Impact of Flood on Farming in Demsa Local Government Area. The Role of Credit and Subsidy Removal. Can Dry Season Farming Provide Alterative?

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Abstract

The study investigate the effects of flood on raining season agricultural output in Demsa and the resulting impact on dry season farming by identifying the role of agricultural credit and fuel subsidy removal. The major objective of the study is to evaluate the impact of climate change and flood on agricultural output and dry season farming considering the role of agricultural credit and fuel subsidy removal. The study used 150 structured questionnaires from three wards in Demsa LGA (Mbula, Borrong and Dilli). The findings revealed that climate change has a significant impact on agricultural produced in Demsa LGA which led to years of flooding thereby destroying and washing away of farmlands. The findings further suggests that loss of output as a result of flooding during the raining season makes farmers to consider dry season farming as an alternative. Also, agricultural credit contributes significantly to farmers participation in dry season farming while removal of fuel subsidy had serious impact on the farmers capabilities to engaged in dry season farming. The study recommends among others, the dredging of the river Benue to make the river deeper allowing free flow of water thereby reducing the impact of flood on their farmlands.

Key words: *Climate change, Agricultural, dry season farming, agricultural credit, subsidy*

INTRODUCTION

1.0 Background of the Research

The majority of the global warming over the past 200 years has been caused by human activity, according to climate scientists' findings (United Nations, 2020). Long-term changes in global temperatures and weather patterns are called climate change, and they can be caused by alterations in the sun's activity, volcanic eruptions, and human activity like burning fossil fuels (United Nations, 2020). In light of the record high global temperatures and the catastrophic

weather events that will impact people worldwide in 2024, it is critical to reverse direction and step-up efforts to address the climate issues. The Paris Agreement, a historic climate pact signed in 2015, allows world leaders to assess progress and develop a plan of action to systematically cut emissions and save lives and livelihoods. This is made possible by the United Nations Climate Change Conference or Conference of the Parties (COP28, 2024).

According to data from the International Federation of Red Cross and Red Crescent Societies (IFCR 2012), 30 out of the 36 states were impacted by the floods in Nigeria in 2012, and approximately 7.7 million people were displaced and over 2.1 million had registered with the IDP camps. Additionally, 64473 people were injured and 202 people lost their lives. Seven million people were reportedly affected by the floods, which were dubbed the worst to hit Nigeria in 40 years (Nkwunonwo 2016).

At least 2.8 million people have been impacted by the flood in 2023, and the devastating effects of this natural disaster have resulted in the deaths of over 600 people and the displacement of numerous more communities (IFCR, 2023). Although the most of these floods were thought to be primarily caused by climate change, additional factors that are causing flooding in the nation include increased urbanization and a lack of dredging of the major rivers, the Niger and Benue. Sand flooding of the Benue River, which runs through Demsa Local Government and into Numan, poses a major risk of flooding calamity. This devastating flood disasters which led to the displacement of communities in Demsa Local Government resulted to low agricultural productivity during the raining season in the area.

According to the United Nations Climate Change Performance Index (CCPI, 2024), Nigeria is among the few developing countries to have set an economy-wide emissions reduction target. The Nationally Determined Contribution (NDC), updated in 2021, pledges an unconditional contribution of 20% below business-as-usual by 2030 and a 47% contribution conditional on international support. The conditional target was increased from 45% to 47%. Nigeria has also a net-zero target of 2060. But despite these targets, fossil fuels are expected to remain a significant part of Nigeria’s energy mix in the near future. The United Nation Climate Scorecard has it that Nigeria is ranked among the top ten nation’s most susceptible to the effects of climate change and natural disasters. There must be cumulative effects on Nigeria's social, economic, and environmental structures as a result of increased susceptibility. Particularly severe rainfall and flooding can have a major impact on the environment, society, the state of food security, and the overall economy. Significant effects are also anticipated for the nation's agricultural, health, and water resources sectors. Both urban and rural communities are at risk from rising temperatures, flooding, increased aridity, and soil erosion.

Nigeria was hit by two major natural disasters in 2012 a severe drought in the northeast and e xtensive flooding that nearly destroyed the entire nation. Prior to the discovery of crude oil, the agricultural sector accounted for over two-thirds of the nation's total export revenue and over 75% of the national income. Anyanwu (1997) asserts that "agriculture has been the nation's main source of gainful employment from which it can feed its teeming industries, as well as a reliable source of government revenue." Nigeria's national output is largely derived from agriculture, with smallholder farmers accounting for the majority of this contribution (Rahji and Fakayode 2009). However, these farmers' productivity and growth are hindered by their limited access to credit, which is expected to be essential for the expansion and development of agriculture. Less than a month after the announcement in May 29th , 2023 that subsidies would no longer be provided in Nigeria, the Nigerian Analysis Team of the United States Agency for International Development (USAID)2023 reports that the average cost of food items in Northeast Nigeria has increased by 53%, farm inputs by 71%, farm laborers' wages by

149%, and transportation costs by 137%. Flooding and the elimination of fuel subsidies were cited as the main causes of the cost rises in northeastern Nigeria. While food shortages were directly caused by flooding, input and transportation prices increased as a result of the loss of fuel subsidies. According to farmers who took part in USAID focus groups and interviews, Agricultural Market Actors in the states of Borno, Adamawa, Yobe, and Gombe report that fewer people are cultivating in 2023 than in prior years. Because of the high expense of transportation, some impoverished farmers are unable to afford to travel to their farms and cannot afford to purchase the escalating expensive farm inputs. The number of times that those who can afford to travel to their farms have visited their farmed plots has decreased.

1.2 Statement of problem/ Justification

Demsa is one of the 21 local governments in Adamawa State northeastern Nigeria with farming as one of the major economic activities which has dominated the area. Crops such as corn, guinea corn, beans and rice were grown during the raining season but a decade long flood disaster in most of the communities, most farmers resort to dry season or irrigated farming as an alternative. Even though dry season farming has been in practiced in these communities, the activity has increased owing to the establishments of micro finance credit institutions such as Agricultural Credit Guarantee Scheme (ACGSF), credit access particularly small holders' farmers (Nigeria Incentive-Based Risk Sharing System for Agricultural Lending, NIRSAL) which is a $500 million dollars non- bank financial institution own by the Central Bank of Nigeria (CBN). This was created to redefine, measure, re-price and share agribusiness related credit hazards that are mostly insufficient in Nigeria and other private individual firms. For example, the majority of farmers during the dry season either borrowed money from vendors in rural areas who charged high interest and typically preferred to be reimbursed with farm produce, or they utilized their own personal income. Some also collaborate with others from outside these communities who gave them money on a predetermined share basis following harvest.

The Nigerian President announced the removal of gasoline subsidy in May 29, 2023, which caused the price of petroleum to soar from roughly 250 naira per liter to 750 per liter at filling stations in the nation's largest cities. Even yet, given that rural areas lack access to filling station pricing controls, the product's price may be greater there. These have had a significant impact on Demsa Local Government Area's dry season activities. This is due to the fact that many people, despite the fact that petroleum subsidies have both beneficial and negative effects on the economy, could not afford these items to irrigate their crops in addition to the financial hardship caused by their removal. On the other hand, the farmer was led to believe that the withdrawal of subsidies would help them by giving them access to reasonable credit facilities, inexpensive farming inputs, and fair pricing for their agricultural products. Could dry season farming be an alternative to Demsa local government given the growing worry over climate change causing increased floods, low seasonal agricultural productivity, economic suffering due to the elimination of subsidies, and inadequate agricultural credit facilities?

1.3 Objectives of the study

The research objectives of this study are to investigates the effect of flood on raining season agricultural output in Demsa and the resulting impact on dry season farming by identifying the role of agricultural credit and fuel subsidy removal in the area. The specific objective of this study is as follows:

i. To analyzed the effect of climate change on flood an it resultant impact on agricultural output in Demsa local government,
ii. To examine the impact of dry season farming as an alternative due to seasonal flood in Demsa local government,
iii. To access the contribution of agricultural credit facilities on dry season farming in Demsa local government,
iv. To investigates the impact of fuel subsidy removal on cost of agricultural production in dry season farming in Demsa local government.

1.4 Research Hypothesis

This study sought to test the following null hypothesis

a. **Ho_1**: Climate change has no significant effect on flood and it resultant effects on agricultural output in Demsa LGA
b. **Ho_2**: Flood has no significant impact on dry season farming as an alternative in Demsa LGA
c. **Ho_3**: Agricultural credit facilities have no significant contribution on dry season farming in Demsa LGA
d. **Ho_4**: Fuel subsidy removal have no significant impact on the cost of production in dry season farming in Demsa LGA

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 *Stylized Fact on Agricultural Credit in Nigeria*

With over 70% of the country's export revenue coming from agriculture, Nigeria's economy was significantly stimulated in the 1960s and 1970s (Central Bank of Nigeria 1970). But agriculture had a significant setback in the early 1980s, which led to more funding for the industry in the following twenty years. Among the programs for financing agriculture are: i. N200 billion Commercial Agriculture Credit Scheme: This program, which was launched in 2009, was designed to finance significant initiatives in the agricultural value chain. ii. The Agricultural Credit Guarantee Scheme Fund (ACGSF) was developed to incentivize financing to the agricultural industry by offering commercial banks a guarantee. In addition to the program, the Bank offers farmers who make on-time repayments a 40% interest rebate through its interest drawback program. iii. The Agricultural Credit Support Scheme (ACSS) offers credit facilities with a fixed interest rate. Beneficiaries of the scheme are entitled to a percentage of the interest returned back when they repay the loan on time. The commercial banks have been the main drivers of the steady growth of credit to the Agricultural sector since early 2006. According to Bagehot (1873) and Hicks (1969), it enabled the capital to be raised for "immense works" throughout England's industrialization. While Schumpeter (1912) claimed that efficiently operating banks promote technical innovation by locating and supporting business owners who have the best prospects of bringing novel ideas to market and streamlining production methods. Some economists, on the other hand, disagree that there is a connection between credit and growth. Levine (1997) asserted, however, that future rates of capital accumulation, technical advancement, and economic growth may all be accurately predicted by the state of the financial system. While less developed theoretical literature demonstrated that changes in economic activity could influence financial systems, proponents of theory have also claimed that financial instruments, markets, and institutions originate to limit the effects of information and transaction cost.

Musgrave Theory of Public Expenditure

According to Musgrave's (1997) theory of public expenditure, the efficacy of government spending is the most important factor. Economic growth may suffer if government expenditure in the "productive" category is ineffective. Musgrave developed this idea after observing variations in the demand for public services across three ranges of per capita income. First off, there is typically very little demand for public services at low levels of per capita income. This is true because the fundamental purpose of such revenue is to meet necessities. Second, as per capita income begins to climb above these low-income levels, there is an increase in demand for public sector services including transportation, health, education, and agriculture.

Keynesian Public Expenditure Theory

According to the Keynesian school of thought, government expenditure can support sectorial growth in an economy, such as that of the agriculture sector. Therefore, through multiplier effects on aggregate demand, a rise in government spending is anticipated to result in an increase in employment, profitability, and investment. As a result, government spending raises aggregate demand, and depending on expenditure multipliers, this raises output. According to Keynes (1936), public spending is an exogenous component that can be used as a tool for policy to encourage production growth. 2015; Ewubare & Eyitope). Government support of agriculture is therefore more likely to increase agricultural output.

Traditional view of Public Spending

Rather than being the engine of economic progress, government spending is thought to be the destabilizing factor in a nation's economic development. Classical economics think that full employment equilibrium in the economy will be ensured by the forces of the invincible hand, or free markets. The classical economists held that the government should only have a limited role in promoting the rule of law and domestic security, and that the economy should be allowed to function on its own (Chipaumire, 2014).

2.2 Empirical Literature

Olowofeso et al (2017). examines the relationship between credit and output in Nigeria's agricultural sector using nonlinear ARDL evidence. The results indicate that there is no evidence of asymmetry in the short-term link between loan and output growth in the agriculture sector, but that there are distinct equilibrium correlations in the long run. The impact of credit availability on agricultural output in Nigeria is investigated by Awotide et al. (2015). The results show that the size of the farm and the total number of cattle have a favorable and statistically significant impact on the farmers' ability to obtain financing. It also shows that the number of livestock units and farm size are negatively and statistically significantly related to the variations in cassava productivity among farmers who have access to credit, whereas the differences in productivity among farmers who do not have credit are negatively and statistically significantly related to household size, farm size, and information asset access.

Adewale (2023) in his work impact of credit on the climate adaptation utilization among food crop farmers in Southwest, Nigeria used Descriptive statistics and the endogenous treatment Poisson regression (ETPR) model. The findings revealed that credit status positively and significantly affected the intensity of CAS utilization. Furthermore, on the average, NCT farmers adopt 1.629 times more CAS than the CCT farmers.

An analysis of the effect of flooding on food crop production in Kaduna State was conducted by Adedapo et al. in (2020). They employed a structured questionnaire and the purposive sample technique to gather information from 380 farmers who grow food crops. Chi square

and descriptive statistics were used in their study. The results showed that 93% of the respondents were flood-prone, and 96% of them normally experienced flooding at least once every five years. The survey also reveals that more than 50% of respondents were impacted by poverty, food insecurity, deterioration of roads and other infrastructure, and loss of soil nutrients.

Jonathan, et al (2020). Utilizing logistic regression modeling, food security index, and descriptive statistics, examine the financial impact of the flood disaster on the food security of arable farming households in the southern Guinea savanna zone of Nigeria. The results showed that the years of education, household expenses, and flooding were the significant coefficients. Using a structured questionnaire, Ibrahim, et al (2020) investigated the effects of flooding on crop producers in Niger State, Nigeria. Ordinary least square, perception index, and descriptive statistics were used to analyze the data. According to the results, 50% of respondents experienced floods once a year, and 94.84% of respondents cited river overflow as the main cause.

Udemezue, et al (2019) investigated how floods affected Nigeria's Anambra state's small-scale farmers. Data were examined using frequency, percentage, mean scores, and standard deviation using structured questionnaires. The study's findings showed that farmers viewed the loss of their farms (2.72), hunger and starvation (2.59), displacement from their natural habitat (2.59), loss of properties (2.55), high rates of poverty (2.53), poor health (2.35), death of family members (2.25), and causing damage to roads (2.13) as extremely serious effects on their ability to make a living. Shehu (2014). Utilizing descriptive statistics, partial farm budget analyses, and t-tests, the study evaluates the impact of flood vulnerability on farming households' profitability in Kwara state, Nigeria. Except for the lone rice (E1) enterprise, all of the enterprises produced a positive average return on farmer labor and management (RLM), according to the data.

Roland et al. (2023) investigated the impact of floods on agriculture output in Sub-Saharan Africa. Their objective is to analyze the effects of multiple cases of flash, coastal and riverine-cum-pluvial floods on agriculture productivity in three geo-ecological zones of Cameroon. Their findings revealed that agriculture-dependent livelihoods have a negative impact across all the geo ecological Zones. Besides the economic losses, which were high in all the geo-ecological zones, a high regional variance was observed for other parameters, such health hazards, physical injuries, and the loss of human lives.

Epsar et al. (2024) investigated the flood impact on agricultural activities along river Dilimi, Jos North Local Government Area of Plateau State. The aim is to utilized a satellite image of 2021 to digitize urban agricultural farmland along River Dlimi. It revealed that severity of the flood is mostly felt around the lower point along the river and the economic impact is felt by farmers along river Dilimi mostly in the month of July, August, and September as a result of heavy rainfall leading to overflow of the river bank thereby making agricultural land use areas to submerge and leading to a break in constant crop practice along river Dilimi within the Study area. Ma'aruf and Muhammad (2023) examines the Effects of flood on agricultural production in Auyo Local Government Area of Jigawa State, Nigeria using primary and secondary data. Their findings revealed that the relationships rice yield and flood occurrence show that flood exert much negative effects on rice yield.

Adewunmi, et al (2014). Using data from 1980 to 2012, examine the short- and long-term effects of the withdrawal of gasoline subsidies on Nigeria's socioeconomic development. The results demonstrate that the elimination of fuel subsidies has no immediate effect on Nigerians' social well-being. The long-term effects of this policy, however, are quite positive, as it has

been shown that deregulating the downstream industry will eventually contribute to the nation's future economic growth.

Ibrahim and Tasi'u (2020) determine the effects of flood on agricultural output in Ringim Local Government Area Jigawa State. They used descriptive statistics, t-test and Likert scale of analysis. Their findings revealed that flood poses serious damages to agriculture and economic resources of the study area in terms of damage to farmlands, loss of crops and loss of livestock.

Ikpe et al. (2023). Assessed farmers' perception on the impact of climate change on crop production in Benue state, Nigeria using 385 questionnaires. Their findings shows that Climate change has negatively effects on crop output. Thus, majority of the farmers are aware of climate change issues.

Ozor (2023) examine the impact of climate change on crop output in Nigerian by utilizing tike series data. He employed ARDL model and the findings shows that the long run impact of rainfall on crop output is close to one, indicating that any excess inch in rainfall would likely impede crop production by the same magnitude.

Samson (2024) examined the impact of fuel subsidy removal on agricultural output among smallholder farmers in Niger state, Nigeria. He employed structured questionnaires distributed to 120 smallholder farmers and a multistage stage random sampling procedure to select farming household from each village. Descriptive statistics, regression and Likert type scales were employed to analyze the data. The findings revealed that fuel subsidy removal has negative effects on agricultural output with challenges such as increased in transportation cost, inadequate vehicles to transport produce to the market due to high cost of fuel, poor sales and lastly increase in prices of agricultural commodities in the country.

2.3 Theoretical framework

Planetary Theory of Motion

Planetary motion theory developed by Johannes Kepler. According to the idea, the natural gravitational and magnetic oscillations of the solar system caused by the planet's motion through space can account for much, if not all, of the warming observed in the latter half of the 20th century. Climate change is driven by these oscillations because they modulate solar fluctuations and/or other alien effects on Earth. The earliest indication of an alien impact on climate on a multi-millennial timescale linked to planetary motion came from Serbian scientist Milutin Milankovitch, whose findings were published in 1941. Scientists are now able to precisely evaluate these effects on climate thanks to more recent discoveries. Instead of being a circle, Earth's orbit around the sun is an ellipse, with the planet moving further away from the sun at one end of the orbit than at the other end.

METHODOLOGY

3.1 Description of the study area

Demsa Local Government Area is located in Adamawa State, the northeastern Nigeria, and it is among the four administrative divisions of the State. Demsa occupies about 674.23 square Kilometers with a total population of about 87.254 people. The mean annual rainfall in this area is 140-160cm annually. Rainfall is at its peak in the months of August and October while it is low in the months of July. The mean annual Temperature is 18°C -27°C. This area occupies the northern guinea savanna vegetation of Adamawa State and is characterized by the same plants such as Afzelia Africana, Paradoxa, laxiflora, wood species with pennisetum and klyparrhrnia as the grass under growth. The major occupation of this area is farming and fishing perhaps due its proximity to the Benue River. According to Adebayo and Umar (1999), the

drainage of Adamawa State is dominated by three main drainage systems-the Benue, the Yedzaram and the Taraba. River Gongola also transports a large amount of sediment which accumulates at the river mouth near Numan (Federal Ministry of Water Resources, FMWR, 1994).

3.2 Research Design

The research design for this study is a triangulation method as a standardized and comprehensive research design. The quantitative method of data collection is achieved via the deployment of both structure and semi-structured questionnaires which was administered across different dry season farmers within the study location. The qualitative technique on the other hand, is achieved through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) where by comprehensive interviews guides was designed.

3.3 Source and Method of Data Collection

The data for this study is purely primary source that was collected via certified and piloted structured questionnaire.

3.4 Sampling Technique

In order to achieve unbiased estimators, a multi-stage sampling technique was employed, but with specific interest to proportional stratified, cluster and systematic random sampling techniques which will be implemented in three stages. In the first stage, the researcher used purposeful and cluster sampling techniques whereby three wards have been proposed. The wards are Mbula, Borrong and Dilli. These areas were carefully selected as the first three that are located along the river Benue. The second stage of the sampling technique considers certain socio-economic features such as income level of farming, income size, the intensity of economic activities. The researcher, at the last stage of the sampling used systematic random sampling technique in the selection of number of farmers at 20^{th} interval in low income/high density, 10^{th} interval in medium income/medium density and 5^{th} interval in high income/low density residential areas. Thus, a sample of 50 farmer was drawn from the three wards of Mbula, Borrong and Dilli making the sample size to be 150 farmers.

The use of multi-stage sampling technique was adopted because of its easy implementation and could create a more representative sample of the population than the conventional single sampling technique. In other words, it is both cost and time efficient while retaining both the randomness and sufficient size of the sample particularly in a general sampling frame like this. This sample technique is in tune with the recommendations of Maiyaki (2012) and Balian (1982).

3.6 Method of Data Analysis

The data collected were analysed using descriptive techniques such as tables and simple percentages and Chi-square analysis.
The expected outcome of the research will be useful in providing robust practical roadmap for achieving an efficient sufficiency in food production for sustainable development. It will also contribute to the global knowledge bank on climate change and its impact on seasonal agricultural output the role of flood, fuel subsidy removal and dry season farming. Lastly, the outcome will provide a comprehensive knowledge that will fill in the research gap identified during the literature review.

DATA PRESENTATION AND ANALYSIS

4.1 Data Presentation

Table1: Demographic information

Qualification	Variables	Frequency	Percentage
	PhD/ MSc	12	8
	BSc	30	20
	Diploma/ NCE	70	46.7
	SSCE	18	12
	Primary School	20	13.3
	Total	**150**	**100%**
Age	15-25	2	1.3
	26-35	10	6.7
	36- 45	70	46.7
	46 and above	68	45.3
	Total	**150**	**100%**
Gender	Male	137	91.3
	Female	13	8.7
	Total	**150**	**100%**
LGA ward	Mbula	50	33.33
	Borrong	50	33.33
	Dilli	50	33.33
	Total	**150**	**100%**
Marital Status	Single	19	12.6
	Married	117	78
	Divorced	4	2.7
	Widow/Widower	10	6.7
	Total	**150**	**100%**

Source: Authors Field survey, 2024

The demographic data in Table1 shows that most of the respondents falls within the educational qualification of Diploma/NCE and BSc as their highest qualification with about 46.7% and 20% receptively, while Primary school and SSCE account for about 13.3% and 12% respectively but PhD account for only 8% of the respondents. About 46.7% and 45.3% of the respondents falls within the age of 36-45 and 45 above, while 6.7% and 1.3% falls within the age 15 to 35 which are perceived to be in school resulting to their low participation. Majority of the respondents are male accounting for about 91.3% and the remaining 8.7 are female respondents and among these respondents 12.6%, 78%, 2.7% and 6.7% were either Single, Married, Divorced or widow/widowers respectively.

Table 2: Climate change and flooding

Variable	Frequency	Percentage
Have you observed any changes in flood patterns in your area?		
Yes	130	86.7
No	20	13.3
Total	**150**	**100%**
How have floods affected your agricultural output?		
Not affected at all	2	1.33
Minimally affected	5	3.34
Moderately affected	15	10
Severally affected	57	38
Extremely affected	71	47.33
Total	**150**	**100%**

Source: Authors Field survey, 2024

On the issue of climate change and flooding in Table 2, about 86.7% of the 150 respondents claimed that they had observed changes in flood patterns in the area, while 13.34% do not observed any changes in flood patterns. Furthermore, 47.33% and 38% of the respondent's agricultural output were extremely and severally affected by flood, while 10% and 3.34% were moderately and minimally affected but only 1.33% were not affected at all by the flood.

Table 3: Dry season farming

Variable	Frequency	Percentage
Do you engage in dry season farming?		
Yes	120	80
No	30	20
Total	**150**	**100%**
If yes, what crops do you grow during the dry season?		
Rice	94	62.7
Maize	6	4
Potatoes	15	10
Guinea corn	35	23.3
Total	**150**	**100%**
Has flooding influenced your interest to engage in dry season farming?		
Yes	137	91.3
No	13	8.7
Total	**150**	**100%**
How has flooding impacted your participation in dry season farming?		
Not impacted at all	3	2
Minimally impacted	5	3.3
Moderately impacted	21	14
Severally impacted	54	36
Extremely impacted.	67	44.7

Total	**150**	**100%**

Source: Authors Field survey, 2024

Table3, revealed that 80% of the 150 respondents engaged in dry season farming out of which 62.7% grow rice, 4% maize, 10% potatoes and 23.3% guinea corn. While only 20% of the respondents do not engage in dry season farming. About 91.3% of the respondents claimed that flood has influenced their interest to engaged in dry season farming, while 8.7% were motivated by the profit gains in dry season farming. Flooding has impacted most of the respondent's participation in dry season farming with about 44.7% and 36% extremely and severally impacted, 14% and 3.3%, moderately and minimally impacted while 2% not impacted at all.

Table 4: Agricultural credit facilities

Variables	Frequency	Percentage
Have you accessed agricultural credit facilities?		
Yes	7	4.7
No	143	95.3
Total	**150**	**100%**
If yes, how have these facilities impacted your dry season farming?		
Not impacted at all	1	0.7
Minimally impacted	12	8
Moderately impacted	19	12.7
Severally impacted	20	13.3
Extremely impacted	98	65.3
Total	**150**	**100%**
Do you believe agricultural credit facilities are essential for dry season farming?		
Yes	135	90
No	15	10
Total	**150**	**100%**

Source: Authors Field survey, 2024

Table 4, revealed that only 4.7% of the respondents had ever accessed any agricultural credit facilities while 95.3% had never accessed any agricultural credit facilities in the Area. But the few who had accessed to any agricultural credit facilities claimed that the facilities have impacted their dry season farming with about 65.3% and 13.3% extremely and severally impacted, 12.7% and 8% moderately and minimally impacted, while only 0.7% were not impacted by the credit. About 90% of the respondents believed that agricultural credit facilities are essential for dry season farming while 10% believed otherwise.

Table 5: Fuel subsidy removal

Variables	Frequency	Percentage
Have you noticed any changes in the cost of production for dry season farming since the fuel subsidy removal?		
Yes	133	88.7
	17	11.3

No **Total**	**150**	**100%**
How has the fuel subsidy removal affected your dry season farming costs? Not affected at all Minimally affected Moderately affected Severally affected Extremely affected **Total**	 5 10 23 20 92 **150**	 3.3 6.7 15.3 13.3 61.4 **100%**
Do you believe the fuel subsidy removal has affected your ability to engage in dry season farming? Yes No **Total**	 136 14 **150**	 90.7 9.3 **100%**

Source: Authors Field survey, 2024

Table 5, revealed that 88.7% of the respondents' noticed changes in the cost of production for dry season farming since the removal of fuel subsidy, while 11.3% do not noticed. But about 61.4% to 13.3% of the respondents extremely and severally affected by the cost due to the removal of fuel subsidy, 15.3% and 6.7% were moderately and minimally affected, while 3.3% were not affected by the cost due to the removal of fuel subsidy. This has largely affected about 90.7% of the respondent's ability to engage in dry season farming, while 9.3% of the respondent's ability was not affected.

4.2 Data Analysis

This section deals with testing of the hypothesis. The criteria used for accepting or rejecting of this hypothesis are based on the outcome of the findings considered in data presentation. If the calculated chi-square value (X^2) is greater than or equal to the tabulated value at 0.05 level of significance, the alternate hypothesis (H_1) is accepted, but if the calculated chi-square value is less than the tabulated value, the null hypothesis (H_0) is rejected.

Test of Hypothesis 1 on the effect of climate change and it impact of agricultural output

Ho: Climate change has no significant effect on flood and its resultant effects on agricultural output in Demsa LGA

H_1: Climate change has a significant effect on flood and its resultant effects on agricultural output in Demsa LGA

Data from Table2: Analysis of Respondent's Responses on climate change and flooding. Hypothesis is tested at the 0.05 level of significance.

Table 6: Determination of Observed Frequency for Hypothesis 1

Variables	**O**	**E**	**O - E**	**$(O-E)^2$**	**$\frac{(O-E)^2}{E}$**
Not affected at all	2	30	28	784	26.13
Minimally affected	5	30	25	625	20.83
Moderately affected	15	30	15	225	7.5

Severally affected	57	30	-27	729	24.3
Extremely affected	71	30	-41	1681	56.03
Total	150	150	0	4.044	$\mathbf{X^2}$ = 216.96

Note: O = observed frequency, E = expected frequency

Source: Author's computation

The calculated chi-square (X^2) value = 216.96

$E_i = \frac{Sum\ of\ responses}{No\ of\ categories} = \frac{150}{5} = 30$

Degree of Freedom (DF) = n-1

Where n is the number of categories

DF = 5-1 = 4

Level of significance = 0.05

Critical value, that is, X^2 Tabulated = 9.488

Decision Rule on the effect of climate change on it impact on agricultural output

Since the X^2 tabulated value of 9.488 is less than its calculated value of 216.96, we reject the null hypothesis and accept the alternate hypothesis. The alternate hypothesis states that climate change has a significant effect on flood and its resultant effects on agricultural output in Demsa LGA. This indicates that climate change has seriously affected agricultural output by destroying and washing away of farm produce and its persistence has created fears for raining season farming in the Area.

Test of Hypothesis 2 on the impact of dry season farming

Ho: Flood has no significant impact on dry season farming as an alternative in Demsa LGA

H_1: Flood has a significant impact on dry season farming as an alternative in Demsa LGA

Data from Table3: Analysis of Respondent's Responses on dry season farming. Hypothesis is tested at the 0.05 level of significance.

Table 7: Determination of Observed Frequency for Hypothesis 2

Variables	**O**	**E**	**O - E**	$\mathbf{(O-E)^2}$	$\frac{\mathbf{(O-E)^2}}{\mathbf{E}}$
Not affected at all	3	30	27	729	24.3
Minimally affected	5	30	25	625	20.83
Moderately affected	21	30	9	81	2.7
Severally affected	54	30	-24	576	19.2
Extremely affected	67	30	-37	1369	46.53
Total	150	150	0	3380	$\mathbf{X^2}$ = 67.03

Note: O = observed frequency, E = expected frequency

Source: Author's computation

The calculated chi-square (X^2) value = 67.03

$E_i = \frac{Sum\ of\ responses}{No\ of\ categories} = \frac{150}{5} = 30$

Degree of Freedom (DF) = n-1

Where n is the number of categories

DF = 5-1 = 4

Level of significance = 0.05

Critical value, that is, X^2 Tabulated = 9.488

Decision Rule on the impact of flood on dry season farming as an alterative

Since the X^2 tabulated value of 9.488 is less than its calculated value of 67.03, we reject the null hypothesis and accept the alternate hypothesis. The alternate hypothesis states that flood has a significant impact on dry season farming as an alternative in Demsa LGA. This suggests that lost of output as a result of flooding during the raining season makes farmers to consider dry season farming as an alternative.

Test of Hypothesis 3 on the impact of agricultural credit facilities

Ho: Agricultural credit facilities have no significant contribution on dry season farming in Demsa LGA

H_1: Agricultural credit facilities have a significant contribution on dry season farming in Demsa LGA

Data from Table4: Analysis of Respondent's Responses on agricultural credit. Hypothesis is tested at the 0.05 level of significance.

Table 8: Determination of Observed Frequency for Hypothesis 3

Variables	**O**	**E**	**O - E**	**$(O-E)^2$**	**$\frac{(O-E)^2}{E}$**
Not affected at all	1	30	29	841	28.03
Minimally affected	12	30	18	324	10.8
Moderately affected	19	30	11	121	4.03
Severally affected	20	30	10	100	3.33
Extremely affected	98	30	-68	4624	154.13
Total	150	150	0	6010	**X^2** = 200.32

Note: O = observed frequency, E = expected frequency

Source: Author's computation

The calculated chi-square (X^2) value = 200.32

$E_i = \frac{Sum\ of\ responses}{No\ of\ categories} = \frac{150}{5} = 30$

Degree of Freedom (DF) = n-1

Where n is the number of categories

DF = 5-1 = 4

Level of significance = 0.05

Critical value, that is, X^2 Tabulated = 9.488

Decision Rule on the impact of agricultural credit

Since the X^2 tabulated value of 9.488 is less than its calculated value of 200.32, we reject the null hypothesis and accept the alternate hypothesis. The alternate hypothesis states that agricultural credit facilities have a significant contribution on dry season farming in Demsa LGA. This revealed that even though majority of the respondents have never accessed any agricultural credit in the Area, they believe that agricultural credit will contribute significantly on their participation in dry season farming. This will also encourage large cultivation which will eventually led to increase productivity.

Test of Hypothesis 4 on the impact of fuel subsidy removal

Ho: Fuel subsidy removal have no significant impact on the cost of production in dry season farming in Demsa LGA

H_1: Fuel subsidy removal have a significant impact on the cost of production in dry season farming in Demsa LGA

Data from Table5: Analysis of Respondent's Responses on fuel subsidy removal. Hypothesis is tested at the 0.05 level of significance.

Table 9: Determination of Observed Frequency for Hypothesis 4

Variables	**O**	**E**	**O - E**	**$(O-E)^2$**	**$\frac{(O-E)^2}{E}$**
Not affected at all	5	30	25	625	20.83
Minimally affected	10	30	20	400	13.33
Moderately affected	23	30	7	49	1.63
Severally affected	20	30	10	100	3.33
Extremely affected	92	30	-62	3844	128.13
Total	150	150	0	5018	**X^2** = 167.25

Note: O = observed frequency, E = expected frequency

Source: Author's computation

The calculated chi-square (X^2) value = 167.25

$E_i = \frac{Sum\ of\ responses}{No\ of\ categories} = \frac{150}{5} = 30$

Degree of Freedom (DF) = n-1

Where n is the number of categories

DF = 5-1 = 4

Level of significance = 0.05

Critical value, that is, X^2 Tabulated = 9.488

Decision Rule on the impact of fuel subsidy removal

Since the X^2 tabulated value of 9.488 is less than its calculated value of 167.25, we reject the null hypothesis and accept the alternate hypothesis. The alternate hypothesis states that Fuel subsidy removal have a significant impact on the cost of production in dry season farming in Demsa LGA. This implies that the removal of fuel subsidy has a serious impact on the farmers capabilities to engaged in dry season farming. Inadequate agricultural credit coupled with high cost of fuel has render some farmers incapacitated since dry season farming is capital intensive.

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study investigates the effect of flood on season agricultural output in Demsa and the resulting impact on dry season farming by identifying the role of agricultural credit and fuel subsidy removal. The findings revealed that climate change has a significant effect on agricultural output in Demsa LGA. This has led to decades of flooding thereby distracting farming activities by destroying and washing away of farm produce and its persistence has created fears for raining season farming in the Area. On the issue of dry season farming, the findings suggests that loss of output as a result of flooding during the raining season makes farmers to consider dry season farming as an alternative. The location of the three Local Government Wards (Mbula, Borrong and Dilli) proximity to the river Banue makes raining season farming a huge gamble and dry season farming a huge gain since water can be accessed easily from the river.

Even though majority of the respondents have never accessed any agricultural credit in Demsa Local Government Area, they believe that agricultural credit will contribute significantly on their participation in dry season farming. This will also encourage large cultivation which will eventually led to increase productivity as revealed by the findings. The removal of fuel subsidy had serious impact on the farmers capabilities to engaged in dry season farming. Inadequate agricultural credit coupled with high cost of fuel has render some farmers incapacitated since dry season farming is capital intensive. This has severely crippled dry season farming which contribute significantly to household income in Demsa Local Government Area.

5.2 Recommendations

In line with findings, the following recommendations were sought.

i. Since climate change has significant impact on agricultural output in Demsa LGA, the dredging of the river Benue will be a game changer for the people of Demsa. This will make the river deeper allowing free flow of water thereby reducing the impact of flood on their farmlands. Though the Nigerian Senate has included this in the 2024 Appropriation Bill to addressed the perennial flood in virous revers in the country including river Benue, the implementation is key to actualising these goals.

ii. Agricultural enlightenments programmes such as seminars, symposium, televised and radio broadcast should be organised in the three wards of Mbula, Borrong and Dilli to educates farmers on climate change variations which caused flooding and advising them to engage more in the dry season farming which has less or no risk of flood disaster. This has been proven to be more productive and sustainable than the raining season farming.

iii. Capital is a major challenge in the dry season farming. Many farmers were constraints due to lack of capital. Despite numerous agricultural credit facilities such as Bank of Agriculture, Agricultural Credit Support Scheme (ACSS), Commercial Agricultural Credit Scheme (CACS), Agricultural Credit Guarantee Scheme Fund (ACGSF) and The Nigerian Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL), majority of farmers in Demsa never heard or find it difficult to access these facilities. This is attributed to long processes, sureties, collateral, lack of feedback, nepotism, sentiments and lack of adequate information on how, who, when and where to apply for these facilities. A proper detailed publicity of the advantages of these facilities should be organised in the rural areas where these farmers are located and interpreting in local language all processes involve from application to securing the credit.

iv. The removal of fuel subsidy has increased the cost of dry season farming rendering a lot of people in Demsa to abandoned it due to surge in agricultural inputs. Government can also subsidize agricultural inputs such as fertilizer, herbicides, transportation and the supply of water for farmers to irrigates their farms.

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