January and July respectively (Monanu, 1975a; Monanu, 1975b; Anyadike, 2002; Akukwe, 2007). Floods in Anambra and Imo States are greatly influenced by the rainfall pattern which are usually experienced between July and October (also the harvest season for most crops).

Population

Anambra State and Imo State had a population of 4,177,828 (with 2,117,984 male and 2,059,844 female) and 3,927,563 (with 1,976,471 male and 1,951,092 female) persons respectively according to the 2006 population census figures. The population of the four selected Local Government Areas (LGAs) according to National Population Commission (2010) are; 152,149 persons for Anambra East; 223,317 persons for Ogbaru; 142,340 persons for Oguta and 182,891 persons for Ohaji/Egbema. The population figures were projected into 2016 and the figure for Anambra East LGA was 205,401 persons; Ogbaru – 301,478 persons; Oguta – 192,159 persons and Ohaji/Egbema – 246,903 persons. These projected population figures were calculated using the equation below;

$$P_2 = P_1 (1+r)^n \quad ...(1)$$

Where; P_2 is the projected population

P_1 is the known population (2006 in this case)

R is the rate of natural increase, 2.8% as noted by the United Nations, 2013.

n is the number of years between P_1 and P_2 (interval) and its 11 years in our case.

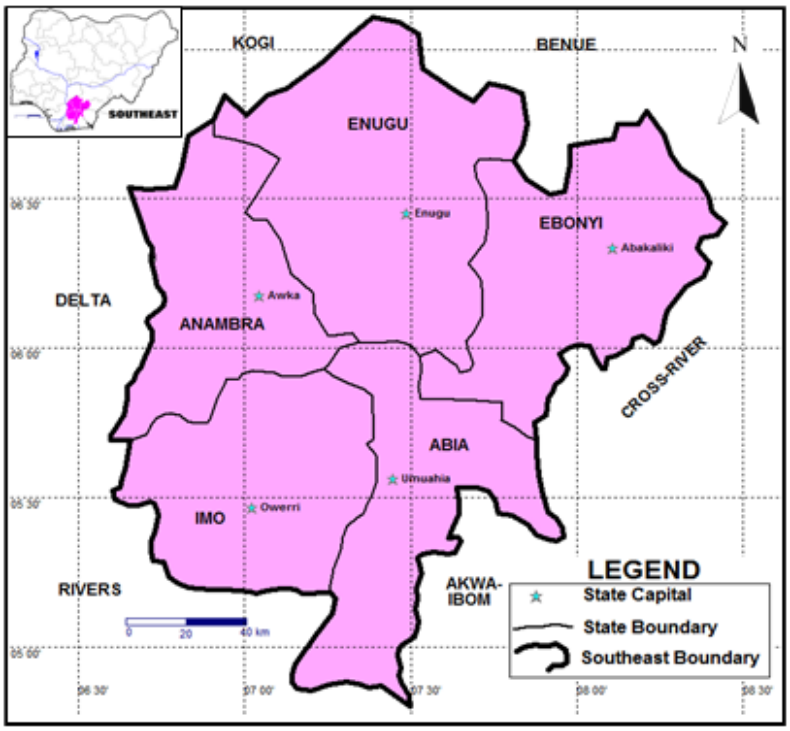

Figure 1: Map of the Study Area.
Source: GIS Lab., Department of Geography, University of Nigeria, Nsukka, 2016

III. Methodology

Sample size and sampling method

The study was carried out in two States namely; Imo and Anambra States which are vulnerable to flooding as they were the only two States affected in the region by the 2012 floods termed the most devastating floods in Nigeria by the UN-OCHA (2012). Oguta and Ohaji/Egbema were the only two affected Local Government Areas (LGAs) in Imo State and for equal representation, Anambra East and Ogbaru LGAs in Anambra State that are vulnerable to flooding, were purposively selected. The sample size was determined using Yamane (1967) and Israel (1992) equation as given below;

$n = N/1+N(e^2)$...(2)

where;

n – is the sample size

N- is the population of Anambra East, Ogbaru, Oguta and Ohaji/Egbema LGAs

e – is the level of precision/sampling error i.e. 0.05 (at +/-5% level of precision)

$n = (205,401+301,478+192,159+246,903)/(1+ (205,401+301,478+192,159+246,903)(0.05)^2)$

n = 400 households

A multi-stage purposive sampling technique was employed to establish the sampling frame and two (2) communities (one being the LGA headquarters) was purposively selected based on the criteria used in selecting the LGAs, giving a total of four (4) communities for each State and eight (8) communities for the two (2) States (Figure 2). In addition, stratified sampling method was used to determine the number of households sampled in each LGA and community, and random sampling method was employed in administering the 400 copies of questionnaire. The study period was between 2016 and 2017.

IV. Data Collection and Data Analysis

Data were collected through a structured questionnaire where the respondents were requested to tick their meal frequency before and after flooding, and their responses were analysed. Four hundred (400) copies of questionnaire derived from the sample size were administered. The respondents consisted of households' heads (mostly farmers) whose households had experienced flooding and its effects in one form or the other at any point in time.

Descriptive statistics (simple percentages) was used in analysing the effects of flooding on meal frequency as well as on the household type (female- or male-headed) mostly affected. A daily meal of three times (three square meal) was considered the normal meal frequency a day.

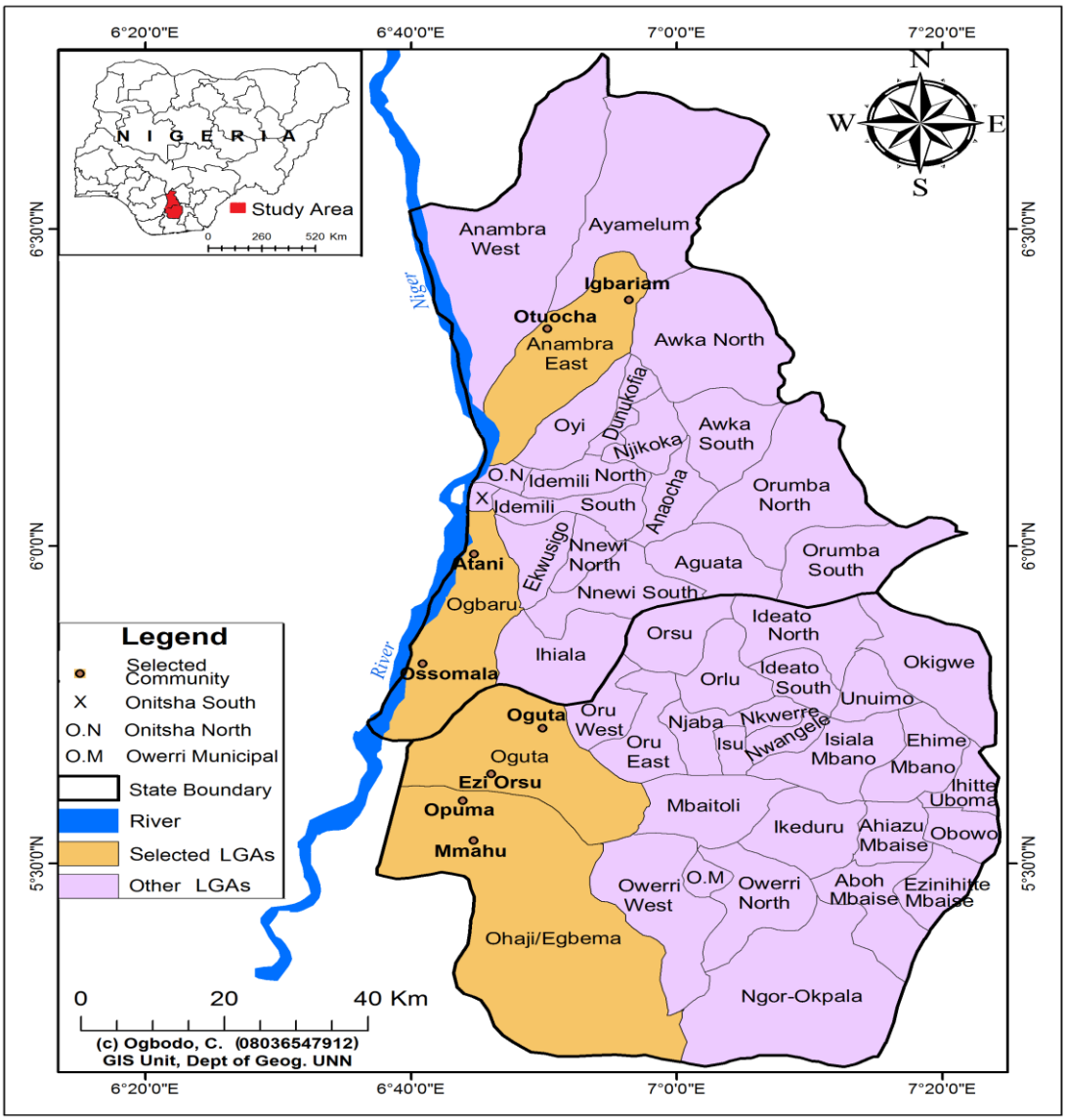

Figure 2: Map of the study area showing the sampled LGAs/Communities.
Source: GIS Lab., Department of Geography, University of Nigeria, Nsukka, 2016

V. Findings And Discussion

Demographic and Socio-economic Characteristics of respondents

The demographic and socio-economic characteristics of the respondents are shown in Table 1. The sampled households consist of 56.2% male-headed and 43.8% female-headed households that had experienced flooding with a high literacy rate as only 25.8% respondents had no formal education. The table also shows that majority of the households' heads relied on agriculture as their key source of income/livelihoods making them highly vulnerable to both flooding and its associated effects since their primary livelihood sources was climate-related.

Moreover, 64.5% of the respondents were married with 19.8% being widows while 7.8% were single and 8% were either divorced or separated. In terms of age, majority (50.8%) of the household heads were between the ages of 40 and 49 years and 60 and 69 years. Household heads between 20 and 29 years accounted for 6.3% while only 1.2% of respondents were 70 years and above.

However, the largest proportion (36%) of these heads of households earn between fifteen and thirty thousand Naira monthly while about a quarter of them earn either below fifteen thousand or between thirty and forty-five thousand Naira monthly. Only 17.8% of all the household heads earned a monthly income of above forty-five thousand Naira.

Table 1: Socio-economic characteristics of respondents

Characteristic	Component	Frequency (percentage)
Sex	Male	225 (56.2%)
	Female	175 (43.8%)
	Total	400 (100%)
Age	20-29 Years	25 (6.3%)
	30-39 Years	83 (20.7%)
	40-49 Years	103 (25.8%)
	50-59 years	84 (21.0%)
	60-69 Years	100 (25.0%)
	70 Years & above	5 (1.2%)
	Total	400 (100%)
Primary sources of livelihoods	Farming	368 (92.0%)
	Fishing	3 (0.8%)
	Trading/Business	3 (0.8%)
	Civil servant	26 (6.5%)
	Total	400 (100%)
Marital status	Single	31 (7.8%)
	Married	258 (64.5%)
	Divorced	5 (1.3%)
	Separated	27 (6.7%)
	Widowed	79 (19.8%)
	Total	400 (100%)
Level of education	Non formal	103 (25.8%)
	FSLC	115 (28.7%)
	SSCE	98 (24.5%)
	NCE/OND	64 (16.0%)
	HND/B.Sc/B.Ed/B.A	17 (4.3%)
	M.Sc/M.A/Equivalent	3 (0.7%)
	Total	400 (100.0%)
Monthly income	<15,000	95 (23.8%)
	15,001-30,000	144 (36.0%)
	30,001-45,000	90 (22.5%)
	45,001-60,000	34 (8.5%)
	60,001-75,000	24 (6.0%)
	75,001-90,000	4 (1.0%)
	90,001 and above	9 (2.3%)
	Total	400 (100.0%)

Source: Researcher's computation, 2017

Determination of the effects of flooding on food security using Meal Frequency in Southeastern Nigeria

The number of time meals are eaten in a household daily can also be used to determine food security level in terms of food availability in a household as households are usually expected to have meals thrice daily. Akukwe et al. (2018) had identified that flooding forces people to reduce their meal frequency and the need to show the percentage effects of flooding on meal frequency formed the basis of this study.

Based on household daily meal frequency data, it was generally noted that the daily meal frequency drastically reduced after a flood disaster in the study area. The before flood (normal) and after flood (forced) daily meal frequencies are shown in Table 2. Prior to any flood event, households that usually had meals twice a day accounted for 0.8%, those with a daily meal frequency of twice-thrice and thrice respectively accounted for 16.7% and 82.5% while no household indicated to have eaten just once daily. As seen in Table 2, flooding forced the percentage of those who had meals once and twice daily to increase to 2.3% and 24.3% correspondingly as well as increased households that had twice-thrice daily meals to 51.7%, and it reduced the percentage of households with a daily meal frequency of thrice to 21.7%.

This implies that flooding has a negative effect on daily meal frequency associated with food security, with a 60.8% reduction in number of those who usually had three square meals, a 35% increase in the number of households who had two-three times meal daily, a 23.5% increase in households with a daily meal frequency of twice and a 2.3% increase in households who ate just once daily. Consequently, the reduction in daily meal frequency is as a result of destruction of farmlands with associated crop failure; disruption in livelihood sources; rise in food prices and seasonal displacement as corroborated by the findings of Otomofa et al. (2015); Ikani (2016); Ajaero (2017) and Akukwe et al. (2018).

Table 2: Daily Meal Frequency in Southeastern (Anambra and Imo States), Nigeria

Event	Daily meal frequency			
	Once	Twice	Twice-thrice	Thrice
Before flood	0 (0.0%)	3 (0.8%)	67 (16.7%)	330 (82.5%)
After flood	9 (2.3%)	97 (24.3%)	207 (51.7%)	87 (21.7%)
Difference	9 (2.3%)	94 (23.5%)	140 (35.0%)	143 (60.8%)

Source: Researcher's computation, 2017

Gender-based disparity on effects of flooding on meal frequency in Anambra and Imo States

There was an observed disparity in the effects of flooding on meal frequency by the two household types; female-headed households (FHHs) and male-headed households (MMHs) in Anambra and Imo States as shown in Figures 3 and 4.

Normally (before flood events), no household had meals once in Anambra and Imo States irrespective of who (male or female) headed the household.

In Anambra State, only 3.5% households (FHHs) with no MHHs reported to have a daily meal frequency of twice prior to any flood event while majority (86.8% for MHHs and 75.6% for FHHs) had a daily meal frequency of thrice. 13.2% and 20.9% respectively accounted for MHHs and FHHs that had their meals two to three times daily before flooding in Anambra State. The results revealed that, flooding forced people to reduce their meal frequency as food availability and accessibility were affected. For instance, it forced 62.8% and 58.2% MHHs and FHHs correspondingly in Anambra State to reduce their daily meal frequency of thrice to either once (for only FHHs), twice or twice-thrice. 8.2% FHHs (with no MHHs) recorded a meal frequency of once daily after flood episodes whereas 31.4% and 22.5% accounted for FHHs and MHHs that ate just twice daily, after flood events in Anambra State. There was also an increase in the number of FHHs and MHHs that had their meals twice-thrice in the State as shown in Figure 3.

Households in Imo State were reported not to have a normal meal frequency of once or twice since no household indicated to eat once or twice daily, before any flood event (Figure 4). There was 1.1% and 36% respective increase in FHHs that ate only once and twice daily after flooding with a corresponding 1% and 9.4% increase of MHHs with a daily meal frequency of once and twice after flood events as shown in Figure 4. Moreover, flooding caused a 57.3% decline of FHHs that had three square meal and 63.5% in number of MHHs that usually ate three times daily as well as increased the number of FHHs (from 28.1% to 48.3%) and MHHs (from 7.3% to 60.4%) that had twice-thrice meal frequency in Imo State (Figure 4).

The implication of the results is that, flooding affected meal frequency by decreasing the number of households with daily meal frequency of thrice, thereby increasing the number of households that ate once, twice and two to three times daily in Anambra and Imo States with FHHs having the largest proportions. This is an indication that flooding increases malnutrition by forcing households to reduce the number of times food is eaten (away from the expected three times) in order to survive, though meal frequency reduction had been identified as a coping mechanism adopted by households to survive in times of disasters (Gupta et al., 2015; Farzana et al., 2017).

Thus, it is concluded that female-households were the most affected by flooding in both States in terms of reduction in the number of times meals were eaten after flood episodes since the FHHs accounted for majority of households with once or twice daily meal frequency after flood events.

In order to reduce the number of malnourished households after flooding, increase access to food by flood victims through creating Internally Displaced Persons (IDPs) camps, in addition to encouraging especially women to diversify their income sources (through off-farm activities) are suggested.

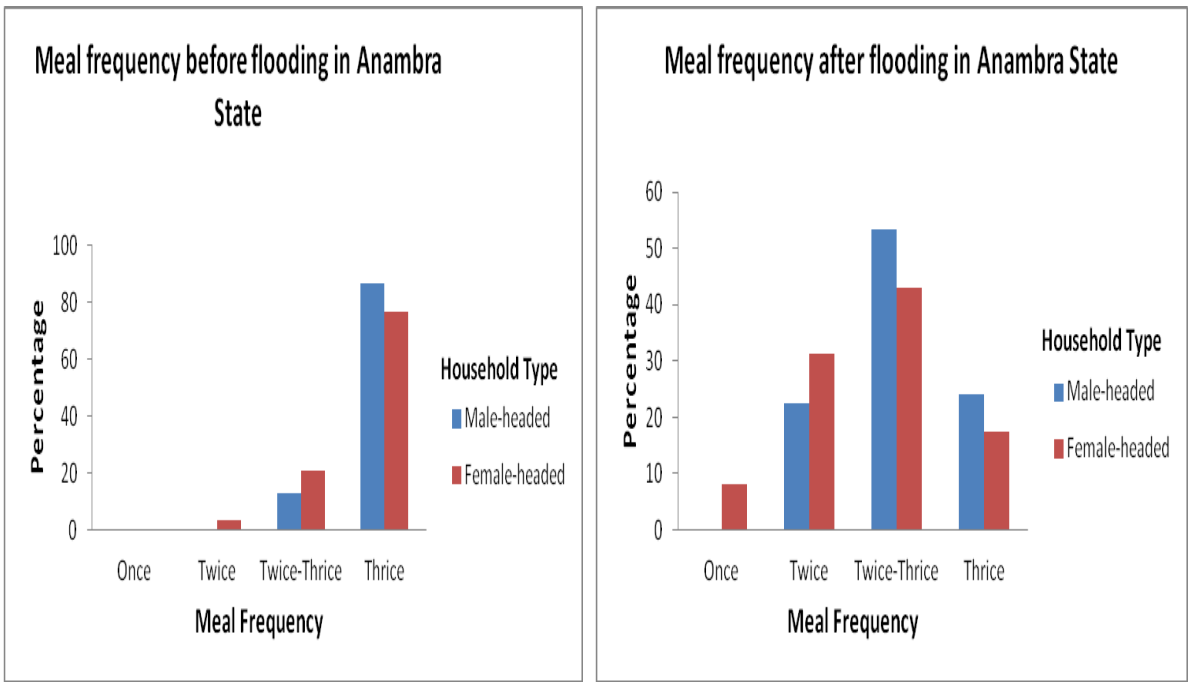

Figure 3: Meal frequency before and after flood events in Anambra State

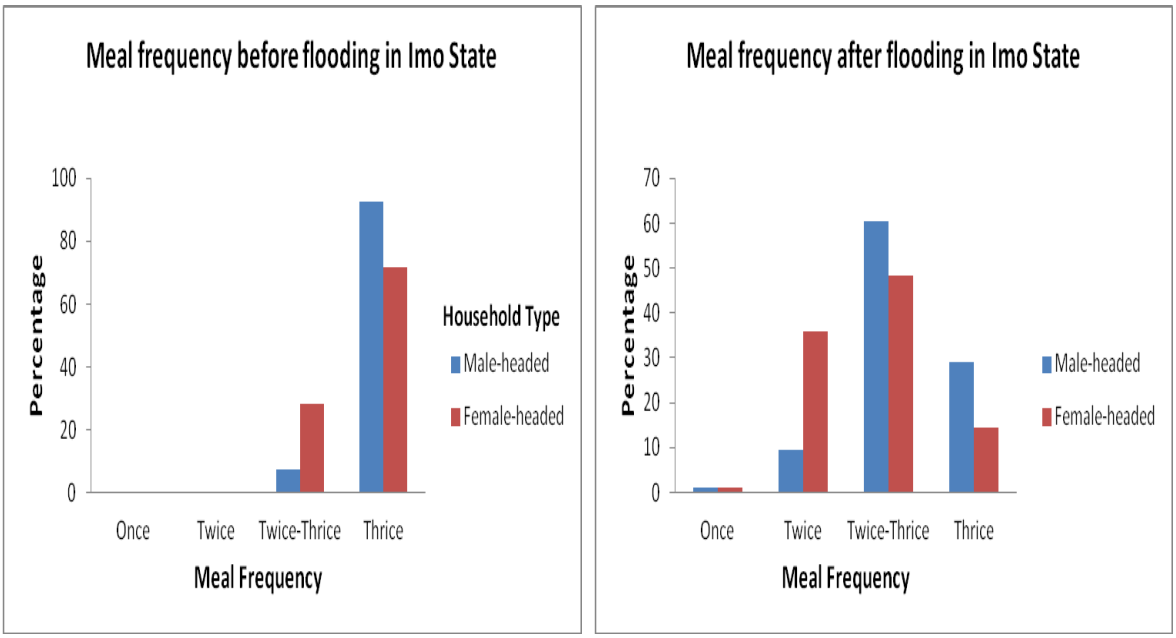

Figure 4: Meal frequency before and after flood events in Imo State

VI. Conclusion

The study set out to analyse the effects of flooding on household meal frequency and it was revealed that flooding forced people to reduce the number of times meals are eaten as a result of destruction of farmlands, seasonal displacement, disruption of livelihood sources and hike in food prices in Anambra and Imo States.

Flooding was found to increase malnutrition as it caused a 60.8% reduction in number of households that usually had three square meals, a 35% and 23.5% respective increase in the number of households with twice-thrice and twice daily meal frequency, and a 2.3% increase in households who ate just once daily in the Southeastern region of Nigeria. Female-headed households have been found to be the most affected by flooding as they recorded the largest number of households that had to eat once or twice as a result of flood disaster in Anambra and Imo States. Thus, efforts (institutional or community-based) to improve access to food for flood victims through recovery and rehabilitation centres as well as income diversification (through off-farm activities) for particularly female-headed households are recommended.

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