Assessment of Post Flood Impact on Farmlands Along River Benue Floodplains of Yola and Environs

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Abstract- Over the years farming activities are carried out by the small scale farmers along river Benue flood plains of Yola North local government area of Adamawa state. However, the farmers were faced with seasonal effects of flooding which damage their farmlands leading to economic lost. The Flood scenario and damaged on farmlands experienced in 2018 in the area was unprecedented for almost a decade. Therefore, this study aim at assessment of post floods impact on farmlands along river Benue floodplains of Yola and Environs. The samples of 351 respondents (farmers) in the study area were randomly selected and administered well-structured and defined questioners. The data obtained were analyzed using simple descriptive statistics. The result of the study revealed that rice 36.5 % and maize 33 % were the major food crops grown in the area. Similarly, overflows of water from river Benue was the major caused of floods with value of 41 % of the respondents then followed by high amount of rainfall (28 %). The level of flood destruction was found to be severe (35 % respondents) which destroyed 61-80 hectares of farmland and reduced more than 80 % of their farm output. To reduce the menace of flood on farm lands in the area it is therefore recommends that extension agent and agricultural agencies should help the farmers to redevelop their farms after the flood through re-cultivation of economic alternative crops and vegetables that could regenerate income temporarily before the farmers could resume their normal farming activities. In a long-term, structural measure such construction of river-embankments, multipurpose dams and rejuvenation of river Benue trough projects by the federal government should be considered with the aim of reducing the damage caused by flood on their farmlands in the study area.

Index Terms- Flood, farmlands, floodplains, impact

I. INTRODUCTION

Floods can occur in rivers and lakes when the flow rate exceeds the capacity of the river or lake channels, or it may occur due to an accumulation of rainwater on saturated ground. (Dama, Ishaku and Abdurrahman 2014). Nigeria has been among the most vulnerable countries in West-Africa consequentially affected by floods seasonally in the African continent. In Nigeria, flooding is the most frequent and most widespread natural hazard accounting for about one-third of all disasters arising from geophysical hazards and adversely affecting more people than any other natural hazard (Adebayo and Oruonye , 2012). Similarly, Floods are the most common environmental hazard in Nigeria. (Etuonovbe, 2011: in Dama, Ishaku, and Abdurrahman. 2014). Nigerians in several parts of the country are lamenting the devastating effect of farmlands caused by flooding. It has inundated several farmlands across the country, destroyed property worth millions of naira, and rendered thousands of people, including farmers, homeless. A reconnaissance survey in some states of the country revealed that heavy rainfall and resultant flooding also destroyed agricultural produce running into billions of naira. (Eni, Atu, Oko, and Ekwok 2011). Flood will cause slow viability growth in agricultural sectors, food security, emotional effects and economic growth.

In Nigeria agriculture is the most important sector of the economy from the standpoint of rural employment, sufficiency in food and fibre, and export earning prior to the discovery of oil (Abdullahi, 2015). It has been reported that the global demand for food shall be doubled over the period 1990 - 2030 with an increase of 2.5 - 3 times in developing countries and as high as 5 times in the sub-Saharan Africa (Daily *et al.*, 1998). Despite the global demand of food for the growing population the food production still remains inadequate in African countries which associated with natural disasters such as flood, drought and fertility degradation. Lack of food security may lead to disasters which would cause instability to the human population and socio-economy of a nation. During flood, food security will be an issue because the affected areas are destroyed. Thus, Flooding lowers yields, quality and causes higher production costs (Jay and Donald, 1977). According to the OECD (2002) the impact of flood disasters can be categorized into positive and negative, primary and secondary long-term effects produced by a development intervention which could be directly or indirectly, intended or unintended. Flood disasters will have an impact on the psychology of the victims, the socio-economy and also food security.

In Nigeria, Adamawa state is one of the most occurring flooded states over the decade with a large extent of vulnerability leading to devastating loss of lives, properties, farmlands, displacement and negatively affecting the socio-economic activities in the state.

In Adamawa state, Yola is among the probable flood prone area which might be associated with anthropogenic activities and their proximity to the River Benue Plains coupled with some natural climatic phenomenon such as high rainfall or precipitation, River flow, Run-off, gauge height (Sadiq, 2018). The extent and degree of flooding varies from farm to farm and from year to year resulting in a large number of losses of farmlands and farm produce respectively. The type of predominant flooding in the

study area is of more annual flooding caused by heavy rainfall and overflow of river banks. The seasonal glaring effects of flood on farmlands in the area have affected negatively food production per unit area. It is therefore very important to assess the vulnerability of flood on farmlands along river Benue plains of Yola and environs in Adamawa State.

II. STATEMENT OF THE PROBLEM.

Farming is highly intensive along river Benue flood plains of Yola north LGA where small scale farmers utilizes the available fertile farmlands cultivating food crops such as maize, rice seasonally with an average profitable yield. However, in the year 2018 the study area has experienced unprecedented flooding which destroyed hundreds hectares of farmlands and damaged crops as a result of different heavy downpour, river overflows among others. Therefore, this study saddled with the specific objectives of assessing the level of vulnerability of post flood on farmland and food products and identifies the socio-economic profile of farmers among flood victims. The results can be used for policy makers and agricultural agencies to formulate plans and strategies to ensure the development of agriculture sectors in Yola and the state at large for sustainable and optimum food production for the growing population.

III. STUDY AREA

Yola North LGA is also called "**Jimeta**" which is located in the north eastern part of Nigeria, (Mohammed, 1999). It lies on latitude 09^0 14'N and 09^0 20'N of the equator and longitude 12^0 25'E and 12^0 28'E of the Greenwich meridian, it has total population of 198,314 persons (National Bureau of Statistics, 2006). Population of the Yola North through which the study segment traverses is about 198,314 persons (NPC, 2006).It is also characterized by high population progression of 3.6% and rapid urbanization of about 7% (Census, 2006). The average annual rainfall in the study area ranges between 850mm-1000mm with over 41% of rain falling in August and September. Temperature also has a significant temporal variation in the study area; with an average maximum temperature of 42^0C with an average relative humidity of about 29%. (Upper Benue River Basin Development Authority, 'UBRBDA' 2018).

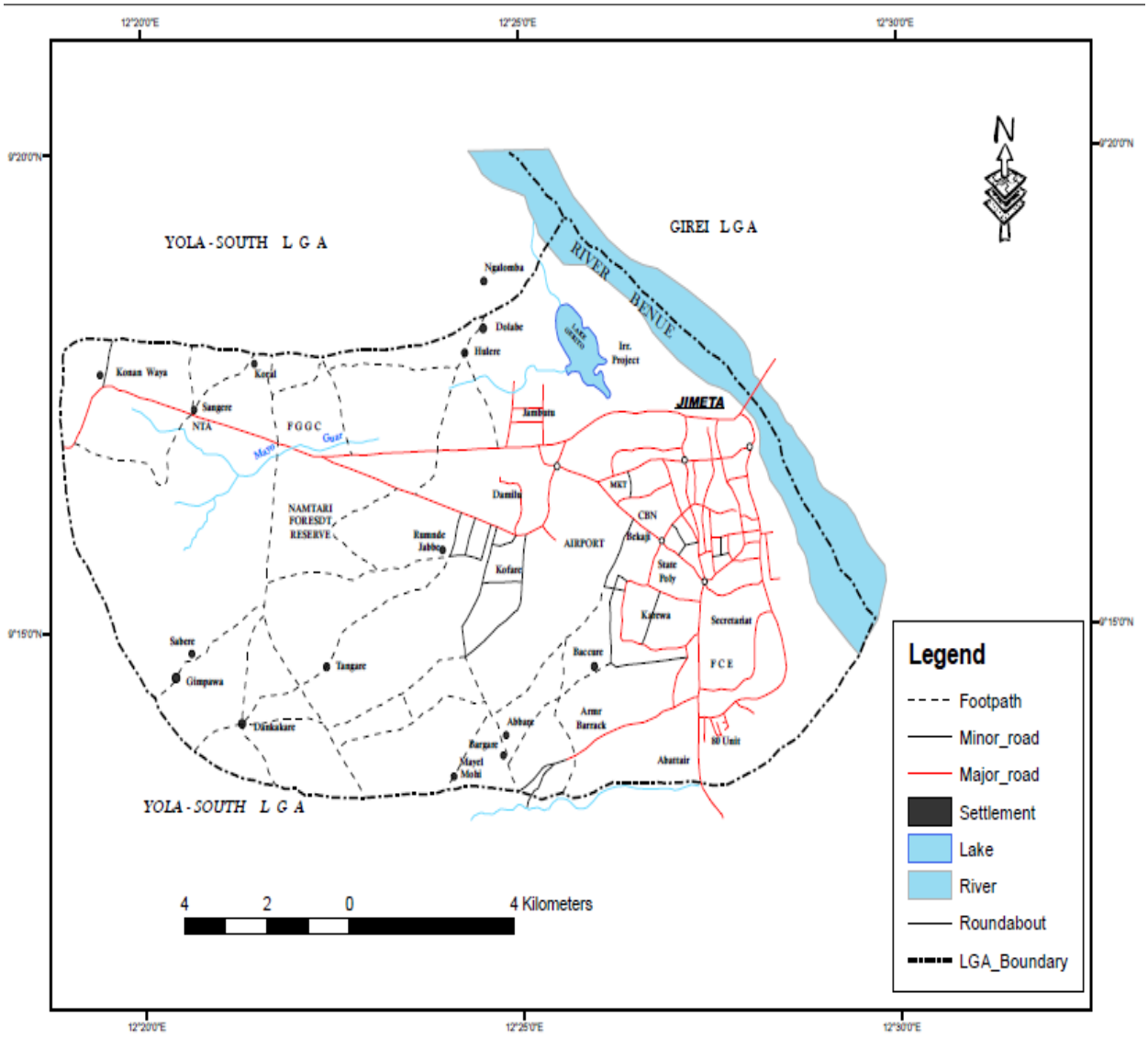

Fig 1. Shows the map of the study area (Adopted from Festus, 2016)

IV. LITERATURE REVIEW

According to Obeta, (2009), flood disasters accounted for about 38% of all the federally declared natural disasters between 1995 and 2005 in Nigeria. It is reported by the Nigeria Hydrological Services Agency *Annual flood outlook* (NIHSA: AFO: 2013) that, during recent years there has been an alarming rise in economic losses due to flooding in the country. In 2012 alone, Nigeria recorded a total estimated loss of N 2.29 Trillion (National Emergency Management Agency, NEMA: 2013 in NIHSA; AFO; 2016). Food Agriculture Organization (FAO, 2007) has stated that the croplands, pasture and forests which occupy 60% of the earth's surface are progressively being exposed to threats from increased climatic variability and, in the long run, they become vulnerable to climate change. Abnormal changes in air temperature and heavy rainfall have increased the frequency and the intensity of flood disasters. Rainfall of high intensity seals soil spores resulting surface runoff. Runoff starts if the intensity of rainfall is more than the infiltration capacity of soil. When the rainfall continuous for longer periods, the runoff increases and causes floods. When the catchment areas of rivers receive very high rainfall, rivers cannot carry the entire runoff, they overflow and submerge the neighboring fields are silted. Due to higher rainfall, tank bands are breached. Floods cause considerable damage to the crops, livestock and human life. (Chakraverty, 2004). The researcher has observed that, flooding along river Benue plains of Yola north is a direct consequence of intensive rainfall and river overflows experienced in the year 2018 coupled with poor planning, development and utilization of agricultural and nonagricultural lands respectively. Thus, urbanization influences all phases of hydrological cycle from precipitation to infiltration rates and the hydraulics of overland flow.

The principal flood problem in the River Benue Basin is damage to agricultural land and crops. During the months of July, August and September (flood predicted months) floodwaters overflow the banks of low capacity channels such as Mayo Chuchi, Mayo Malkuhi and its tributaries such as river Faro inundated thousands of hectares of adjacent farmlands in the study area. Similarly, Intensive precipitation and long duration recorded

in the year 2018 also produced stream flows in excess of channel capacities that cause sheet water flooding in the area. These floods result in serious reductions in agricultural productions which in turn have a depressing effect on the economy of the farmers in the flood plains of the study area. Therefore, there is aneed to assess the damage inflected by flood and to develop a plan to reduce flood damages in the area that will take into account the conflicting interests of all concerned.

V. EFFECTS OF FLOOD ON FARMLANDS

Flooding of agricultural land that occurs after seeding can be as costly as flooding before seeding, and possibly more costly to the individual who has incurred production expenditures. (Jay and Donald , 1977). The ability for plant roots to tolerated long period of being submerged in flood water depends on the period of year the flood event occurred, duration of the flood event, species sensitivity to flooding and type of soil the plants grow on (dormant growing plants are more tolerant to flooding than actively growing plants). Flood pragmatic frequencies rejuvenate erosion indices of soil in most places where it occurs and the consequences on farmland productivity can be measurable in situ. According to Sadiq and Tekwa, (2018) conceived that soil erosion by water or wind agents selectively damages the soil by removing organic matter (OM) soil particles, plant nutrients, pedon thickness, and reducing soil chemical capacity to retain added nutrients. Hence, erosion removes soil particles that are necessary for water storage and denies root exploration for plant nutrients. Thus, erosion is a two-way problem; loss of soil fertility and thickness of the eroding soil (on-site problems) and the addition of unwanted sediments in the depositional sites (off-site problem). Similarly, the removal of topsoil is always a loss to agricultural productivity as topsoil is the part of the soil horizon with higher level of organic matter and nutrients and generally better structure (United State Department of Agriculture, USDA; 1993). In West Africa, soil erosion gulps about 10-21 tons of top soils per ha on nearly gentle slopes of 0.4 - 0.8% and up to 30 - 35 tons on 1-2% slopes (Serageldin, 1987). In Nigeria, it has been reported that over 25 million tons of valuable top soils are lost annually to erosion (Ezedinma, 1982).
In the study area, the floods have removed significant amount of topsoil on farm lands. While some parts of the farmlands were deposited this damaged crops as shown in plate 1 and 2 respectively.

Plate 1. Shows the apparent effects of on-site erosion caused by river flooding in the study area.

Plate 2. Shows the apparent effects of off-site erosion caused by river flooding in the study area.

The Yola flood plains falls within the River Benue Trough as depicted in fig 3 which is generally a low lying flat terrain of 183.3-200 meters above the sea level with gentle undulation and hill ranges punctuating the extensive flat flood plain at various locations notably across the River Benue (from Yola) eastward, the land rises steeply to attain a maximum height of 240 meter above mean sea level (Festus, 2016). The flat terrain bordering the river Benue is a favorable locale for wide range of socio-economic activities such as farming, grazing and settlement etc. Hence it attracts a considerable proportion of population concentrated heavily on intensive crop production. Within the flank of river Benue, there exist lakes Njuwa and Gerio. The former is an ox-bow lake, which used to host the annual Njuwa fishing festival, until recently when it dried up mainly as a result of siltation effects. The later serve as the water source for the Gerio irrigation project, which is located along the bank of river Benue. (UBRBDA, 2018).

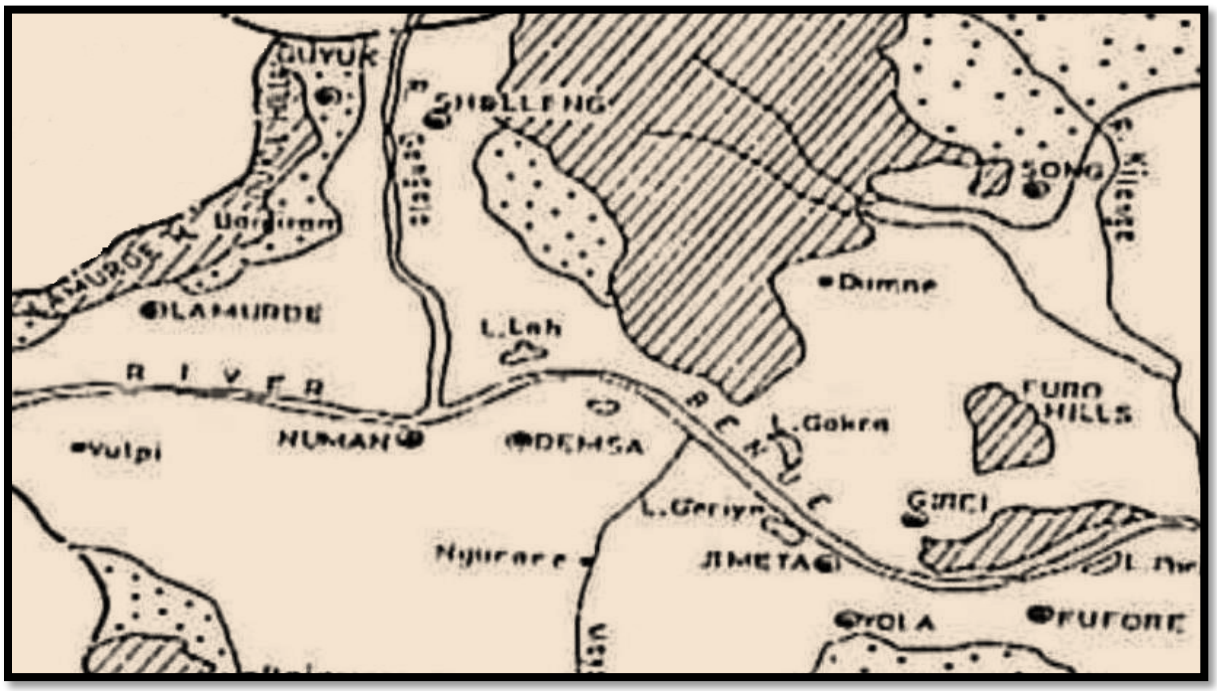

Fig 2. Shows the cross section of flood prone LGAs in Adamawa state. (Adopted from Adebayo and Tukur, 1999)

VI. RESEARCH METHODOLOGY

This study was quantitative in nature which largely based on data collection where total number of 351 sampled farmers who were the victims of flood disaster in 2018 in the study area were selected randomly as the respondents. The survey adopted a face-to-face quantitative survey approach using well defined and structured questionnaires that consisted of four parts: respondents' profile; farming profile; flood scenarios and perceptions on the post flood destruction impact on farmlands and were randomly administered to the sampled farmers. The data collected were subjected to descriptive statistical analysis where simple percentages, frequency distribution and charts were obtained. Additional relevant data such as journal, textbooks, unpublished thesis and maps were sourced as secondary sources from library, internets institutions and agencies respectively.

VII. RESULTS AND DISCUSSIONS.

Table 1 Demographic profile and socio-economic status of the respondents (n = 351)

VARIABLES	CATEGORY	FFREQUENCY (n=351)	PERCENT % (p=100)
Age	≤ 20	4	1.1
	21-30	46	13.0
	31-40	71	20.3
	41-50	107	30.5
	51-60	81	23.1
	61-70	32	9.0
	≥70	10	3.0
Level of Education	Never been in school	60	17.0
	Religion school	67	19.0
	Primary school	95	27.0
	Secondary school	75	21.5
	Tertiary school	54	15.5
Occupational status	Civil servant	67	19.0
	Private servant	30	8.5

	Business	82	23.5
	Pensioner	39	11.0
	Farmer	133	38.0
	≤ 5,000	74	21.0
	6,000-10,000	105	30.0
Monthly Income level(Naira)	11,000-15,000	71	20.2
	16,000-20,000	69	19.8
	≥21,000	32	9.0

Source: field survey, (2018).

The result on the demographic profile and socio-economic status of the farmers was presented in table 1. The result shows that most (30.5 %) farmers in the area were within the age of 41-50 years while 20.3 % of them were within the age of range of 31-40 % respectively. This result revealed that the sampled farmers are in the active working ages responsible to participate actively in farming activities. The result on the level of education of the sampled farmers shown that 27 % were with primary school certificate and 21.8 % having secondary certificate, while 19 % were those had attended religion school and 17 % among them never been in school, the remaining 15 % were obtained tertiary certificates. Results regarding the occupational status of the sampled farmers portrayed that most farmers (38 %) were farmers and 23.5 % engaged intensively in business activities, while 19 % were found to be civil servant, 11 % of them were pensioners and the remaining 8.5 % worked as private servant. This finding explained that farming is the main primary function of the most respondents in the study area. Similarly, the result on the sampled farmers shows that majority of the farmers (30 %) they leaved within the range of 6000-10,000 naira monthly, and 20.2 % of the farmers obtained 11, 000-15, 000 naira monthly, also 21 % of the respondents gained monthly income of ≤ 5000 naira while 19.8 % among the farmers obtained 16,000-20, 000 naira monthly and the remaining 9 % of the farmers gained ≥ 21, 000 as their monthly income. This result expressed that majority of the farmers were leaving at poverty level of ≤ 10,000 monthly which is not up to the minimum wage benchmark of 18, 000 naira of the country. This is as a result of the nature of their occupation as mainly farming at a subsistence (hand to mouth) level and this perhaps suggests the different reasons they gave for their continuous farming in the area despite the annual threat of flood.

Table 2. Farming profile of the respondents (n = 351)

VARIABLES	**CATEGORY**	**FREQUENCY (n= 351)**	**PERCENT%(p=100)**
	≤ 5 years	21	6.0
Years of farming experience	6-10 years	39	11.0
	11-15 years	81	23.0
	16-20 years	121	34.5
	≥ 20	89	25.5
	Maize	116	33
	Rice	126	36
Types of crop grown	Sorghum	42	12
	Beans	46	13
	Others	21	6.0
	≤10	36.0	10.2
	11-20	127.0	36.2
The average annual farm output	21-30	88.8	25.3
(in bags. i.e100 Kg/bag)			
	31-40	52.6	15
	≥41	45.61	13.3

Source: field survey, (2018)

Table 2 above shows the result on the farming profile of the sampled farmers. From the result it was revealed that most farmers (34.5 %) had 16-20 years of farming experience where 25.5 % of them had farming experience of ≥ 20 years and 11-15 years of farming was experienced with 23 % farmers in the study, also 11 % of the farmers had experienced farming of 6-10 years, others (6 %) of the farmers had only ≤ 5 years of farming experience. This result conveyed that most of the farmers in the area engaged intensively in farming activities for more than two decades of experiences. Similarly, from the types of crop grown by the farmers in the study area, the result has shown that 36 % of the farmers cultivates rice as highest crop grown and 33 % of them had grown maize as a crop while beans was cultivated by 13 % of the sampled farmers. This result expressed that rice and maize crops were the major crops grown in the study area. Also, the average annual farm output estimated in bags (1000 K g) revealed that most (36. 2 %) of the farmers had 11-20 bags as annual farm output and also only 13.3 % of them had harvested more than ≥ 40 bags annually, while 21-30 bags were cultivated annually by 25. 3 %. of the sampled farmers. The above result revealed that

most farmers in the area had an average annual farm output ranges from 11- 20 bags on their farmlands were few among them were able to harvest more than 40 bags which could be attributed to flood destructions and feasibly their low level of socio-economic status and technical supports were also low and inadequate to support their farming activities optimum and effectively. Thus, farming in the study area is still in its subsistence level than commercial respectively.

Table 3 Floods scenario on the farmlands of the respondents (n = 351)

VARIABLES	CATEGORY	FREQUENCY (n=351)	PERCENT % (p= 100)
Are you aware of flood scenario in the area	Aware	307	87.5
	Not aware	44	12.5
What is the major caused of flood in the area	High amount and duration of rainfall	98	28
	Soil type and topography	35	10
	River Benue overflows	140	41
	Poor drainage system	14	4.0
	Siltation effects in river Benue	60	17
In which month does the flood occurred	June	56	16.0
	July	79	22.5
	August	104	29.5
	September	98	28
	October	14	4.0
How long does the flood stayed on the farmlands before it disappears.	≤7 days	42	12
	8-14 days	49	14
	15-21 days	112	32
	22-30 days	81	23
	≥ 30 days	67	19
Why do you farm in the area	It is very cheap to hire	72	20.5
	Unavailability of land	90	25.5
	It is highly fertile	84	24
	It is not far from town	63	18
	Inheritance farm	42	12

Source: field survey, (2018).

The table 3 above revealed the flood scenarios on farmlands in the study area. Findings from the result expressed that 87.5 % of the farmers were aware of flood incidences in the area , while the remaining 12.5% conceived to had not aware of flood actions in the area. This might be as a result of inadequate land for farming due to rapid urbanization and industrialization prompted farmers in the area to shift in to the floodplains area of river Benue in the study area for farming.

Moreover, from the result of the study it was the result revealed that many factors are responsible from flooding in the study area, where majority of the respondents 41 % attributed it to over flow River Benue banks. This result is in conformity with that of Dalrymple, (1960) who revealed that when river banks are over topped, water spreads over floodplains and comes into severe conflict with man. Floodwaters overflow the banks of low channels and other tributaries such as river Faro and inundate more than 50 hectares of adjacent cropland. These floods result in serious reductions in agricultural crop production which in turn have a depressing effect on the economy of the area, while 28.5% of them believed that high amount and prolong duration of rainfall was responsible for flooding in the area. This finding agreed with what Mazumder (1983) conceived, when there is heavy downpour in short period of time with poor drainage system in the area will lead to stagnation of surface run off for some period consequently leading to flooding. Thus, this might also be an accredited factor that impaired overwhelmed exceptional flooding in the state

during the year 2012.Thus, the total amount of rainfall experienced in 2018 was highest with about 961.5 mm than that of 2017 with a value of 920.6 mm (UBRBDA, 2018).The high amount of rainfall experienced in the year 2018 had led to the excessive run-off which subsequently resulted to river flooding in the study area. Thus, excess water is as lack of water, excess water is expressed in form of floods and poor drainage. (Ayoade, 1988).

Moreover, the recorded rainy days were highest in 2018 with 791days (fig 1) than in the five recent past years .Thus, Hydrologically, "The more the intensive rainy days the more the tendency or susceptibility of flood scenario in the geographical area"

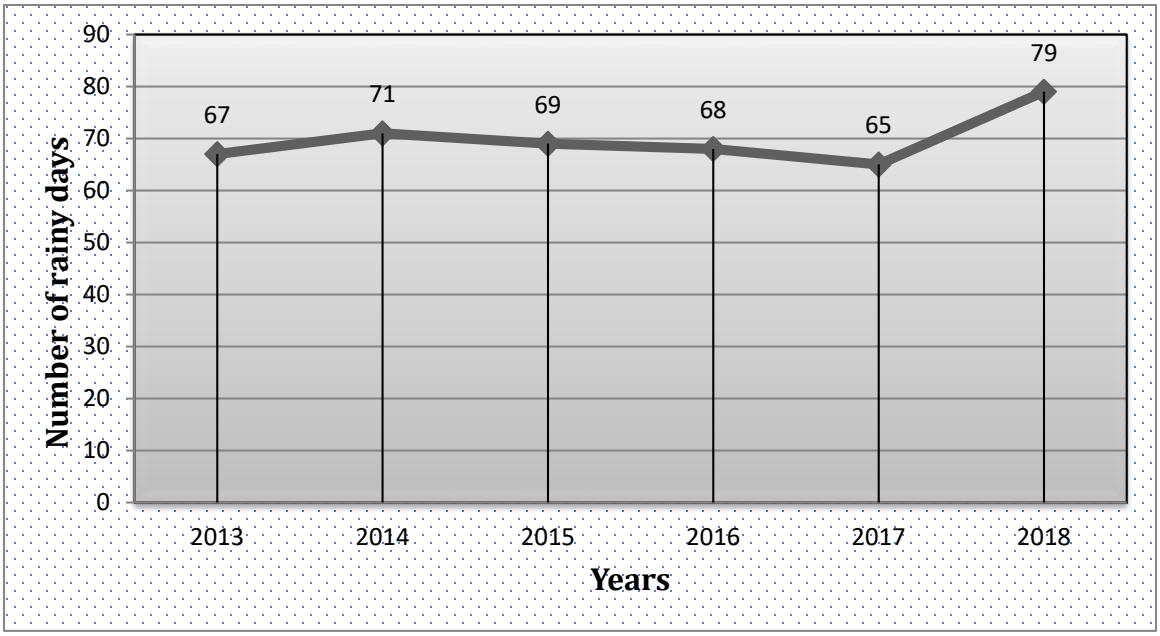

Fig 3. Shows the total number of rainy days from 2013-2018. (Source; UBRBDA, 2018)

This finding is in conformity with the findings of Adewusi, (1990) explained that flood is not caused by heavy rainfall but is caused by the exposure of the soil to water where quick flood are those usually caused by intense or prolonged rainfall or snow melt or combination of these two in a given area. Similarly, it was noted also by Oyegun, (2001) and Angillieri, (2007) that flood may be induced by a variety of factors, most notably heavy precipitation in terms of its intensity, duration, amount, or snow. Heavy rainfall accompanied by flooding cannot only cause tremendous damage to buildings and homes, but also kill woody and herbaceous plants. (Eni, *et al*, 2011).Others forming 17 % were of the o pinion that flooding in the area was as a result of siltation effects in River Benue. However, nature of soil type and topography of the area merely recorded 10 % of the sampled farmers as agent of flooding respectively. Thus, Floods are primarily due to surface run off and this runoff is being influenced by the nature of the soil. The remaining 4% of the respondents revealed that poor drainage system is responsible for flooding scenario in the area. Mazmur, (1983) also conceived that floods occur largely due to poor drainage systems and drains of inadequate capacity. Because when there is heavy downpour in a short period of time and the resulting excess rainfall is so heavy that the existing drainage capacity is not adequate to accommodate it. Thus, there will be a stagnation of the surface run off for some period leading to flooding scenario in the area. It was also revealed from the result of the study that flooding occurred usually in the months of August with 29 .5 % of the respondents then followed by 28 % who believed that flood occurred in the month of September and 22.5% of the respondents were recorded in the month of July. From the year 2011-2018, the month of July in the year 2018 amount of rainfall was highest (169.9 mm) than the other corresponding values of July months except that of the year 2015. Thus, the study revealed that the peak months of flood occurrence in the study area based on responses of the respondents in the months of September, August, July and then followed by June. It was recorded that the number of rainy days were highest in the months of August and September with 15 days then followed by July and June (14 days) in the year 2018 as shown in fig 4 respectively.

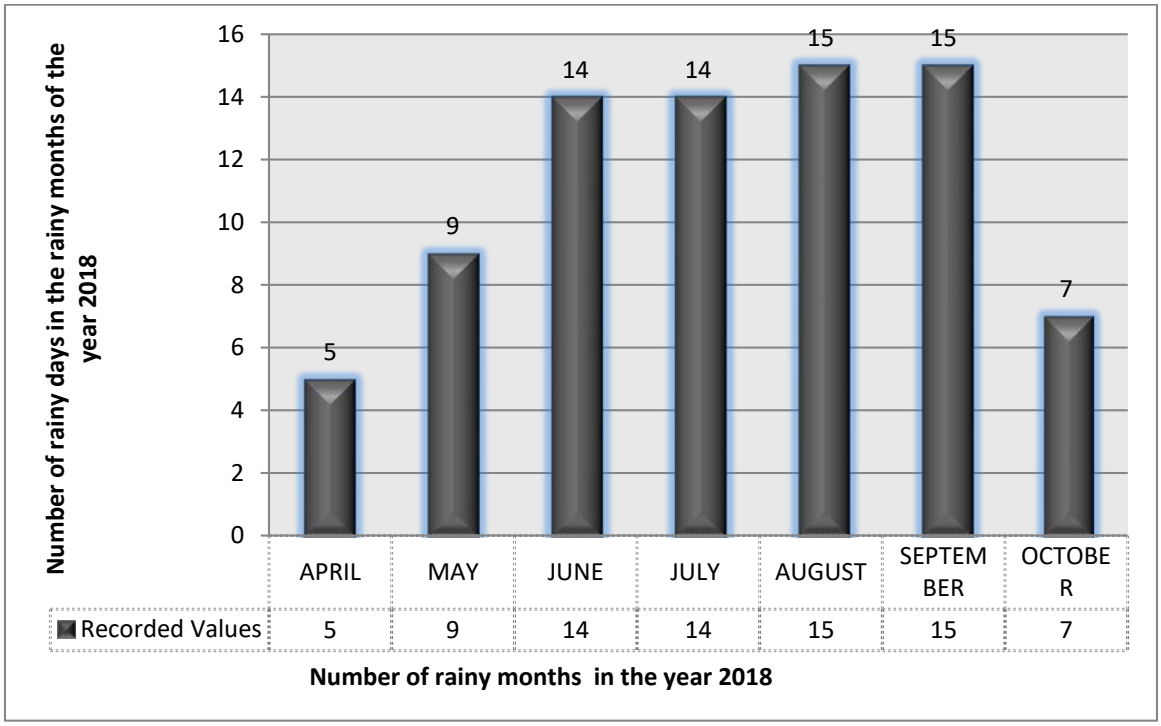

Fig 4. Shows the total number of rainy days recorded in rainy months of the year 2018. (Source: UBRBDA, 2018).

However, it might vary from year to year depending on the rainfall intensity experienced in a given geographical area. Similarly, flood stayed on the farmland for a period of 15-21 days with 32 % of the respondents agreed, while 23.5 % of them believed that flood water remained for 22-30 days on their farmlands. The remaining respondents revealed that their farmlands were submerged for ≥ 30 days and 14 % of them responded to had stayed for about 8-14 days respectively. The periodicity of flooded water on farmlands experienced in the area caused intensive damage on the existence crops (maize and rice) cultivated by the farmers. Physiologically, those crops were morphologically not as strong as the plantation crops to withstand flood. Thus, the ability for plant roots most especially maize the second major crops cultivated in the area to tolerated long period of being submerged is less. Eni, *et al*. 2011 explained that dormant plants are more tolerant to flooding than actively growing plants. Most of the farmers in the study area (25.5%) believed that unavailability of land for agricultural farming in the area had led them to farm along the flood plain areas of river Benue while 24 % of them also had agreed that high fertility status of the soil ignited them to remained farming in the area. 20.5% of the respondents were expressed the cheapness in hiring the farmland allowed them to remain static in the area, while 18 % of the farmers conceived that farmlands are located near town which can be access easily and the remaining 12 % of them inherited the farmland from their parents.

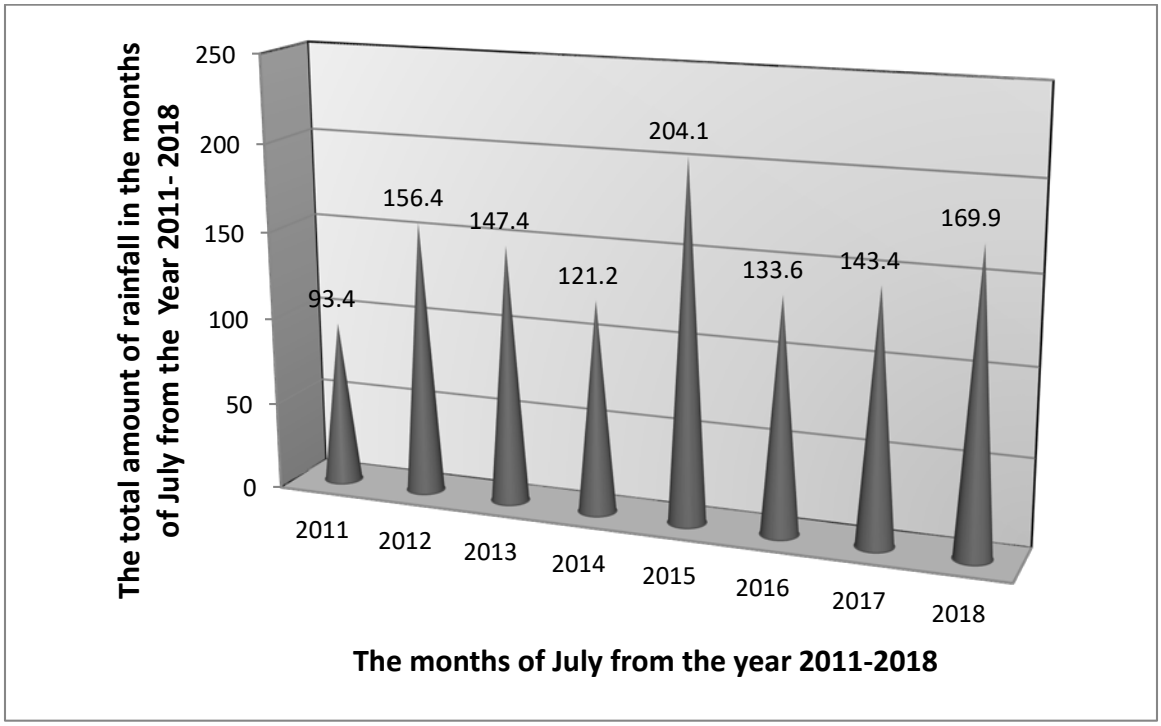

Fig 5.Shows the total amount of rainfall in the months of July from the year 2011-2018 (UBRDA, 2018).

Table 4 The impact and extent of flood destruction on farmlands of the respondents (n = 351)

VARIABLES	CATEGORY	FREQUENCY (n=351)	PERCENT % (p=100)
How much have you spent on the farm (in Naira)	≤10, 000	28	8.0
	11,000-20,000	35	10
	21,000-30,000	49	14
	31,000-40,000	95	27
	41,000-50,000	81	23
	≥50	63	18
What was the level of flood destruction on the farmlands	None	46	13
	Low	84	24
	Severe	123	35
	Highly severe	98	28
What was the approximate hectares of farmland destroyed by flood in the area	≤20 hectares	42	12
	21-40 hectares	53	15
	41-60 hectares	70	20
	61-80 hectares	105	30
	≥81 hectares	81	23
	≤ 20 %	25	7.0
	21-40 %	35	10

The flood reduces your farm output to about how many percent %	41-60 %	70	20
	61-80 %	123	35
	≥ 81%	98	28

Source: field survey, (2018).

The result on the impact and extent of flood destruction on farmlands of the farmers was depicted in table 4 above. Findings from the result has shown that 27.5% of the respondents spent 31,000-40,000 naira on their farming activities, while 23.5% of them revealed to had spent 41, 000-50,000 naira on the farm and ≥ 50, 000 naira was spent by 18 % of the sampled farmers in the area, also 8 % of the farmers had believed to spent ≤ 10, 000 on their farming cultural practices. It was reorted by National Emergency Management Agency (NEMA) in 2012 alone, Nigeria recorded a total estimated loss of N 2.29 Trillion (Sadiq, 2018). Most of the farmers(35 %) had the opinion that the flood destruction level on their farmlands was severe, while 28.5 % agreed that their farmlands experienced highly severe destruction, it was low (24%) on some farmlands and only 13.5 % of them also revealed to had none flood destructions level on their farmlands. It was also assessed from the study that 61-80 hectares of land were destroyed by the flood in the area with about 30 % of the framers agreed , while 23.5% of tem believed ≥ 81 hectares of farmlands were destroyed by the flood scenarios and 41-60 hectares of farmland were agreed by 20 % of the respondents in the sampled area while others 15 % of the farmers had the opinion that an approximate hectares of 21-40 were also destroyed by the flood and the remaining 12.5% of the respondent had experienced ≤ 20 hectares destruction of farmland in the study area. This result also agreed with the findings of Jay and Donald, (1977) explained that during the spring, floodwaters overflow the banks of low capacity channels and inundate thousands of acres of adjacent cropland in North Dakota. Similarly, the flood scenario reduced about 61-80 % of farm output of 35 % of farmers, 28 % of them agreed to have lost ≥ 80 % of their farm output by the flood actions in the study area.41-60 % of the farm output were significantly reduced by the flood destruction as agreed by 20 % of the sampled farmers while 10.5% of them also conceived that 21- 40 % lost in farm output was experienced on their farm and the remaining 7% believed to had lost ≤ 20 % of farm output respectively. Similar finding was also reported by Jay and Donald, (1977) that the farm operator loses part of his profit and he experiences an out-of-pocket loss when gross revenue is less than his production expenditures.

VIII. CONCLUSIONS

Agriculture still remains the major important sector of economy in Nigeria most especially in the current government as it is also remain the major primary functions of people along river Benue of Yola north LGA and environs. However, the farming system in the area has been associated with different problems of which flooding. is the most apparent and most destructive as well. The negative impacts of flood on farmers and farmlands in Yola north LGA and environs cannot be overemphasized. The results obtained from the study have revealed that the hundreds hectares of farmlands had been affected by flood and this led to negative impacts on the farming community members who engaged primarily in farming activities with low monthly average income. However, majority of the farmers in the area were well known about the flood scenarios which basically caused due to overflows of river Benue and heavy rainfall usually in the months of August and September respectively. In terms of farm output, majority of the respondents in the area suffered individual loss of more than 61-80 % as a result of 2018 flood. This indicates that the impact of flood on respondents were severe because majority of them spent more than 40, 000 naira on farming cultural practices and harvested an average annual farm output of less than 40 bags only. Thus, yield was revealed to have reduced with more 70 % due to flood damaged.

IX. RECOMMENDATION

Based on the findings obtained from this study, it is therefore recommends that there is a critical need to strengthen the social adaptation of farmers towards flood impacts and climate change. There is fervent need to encourage the farmers by the extension agents to practice good preparation operatory strategies such as early planting of short life cycle viable seeds with the aim of averting their farmlands to the flood vulnerability in the subsequent years and to ensure that farmers have proper flood-resistant storage to reduce the impacts of flood prior to harvesting period. Other than that, extension programs and agricultural agencies could help the farmers to redevelop their farms after the flood through re-cultivation of economic alternative crops and vegetables that could regenerate income temporarily before the farmers could resume their normal farming activities. Some of the long-term structural measures which is more necessary to minimize the damage caused by floods such as construction of river-embankments, multipurpose dams and rejuvenation of multi-purpose river Benue trough projects and more financing of Upper Benue irrigation projects in the study area should be implemented by the federal government. Simple drainage system should be constructed by the farmers with the aim of lessen the damage to their crops by floods owing to heavy rainfall for realizing profitable farming practices in the area.

REFERENCES

[1] Abdullahi, A. (2015). Employment creation and opportunities in the agro-allied sub-sector: The case of cassava production. *CBN Bullion Publication, 27(4): 10*

[2] Adebayo A.A, Oruonye E.D. (2012). An Assessment of the effects of the 2012 floods in Taraba State, Nigeria. Paper delivered at the Annual National Conference, organized by the *Association of Hydrological Science at University of Agriculture, Abeokuta, Ogun, state, Nigeria. 2013;13-18.*

[3] Adebayo, A.A and Tukur, A.L (1999) Edits. Adamawa sate in maps Publshed by Paracelete publishers Yola. ISBN 978-35157-0-5 PP.1-3, 12-14.

[4] Adewusi, H.G (I990). Combting Water Erosion and Floodin Gongola State. Wekly Scope 5 (133) : 10

[5] Angillieri, M.Y.E (2007) Morphometric analysis of colanguil river basin and flash flood hazard. Environmental Geology. San Juan, Argentina.;10:16-22.

[6] Ayoade, J.O (1988). Tropical Hydrology and Water Resources. MacMillan Publishers Ltd. London and Basingstoke.

[7] Chakraverty, A. (2004). Handbook of Agriculture by India council of Agricultural Resaerch New Delhi pp. 7-12 and 9.

[8] Daily, C., P. Dasgupta, Bolin, B. Crosson, P. Guerry, J. P., Ehrlich, P., Folke, C., Jansson, A. M., Janson, B. O., Kautsky, N., Kinzig, A. Levin, S., Maler, K. G., Pinstrup-Adersen, P., Sinisealco, D. and Walker, B. (1998). Food production, population growth and the environment. *Science* 281: 1291-1292.

[9] Dalrymple, T (1960). Flood frequency analysis. USA. Geological Survey Water Supply Paper1543A

[10] Dama F.M, Ishaku H. T and Abdurrahman B. I (2014) Analysis of the Determinants of Floods in Numan Town, Nigeria. Journal of Environmental Science and Engineering B 3 (2014) 264-273 doi: 10.17265/2162-5263/2014.05.005

[11] Eni, D. I, Atu, J.E, Oko,C.O and Ekwok,I. (2011). Flood and its impact on farmlands in Itigidi, Abi local government area, Cross River state, Nigeria. *International Journal of Humanities and Social Science Vol. 1:(9)* 98-104

[12] Etuonovbe, A. K. (2011). "Devastating effect of flooding in Nigeria. FIG Working Week." Accessed July 10, 2014. *http://www.fig.net/pub/fig2011/papers/ts06j/ts06j _etuonovbe_ 5002. pdf.*

[13] Ezedinma, F.O.C. (1982) Efficient use of Nigerian land resources. *In: Proceedings of the First National Seminar on Agric*. Land Resources held at Kaduna, Sept. 13-18.

[14] FAO (1983). World Food Security: a Reappraisal of the Concepts and Approaches. Director Generals Report, Rome

[15] FAO (2007). The State of Food and Agriculture 2007. FAO Agriculture Series. Retrieved from: http://www.fao.org/docrep/010/a1200e/a1200e00.htm.

[16] Festus. J. (2016) Assessment of spatio-temporal changes in land cover in Yola North using remote sensing and geographic information system (GIS) techniques. Being a dissertation submitted to department of geography Adamawa state University mubi in partial fulfillment of the requirements for the award of masters of Science (Msc. Hons) degree in remote sensing and geographic information system.Pp 14-15

[17] Hazran, Z., *Norsida. M., Nitty Hirawaty. K., Nolila. M. N. (2017). The Post-flood Impacts on Farmers, Agricultural Sector and Food Security in Kelantan. *International Journal of Academic Research in Business and Social Sciences 2017, Vol. 7, No. 9 pp 175-184 ISSN: 2222-6990*

[18] Jay A. L and Donald F. S (1997).Economic impact of flooding on agricultural production in Northeast Central North Dakota. Department of Agricultural Economics North Dakota Agricultural Experiment Station North Dakota State University Fargo, North Dakota Pp 1-62

[19] Mazumder, S.K (1983). Irrigation Engineering. Tata McGraw Hill Publishing Company New Delhi. Pp. 210-213.

[20] Mohammed K. (1999).Historical background in Adebayo A.A. and Tukur A. L. (Eds).Adamawa in Maps, Yola. Department of geography, Federal University of Technology Yola, and Paraclet Publishers, Nigeria.

[21] National Bureau of Statistic (2006), Yola Adamawa State, Nigeria.

[22] National Emergency Management Agency, NEMA: (2013) in Nigeria Hydrological Services Agency:(NIHSA) *Annual flood outlook for Nigeria April*,(2013). Presented by the Nigeria Hydrological Services Agency on 26th April, 2013.pp 10-26

[23] National population commission of Nigeria, N.P.C. (2006) population and housing figures, Yola http//www.population gov.ng.

[24] Obeta M.C.(2009). Extreme river flood events in Nigeria: A geographical perspective. *Nigerian Journal of Geography and the Environment. 2009;1:170-179.*

[25] OECD (2002). Glossary of Key Terms in Evaluation and Results Based Management. Available at: http://bit.ly/1KG9WUk

[26] Oyegun, R.O. (2001) Environmental problems of water resources development: Geographical perspective. In Ofomata GEK, Phil-Eze PO, editors; Geographical Perspectives on Environmental Problems and Management in Nigeria. Enugu, Jamoe Enterprises Nig;

[27] Sadiq A.A and Tekwa, I.J (2018) Soil fertility and Management practices in Mubi region. Published by Life-line international printing press,Yola Nigeria. Pp.3-5, 23-33, 65-70 ISBN: 978- 978-959-589-1

[28] Sadiq, A.A (2018). A review of dominant flood prone areas and extent in Adamawa state, North- eatern part of Nigeria. Paper presented at 2nd Annual Conference theme "*Environmental Science Technology and Security Challenges in Nigeria*." Organized by the college of Environmental science and Technology, Federal Polytechnic, Mubi held on 21st-23rd September, 2018.Pp 1-18.

[29] Serageldin, I (1987). *Poverty, Adjustment and Growth in Africa* World Bank, Washington, D.C., USA.

[30] Upper Benue River Basin Authority. (2018). Hydrological Year Book of the Upper Benue River Basin Authority, Yola, Nigeria.

[31] USDA (1993). West Virginia erosion and sediment control handbook for developing areas. In USDA. Sol conservation service: Morgantowa, W. V. West Virginia Division Highways (WVDOH) (2000). Standard specifications for roads and bridges, State Government, Charleston, W. V.

[32] Ward R.C.and Robinson. (1990). Principles of Hydrology. McGraw Hills Co.,Europe (England) pp.284-286.

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