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WEATHER INDUCED FLOOD AND FOOD SECURITY IN IFELODUN LOCAL GOVERNMENT AREA, OSUN STATE, NIGERIA

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Abstract

There are growing problems of extreme rainfall in the world today, which has made many towns and cities vulnerable to flood events. In recent times, flooding has been a recurrent problem in most part of the world due to severe weather. In Nigeria, there are many flooding reports in some parts of the country during heavy downpour of rain which is threatening food supply. This study assessed the effect of flood incidence on agricultural production in Ifelodun local government area of Osun State, Nigeria. Descriptive statistics used in this study include mean, standard deviation, tables and charts. Questionnaire administration method was used to obtain information on weather and food security from 102 respondents in the study area. The result shows that, rainfall has resulted in flooding in the area and this has led to the low yield of agricultural products. Lives and properties were in jeopardy due to negative effect of flood in the area. Rural people are often susceptible to the menace of climate change and living standard is drastically reduced compared to urban areas. It is therefore recommended that, rainfall forecast should be communicated to the farmers which will enable them to plan toward the coming rainy season.

Key Words: Climate, Rainfall, Flooding, Farming, Food,

Background to the Study

Osun State suffers from high flood risk because of the changing in land use, increasing population trends, obsolete drainage infrastructure and most significantly climate change

effect. The heavy rainfalls recorded in Nigeria between May and October 2012 have given rise to flooding of unbelievable magnitude all over the country. Settlements along the courses of major rivers have been ravaged by rampaging floods. Anuforom (2012) opined that rainfall amounts of the year 2012 all over the country were generally higher than long term mean values except in places in and around Kwara State. This according to him has led to serious flooding and opening of dams erected across rivers especially in rivers Niger and Benue. The flooding events have led to the dislocation of families, destruction of farmlands, houses and loss of lives.

However, over 90% of Nigeria is wetter than the normal conditions and this was the major reason for the unprecedented flooding being observed almost everywhere. Quite expectedly very early in the year (2012), the Nigerian Meteorological Agency (NIMET) issued a warning that the year would be very wet which would result in serious flooding in most parts of Nigeria especially between the months August and October 2012. It further noted that the flooding that would be generated by the rainfall will be very serious in 12 States (NIMET, 2012). It was later seen that in the affected states, those worse hit were as expected, the riparian communities located in the flood plains of rivers Niger and Benue and their major tributaries. In Anambra State, rainfall figures recorded so far in 2012 show a clear departure from the normal (Abbey and Nwankwo, 2012, Anambra State Ministry of Agriculture, 2012). It is generally acceptable that rainfall is the most common cause of flooding worldwide (Nwagbara, Ijeoma and Chima 2010 and Agrawal 2010).

The paper therefore seeks to examine the effect of flood incidence on agricultural production in Ifelodun area of Osun State Nigeria. Earth's climate is warming and will continue to warm in the future, as a result of changes in atmospheric CO₂ and other trace gases (Houghton et al., 1990). Recently, it has been generally held that any climate change will lead firstly to changes in the frequency and intensity of extreme events such as floods and droughts; this was supported by some enhanced-greenhouse simulation studies analysed in terms of changes in precipitation intensity (Mearns et al., 1990; Noda and Tokioka, 1989; Freiet al., 1998). Floods are natural hazards causing loss of life, injury, damage to agricultural lands, and major property losses (Fill and Stedinger, 1995). According to Gupta (2003), prolonged stagnation of the flood and storm water not only affects people's lives, but causes damages to agriculture, loss of wetlands and destruction of animal habitats and generates health problems. Olaniran (1983) reported three (3) flooding events in Ilorin in just one decade, causing untold hardships and damages in the town.

Previous studies also reported that communications and traffic are interrupted while many land areas are inundated, and industrial plants and commercial establishment are paralyzed during floods. Besides, untold hardship is experienced, especially by the most vulnerable groups (women and school children) whenever there is flood disaster in Lagos (Folorunsho and Awosika, 2001).

Dixit (2003) stated that in Southern Nepal, flooding leads to large scale disruption of social and economic lives. The rivers bring large sediments whose deposition on agricultural lands harms productivity. According to Lind, Mahesh, and Nathwani, (2008), the loss in case of flooding has many dimensions. In addition to economic loss and loss of life and injury, there may be irreversible loss of land, historical or cultural valuables and loss of nature or ecological valuables. Olayinka et al (2012) stated that some of the direct impacts of flood events include human casualties, physical damages to buildings, bridges, cars and other structures, economic breakdown that led to hardship due to investment lost, rebuilding cost of damages and impact on agriculture such as poultry farms, farmland and products. Nwilo (2013) stated that recently, flood disasters of various magnitudes occurred in different parts of Nigeria causing catastrophic destruction of human lives, public and private infrastructures include road bridges, houses and farm lands. It threatened national security; submergence; shore line encroachments and erosion of coastal areas; reduction in national revenue from oil sector as well as impacting on the government's poverty reduction programme.

Study Area

Ifelodun is a Local Government Area in Osun State, Nigeria with headquarters in the town of Ikirun; and it is located at longitude 7° 55' N and latitude 4° 40' E with a total land mass of 114 km². Based on the 2006 national census, it has a population of 96,748 (NPC, 2006). The climate of Ifelodun follows the tropical pattern. The average annual temperature is 26°C while the average annual rainfall is 1241mm. The driest month is January with 9mm, most precipitation falls in September, with an average of 202mm. The warmest month of the year is March with an average of 28.3°C (Osun.gov.ng. Retrieved 26 August 2017). The geologic formation of the study area falls within the basement complex of the South-Western Nigeria which consists of the amphibolites, migmatite gneisses, granite and pegmatites with highly ferruginous tropical red soil (Osun.gov.ng. Retrieved on August 26, 2017). The soil is generally deep with two types, namely, deep clayey soil formed on low smooth hills crest and upper slopes; and sandy hills soil on the lower slope. The well drained clay soil of the hill crest and slope is very important for kolanut, cocoa and coffee cultivation, while the lighter loams are more suitable for the cultivation of food crops such as, cassava, yam and maize. Economic activities undertaken by people of Ifelodun local government include farming of different types of food crops like yam, maize, cassava and cocoa which is the main cash crop in the state. The area is also known for its high production of citrus crops like oranges, pineapple, tangerine, plantain, banana among others (Osun.gov.ng. Retrieved 26 August 2017).

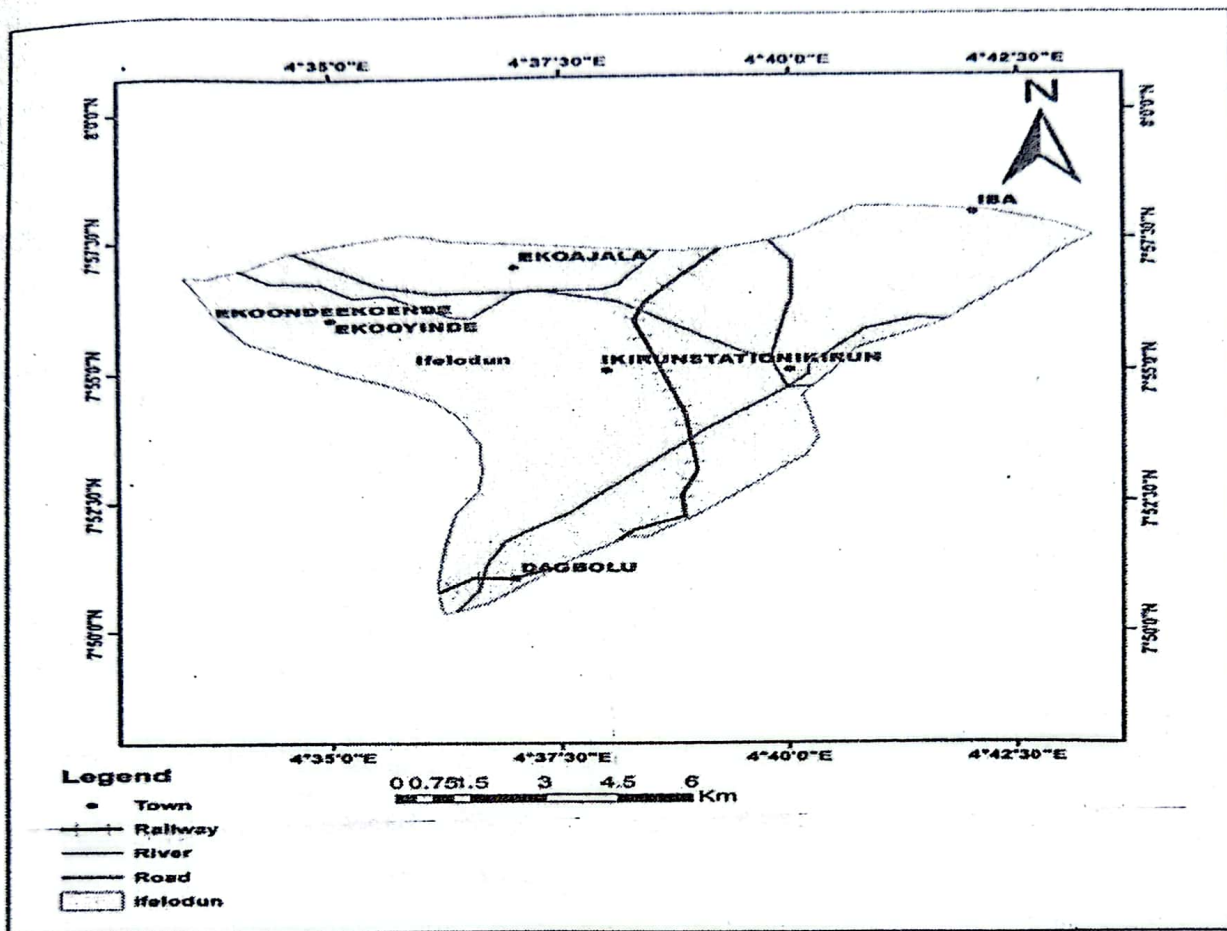


Figure 1: Map of the Study Area.

Source: Urban and Regional Planning, Osun State.
Data and Method of Analysis

The data required for this study were generated from both primary and secondary sources. The primary data in this research was the socioeconomic characteristics of respondents, knowledge on the causes and impact of flood, frequency of flood and their adaptive strategies to flood incidence. These were obtained through field work using questionnaire and oral interview. The secondary data are maps of the study area obtained from Osun State Ministry of Lands and Regional Planning, rainfall data from 1997-2016, population data obtained from Osun state National Population Commission.

The population size of this research work covered the whole population of Ifelodun local Government of Osun State which is 96,748sq. The sampling techniques used in this study were purposeful sampling and simple random sampling techniques for the selection of 102 respondents due to the heterogeneous nature of the population. The descriptive statistics that was used include Tables, Simple percentages, pie charts, bar charts, Mean

and standard deviation.

Results Presentation

Rainfall Pattern

As stated in Table 1, the lowest rainfall was experienced in 2001 with 84.5mm while the highest was experienced in 2009 with 158.9mm. The mean rainfall for the study period is 117.65mm with a standard deviation of 17.96mm and coefficient of variance of 15.27mm.

Table 1: Rainfall Pattern between 1997-2016

s/n	Year	Rainfall (mm)	s/n	Year	Rainfall (mm)
1	1997	102.6	12	2008	92.2
2	1998	100.3	13	2009	158.9
3	1999	127.4	14	2010	140.9
4	2000	113.9	15	2011	103.4
5	2001	84.5	16	2012	126.8
6	2002	113.4	17	2013	122.2
7	2003	136.0	18	2014	124.5
8	2004	116.1	19	2015	123.4
9	2005	94.2	20	2016	131.4
10	2006	122.4		Mean	117.65
11	2007	118.5		SD	17.96
				CV	15.27

Source: Nimet, 2016

The coefficient of variation shows that rainfall amount was evenly spread with homogenous values; with high number of wet years between 1997-2016 because coefficient of variation is less than 33% according to Olubusoye et al., 2002. This means that the year 1999, 2003, 2006, 2009, 2010, 2012, 2013, 2014, 2015, 2016 were wet years and recorded high amount of rainfall with likelihood of flood incidence that affected crop production. Dry year were marked in 1997, 2000, 2001, 2002, 2004, 2005, 2008 and 2011 respectively. The trend of rainfall in the area is upward sloping which implies that there is an increase in the amount of rainfall received in the area for the period. This increase can be attributed to severity of weather which is making the area wetter. Increase in rainfall will lead to increase in flooding if proper measure is not put in place. Also increase in rainfall can reduce the yield of crops that does not require much water to grow and boost the yield of crops that require much water to grow.

Socio-economic Characteristics of the Respondents

The gender distribution of the respondents is observed from the figure 3 and Table 2 showing that 64.7% of the respondents are males while 36.6% are females. This is because the males are more involved in farming activities than the females in the area. The females are more adaptable to menial works that are less hectic compared with their male counterparts.

Table 2: Socio economic characteristics of respondents

Socio economic characteristics	Frequency	Percentage
Sex		
Male	65	64.7
Female	37	36.6
Total	102	100.0
Marital Status		
Single	40	38.2
Married	62	61.8
Total	102	100.0
Age group		
15-24	24	23.5
25-34	25	24.5
35-44	30	29.4
Above 45	23	22.5
Total	102	100.0
Education		
Primary	26	25.5
Secondary	50	44.1
Tertiary	18	17.7
Others	12	12.7
Total	102	100.0

Source: Author's Field Survey, 2017

As stated in Table 2, 38.2% of the respondents are single while 61.8% are married. This shows that majority of the respondents are married. Further, 23.5% of the respondents are within the age group of 15-24 years, 24.5% are within the age group of 25-34, 29.4% are within the age group of 35-44 years while 22.5% are above 45%. From the result, it could be seen that majority of the respondents are still in the productive age. It could be concluded that the young population in the study area are effectively engaged in farming activities. Further, 25.5% of the respondents have primary education, 44.1% have secondary education, 17.7% have tertiary education while 12.7% have other forms of education. It could be seen that the educational level of the respondents is low, majority of them 82.7% do not have tertiary education; this could be as a result of lack of money to further their education or lack of interest in education.

Farming Activities in the Area

The farming activities as seen in Figure 3 shows that 73% of the respondents are the owners of their farms while 27% of the respondents do not own farm. This shows that majority of the respondents with the view point of the researcher on the field are the owners of their farms, while 27% of the respondents are laborers that are paid to work for others. This implies that 73% of the respondent that owns farm are likely to be indigenes of the study area while the 27% who do not own farm are likely to be migrants who are assumed to be labourers. Nonetheless, they all contributed positively to agricultural development with high mind of increasing food supply in the area.

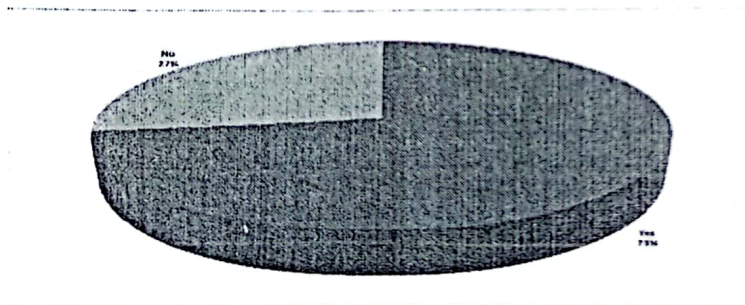


Figure 3: Ownership of farm

Source: Author's Computation, 2017

Types of Farming

In Table 4, out of the 102 respondents, 75% of the respondents are subsistence farmers while 25% engage in commercial farming. From this result, it could be seen that majority of the respondents are subsistence farmers, they produce food mainly for themselves and sell little of their produce. The main reasons for subsistence farming in the area include the use of crude tools for farming, unavailability of land, inaccessibility to fund, poor technical knowhow among others.

Table 4 Type of Farming

Type of farming	Frequency	Percentage
Subsistence	78	75
Commercial	24	25
Total	102	100

Source: Author's Field Survey, 2017.

Source of Labour

Figure 5 shows that 60% of the respondents use personal labour which include their wives and children who help them to carry out the farm activities, 15% make use of communal labour; this is the type of labour whereby the farmers gather and work on one person's farm today and another the next day. 22% of the respondents' use hired labour on their farm, they employ people to work on the farm at a fee while 3% of the respondent's make use of machine labour on their farms.

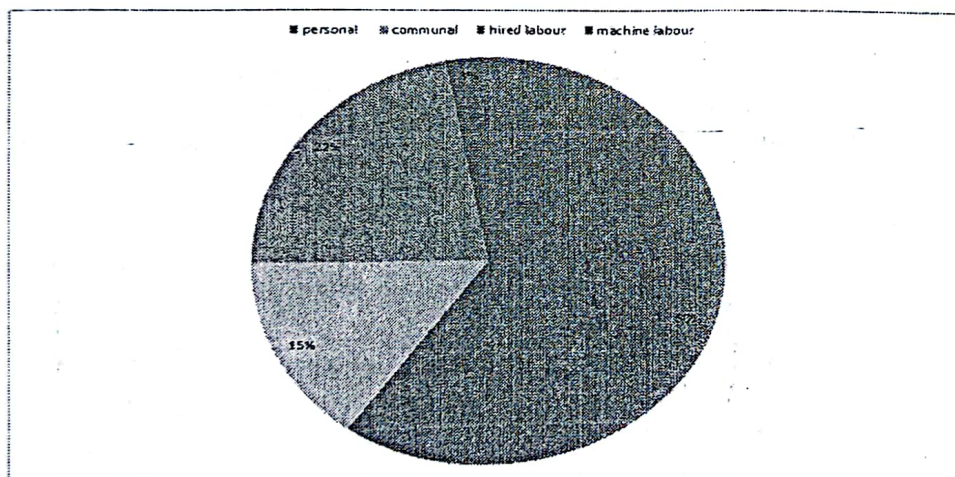


Figure 5: Source of Labour

Source: Author's Computation, 2017

Farming Experience

As indicated in Table 6, about 17% of the respondents have been engaged in farming for within a period of 5-10 years, 53% have been engaged for 11-15 years, 24% have been engaged for within 16-20 years while 6% of the respondents have been farming for more than 20 years. From the result, it could be seen that majority of the respondents have been farming for a long period of time, thus they have a good cognitive knowledge about the subject of research.

Duration	Frequency	Percentage
5-10years	17	17
11-15years	54	53
16-20years	25	24
Above 20years	6	6
Total	102	100

Source: Author's Field Survey, 2017

Method of Farming

Table 7 shows that 12% of the farmers practice shifting cultivation, 30% practice crop rotation while 58% of the farmers practice mixed cropping. From the result, it could be seen that majority of the farmers practice mixed cropping; this is due to the unavailability of large expanse of land.

Table 7: Method of farming

Method of farming	Frequency	Percentage
Shifting Cultivation	12	12
Crop rotation	31	30
Mixed cropping	59	58
Total	102	100

Source: Author's Field Survey, 2017

Causes and Magnitude of Flood

As shown in Figure 6, the respondents who account for 96% of the farmers are aware of climate change while 6% of the farmers are not aware of climate change. It could be seen that majority of the farmers are aware of climate change; they must have noticed the changes in rainfall amount and pattern which is an important factor in agriculture. Majority of the farmers also stated that their agriculture produce have been affected by climate change; their crops no longer yield as much as it used to yield.

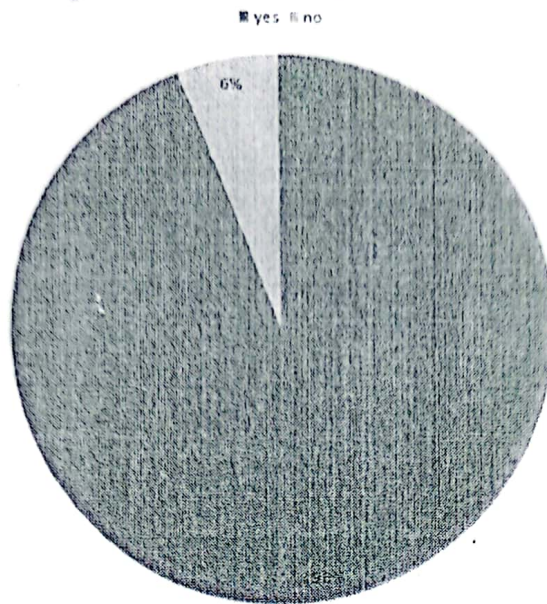


Figure 6: Awareness to climate change

Source: Author's Computation, 2017

Severity of Weather on Food Production

In Table 8, out of the 96 respondents that are aware of climate change, 52% stated that climate change has led to heavy rainfall that destroys crops, causes flooding and reduces yield of crops that require little water such as yams, 33% stated that climate change has led to flooding in the area; an increase in rainfall will cause flood to occur, 2% stated that they have experienced drought while 13% stated that they have experienced destructive winds; this winds destroy crops such as Okra, Banana, plantain. This means that majority of the respondents have noticed the climate change effect in the area. Although, they did not have scientific knowledge of the climate issues and how the changes occur, yet they felt the impact of severity of weather on their agricultural output which, if a drastic measure is not taken, will reduce agricultural output in the area and much as well in the country.

Table 8: Severe Weather and Food Production

Effect	Frequency	Percentage
Heavy rainfall	50	52
Flood	32	33
Drought	2	2
Destructive wind	12	13
Total	96	100

Source: Author's Field Survey, 2017

People's Perception on the Causes of flood

Figure 7 shows the perceived opinion of the people on the causes of flooding in the study area. It was observed that out of the 102 respondents, 98 respondents were of the view that excessive rainfall received in the area is the major cause of flood in the area; once heavy rainfall occurs the soil becomes saturated resulting to flooding in the area. 1 respondent stated that inadequate drainage is the cause of flood; when rainfall occurs, there is no drainage to channel the water thus it overflows on the surface resulting to flood. 2 respondents stated poor land use while 1 respondent stated blockage of drains.

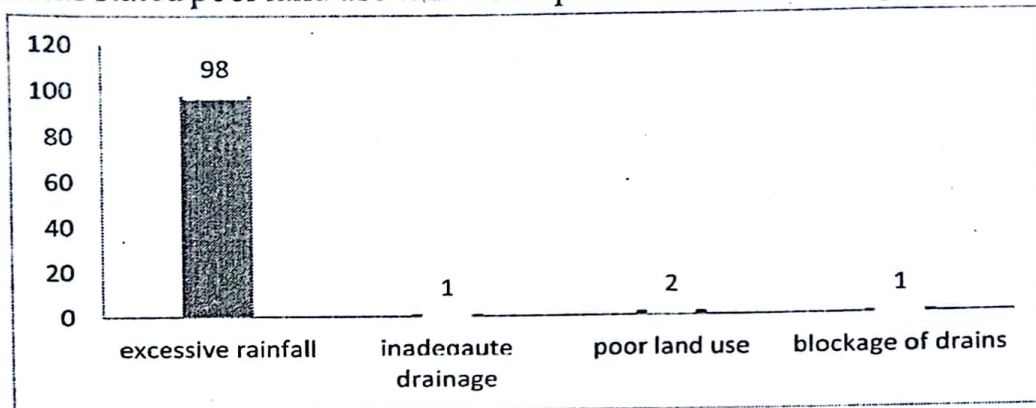


Figure 7: Causes of flood in the area

Source: Author's Computation, 2017

Areas Prone to Flooding

As indicated in Table 9, about 47% of the respondents stated that the farmland is prone to flooding, this is due to the streams and small rivers that pass through the farmland, once there is heavy rainfall this stream and rivers flood the surrounding farmlands. Moreover, there were no built-up drainages to drain excess water on the farmlands because majority of the farmers do not have enough capital to build the drainages in as much they live on subsistence farming. The 31% stated that residential area is prone to flooding due to poor drainages system, 17% stated that roads are prone to flooding, while 55 respondents stated that other areas such as markets are prone to flooding.

Table 9: Area prone to flood

Area prone to flooding	Frequency	Percentage
Farmland	48	47
Residential area	32	31
Roads	17	17
Others	5	5
Total	102	100

Source: Author's Field Survey, 2017

Rating the Damage from Flood

Figure 9, shows that 14 respondents stated that they have been severely affected by flood; properties and crops have been destroyed by flood, 78 respondents stated that the effect of flood has been minimal while 10 respondents stated that they have not been affected by flood. This implies that flood truly is a major climate change effect, yet the impact is not much pronounced in the lives of the people

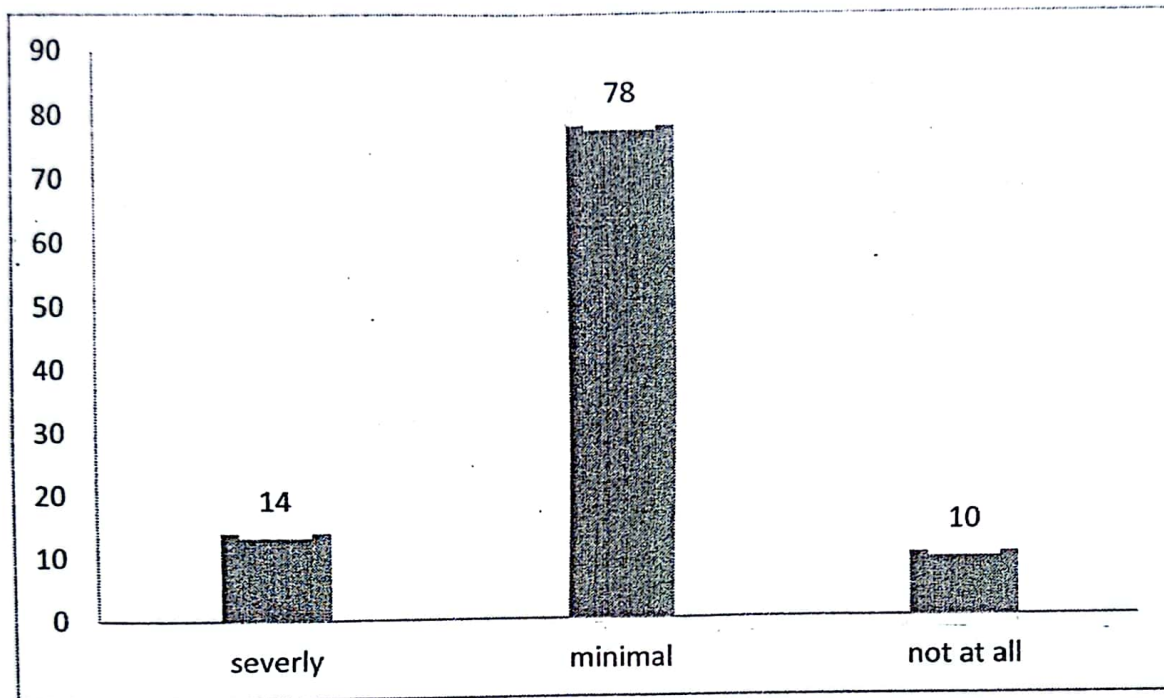


Figure 9: Severity of Flooding

Source: Author's Computation, 2017

Floods and Agriculture Production

Table 10 shows the effect of flood on agriculture in the area, 25% stated that flooding has led to good yield of crops in the area; if flood occurs before the crops are planted; it deposits nutrients into the soil boosting the fertility of the soil. 31% of the respondents stated that flood in the area has led to average yield of their farm produce; flood may destroy some of the crops reducing the yield, it may also alter the chemistry of the soil resulting to an average yield. 44% stated that flood has led to low yield of crops in the area; flood destroys the crops that are on the farm, it can also alter the chemistry of the soil resulting in low yield of the crops. This means that flooding did not have a pronounced effect to the extent of destroying lives and properties in some areas. Those people that were severely affected were probably living and farming in flood-prone areas.

Table 10: Floods and Agriculture

Effect on agriculture	Frequency	Percentage
Good yield	25	25
Average yield	32	31
Low yield	45	44
Total	102	100

Source: Author's Field Survey, 2017

The primitive ideas adopted to control floods have yielded great results by reducing the flood effect on farm produce, though there is a need to develop and adopt modern technology to combat flooding.

Flood Control Measure

As stated in Table 11, 54% of the respondents stated that they made use of channelization to control flood. The farmers made channels in the farm between the ridges and around the farms; once flood water comes, it passes through the channels and flows out instead of flooding the farm while 46% of the farmers stated that they construct flood barriers to keep the flood out of their farms. They put sand in sacks and put it round the farm, during flooding, the sand sacks prevent the flood from entering the farmlands.

Table 11: Flood Control Measures

Flood control measures	Frequency	Percentage
Channelization	55	54
Flood barriers	47	46
Total	102	100

Source: Author's Field Survey, 2017

Effectiveness of Control Measure

In Figure 11, 78% of the farmers stated that the flood control measure has been effective while 22% of the farmers stated that the flood control measures have not been effective. It could be seen that the flood control measures used by the farmers have been effective.

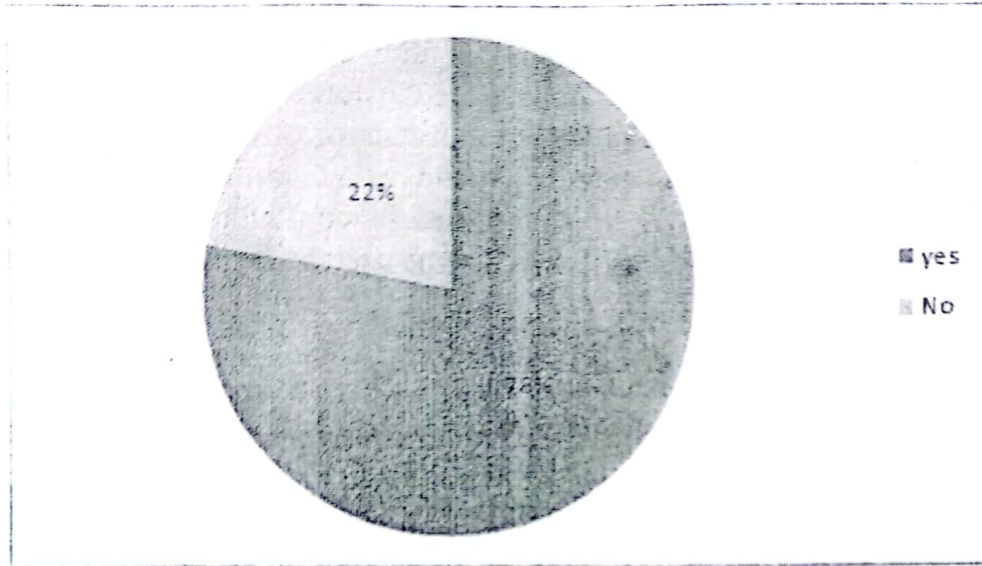


Figure 11: Effectiveness of Control Measures

Source: Author's Computation, 2017

Government Intervention

In Table 12, 12% of the respondents stated that government has intervened in the flood incidence in the area while 88% stated that government has not intervened. From the result, it could be seen that the government has not intervened in the flood issues in the area. This means that government has not extended a hand of help in order to curtail or ameliorate the negative effect of flood on farmers in the area.

Table 12: Government intervention

Government intervention	Frequency	Percentage
Yes	12	12
No	90	88
Total	102	100

Source: Author's Field Survey, 2017

Conclusion

This study examines the nature of extreme rainfall with the incidence of flooding and its effect on agricultural production. From the result of the study, it could be concluded that rainfall has resulted in flooding in the area and this has led to the low yielding of crops in the study area. The opportunity for storing enough food during harvest season has been threatened by adverse effect of weather in the study area. Lives and properties are in jeopardy due to negative effect of flood in the area. Rural people are often susceptible to the menace of climate change and living standard is drastically reduced compared to urban areas. The study however recommends that rainfall forecast should be communicated to the farmers so as to plan toward the coming rainy season in respect to flooding. Flood mitigation measures should also be used by farmers to reduce the impact of the flood on their produce.

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