INCIDENCE OF FLOODING AND COPING STRATEGIES AMONG RICE FARMERS IN SELECTED LOCAL GOVERNMENT AREAS, KWARA STATE, NIGERIA

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DECLARATION

I, OLADAPO Fisayo Elizabeth, a Master degree student in the Department of Agricultural Economics and Extension, College of Agricultural Sciences, Landmark University, Omu Aran, hereby declare that this thesis entitled “Incidence of Flooding and Coping Strategies Among Rice Farmers in Selected Local Government Areas, Kwara State, Nigeria”, submitted by me is based on my original work. Any material(s) obtained from other sources or work done by any other persons or institutions have been duly acknowledged.

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CERTIFICATION

This is to certify that this thesis has been read and approved as meeting the requirements of the Department of Agricultural Economics and Extension, College of Agricultural Sciences, Landmark University, Omu Aran, Kwara State, Nigeria, for the award of Master of Science in Agricultural Extension and Rural Development.

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DEDICATION

I dedicate this work to Almighty God who moved with me and saw me through the programme. It is also dedicated to my partner for his love, prayers and patience throughout the duration of this programme. Also, to my loving and wonderful parents Mr. and Mrs. Olalekan Oladapo and my siblings who were never tired of me and my requests. May God continue to shower us with the rain of his grace and mercy, Amen.

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ABSTRACT

The incidence of flooding and coping strategies among rice farmers in Edu and Patigi Local Government Areas of Kwara State was investigated. Insufficient rice production by farmers in these fertile low-land areas can be controlled by examining the frequency of flooding and coping strategy adopted by rice farmers. The specific objectives were to describe the socio-economic characteristics of the rice farmers; ascertained the frequency of flooding; damages caused by flooding on rice farmland; coping strategies and constraints to adopting coping strategies used by rice farmers in the study areas of the local government.

Data were collected from two hundred and forty rice farmers that grow rice along river Niger using a purposive sampling procedure. Twelve farmers were picked per village from ten villages in each of the two local government areas. A structured interview was used to collect data which were analysed using both descriptive and inferential statistics.

The socio-economic characteristics revealed that 97.1% were male, average age was 41 years, and 98.3% married. The average farm size cultivated in the two LGAs was 8.1 hectares. Flooding reaches a peak usually in September. The damages caused by flooding includes loss of crop stands, reduction in yield and less monetary income. The coping strategies adopted by the farmers were planting of improved rice variety and change in planting dates. The rice farmers were faced with no easy access to purchase of improved seed variety and the seeds were costly to buy. The multiple linear regression showed significant relationship in marital status (t= 2.273), rice farm size (t= -5.474) and household size (t= -2.947) all measured at $P<0.05$. The chi-square result showed a significant difference on damages caused by flooding in burying of seeds (t= 91.202), washing away seedling (t= 40.900), and loss of farmland (t= 70.758) all measured at $P<0.05$.

The study concludes that the rice farmers applied coping strategies to the flooding problem they face yearly. This assisted them in increasing their farm sizes, yield and more income from the sales of rice. It is therefore recommended that farmers in the flooded areas should plant improved rice varieties. (extension agencies should intensify extension programme to improve farmers production in the flooded areas.)

Keywords: *Coping strategies, incidence, flooding, and farmers*

CHAPTER ONE

1.1. Introduction

1.2 Background of the Study

Agricultural production is influenced by a variety of production factors, including crop genetic traits, livestock, soils, and the environment, among others (Danbaba et al., 2007). The sensitivity of agricultural elements varies such as soil, crops, livestock, and poultry productivity, among others, the most significant element in crop productivity is considered to be the climate (Antle, 2010). A major and long-term shift in the statistical model of weather conditions spanning decades to millions of years is referred to as climate change. Climate change can be described as a shift in the weather through time caused by either human activity or natural variability (IPCC, 2001). The alteration and increase in rainfall patterns are values of global warming in humid environments (O' Hare, 2002). This change causes flooding, which has adverse effects on agricultural production, property values, and socioeconomic activities. Despite the fact that climate condition is a universal phenomenon, and its threat and susceptibility differ not just between continents, but also between countries, sub-regions and communities.

In the face of changing climatic patterns, flooding is regarded as a global challenge. Floods are typically the result of extreme weather events such as precipitation, prolonged rainfall, and melting snow from snowfall, which are exacerbated by a geographical location and human activities. A flood is a significant volume of water that overflows a typically dry area. It is the overflow of a huge body of water across land that is typically submerged. Flooding is a natural hazard, similar to desertification and drought that occurs as a result of an extreme hydrological event

(Nwafor, 2006). In addition, a flood is a huge volume of water which fills the river system and flood plains in a short period of time, thereby damaging economic activities like houses (Abam, 2006).

Clearly, Nigeria has experienced devastating floods that have affected millions of people and resulted in billions of dollars in financial losses (National Emergency Management Agency, NEMA, 2013). Due to heavy rainfall that lasted several days, the worst flooding event was experienced in Nigeria in 2012. The outbreak cut across 32 states and 24 states out of it were terribly affected (NEMA, 2013). These flooding events happened within four months that year which affected 7.7 million people, where more than 2 million were regarded as displaced people. Over 5000 people have been hurt, and over 5900 homes have been damaged; food crops have been destroyed, posing serious threats to the nation's food security (Nkwunonwo, Malcolm, and Brian, 2015; Nemine, 2015). The National Emergency Management Agency (NEMA) estimates that floods cost the country N2.29 trillion, or 2.83% of the re-established Gross Domestic Product (GDP) for 2013.

The flooding event has damaged over 1.9 million hectares of land which reduced food production cultivated within flood plains, according to Anugwara and Emakpe (2013). The affected areas had their rice production reduced by 22.4 percent. Floods in Nigeria require immediate attention due to their impact on agriculture, particularly lowland rice production in the country. Nigeria is said to be the largest rice producer in the West African subregion (Kwari, Ayuba, and Denis 2015), it is clear that the country has significant untapped potential.

Given the common agricultural practice of farming along the flood plains of identified rivers, flooding is clearly one of the major setbacks to rice production in Nigeria.

Flooding is still a major concern because of the threats it poses to food security and the negative impact it has on national wealth. According to Obalola and Tanko (2016), Nigeria's reliance on rainfall alone is becoming increasingly insecure as a result of climate change. Flood impacts in Nigeria continues to raise concerns about food security and the vulnerability of the general public, according to Nkwunonwo, Malcolm, and Brian (2015) and Nemine (2015). Floods and the means to address them are of the utmost concern in Nigeria (Obeta, 2014). Flood damage and the vulnerability of rural smallholder farmers due to a lack of capital have always had a negative impact on their welfare, and their ability to employ various adaptation techniques, thus alleviating subsequent shock events, is usually left to the government (Ajibade, Babatunde, Ajibade and Akinsola, 2015).

Given the various constraints to rice production in Nigeria, the most significant of which is flooding, farmers have been forced to seek ways to overcome their difficulties, leading them to develop some sort of coping mechanism and adaptation strategy in order to alleviate the issue, which has reportedly persisted.

According to Asian Disaster Preparedness Center (2003) and Maskrey (2014), there has been a growing recognition over the last two decades that disaster management at the community level is most effective when unique local requirements, capacities and resources are fulfilled. Several studies have found that community-based disaster management approaches produce positive results all over the world (Zhang et al., 2013; Zahari and Ariffin, 2013; Chen et al., 2006).

1.3 Statement of the Problem

Farmers in the riverine areas of Kwara State, Nigeria, have remained conservative and living conditions unbearable for a long time, despite the efforts of the State and Federal government of Nigeria, and particularly donor agencies with their intervention programme slated to cause improvement in the area of agricultural production, resulting in a change in the rural people's living conditions.

It is indeed perplexing what could be causing insufficient rice production by farmers in these fertile low-land areas that support large-scale rice production. A variety of factors may be to blame, but one of the most visible is the destruction of crops especially rice planted as a result of flooding.

Rice production in Kwara is estimated to be close to 500,000 metric tonnes in 2019, with more potential for producing enough rice to feed the state's growing population. It is true that the people of Kwara State, especially the young, children, and adults, rely heavily on rice consumption, but the devastating effect of flooding, which destroys many hectares of rice farmland, reduces the number of metric tonnes of rice that can be produced from the state's rice farmlands.

Despite the extensive damage done to rice farmland by floods year after year, there is a need to investigate the incidence of flooding and coping strategies among rice farmers in the study area of Edu and Patigi Local Government Areas of Kwara State, Nigeria. To find a solution to this destruction, one must delve into the following research questions.

1.4 Objectives of the Study

The general objective of the study is to determine the incidence of flooding and coping strategies among rice farmers in Kwara State. To achieve this, the following specific objectives are set for the research to:

a. describe the socio-economic characteristics of the rice farmers in the study area;
b. ascertain the frequency/occurrence of flooding of the study area;
c. assess the damage caused by flooding on rice farmland in the study area;
d. examine the coping strategies used as cushing effect by the farmers in the study area;
e. identify constraints to adopting the coping strategies used by the farmers in the study area.

1.5 Research Questions

a. What are the socio-economic characteristics of rice farmers in the study area?
b. How can we determine the frequency/occurrence of flooding in the study area?
c. What is the damage caused by flooding on rice farmland?
d. What coping strategies do farmers put in place to cushing the effect of flooding?
e. What are the constraints to adopting the coping strategies used by the farmers in the study area?

1.6 Research Hypotheses

The following null hypotheses are set to test for the difference among the dependent variables and independent variables in the study:

Hypothesis 1: There is no significant relationship among socio-economic characteristics of rice farmers and coping strategies used on the rice farmland.

Hypothesis 2: There is no significant relationship among the damage caused by flooding and the coping strategies used on rice farmers farmland.

1.7 Scope of Study

The study is mainly restricted to the effect of flooding on rice farmer farmland, using Patigi and Edu Local Government Area as a case study. Due to financial limitation, one will not be able to expand the study beyond the study area.

1.8 Significance of Study

This research work is significant because fertile rice farmland gradually erodes every year and thus reduces farm sizes and minimizing the quantity of rice produced in a very large essence, therefore resulting in low income from the production.

The study will assist donor agencies to know the building knowledge about flooding and its effects on agricultural productivity. Also, it will assist extension agent to introduce more coping strategies that will help farmers in adaptation during the incidence of flooding. Similarly, it will help policy makers to make sound decision in solving flooding problems in the region.

1.9 Area of Further Studies

Other researchers may want to investigate the effect of coping strategies used as cushing effect before and after flooding in the same study area.

CHAPTER TWO

2.1 LITERATURE REVIEW

This Chapter present review of literature in the following areas;

i. Conceptual issues

ii. Review of methodological approaches

iii. Theoretical model of the study

iv. Conceptual framework of the study

2.2 Conceptual Issues

2.2.1 Historical Background of Flooding generally and in Kwara State.

Flooding occurs on a yearly basis on varying scales in Kwara state (Kwara State Ministry of Environment). Those who farm on the Niger River plains, which is the main river affecting farmers in Edu and Patigi, are the most vulnerable. Recent floods and their consequences have become far too common around the world, posing a threat to the long-term development of human settlements (Aderogba, 2012). In terms of water resources, Nigeria is one of the luckiest countries on the planet. However, we must recognize that flooding and water stress are environmental challenges that require intervention to ensure long-term sustainability in Nigeria, Africa, and around the world (Akolokwu, 2012).

Flooding is regarded as the most significant environmental issues that society will face in twenty-first century. This is especially true in the vast majority of the world's wetlands (Bariweni et al., 2012). This is due to global sea-level rise induced by global warming, including the saturated condition of many wetlands around the world, including Nigeria. Many rivers flood on a regular basis due to factors such as excessive rainfall, etc. River overflows have the advantage of depositing sand, silt, and debris on the surrounding land as flood waters flow into the banks. The deposited elements help to make the soil richer or more valuable when the river water has receded and returned to its regular flow. As a result, river water deposits organic materials and minerals that retain the soil fertility and productive (Abowei and Sikoki, 2005).

In some parts of Nigeria, the flooding in 2012 was the worst in living memory (Social Action, 2012). Floods are regarded as the most catastrophic natural disasters in the world, which claims lives thereby causing more damage to property than any natural occurrence. As this is not the primary cause of mortality, flood impacts and disperses people in Nigeria than any other natural disaster; it causes more damage to property. Flooding in some form or another threatens at least 20% of the population. Flooding has posed a threat to communities and institutions in Nigeria. It has demolished both the physical environment and the unfinished plan. As a result of its occurrences, many lives have been lost with millions of properties destroyed. Flooding, for example, does not distinguish, but rather excludes those who refuse to plan for its advent (Etuonovbe, 2011).

A variety of seasonal and non-climatic variables have an impact on flood dynamics, which results in a range of flood types (Collins and Simpson, 2007). Flooding is now widely regarded as a major threat caused by climatic change in many parts of the world (Dyson, 2002). Several studies have concluded that extreme rainfall is the leading cause of floods worldwide, including in Nigeria (Ologunorisa and Tersoo, 2006).

In Kwara State every year flooding causes havoc. Communities that have been impacted are always those that are located at lower elevations and on floodplains.

With increased storm frequency due to climate change and a constant increase in the city's population, there is an urgent need to implement improved drainage systems and proper river management, as well as better planning and reviewing laws governing structure erecting and refuse disposal.

2.2.2 The concept of flooding

A flood, according to Merriam-Webster (2012), is defined as the body of water swelling and overflowing, particularly into a dry land. The term "flood" emanates from an English word; /flod/, a word common to Germanic languages (compare German /Flut/, Dutch /vloed/ from the same root as seen in /flow, float/; Latin /fluctus/, /flumen/), and was first used in 1663. Flooding is the world's most widely recorded cost-effective disaster, accounting for over 40% of all disasters that occurs naturally (Tapsell and Tunstall, 2008).

Flood can be defined as an overflowing body of water which is typically submerged (NEST, 1991). These are natural disasters which occur on a yearly basis in various parts of the world, most notably during the rainy season. Floodwaters flood the land, submerging it. Flooding is commonly associated with an increase in the amount of water in a body of water, like lakes and rivers. Water tends to surpass the capacity of the drainage channel capacity thereby flood its borders.

Flooding happens frequently when there is an overabundance of water which occurs as a result of the soil's inability to absorb water or when the soil’s field potential or saturation has been surpassed. As a result, there is an abundance of precipitation, which engulfs the land. This type of flooding is very prevalent in most urban places across the world, and particularly in Nigeria, where development has interrupted or changed the natural infiltration cycle.

Flooding has a very serious overall effect, both in terms of frequency and intensity. The incidence has gradually reduced the use of fertile farmland, particularly topsoil. Floods have two effects on our surroundings, which is viewed from two various perspectives. Its influence on the ecological world on one hand, with its influence on the constructed or tropical world on the other. Nonetheless, due to human activities and population growth, the impact of flooding on developed surrounding (i.e., urban areas) is naturally severe.

Flooding, as defined by Rosenzweig (2009), as an extraordinary volume of water above earth produced by severe rainfall or fast runoff from concrete areas. Natural flood plains exist on some of the rivers. Flooding is most severe along the coastline. Flooding occurs in these areas due to a combination of heavy rainfall and weak soils.

Floods occur when more water is introduced into a drainage canal than the canal can hold, according to Burrus (2010). The surplus overflows the banks and causes a flood in the surrounding area. According to Hendrick (2007), any overland flow across urban area that causes considerable property damage, pollution, health hazard or transportation congestion is considered a flood. This study focuses on the occurrence of flooding and coping strategies among rice farmers in the Edu and Patigi Local Government Areas of Kwara State.

The flood, according to U.N. Hydrologists Wisler and Brater (1959), is an excess hydrological occurrence that occurs when soil encroachment potential is less than the precipitation level. Rainwater enters the earth's surface, percolates into the ground, and contributes to shallow subsurface drainage, saturation overland, and groundwater drainage (Odemeuro 1990).

Smith (2006), defined infiltration as the average velocity during which the topsoil of a specific environment can receive rain. Excessive rainfall that cannot be absorbed by the soil is deposited on the ground, and runoff begins.

2.2.3 Characteristics of flood

According to Gabler (2010), there exist numerous variables which are used to characterize the nature and frequency of floods. It includes for example coverage area, duration, flow rate, and volume of water discharged per unit time, for example. Furthermore, the amount of precipitation, seasonality (season of the year), the soil type, the slope nature, and geomorphic features of the region all have an impact on these variables. Akin (2009) concurred with this definition. The followings are the most important traits:

Flood velocity: The velocity of floodwater is defined as its speed. It is normally calculated by subtracting the velocity of the floodwater from its length. The existence of the area's relief and roughness coefficients generally defines flood velocity.

Flood seasonality: This is a seasonal indicator on the occurrence of floods in various sizes. Floods are very prevalent during wet or rainy seasons, in tropical areas especially. This is due to the fact that during rainy season, big rivers are at their peak, whereas normal rainfall may also cause rivers to flood.

Flood frequency: Flood frequency can be referred to as a statistical indicator on the likelihood of a given-intensity flood occurring. The magnitude of each flood is determined by its frequency. Flooding is a relatively rare occurrence that can have a ten-year recurrence period. Small floods, occurs at least four times in a year and have a short return period or recurrence period.

Flood duration: The duration of a flood refers to how long an area is subject to peak water release or runoff. Many floods have been known to rise and fall in an hour's time. Other flood areas, particularly in coastal areas during the rainy season, remain at high levels for several days. The flood hydrograph depicts the discharge over a continuous time period during a flood event.

2.2.4 Organizations and agencies that have worked with flooding

National Emergency Management Agency (NEMA) was established in March 1999 by Act 12 of 1999, as amended by Act 50 of 1999. NEMA was tasked with coordinating the country's disaster management efforts (Nigeria-Government, 2010), as stated in its mission statement, is given roles and functions responsible for a comprehensive approach to management of disaster. Their mandate is as follows: *to lead and assist disaster management stakeholders in a complete risk-based emergency management programme of mitigation, readiness, response, and recovery in order to reduce the loss of lives, property and safeguard lives from danger* (NEMA n.d.b). NEMA's specific functions include (1) disaster preparedness and mitigation plans and activities; (2) notifying, activating, mobilizing, and deploying personnel as well as establishing the necessary response facilities; (3) assessing and evaluating disaster damages; (4) managing disaster funds; (5) informing and enlightening the public; (6) developing disaster management guidelines and policies in the country; and (7) distributing relief materials to victims of disaster through collaboration with State Emergency Management Committees, non-governmental organizations (NGOs), regional and international bodies (NEMA, 2004a; Shaba, 2009).

The NEMA organizational structure consists of five major departments with three units. These include search and rescue, relief and rehabilitation, training, finance and administration, a public relations unit, a legal unit, and an audit unit. NEMA's objectives are met through collaboration with state and local governments, voluntary organizations, international agencies, and 57 disaster response units located throughout the country (Ndiribe, 2010; NEMA n.d.b).

The World Health Organization (WHO) is working closely with the Federal Ministry of Health, the Nigeria Centre for Disease Control (NCDC), the United Nations (UN), and the National Emergency Management Agency (NEMA) to support the health response in flood-affected states. In close collaboration with the Federal Ministry of Health (FMOH), the National Center for Disease Control and Prevention (NCDC), and the National Emergency Management Agency (NEMA), WHO is assisting Nigeria's response to flooding provides lifesaving health emergency services to affected population. Floods and their consequences (like lack of clean water and shelter) can raise the risk.

2.2.5 Causes of flooding

Floods have occurred all over the world as a result of prolonged heavy rain showers that have occurred and reoccurred (Pilgrim and Cordery, 1993; Christopherson, 1997; Adeaga, 2008; Wright, 2011; Action Aid, 2006; Adeaga, 2006; Aderogba, 2012). During the rainy season, flood disasters are frequently reported in newspapers and magazines, as well as on television (Dow and Dowing, 2006; Kersh and Simon, 2005). Floods are a result of a variety of factors such as heavy rainfall, accelerated snowmelt, severe winds over water, unusually high tides, tsunamis, or dams, retention ponds, or other structures.

Runoff from sustained rainfall or fast snow melts that exceeds a river's channel capacity can result in heavy rains from hurricanes and tropical depressions, foreign winds, and warm rain that affects snow pack. Unexpected drainage obstacles like landslides, ice, or debris might create delayed flooding upstream (USEPA, 2002). Flooding can occur as a result of severe sea storms or another hazard, such as a tsunami or hurricane (Powell, 2009). Floods can also be caused by an unexpected and significant event, such as dam failure, or by another disaster (e.g., earthquake or volcanic eruption). Other causes of floods, as summarized by Bariweni et al. (2012), include: when rainfall is very light, the shoreline of lakes and bays can be flooded by huge winds which blow water into shore areas, like hurricanes. Coastal areas can be flooded through unusually high tides, like spring tides, which are exacerbated by storm surges and high winds. Tsunamis are large, high-energy waves created by undersea earthquakes, volcanic eruptions, or massive explosions, resulting in seawater flooding on buildings near the sea and even further away from the coast. According to Bariweni et al. (2012), climatic change is another factor that contributes to flooding because as the climate warms, it causes the following:

a. Torrential rains

b. Relative sea level continues to rise along most coastlines.

c. Extreme sea levels will become more common.

As a result, climate change is anticipated to dramatically increase flood vulnerability and gradually over time. Low-lying coastal areas, as well as areas that are not currently prone to fluvial or tidal flooding, will be particularly vulnerable as sea levels rise, as more high rainfall result to a massive increased threat of flooding from surface runoff and an overburdened drainage system. However, according to Etuonovbe (2011), flooding in Nigeria is caused by either natural or human causes, and the causes were divided into the following categories:

<u>Causes that are natural</u>

a. A lot of rain

b. Storms and tidal waves in the ocean, usually along the coast.

c. Lack of lakes

d. Silting

<u>Causes caused by humans</u>

Other human-caused flooding in Nigeria may be caused by one of the following factors:

a. burst water from pipes

b. dam failures

c. Population growth (especially in the city of Lagos)

d. Destruction of forests (such as North part of Nigeria)

e. Interfering with water storm drains (key cause in Southern Nigeria)

f. Unplanned urbanization (a major cause of urban flooding in many cities)

g. Inadequate Sewerage Management

h. Ignoring warnings derived from hydrological system data (major cause of 2012 flooding in Nigeria)

i. Inadequate flood control measures (especially by government)

According to Hoyt (2009) flood are proposed to be natural hazards which are not caused by man, despite our activities such as urbanization and deforestation, most especially flood-prone places, which has raised flood frequency in the world. "*Thus,* *in actual sense, human causes most of the flood problem. If flood-prone regions can be avoided by people, the floods and challenges would be of lesser impact while flood would be regarded as a natural occurrence rather than a natural hazard*". According to Wright (2011), man seems to be exacerbating the challenges by creating artificial conditions which result in extreme runoff, which is the prevalent cause of flood. The activities of man to replace rocks and soils, which grip water like a sponge, with concrete and asphalt constructions, that cannot infiltrate or absorb water into groundwater. The following are the causes of floods:

(a) **Soil Structure:** The structure of the soil through which rainwater flows or percolates determines the velocity of runoff and the amount of water generated as a result of runoff to a large extent. Some soils have a high capacity for infiltration, whereas others have a low capacity for infiltration.

According to studies, the average soil moisture content in West Africa is 200 mm. In Nigeria, large saturation is attained within September. Most of Nigeria's landscape, particularly low-lying places, will be flooded during the rainy season's peak in September.

(b) Deforestation: Large-scale deforestation of the world's forests and vegetation has contributed to an increase in the frequency of floods. This refers to the fact that vegetation and forests retain direct rainwater which slowly flows to the topsoil in a way that the intensity of the rainfall balances the velocity of infiltration. Therefore, proper infiltration is allowed which reduces flooding.

In most forest areas, high infiltration is maintained, resulting in the removal of vegetation and trees without exploiting or replanting them in a way that their replenishment or replacement that can cause more floods in the globe.

(c) Climate Change: Climate change has also contributed to global occurrence of flooding. The climate is an important component in the environment that influences and reshapes human actions (Etuonovbe, 2011). Climate change is defined by the United Nations Framework Convention on Climate Change (UNFCCC) as "a direct or indirect change related to human activities which alter the combination of the ambiance and increase the observed climatic variation over a particular time period" (Sani-sidi, 2012).

Climate change was blamed for the world's worst flood disaster in 2012, according to NEMA. Climate change exacerbates flooding in cities indirectly by changing the floods pattern in flood-prone places, undermining flood prediction (Odjugo, 2012).

(d) Improper Waste Disposal: Improper waste disposal, particularly in developed areas, causes drainage channels to become clogged. Such channels are intended to allow the passage of water which is frequently clogged by debris and in many cases, waste and sewage. Certain factors cause rivers and drainage canals to rise by enhancing the bed load. As a result, the rivers' boundaries are breached to neighbouring flood areas. Dams and bridges can be built over rivers, obstructing river flow and causing flash floods on a regular basis.

(e) Improper Land Use Policy Planning and Management: Inadequate land use policy management and planning are essential contributors to urban flooding worldwide, particularly in developing countries. There is a severe lack of land use policies and adequate planning in developing countries to enable proper placement of structures, buildings, drainage, road construction, and land use decrees (Adelye and Rustum, 2011). Such control mechanisms, which have allowed for uncontrolled development in developing countries around the world, are no longer available. It is unfortunate that the developing countries like Nigeria, are unable plan properly and decree land use that has either facilitated or failed to regulate floods (Adegboye, 2011).

(f) Heavy Rainfall: Heavy rainfall occurs in mostly several parts of the world, particularly in humid areas. This area is located between 00 and 300 latitudes north and south of the equator. Rainfall intensity is considered high in this region, with an average annual rainfall of around 2000 mm. Intense rainfall is most common from March to September, during the rainy or wet season. Most tropical soils find it difficult to infiltrate rainwater at a rate that matches the intensity of the rainfall. The problem is exacerbated via the abundance of concrete surfaces that define our metropolitan environment, which also prevents rainwater absorption.

2.2.6 Types of floods

Floods are part of the common weather disasters on the planet which can occur anywhere, at any time. Flooding occurs in minutes. The effects of flood can be local, which affects single community or widespread, which has impact on the entire river basins and multiple areas (NOAA, 2013). There are several types of flooding. Floods are classified as follows by the New Delhi Municipal Corporation (2012) based on duration and location:

Depending on the duration of the flood, it is classified as;

(i) Flash Flooding,

(ii) Slow-Onset Flooding, or

(iii) Rapid-Onset Flooding.

Based on the flood's location

(i) Coastal Inundation

(ii) Urban flooding

(iii) Arroyo's Flooding

(iv) River Flooding

Floods are named or classified in various ways; for example, Bariweni et al., (2012) classified floods as follows:

a) Fluvial flooding: Flooding happens in tropical regions when the capacities of water channels exceed because of snow or rainfall and ice melt in upstream catchment regions. Blockages in watercourses and flood channels may cause water levels to rise. The river defence can be breached as a result of rising water levels or large debris objects which are conveyed at high water rates. In some catchments with slowly rising water levels, the beginning of this sort of flood can be quite sluggish. This type of flood is a river because of its location, but depending on the speed of the water or the nature of the land, it may be flash or slow-onset.

b) Pluvial flooding: This type of flood is caused by rainwater and runoff from low-absorbency both rural and urban land. The intensity of new development in urban areas has resulted in more non-permeable surfaces on land, a problem that is frequently aggravated by overburdened and outdated drainage systems. When these conditions are combined with heavy rain, they can cause localized flooding. This flooding type occurs frequently outside of recognized rivers which makes forecasting extremely difficult due to very localized weather conditions. Its onset can also be very rapid, with severe flooding.

c) Flooding from sewers: Flooding from sewers occurs when the combination of rain and dirty sewer capacity is reached as a result of a high volume of surface water run-off in a short span of time. Drainage systems can become clogged as a result of poor cleaning and maintenance, resulting in local flooding.

Flooding of this magnitude is difficult to anticipate due to the significant health effects for affected individuals which happens quickly.

d) Flooding caused by man-made infrastructure: Waterways, dams and other artificial structures can fail which results in flood downstream. Flooding can also be caused by failures in industrial activities, water mains, and pumping stations, though this type of flooding is uncommon.

e) Groundwater flooding: As groundwater levels rise, low-lying areas over aquifers may flood on a regular basis. This type of flooding is frequently seasonal and thus predictable; however, it is frequently slow to begin.

f) Flash flooding: Flash flooding is much more common and severe in steep catchments. River flooding, especially in well-known floodplains, are normally predicted with reasonable accuracy. Heavy rains, on the other hand, continue to put detection and forecasting systems to the test. Water deeper than about 250 mm carry debris, especially in developed areas which can also be extremely cold. Even with low speeds, it is very dangerous to those who are trapped in it.

g) Tidal flooding, caused by a combined low-pressure weather conditions with high tides, can cause sea and river defences to be breached or overtopped. Storms whose wind speeds are high generate powerful and tall waves with low pressure fronts that cause the sea levels to rise more than the normal level. High tide levels differ with lunar and solar cycles which is combined with other tidal variations with extremely high tides outputs. The initial sea and tidal river floods are frequently abrupt with high forces enabling them pose an enormous risk to life. The tide prediction and the ability of low-pressure factors to track this type of flood can often be forecasted with reasonable accuracy. Where drainage is available, the tide cycle also limits the duration of this type of flooding (Dance and Hynes, 1980). This flood type is classified as a tidal flood due to its location and duration which is slow, fast or even flash.

According to NOAA (2013), floods are classified into five major types.

a) River flooding: This happens on a slower time scale than flash floods in many regions of the world each year. They occur when runoff from rivers and streams accumulates to the point where it overflows the banks. When this happens, the flood occupies a large area which affect areas with downstream even if the rain is not plenty. Flooding is easily predictable but the consequences can be severe for riparian settlements, even over longer time periods.

b) Coastal flooding: Floods occur as ocean water is pushed inland. Tidal storms and hurricanes generate huge waves which even raise sea levels, causing storm surge around beaches. Large quantity of water can be displaced by earthquakes, causing tsunamis to rush inland. Extensively high tides, which are sometimes related with full moon cause minimal tidal flooding on a much smaller scale.

c) Areal flooding: Same as urban flooding, areal flooding is a very common flood threat in many cities near large natural lakes. Areal flooding in low-lying areas and open fields causes standing water. Heavy rainfall over a huge area within a short time is a common cause. Furthermore, heavy rains which extends over a period of time can cause flooding, often results in low-lying areas being at risk of being submerged. Flooding can result in agricultural losses when stagnant water can breed habitats for insects and diseases.

d) Urban flooding: This is caused by flash flooding, river flooding, or tidal flooding, but it is mostly caused through high rainfall rates over developed areas which lack the capacity to take water or poorly maintained drainages. Water runoff in urban areas can be up to six times greater than in natural terrain. These floods have the potential to cause severe economic damage to businesses and homes.

e) Flash flood: The flash flood has the shortest warning time. It is defined a major increase in water level caused by a heavy rainfall. These floods happen as rainfall intensifies which makes the ground unable to take the water fast enough to avoid significant runoff which are especially common in areas with steep slopes. Flash floods are caused by a levee or dam failure. Floods can happen in less than an hour, destroying structures, uprooting trees and washing away roads. Although flash floods do not last that long or cover as much ground as other types of floods, their sudden emergence and strength allow it to wreak havoc in a short period of time.

Floods occur in Nigeria in three ways, according to Folorunsho and Awosika (2001) and Ologunorisa (2004): tidal flooding, urban flooding and river flooding. Tidal flooding exists along the coast in a low-lying belt in mangroves and freshwater swamps. River flooding exists in the flood plains of bigger rivers, whereas flash floods occur in inland areas where heavy rainfall can quickly transform rivers to destructive torrents. Urban flooding, happens in towns on flat terrain, particularly where there is no infrastructure for drainage system or if existing drainage has become clogged with urban waste, refuse and erosion soil particles (Folorunsho and Awosika, 2001; Ologunorisa, 2004). Although many of the floods mentioned above occurred in Nigeria, Etuonovbe (2011) believed that flooding occurs throughout the country in the following forms: tidal flooding, river flooding, flash floods, urban flooding, levee bursts, dam spills and breakage.

2.2.7 Benefit of Flooding

In Nigeria, the term “Fadama” is a Hausa name for irrigable land usually low –lying plains underlined by shallow aquifers found along major river systems Kudi et al (2008). In addition to providing a source of water for livestock during dry seasons, Fadama also support large and diverse resident or transient wildlife including herbivores, carnivores and migratory birds NAFDO (2007). According to Kudi et al. (2002), the word “fadama” (in Hausa language) means a low lying area which is susceptible to periodic (seasonal) flooding. Fadama farming therefore implies cultivation of growing of crop under irrigation or in the dry season because flood plains are inaccessible during the normal season. According to Ike (2012) Fadama is a tripartite funded intervention by World Bank in 1996, the Federal Government of Nigeria and participating states with objectives targeted towards poverty reduction and thus designed to improve the capacities of beneficiary group. Fadama project is mainly aim at sustaining increase in the income of users of rural land and water resources. The need for all year round improved food production in Nigeria is inevitable with the projected annual population growth rate of 5.5 percent and food production at annual growth rate of 3.2 percent World Bank (1996). The Agricultural sector is not only the most important non – oil economic activity in Nigeria; it is also the single largest employer of labour forces (70% according to NBS 2007). Thus agricultural sector is often seen as important for reducing poverty. Agriculture remains the mainstay of Nigeria Economy contributing about 40% of the total cop and employing about 70% of the working population. It is unfortunate that despite the opportunity for Nigeria to be self-sufficient in food production, there are lots of factors affecting agricultural development in the country. These include amongst others instability in government policies and the change of the economy from an agricultural driven economy of the 1960s or early 1970s to oil (crude oil) driven economy leading to the neglect of agricultural sector (Central Bank of Nigeria, 2000). Apart from the economy shifting to the oil sector, it has to be noted that agricultural production in Nigeria is dictated by climatic condition. These factor determine the range of crop planted and efficiency of the crop production is rain – fed, thus determining the agricultural production system that could be exploited to support an all year round production (especially vegetables and one of such is Fadama system of farming (Ingawa, 1998). According to FAO (2000) Nigeria has a potential comparative advantage in the production of a variety of fresh and processed high value crops especially vegetable during the dry season and livestock product (meat and milk) and fisheries product throughout the year. This is because the country is endowed with underground and surface water reserves, rich pasture and favourable agro – ecological condition in the country's low lying with alluvial deposit known as "Fadama" hence, the National Fadama development project (NFDP) supports private production but participating farmer are organized into Fadama users association to facilitate credit borrowing loans administration and recovery. The National Fadama Development Project (NAFDP) is a project of the Federal Government of Nigeria through the pooled World Bank loan, to finance the development of Fadama lands by introducing small-scale irrigation in states with Fadama development potentials. The project aims at boosting incremental food production and raises the standard of living of the beneficiaries.

Fadama are low laying lands subject to seasonal flooding or water logging along the banks of streams or depressions. It is a Hausa word meaning, the seasonally flooded or flood able plains along major savannah rivers and or depressions or adjacent to seasonally or perennially flowing streams and rivers. It is called “Akuro” and “Abata” in Yoruba land.

The enormous potentials for irrigated agriculture in the Fadama and flood plain is unquestioned. According to Baba (1998), the Fadama lands have high potentials and agricultural values several times more than the adjacent upland. Fadama development is a typical form of small scale irrigation practice characterized by flexibility of farming operations, low inputs requirement, high economic values, and minimal social and environmental impact and hence conform to the general criteria for sustainable development (Akinbile et al., 2006).

The first National Fadama Development (NFDP) was designed in the early 1990s to promote simple low – cost improves irrigation technology under the Word Bank Financing. The objective of the FADAMA project is to increase the incomes of Fadama users (farmers, pastoralists, fishers, hunters, gatherers, and service providers).

How Fadama Helps:

- It provides rural finance through the Nigerian Agricultural Co-operative and Rural Development Bank.
- It develops the interests of the private sector in agriculture by contracting private organizations to support farmers with advisory and technical services.
- It offers support for small-scale infrastructure rather than large-scale infrastructure by empowering rural communities to take charge of their development agenda.

- It encourages its users to be proactive by ensuring that they select their own agricultural research and advisory services, rather than supplying them through government channels alone.
- It helps with the availability, accessibility, and sustainability of financial services in areas served under Fadama.

2.2.8 Flood occurrences and consequences in Nigeria

Floods are natural phenomena which occur on a regular basis, according to Magami et al., (2014); the average interval (in years) between such occurrences is often used to indicate the frequency of floods in a certain location. A flood that happens approximately five times in 25 years, for example, is referred to possess a 5year regular interval recurrence (5year flood). It is really important to remember that it won't happen every five years. In addition, such a flood in any given year has a one in five chance of occurring. While a bigger flood, like a 100-year flood, is likely to occur infrequently, such a flood in any given year has a one-in-a-hundred chance of occurring (Emergency Management Australia, 2014). Flooding has posed a threat to Nigerians, communities, and institutions.

In 2010, flooding displaced residents and destroyed many buildings at Usmanu Danfodiyo University in Sokoto and other parts of the state. In fact, the University required students to stay at home for four months due to bridge damage, which was the only way to connect the University to the city; this incident had an impact on the university's academic activities during that time (Etuonovbe, 2011).

In Nigeria, flooding is not a new phenomenon. Its destructive tendencies can be extremely powerful at times. It has been reported in Osogbo (1992, 1996, and 2002), Akure (2004), Yobe (2000), and Ibadan (1985, 1987, 1990, and so on). Numerous incidents have occurred in the tidal cities of Calabar, Warri, Lagos, Uyo, and Port Harcourt, among others, claiming many human lives and property (Folorunsho and Awosika 2001; Ologunorisa, 2004).

The 1948 flood which happened in Ibadan is one of Nigeria's oldest and most well-documented occurrences (Etuonovbe, 2011). The efforts of media organizations and staff (journalist) in facilitating and promoting advocacy, programmes, enlightening people not to block or dump refuse/waste in the rivers or erosion channels contributed positively in reducing the spate and intensity of flooding in Ibadan and other cities in Nigeria. According to reports, communications and traffic have been disrupted, electricity and telephone lines have been out of service for several days, and many land areas have been inundated, paralyzing Nigerian industrial plants and commercial establishments. Furthermore, whenever there is a flood disaster in Nigeria, it causes untold hardship, particularly for the most vulnerable groups (women and schoolchildren) (Oluduro, 1988; Durotoye, 1999; Folorunsho and Awosika, 2001). This report implies that humans would be unable to comprehend the devastation caused by flooding in this country, even if all data on Nigerian flood disasters were available (Etuonovbe, 2011). The recent floods in Nigeria in 2012 destroyed more than twenty-five states, causing destruction to different degrees on the higher levels of our river system network. Among other things, the floods damaged numerous houses, schools, farmlands and sources of revenue.

In comparison, the Niger Delta (9 States) has a unique experience with such devastation (Akolokwu, 2012). Regardless of the fact that flooding has affected 22 of Nigeria's 36 states from one year to the next, the 2012 flooding will be remembered in Nigeria, even though the 2001 flood also affected 14 of the country's 36 states (Etuonovbe, 2011).

Three factors influence the outcome of flooding disasters, according to Bariweni et al. (2012). These are:

a) Predictability: This has an impact on the timing, accuracy, and communication of flood warnings sent in preparation of a flood occurrence.

(b) The degree at which the flood began: The ability of people to properly prepare for and respond to a flood will be decided by how rapidly the water arrives and rises.

(c) The speed and depth of the water: This determines how vulnerable people and property are to a flood. Even in relatively shallow moving water, standing or wading is difficult. Flood water regularly moves debris, including trees and water depths more than one meter may transport items the size of automobiles. Fast moving water can cause considerable damage to property and other objects.

(d) Flood duration: Another significant element in evaluating the degree of the flood's impact, particularly on individuals and impacted areas. According to Bariweni et al. (2012), there are two major types of flood consequences:

Secondary consequences: Water supply contamination is one of the unintended consequences (water pollution). As a result, clean drinking water is becoming limited, leading to filthy circumstances and the development of water-borne illnesses. A variety of 'receptors' are affected by flooding from the aforementioned sources. This includes buildings, people, agriculture, infrastructure, open recreational space, and the entire natural environment. Flooding can be fatal in severe cases. Flooding in and around Ibadan, Nigeria's southwestern city, has now been linked to the deaths of at least 102 people. In August 2011, floods killed a number of people in northern Nigeria. Rivers were flooded over their banks by torrential rains, causing mud homes to collapse and cattle to be washed away. Heavy rains destroyed three bridges and caused a dam to overflow, drowning buildings across the city. The vast majority of those killed were children.

Flooding can also have a significant economic impact. Losses in inventory, productivity, data and less patronage, along with transportation infrastructure and disruptions in utilities, can have far-reaching consequences. Tourism, agriculture, and livestock could all suffer as a result of the storm.

The Nigerian Meteorological Agency (NIMET) predicted the 2012 floods, but governments at all levels failed to act in time, resulting in Nigeria's worst humanitarian crisis since the 1967-1970 civil war. Floods submerged communities in a record 30 percent of the country's landmass, killing more than 300 people while affecting approximately 7.7 million people and displacing over two million (Social Action, 2012).

Flooding's consequences have grown from significant to life-threatening proportions over the last three decades, leading to loss of human lives and property. Though comprehensive statistics on the losses incurred by urban inhabitants and flood victims are unavailable, it is obvious that Nigerian citizens have suffered irreparable harm as a result of what has become a recurrent natural disaster in our cities. In addition to the destruction of homes caused by flooding, school buildings and bridges were also destroyed (Etuonovbe, 2011).

Primary consequences: Physical damage to a variety of structures, including buildings, sewerage systems, bridges, cars, roadways, and canals, has occurred across the country.

Floods wreaked havoc on more than just homes and lives. When schools were flooded, many farmlands, both arable and agroforestry, were carried away resulting in a sudden food shortage caused by the loss of an entire harvest, grain spoilage when submerged in water, and loss of animal fodder. After numerous bridges collapsed and electric poles were destroyed, flooding killed some animals (Etuonovbe, 2011). Buildings, bridges, dams, embankments, drains, roads, and railways have all been destroyed by floods. Other negative effects of flooding include environmental degradation, the spread of infestations, chemical pollution of soil and water, freshwater resources, and a scarcity of drinking water (Etuonovbe, 2011).

2.2.9 Social Systems Theory

Social systems theory is a sociological theory that offers a multi-leveled method to unifying all behavioral patterns in a particular society and their related surroundings. It is interested within a wide range of social relationships; it places an emphasis on information processes and interactions among and between variables (Vandenberghe, 1999). As a result, it is a dynamic view of the social world as well as an integrative analytical framework. However, in this context, the term systems refer to self-regulating systems that correct themselves via feedback. According to Laszlo (1972), nature contains self-regulating systems such as our bodies' physiological systems, global and local ecosystems, and climate, which incorporates human interaction procedures with the natural world.

This study's social systems viewpoint is founded on a few key principles. To begin, every phenomena may be regarded as a system or a network of interrelated parts. Second, all systems, whether biological, physical, or social, have similar patterns, behaviors, and qualities that may be studied and used to acquire a deeper understanding of complicated phenomenon behavior and bring science closer to unification (Laszlo, 1972). Schein (1980) contributed to this point of view by stating that systems theory is made up of interrelated groups of activities or regularly interacting.

According to Laszlo (1972), the new systems perspective of organized complexity moved "one step beyond the Newtonian concept of organized simplicity" in separating the parts from the whole or comprehending the whole from the parts. The interaction of societies with their environments is now famous as the primary source of interdependence and complexity. In agreement with the founders of the systems society, according to Bánáthy (1996), the goal of science, which has made major and far-reaching contributions to the field of systems theory, is "the benefit of humanity." As a result, Bánáthy develops a point of view that iterates on this: the systems perspective, founded on the discipline of system inquiry.

The concept of system is essential to systems research. A system, in the broadest sense, is a collection of elements linked and bound together by a web of relationships. According to the Primer group, a system is a family of relationships between individuals who function as a whole. Von Bertalanffy defines a system as "components in a standing relationship." (Banathy, 1997:22).

Furthermore, another critical analysis of systems theory, Buckley (1967) stated that there are three types of systems: organic, mechanical and socio-cultural. These three types of systems vary qualitatively and quantitatively in terms of how it works and their degree of instability and complexity. Closed systems react to a narrower range of environmental frequency than open systems (for example, socio-cultural systems). Closed systems are generally entropic (that is, they break down), whereas open systems are negentropic (i.e., they tend to elaborate structures).

Luhmann (1927-1998) emphasized in another viewpoint of systems theory whose systems are less complicated than their surroundings. Systems make complex environments simpler by extracting bits of information. Systems are forced to choose from a plethora of pieces of information in a surrounding, systems theorists must regard the disaster of a system's choices, because the system will be chosen differently. This is a potentially disastrous situation since paying attention to certain bits of information while ignoring others may have unintended implications for the system if the information being ignored is critical user (Vandenberghe, 1999).

Autopoietic systems, according to Luhmann (1927-1998), generates its own primary constituents which are self-organizing in the sense that they define their own internal structures and boundaries; they are self-referential in the sense that their constituents refer to the system itself; which are closed systems in the sense that it does not interact with their surroundings directly, but with representations of the environment. He considers society to be an autopoietic system (Vandenberghe, 1999). As a result, communication is the most fundamental element of society, and everything else is part of a society's environment (e.g., biological, psychic and physical systems). Meaning is essential to both social and psychic systems that serve as surroundings for one another. Because of the contingency, meaning is understandable in Luhmann's system theory.

Luhmann (1927-1998), there is a double contingency, every communication must consider how it will be received. Social structures (e.g., roles and norms) increase the probability that both sender and receiver will understand the communication. Social structures also help to maintain communication continuity over time. As a result, double contingency provides a significant impetus for social system evolution. Luhmann's evolutionary viewpoint is inextricably linked to his systems theory of differentiation. In the explanation of Luhmann, differentiation is the process by which a system responds to changes in its environment. Differentiation increases the volume of complexity given in a system; that is, as the environment changes, a system (e.g., behavior or culture) will build new behavioral conditions to deviate from the norm.

According to Luhmann, there are four types of differentiation: stratificatory differentiation, center-periphery differentiation, segmentary differentiation and functional differentiation. The latter type of differentiation, according to Luhmann, is the most complicated and problematic for modern society because it means that issues are frequently shifted from the societal level to its subsystems (e.g., the problem of ecology). In conclusion, Luhmann's society is an international society which can only be examined from within the system. Therefore, observing the connection between a society and its semantics, or how it characterizes itself, can provide insight into society (Vandenberghe, 1999).

2.2.10 Flood Prediction

Flood predictions with forecasting rely heavily on precision of available climatic database. The most significant accomplishments in this regard were the establishment of the Hydrological Operational Multipurpose Sub-Program (HOMs). However, because of the huge benefits, changes in the forecasting system and public awareness promotion are required. A network of instruments, satellites, and other meteorological flood forecasting tools, combined with an appropriate model, can be used to forecast the occurrence and other characteristics of the phenomenon in question in real time (Blandford,2006).

In some countries, the invention of few hydrological forecasting systems has resulted in significant lifesaving and damage reduction. Similar systems will reduce the sensitivity of specific places which encourage the initial evacuation of sensitive places. However, difficulties in relocating people have been identified as a result of the population's resistance to being exposed to flooding. (Plister, 2002) noted this as a major factor in the ineffective response to the evacuation decree in Australia, New South Wales as well as the impact of wolf howling as a factor that might make evacuation more difficult or impossible.

According to Olowu (2010), the weakness of state infrastructure, a lack of an effective legal and policy system, and, in some cases, a lack of sufficient resources makes many developing countries, particularly those in Africa, more susceptible to the repercussions of floods and other natural hazards.

2.2.11 Flood Incidences

The amount of flood damage is difficult to estimate and to measure it in a reasonable manner because of the tendency to exaggerate flood hazard, especially during the flood (Smith, 2006). The higher Mississippi River, the Red River of the North and the Missouri River Basin were flooded from March to May 1965 as a result of heavy snow melting, whereas snow is never experienced in Nigeria because of our perpendicular position and tropical location to the sun. In 2007, Pakistan experienced a rare flood in the Middle East, causing damage to more than 70 acres of land worth more than $2 million.

Flooding in Nigeria is primarily caused by excessive rainfall, urbanization, and insufficient waste disposal. Floods in Nigeria can be classified into three types: river flooding, urban flooding, and tidal flooding (Gwary, 2008; Adeoti, 2010).

The flooding of the Ogunpa stream in Ibadan killed several individuals and halted all socioeconomic activities. It has also flooded 500 homes in various parts of the city.

The flood was caused by heavy rain, and approximately 32 people were killed and 1,000 were injured as a result of the incident (Nigerian Tribune, 8 September, 1980)

Flood disasters struck Ilorin, Kwara State, in 1973, 1976, and 1979. Recently, in August 2008, residents of Makurdi were evicted from their homes and farmlands, leaving them deprived, following two days of heavy rainfall that was described as hazardous (Taiwo, 2008). Akani and Bilesanmi (2011) describe how the Lagos flood enforced residents to change their places as a result of heavy rainfall on July 7 and 8, 2011, not realizing that the following week would bring more devastating torrential rains, resulting in even more destructive floods in the Lagos metropolis. Flooding has affected cities in Nigeria at various times, particularly in densely populated cities (Mordi, 2011, Amaize, 2011).

The Benue River, one of Nigeria's two main rivers that rises from North West Cameroon, was flooded in early October 2012 as a result of heavy rainfall, which contributed to more water being released from the dam. As a result, an unprecedented flood of rivers engulfed all of the states bordering the Benue River and the low-lying areas. Since the floods began in July, at least 325 people have been reported dead, hundreds of thousands have been displaced, and a million farmlands have been flooded, raising concerns about food security (National Emergency Management Agency, NEMA, 2012). The widely publicized flood of September-October 2012 damaged over 2 million homes in 20 cities and numerous towns. (Oct. 31, 2012, Punch)

The flood caused panic in all countries and caused a massive increase in food crop prices, which results in estimated 2% increase in the country's inflation rate (Sanusi 2012). In fact, this is the country's worst flood experience in history, with the effects still felt in most parts of the country. The government has spent higher than a hundred billion Naira (N100,000,000,000) on relief supplies for flood victims in the country (NEMA, 2012).

In the face of a flood disaster that has submerged roughly one-quarter of the country's towns, many Nigerians hope that the floods, which may not recede quickly, have been mitigated. (20th of October, 2012). The main cause of the country's flood disaster is deemed to be inadequate methods and strategies for flood prediction with management that aren't accessible.

2.2.12 Coping strategies of farmers in flooded areas

It is essential to note that the ability to monitor, or at least reduce, the risk of such floods in some areas is a critical factor in saving lives. Certainly, flood control and management do not provide the ultimate solution to the world's flood hazards, but they can provide a framework for reducing their impact on human actions, property and lives. Human cannot completely control the climate that causes rainfall to flood our landscape, immediate and systematic preparations are required to help mitigate the flood's impact (Afiesimama, 2008).

Understanding the spatial aspect of flood hazards and putting disaster management measures in place will help with flood prevention and management. Recently, researchers discovered that one technique for understanding and studying flood behaviors is to create flood risk maps, which can further be used for land management and strategic planning (Ogbonna, 2011). There is a research being conducted on Geographic Information System (GIS)-based integrated assessments of population and agricultural vulnerability to floods (Pradham 2010).

Along with the geographical scope of major hazards and the fact that disaster recovery operations typically include a large number of organizations working in the areas, understanding geographic information is critical for making important decisions. It enables real-time information sharing, time and saving resources.

G.I.S enables the centralization and visual display of information that is vital in an emergency by displaying an interactive flood risk chart. Flood risk mapping identifies the places at risk which should serve as the foundation for any flood damage reduction program and prevalent activities. The risk map's purpose is to:

Raise public awareness of flood-prone places;

Present information on flood-prone areas by identifying the flood risk region; and provide insight into spatial planning.

Carry out spatial planning and land management, which provides a variety of methods for avoiding natural disasters.

According to Samarajiwa et al. (2007), urban planning is used to promote early warning, risk assessment, and monitoring of hazards. Burton et al. (1968) classified alternative flood mitigation measures into two types;

Corrective measures

Preventive dimensions

Flood control and other methods are the two types of corrective measures. Flood control and other preventive dimensions are two parts of preventive dimensions.

Flood control measures include building walls, channelling streams, reservoirs, levees, and constructing drainage infrastructure. This includes flood control measures, evacuation of flood-prone areas, land use planning, fore carts, and other structural and technical adaptations to flood hazards (Zevenbergen, 2008). Furthermore, the provision of flood insurance would assist in reimbursing the affected people in a variety of ways.

2.2.13 Application Areas of Flood Control and Management

Flood control and management applications comprises of rice plantation, irrigation systems, drainage infrastructures, strategic planning and land management, flood prevention and management, and flood impact mitigation.

2.2.14 Need for incidence of flooding and Coping strategies Among Rice Farmers

The challenges that are caused by flooding such as burying of seeds, washing away seedlings, washing away seedbed, loss of crop stand, less customer, less monetary income on rice production, hinder rice farmers from crossing across the flooded areas, reduction in yield and loss of farmland. Hence there is a need to adopt coping strategies such as planting of improved rice variety, changing of planting date, change from lowland to upland site to another place, raising or creating barriers at the edge of the farmland, better road design, improved drainage system, proper garbage disposal, and improved garbage collection.

2.3. Review of Methodological Approaches (Empirical Studies)

Mirza, (2010) worked on climate change, flooding in South Asia and implications, examining South Asia as a prominent flood region caused by heavy monsoon precipitation, which destroys property, crops, and infrastructure. Climate variability may increase the magnitude of the flood over time, raising the level of flood risk. The major rivers in that region, such as the Ganges, Brahmaputra, and Meghna, all play an important role in flooding. This article went on to discuss the research on the high likelihood of the magnitude, frequency and extent of flooding increasing in South

Asia in a warm climate with high vulnerabilities, causing crop, agriculture, and infrastructure damage.

Adeloye and Rustum, (2011) worked on Lagos (Nigeria) flooding and the influence of urban planning, where the causes of flooding issues experienced in Lagos (Nigeria) were investigated and recommendations for long-term management alternatives were made. The data used in the analysis came from physical planning regulations, climate, and drainage infrastructures. The analysis was further combined with survey samples obtained from stakeholders and field inspection, university researchers and residents. The outcome of the research reveals that the primary cause of flooding is not ascribed to climatic change or high rainfall in Lagos. Furthermore, the study discovered the primary cause, which is urbanisation, unplanned building erections in flood plains, and insufficient storm drainage infrastructures in the city. Finally, a long-term halternative to flooding which necessitate the incorporation of long-term drainage systems into the city's flood management strategy.

Bailey-Serres, Lee and Brinton, (2012) worked on Waterproofing Crops. Effective Flooding Survival Strategies which reveals that the increased intensity of water which has resulted into flooding has caused losses in crop production in past years. A better solution is to adopt and develop germplasm that can endure abiotic assaults which can be further disseminated to farmers who cultivate in flood plains. In this research, a lot of flooding mechanisms such as waterproofing crops were itemised and analysed with their properties such as constituents, morphological and anatomical adaptations, and improvements. The conclusion states that the evolution of these itemised survival strategies will regulate flooding and enable tolerance and avoidance strategies.

Jongman, Ward and Aerts, (2012) worked on Global exposure to river and coastal flooding: Long-term trends and changes, this study reviewed flood events, climatic changes, and global management methods. This paper shows the first estimate of universal economic exposure to river and coastal flooding between 1970 and 2050 making use of two different damage assessment methods. The first technique is composed of population, while the second method is based on land decree in places prone to 1/100-year floods. The GDP estimate derived from population is likely to rise in the coming years, with the highest projections focusing on North Africa and Sub-Saharan Africa. In conclusion, the two previously mentioned methods were used to estimate historical, current, and future flood risk on a global scale. This research demonstrates the universal land-use data which are greatly generalized.

Margret Sauter, (2012) worked on Root responses to flooding, which reviews the effects of soil water-logging threat to plants by itemizing the roots that suffer from oxygen shortage, thereby hampering the functional root system, whereas flooding-resistant plants have modifications that aid in the preservation of oxygen supply. The review conclusion reveals that adventitious root formation consists of flooding-adapted plants that support the basic root system when soil aeration is complicated. The adventitious root's unique properties aid in flood control, which improves farming.

Qin, Li and Fu, (2013) worked on the effects of low-impact development on urban flooding under different rainfall conditions, which reviews the impact of development on conventional urban drainage systems This paper's case study was conducted in China, where three techniques, including swales, permeable pavement, and green roofs, were used to analyze and compare with the existing conventional drainage system design. The LID technique was used to conduct a comprehensive analytical review of a variety of storm events with varying rainfall durations, amounts, and peak intensity locations. The three LID scenarios perform best, but it varies significantly depending on the location of peak intensity, such as swales performing best during a storm scenario with early peak, permeable pavements performing ultimately with a middle peak and green roofs performing excellently with a late peak. Finally, this paper provides a detailed analysis of the LID design performance under various rainfall properties that is critical for effective flood management in urban areas.

Ezemonye and Emeribe, (2014) discussed about flooding and household preparedness in Benin City, Nigeria, which iterates flooding as an important environmental disaster in urban areas of Nigeria, exposing them to rapid deforestation, unplanned growth, tropical climate, and encroachment on flood-prone regions. Floods are major hazards that endanger humans and developmental processes while interfering with socioeconomic activities. It is concluded that the phases of preparation and mitigation serve as a better strategy in the event of a flood disaster. Long-term recovery phases are critical, and household preparedness is an immediate response requirement. This paper investigates Disaster Risk Reduction (DRR) in the light of household preparedness in Benin City.

According to the findings of this study, respondents associate their preparedness with the religious belief system, which is an essential governing factor in the use of preparedness as a response to any hazard. The ANOVA and multiple correlation analysis are used as metrics to assess the highest variance in socioeconomic factors that influence disaster preparedness dimensions. According to the study's recommendations, the first mitigation strategy in sensitizing households to flood impact management should be the exploration of household preparedness.

Nkwunonwo, Whitworth and Baily, (2015), worked on flooding and flood risk reduction in Nigeria: Cardinal Gaps, which reflects on critical flood-related issues in Nigeria, including the effects, causes, and solutions. Flooding damages have increased as a result of factors such as urbanization, poor urban planning, climate change, and rapid population growth, which is usually established by the frequency and intensity of rainfall. The most common approaches to dealing with floods are limited to a lack of flood data and a few other unidentified causes. Flooding in Nigeria has affected over 11 million people over the years, resulting in 1100 deaths and billions of dollars in property damage. Lagos state has a high number of floods, as do other states such as Oyo, Adamawa, Niger, Kano, and Jigawa, which are influenced by the rivers Niger, Benue, and Ogun. In conclusion, flood modelling and vulnerability assessment have both been critical to reducing flood risk by analyzing the susceptibilities of social systems to the hazard.

Akukwe and Ogbodo, (2015), worked on spatial analysis of flooding vulnerability in Port Harcourt metropolis, creating vulnerability indices and comparing the indices across the 13 zones which is made up of the Port Harcourt metropolis. This paper adopts an integrated vulnerability assessment measure with indicators classified as sensitivity, adaptive capacity and exposure related to the climatic change defined as vulnerability. The indicators' data was derived from questionnaires, map measurements and fieldwork. The first component scores were calculated using principal component analysis, which is typically used to weight variables before it calculates the vulnerability indices of the 13 zones.

According to the vulnerability indices, Mgbuosimiri (Zone K) is the most vulnerable, while Eligbolo (Zone D) is the least vulnerable. This research used cluster analysis to group various vulnerability indices, resulting in a vulnerability map depicting the spatial pattern of various flood vulnerability levels such as high, very high, low, and very low vulnerability levels. In conclusion, the vulnerability map can be used to reduce damage potential by incorporating its outcome into emergency planning and spatial planning.

Mallakpour and Villarini, (2015) reviewed the changing nature of flooding across the central United States, explaining flooding patterns as well as their societal and economic impact, thereby contributing to fatalities and damages in the central United States. The rise in rainfall is caused by climatic changes that occur over time. The frequency and magnitude of flood events, on the other hand, remain constant or change over time. The mechanisms underlying are worth investigating, which improves the analysis of 774 stream gauge stations from the central United States with limited evidence of major changes in the scale of flood peaks which makes flooding to become more common. The variation in flood occurrences reflects regional variations in seasonal rainfall and temperature.

Ibrahim and Abdullahi, (2016) worked on flood menace in Kaduna metropolis: impacts, remedial and management strategies for reducing yearly flooding in Kaduna metropolis. Data for this study were gathered through interviews, questionnaires, personal observation, ministry archival records, and newspaper reports. The total number of respondents is 196, with descriptive statistics and the Likert Rating System used in data analysis. The data analysis results show that floods in Kaduna metropolis occur mostly during the peak of the rainy season (September), which can last for 3 – 5 days before the flood water recedes according to the impact of the receding factors in different places.

Other factors which contribute to flooding include a lack of or poor drainage networks, waste dumping in drainage and water channels, topographic properties, overflowing water banks, climate change, and low infiltration according to a high-water table. In conclusion, the flood menace has ravaged many places in Kaduna metropolis, necessitating the sensitization of citizens to flood incidence and the implementation of proactive intervention.

Adekola and Lamond, (2017), worked on a media framing analysis of urban flooding in Nigeria: present perceptions and policy consequences. Policies are implemented in an effective flood management system, which necessitates the involvement of key policy actors, which aids in the strategical narratives that influence policy directions. This paper used a scientific data analysis to investigate the frame which consist of five policy stakeholder groupings identified as local communities, business, government, multilateral organizations and non-governmental organizations that are the narratives of causes and strategies in resolving urban flooding in Nigeria and were derived from a national news article published between 2012 and 2016. This paper highlights places of potential agreement and conflict between direct actors like the local communities and government.

Wahab and Ojolowo, (2017), worked on building contraventions and flood incidence in the Lagos Metropolis, Nigeria, which investigates the impact of construction code violations to flooding in flood-prone places of the Lagos metropolis. The Global Positioning System (GPS) can determine the location and elevation above sea level of 1,025 buildings located on 211 flood-prone streets. The building's distance from the drainages was calculated in the ArcGIS 10.2 environment. Further investigation reveals that 63.5 percent and 63.3 percent of the sampled structures violated the building-plot ratio, resulting in tragedy from drainage systems. To reduce flooding and its problems in this metropolis, it is recommended that proactive urban planning, strict enforcement of building codes and development control regulations be implemented.

Andimuthu, Kandasamy, Mudgal, Jeganathan, Balu and Sankar, (2019), worked on the performance of urban storm drainage networks under changing climate scenarios: flood mitigation in an Indian coastal city, which recounts flood events in Chennai with repeated reports over the last decades. In this study the current state of storm water is examined which is compared to current and future climatic scenarios in one of Chennai's most flood-prone areas, viz. Mitigation is a recommended flood-resilience measure. The extremities and Intensity-Duration-Frequency (IDF) curves were generated using daily rainfall data from the India Meteorological Department between 1975 and 2015. The IDF curves are generated for 2, 5, 10, 50, and 100-year return periods based on current and future climatic events derived from DGPS surveys.

Adaku Jane Echendu, (2020), worked on the impact of flooding on Nigeria's SDGs, highlighting and enumerating the specific SDGs that are impacted directly. Flooding is mostly caused by humans, so spatial planning is a good Flood Risk Management (FRM) technique for the Nigerian society. This study educates all stakeholders on how to address the flooding problem, thereby moving Nigerians closer to realizing the United Nations (UN) 2030 SDGs. In conclusion, the information represented in this study aims at enhancing flood-fighting action on a national scale.

Owoeye, Abe and Olasemojo, (2020), worked on a study on anthropogenic actions influencing flood vulnerability in ala riverfront residential areas of Akure, Nigeria, with the goal of identifying areas vulnerable to flood disaster in the river basin and suggesting potential mitigation dimension. During data collection, 265 questionnaires, representing 1% of the research population, were distributed by making use of a random sampling technique. The research show that buildings built along riparian land and improper waste disposal into river bodies, channels, and waterways are solely responsible for the blockage that causes flooding. The general public's failure to adhere to management measures and flood forecasts is also a resultant effect. This study also suggests a public awareness campaign to reduce citizens' vulnerability to flood disasters, as well as the construction of an artificial lake as a natural basin to accumulate massive quantity of water discharged.

2.4 Theories affecting the study

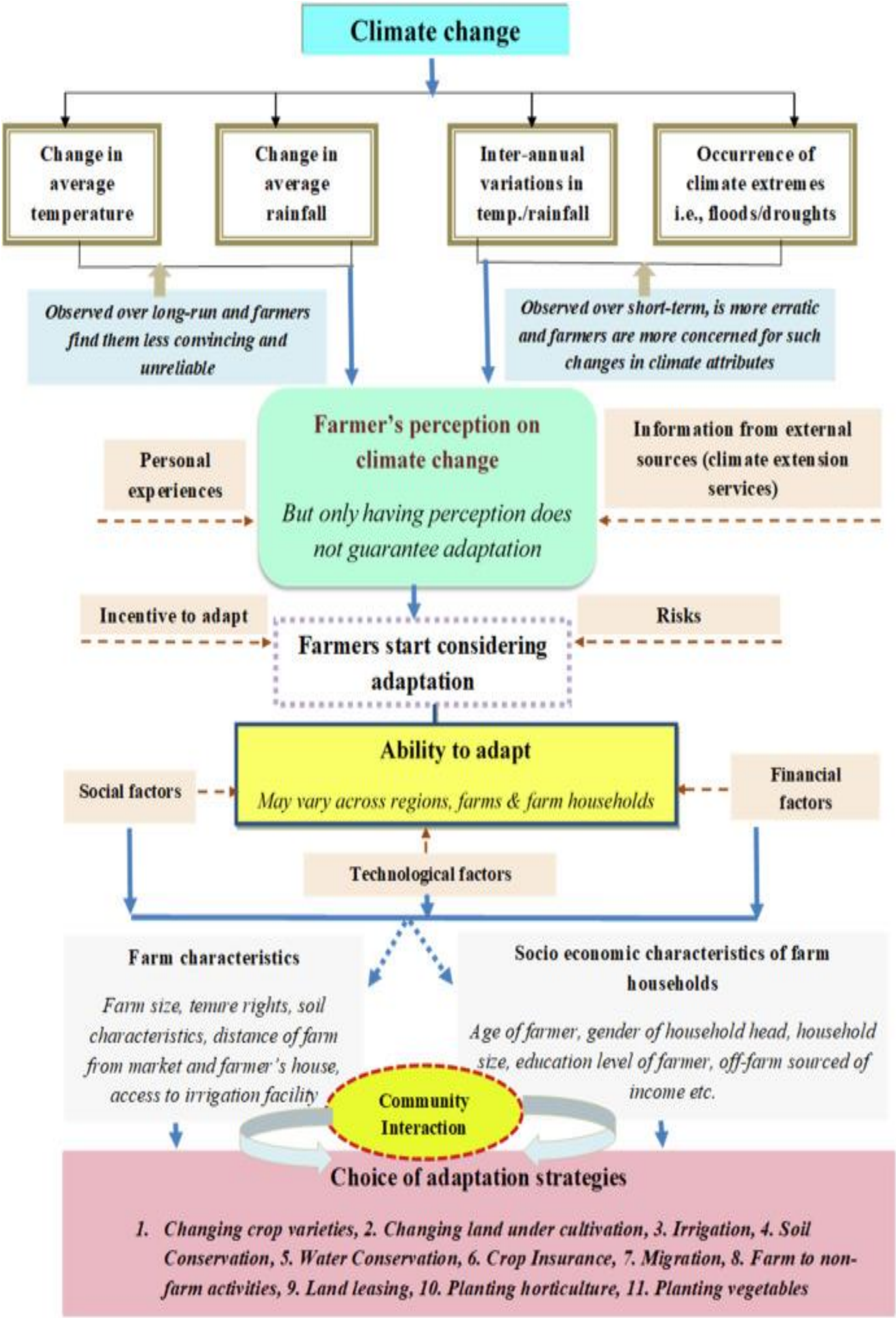

Fig 1: THEORETICAL MODEL OF THE STUDY

Source: Chandan Kumar Jha, Vijaya Gupta (2021)

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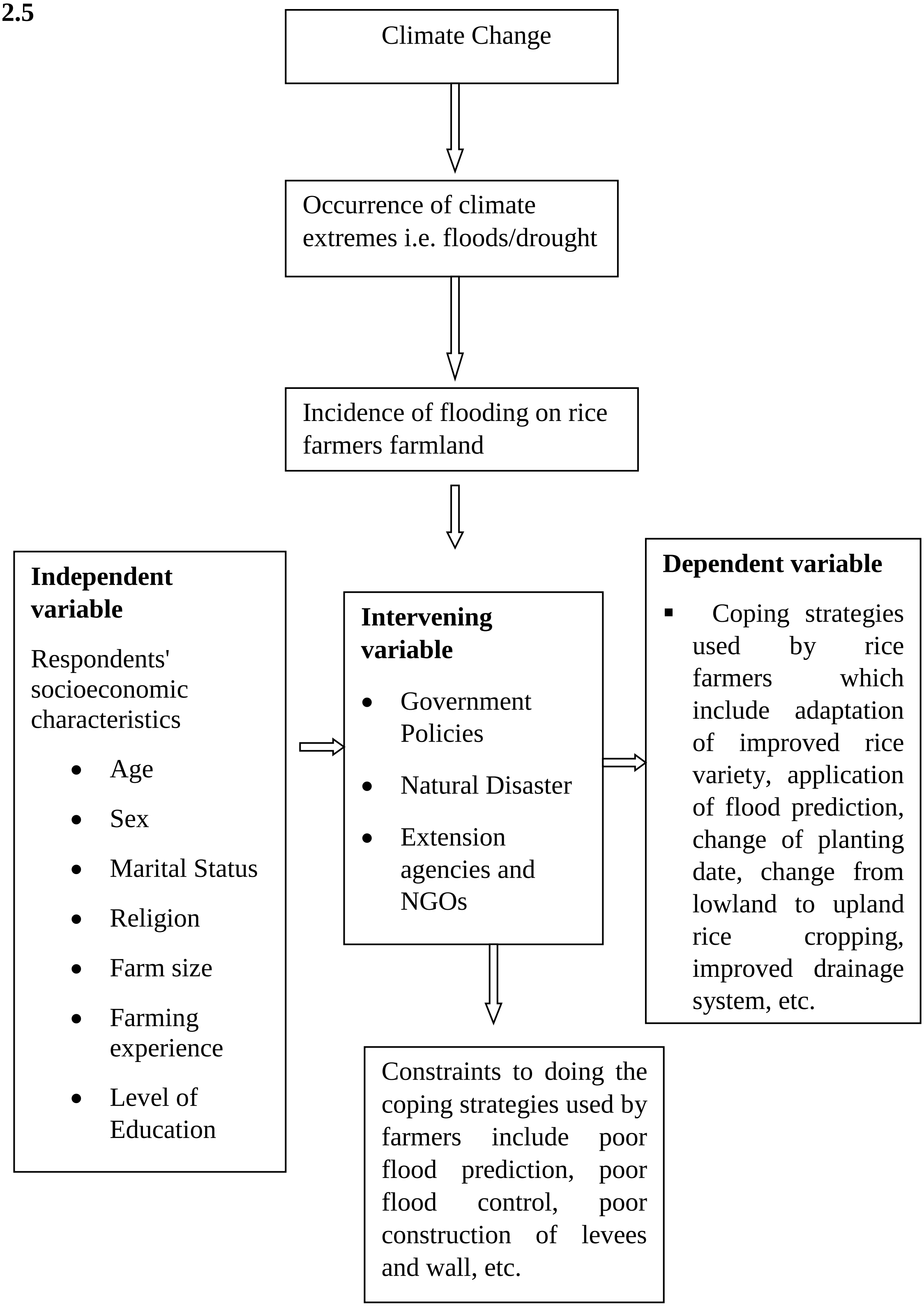

Fig 2: CONCEPTUAL FRAMEWORK OF THE STUDY

Source: Field Data (2020)

2.6. How the conceptual model works

The framework begins with the change in climate. The change in climate varied from change in average temperature, change in average rainfall or occurrence of climate extremes i.e., flood/drought which led to incidence of flooding. Climate change is an important factor in agricultural production such as soil, crops, livestock and poultry production. The alteration and increase of rainfall patterns are one of the factors of global warming in humid environments. This change causes flooding, which has an impact on agricultural production. The coping strategies is well-used by the farmers. The farmer's socio-economics is being impacted by the coping strategies. He uses his marital status, farm size and household size to accept and adopt the strategies. Marital status demonstrates that farmers who are married become reliable, dependable and exhibit more wisdom in coping strategies to flooded rice farmland and also, they can have more hands to assist.

Similarly, farm size is one of the damages caused by flooding, and by implementing coping strategies, farm size will increase. A farmer with large farm will pay more attention to the damages caused by flooding and avoid it with coping strategies. Households with a relatively large size provide a cheap source of family labor, increasing the adoption of coping strategies on flooded rice farmland.

This was approached through the use of coping strategies which are planting of improved rice seedlings variety, adaptation and application of flood prediction by Nigerian Hydrological Services Agency (NIHSA), change of planting date, change from lowlands to upland rice cropping, shifting from flood-prone site to another place. Raising or creating barriers at the edges of the farmland and improved drainage system.

Similarly, extension agent uses extension services, institutions to introduce new farm practices to farmers. Extension agents serve as a bridge between farmers and coping strategies in this case.

According to Luhmann, (1927-1998), his systems theory of differentiation is inextricably linked to the evolutionary viewpoint. In his words, the process through which a system adapts to changes in its environment is known as differentiation. The change in the environment varies from irregular rainfall pattern, change in weather condition, depletion of the ozone layer etc. The coping strategies encourage farmers to have increased agricultural productivity.

The coping strategies adopted by the farmer may indirectly be affected by intervening variables inform of government policies, political environment, natural disasters or risks and uncertainties, therefore being an impediment to farmers performance and achievement of the increased agricultural productivity.

2.6.1 Description of some components of the conceptual model

2.6.1. Independent variables.

The model's independent variables are the farmers' socioeconomic properties such as age, gender, religion, marital status, educational level, major occupation, secondary occupation, household size, years of farming experience, farm size, sources of income, rice production earning, farming experience, sources of labour, sources of information, extension information, membership of association/cooperative society, leadership position in association/cooperative society, land ownership, topography of the land, type of farmland, location of the rice farmland.

2.6.2. Intervening variables

The intervening variables are made up of government policies, political environment, natural disasters, extension agencies, nongovernmental organization and financial institution.

Government policies comprises of policies affecting flooding, senility is weakness that farmers do experience as a result of old age, political environment includes national policy makers, state of economy which further comprises of state of infrastructural development and social structures.

2.6.3. Dependent variables

The dependent variable is the coping strategies used by rice farmers which include planting of improved rice seedling variety, application of flood prediction, change of planting date, change from lowland to upland rice cropping, improved drainage system, which increase agricultural production.

The significance of planting of improved rice seedling variety and improved drainage system is not in doubt. It is for this reason that adoption of coping strategies emphasized in their village against flooding, stressing that the farmers should plant improved rice seedling; they should not allow flood to bury their seedling. With this, it is assumed that the farmers will adopt the use of coping strategies on their rice farmland to reduce the incidence of flooding and thereby increasing agricultural productivity.

2.7 SYNTHESIS OF THE CONCEPTUAL MODEL AND EXPLANATION OF THE FRAMEWORK

2.7.1 Socio-economic characteristics of incidence of flooding and coping strategies

Education acquired and coping strategies to flooding of rice farmland

Education acquired by the farmers in flooded areas has much influence on coping strategies; educated farmers have higher rate of understanding the incidence of flooding and accepting the coping strategies used as a result of planting of improved rice seedling variety and its related coping strategies. Once this is properly understood, the farmers accept and adopt for use.

Various strategies have been tried to educate the rural people in rural development programmes. Agricultural extension education is primarily used to teach farmers enhanced farming techniques which is to increase production efficiency and income, thereby improving the living standard. Farmers in flooded areas will benefit from the coping strategies used by rice farmer and will teach other farmers the damaged caused by flooding, constraints to coping strategies and coping strategies if affected by flood.

Occurrence of flooding of rice farmland

According to farmer's report as shown in Table 5, incidence of flooding usually reaches its peak in September, this may be as a result of variation in climate.

Damages caused by flooding on rice farmland

The damages caused by flooding to rice farmers farmland ranges from less monetary income on rice production, reduction in yield, loss of crop stands, hinder rice farmers from crossing across the flooded areas, washing away seedlings to burying of seeds.

Coping strategies used to cushing effect of flooding

The farmers plant improved rice seedling variety and apply flood prediction by Nigerian Hydrological Services Agency (NIHSA) as their coping strategies. Also, the farmers use change of planting date, change from lowlands to upland rice cropping, shifting from flood-prone to another place, raising barriers at the edge of the farmland and improved drainage system as part of their coping strategies.

Constraints to adopting the coping strategies used by the farmers.

The farmers experience constraints to coping strategies as a result of the poor flood control and poor construction of wall on their rice farmland.

CHAPTER THREE

3.0 METHODOLOGY

3.1 The Study Area

The study area covered Kwara State. Within Kwara State, two Local Government Areas, Edu and Patigi have been chosen as study area. The two Local Government Areas have been studied homogenously. They run along the river Niger where farmers grow rice massively. Kwara State, Nigeria, was established in May 1967 as part of the twelve states which replaced the country's four regions. The State was initially known as the West Central State before changing its name to Kwara that is the local name for the Niger River. It is located at 80°30° N latitude and 50°00° E longitude of the equator, is situated in the transition region between the Savannah Forest of Nigeria and the capital is Ilorin. Kwara State has an estimated population of approximately 2.5 million people (NPC, 2010), occupies approximately 32,500 km^2 and consists of 16 Local Government Areas (LGAs).

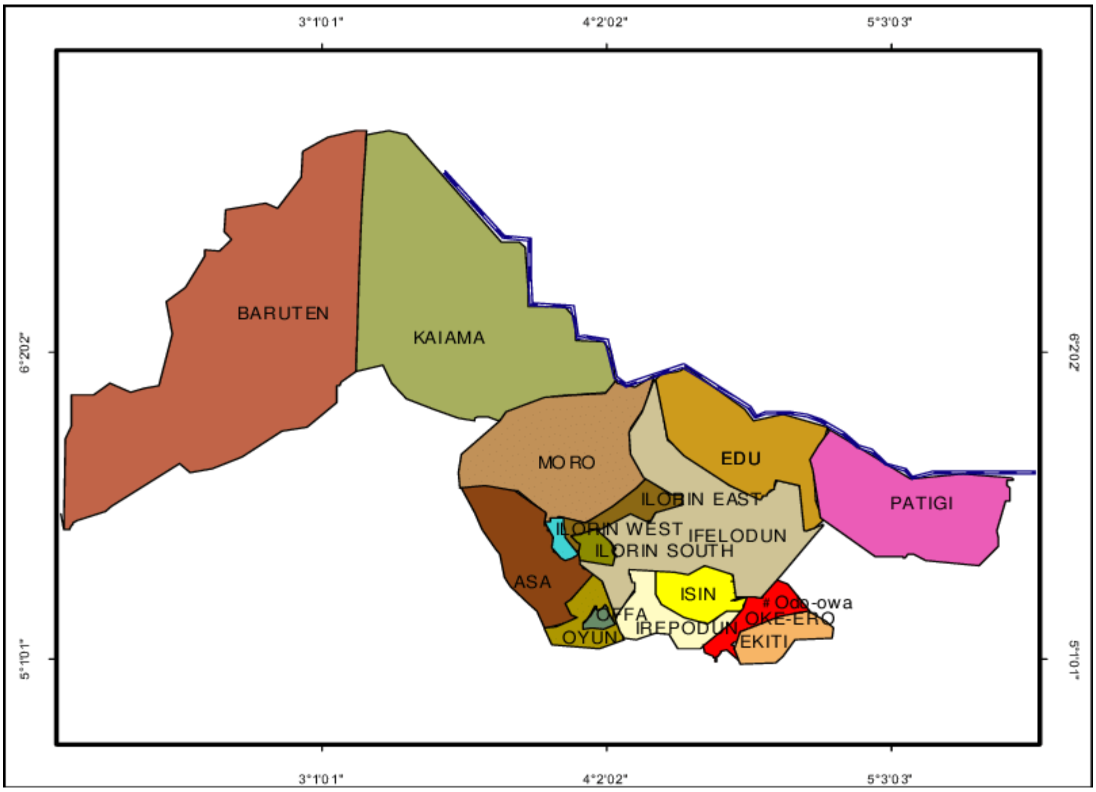

Figure 3: Map of Kwara State, Nigeria (source: http//www.google.com)

Edu Local Government Area is located between Longitude 4° 54'15" South and 50 31'00" North Greenwich meridian and 80 35'latitude 38" North and 90 15'00" East of Ecuador, it precedes an area of 2,542 km^2. Edu is one of Kwara State's 16 local government areas, with the headquarters in Lafiagi. According to the 2006 Census of Population, the local government area has a population of 201,469 people. It is divided into three administrative roles: Lafiagi, Tsaragi, and Shonga. The study area has average annual rainfall of 300 mm and temperatures of 29° C.

The average relative humidity is around 78.6%. This seasonal variation derives the lowest level of achievement as low as 69.99%. This area of study is distinguished via an alternating wet and dry season; the rainy season begins at the end of March which extends till October, while the dry season begins in November and end in early March of next year.

Edu Local Government Area is ruled by Nupe-speaking people who live near river banks and rely primarily on agriculture for a living. The two main activities of the people in the study field are fish farming and rice cultivation.

Patigi LGA is geographically located between Longitude 4°54' and 5°36' and latitude 8°36' and 9°14' with an area of 1168km^2. The location shares common boundaries with Niger State, Kogi State. It has a total land area of about 2924.62sq.km, which is about 5% of the total land area of the state – Kwara State. According to Kwara State Agricultural Development Project, approximately 25% of the land area of the Local Government is used for farming activities. The total estimated population of Patigi Local Government Area according is about 45,494 (22,712 males, 22,782 females).

The town is the headquarters of the Local Government of Patigi and the Emirate of Patigi. It is populated by the Nupe people who also display the Yoruba dialect's linguistic range. They are farmers, freshwater fish sellers/fishers, and traders. The local government is one of the largest Fadama lowlands in the state, with the Niger River as the primary source of water.

3.2 Study Population

Farmers growing rice along the riverine area of the Niger River in Edu and Patigi Local Government Areas of Kwara State were the study's target population.

3.3 Sources of Data

The study's data was obtained from both primary and secondary sources. Farmers growing rice along the banks of rivers of the Edu and Patigi LGAs provided the primary data. This study's data was gathered using an interview schedule.

The secondary data were used to supplement the primary data. Specifically, from literatures from related Journals and internet literatures. The Landmark University Library assisted greatly in finding related literatures, while the Kwara ADP supplied tremendous information that form substantial part of this work

3.4 Sampling Technique and Sample Size

The sample for the study was chosen using a multi-staged sampling technique. The first stage involved the purposive selection of Edu and Patigi local governments based on their location along the Niger River Bank and flood-prone places. Rice farming is practiced in Asa, Baruten, Edu, Ifelodun, Ekiti, Ilorin West, Ilorin East, Ilorin South, Irepodun, Isin, Kaiama, Moro, Offa, Oke-Ero, Oyun and Patigi Local Government Areas, according to the Ministry of Agriculture and Natural Resources (Kwara State

Farmers' Census, 2010). In addition, Oke Ero, Oyun, Irepodun, and Ekiti Local Government Areas have the most rice hectares.

The Local Government areas were selected using a purposive sampling technique related to the effect of flooding in the study area. The villages affected by flood in Edu Local Government are Lafiagi, Edogi, Lilpata, Eko, Dugbangi, Ginda, Shonga, Taada Effagi, Belle; while villages in Patigi Local Government are Edogi Kpasanaku, Sakpefu, Godiwa, Wako, Kpada, Lusama, Zitswala, Sokingi, Maagi, Lade Tsuba. The villages were chosen because of the high frequency of flooding in each of the Local Government Areas. In the second stage, ten villages from each Local Government areas were chosen at random from a list of affected communities. In each village, twelve (12) farmers were chosen at random making a total of one hundred and twenty (120) farmers/LGA.

Primary data was obtained by the use of an interview schedule to interview two hundred and forty (240) farmers from both Local Government Areas using a random selection method.

3.5 Data Instrument and Data Collection

The interview schedule method was used to collect information from respondents. It was designed in a closed-ended format to extract statistically reliable information about the incidence of flooding, damages caused by flooding, coping strategies, and barriers to implementing coping strategies in the study area.

Table 1: Summary of Analytical Tools used for the study

S/N	Objectives/ Hypotheses	Analytical Tools used
1	Objective 1 and 2	Descriptive statistics such as frequency, percentages, tables, graphs, means/averages, charts as well as cross-tabulations.
2	Objective 3,4 and 5	Frequency counts, Percentages, means, ranking and chart
3	Hypothesis 1	Multiple linear regression
4	Hypothesis 2	Chi-square and spearman's rank co-efficient

3.7 **Measurement of Variables**

The Coping strategies among rice farmers is the dependent variable while socio-economic features of the farmers are the independent variables.

The dependent and independent variables were duly subjected to measuring scales.

Socio-economic variables are;

Sex: The respondents were asked to indicate their gender as either male (1) or female (2). It was measured at nominal level

Age: The respondents were asked to indicate their actual ages. This was measured at interval level.

Religion: The respondents were asked if they belong to any religions body and it was measured at nominal level as traditional worship (3), Islam (2), and Christianity (1).

Educational level: The respondents indicated their number of years spent at the various schools they attended. This was measured at interval level.

Marital status: The respondents were asked to classify their marital status and it was categorized at nominal level as single (1), married (2), widower (3), divorced (4).

Major occupation: The respondents were asked to identify their major occupation and it was categorized at nominal level as rice production (1), maize farming (2), guinea corn farming (3), livestock production (4), fish farming (5) or civil service (6).

Secondary occupation: The respondents were asked of their major occupation and it was categorized at nominal level as rice production (1), maize farming (2), guinea corn farming (3), livestock production (4), fish farming (5) or civil service (6).

Household size: The respondents were asked to indicate actual number of people living in the same house with them. It was measured at interval level.

Years of farming experience: The respondents were asked to state their years of farming experience in actual years. This was measured at interval level.

Farm size: The respondents were asked to state their farm size in heaps or hectares. This was measured at interval level.

Sources of income: The respondents were asked of their sources of income and this was categorized at nominal level as personal funds (1), borrowed from bank (2) or borrowed from cooperative society/ association (3).

Rice production earning: The respondents were asked to state their earning from rice production in naira. This was measured at interval level.

Farming experience: This was measured at interval level. The respondents were asked to state how long they have been cultivating rice in years.

Sources of labour: The respondents were asked to state their sources of labour employed for various farm activities which was categorized as self (1), family (2), hired (3) or both family and hired (4).

Sources of information: The respondents were asked to state their sources of information used for various farm activities which was categorized as self (1), family (2), hired (3) or both family and hired (4).

Extension information: Respondents were asked of how frequent they receive extension information on rice production and this was categorized at nominal level as weekly (1), fortnightly (2), monthly (3), quarterly (4), or occasionally (5).

Membership of Association/ cooperative society: This was measured at interval level by asking the respondents to list the number of associations or cooperative society.

Leadership position in Association/cooperative society: This was measured at interval level by asking the respondents to specify her leadership position in the association or cooperative society.

Land ownership: Respondents were asked about the ownership of the land use for rice production and this was categorized at nominal level as inheritance (1), purchased (2), or lease-hold (3).

Topography of the land: Respondents were asked on the topography of the land and this was categorized at nominal level as sloppy land (1), flat land (2), water logged (3).

Type of farmland: Respondents were asked on the type of farmland used for rice production and this was categorized at nominal level as upland rice farm (1), lowland rice farm (2) or flood-prone rice farm (3).

Location of the rice farmland: Respondents were asked on the location of rice farmland and this was categorized at nominal level as very close to river (1), very far from the river (2) or within 10-kilometer minute trek (3).

Incidence of flooding: Respondents were asked on the frequencies of flooding for the past 3 years and was categorized at ordinal level based on monthly basis i.e. April, May, June, July, August, September, October, November.

Damages caused by flooding: This was measured at interval level by asking the respondents to specify the damage caused by flooding on their rice farmland.

Flood duration: Respondents were asked on how long the flood usually last and this was categorized at nominal level as one day (1), two days (2), three days (3), more than three days (4).

Factors contributing to Flooding: Respondents were asked on the factors contributing to flooding and this was categorized at nominal level as deforestation (1), poor drainage design (2), poor road design (3).

Strategies used in Coping strategies: Respondents were asked on the strategies that was reduce the problem of flooding and this was categorized at nominal level as use of improved varieties (1), better road design (2), improved drainage system (3).

Coping Strategies: Respondents were asked to rate the coping strategies which was categorized as planting of improved rice seedling variety (6), application of flood prediction by Nigeria Hydrological Services Agency (5), change of planting date (4), change from lowland to upland rice cropping (3), shifting from flood-prone site to another place (2) or raising barriers at the edges of the farmland (1).

Constraints to doing the Coping Strategies: Respondents were asked to rate the constraints to coping strategy which was categorized as poor flood predictions (3), poor flood control (2), poor construction of wall (1).

3.8 Data Analysis/ Model Specification

To describe the socio-economic status of the study area. Data obtained was analyzed using descriptive statistics like percentages, graphs, means/averages, frequency tables, charts as well as cross-tabulations.

Hypothesis 1: There is no significant relationship between socio-economic features of rice farmers used and coping strategies used on rice farmland.

Data was analyzed using multiple linear regression model to identify factors that determine the farmers' choice of coping strategies.

The empirical specification for examining the influence of explanatory variables on the coping strategies among farmers (Y) is implicitly specified as follows:

$Yi=f(X_1,X_2,X_3…X_n)$

$Yi= \alpha + \sum\beta iXi +\sum\beta_2X_2 + \mu i$ (βi: i=1,2,3…n ; Xi: i=1,2,3…n)

Where Y_0 = Change of farmland,

Y_1= Change of Variety,

Y_2= Change of Planting date,

Y_3= Change of from lowland to upland rice crops,

X_1 = Age (in years),

X_2 = Gender (1 for male and 2 for female),

X_3 = Farm Size (Hectare),

X_4 = Education (years),

X_5 = Household size (persons),

X_6= Farm Experience (in years),

X_7= Access to credit (1 = have access, 0 = otherwise),

α = intercept,

β= regression coefficient,

μi = error term.

Hypothesis 2: There is no significant relationship between the damage caused by flooding and their coping strategies used on rice farmers farmland.

Data obtained was analyzed using spearman's rank co-efficient of correlation

CHAPTER FOUR

4.0 Results and Discussion of Findings

4.1 Socio-economic characteristics of respondents

This chapter presents and discusses the study's findings in relation to the stated objectives and hypotheses.

4.1.1 Distribution of the Respondents by Sex

Figure 4 shows the gender distribution of the respondents in the study area. It was discovered that majority of farmers in the study area were male, representing 233 (97.1%), only 7 (2.9%) were female.

This suggests that male farmers dominate rice farming in the area probably due to its nature of intense and time-consuming activities or because women are more engaged in non-farm activities and domestic chores than their male counterpart (Mustapha *et al.*, 2012). Ayoola *et al.*, (2011) however opined that women could be more involved in the processing and marketing aspects of rice production.

The relationship between sex and coping strategies to flooding of the rice farmland tested with multiple linear regression was not significant.

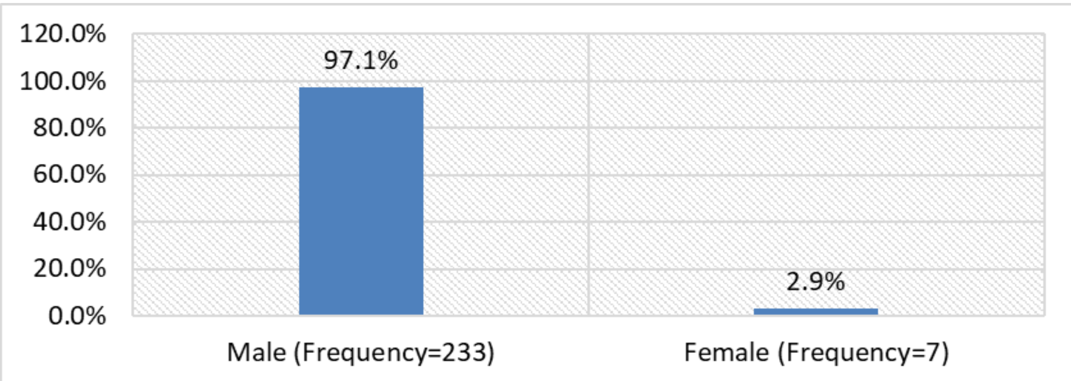

Figure 4: Distribution of the respondents by sex Source: Field Survey, 2020

4.1.2 Distribution of Respondents by Age

Findings in Figure 5 reveal that almost half of the respondents 119 (49.6%) fall in the modal age group of 36-45 years. The mean age is 41 years.

The implication of this is that the farmers were middle-aged, energetic and still in their productive age which is good for the labour-intensive and energy-sapping nature of rice farming in Nigeria. This finding agrees with that of Mustapha *et al.*, (2012) and Matanmi *et al.*, (2011).

With their wealth of experience will influence decision making on flooding and it will assist the farmers cope with incessant flooding disturbing them yearly.

There was no significant relationship between age and coping strategies to flooding on rice farmland in the multiple linear regression tested.

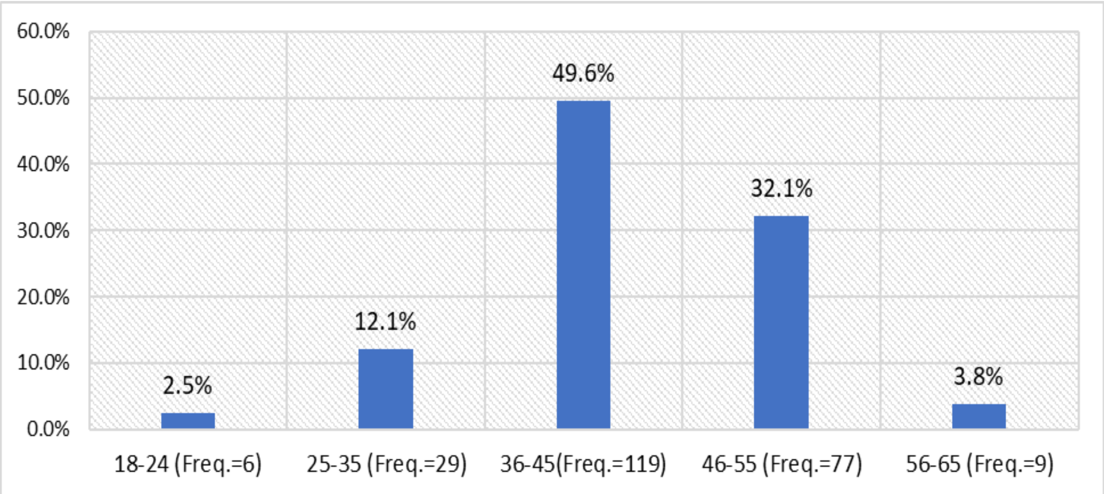

Figure 5: Distribution of respondents by age Source: Field Survey, 2020

4.1.3 Distribution of respondents by Marital Status

Based on the findings in figure 6, the result show that majority 237 (98.3%) of the respondents were married while only 4 (1.7%) farmers were single. These findings have implications for the productivity of rice farmers in the study area.

Married men and women are likely to be focused on their farming activities in order to earn more income to cater for their household and the likelihood that many members of the household would contribute more to rice farming as family labour.

The percentage of single farmers in the study was low 1.7%. This indicates that the married have determined to remain in farming and opt for the task of solving any problem that may come their way like flooding. There was a strong relationship between marital status and coping strategies to flooding on rice farmland.

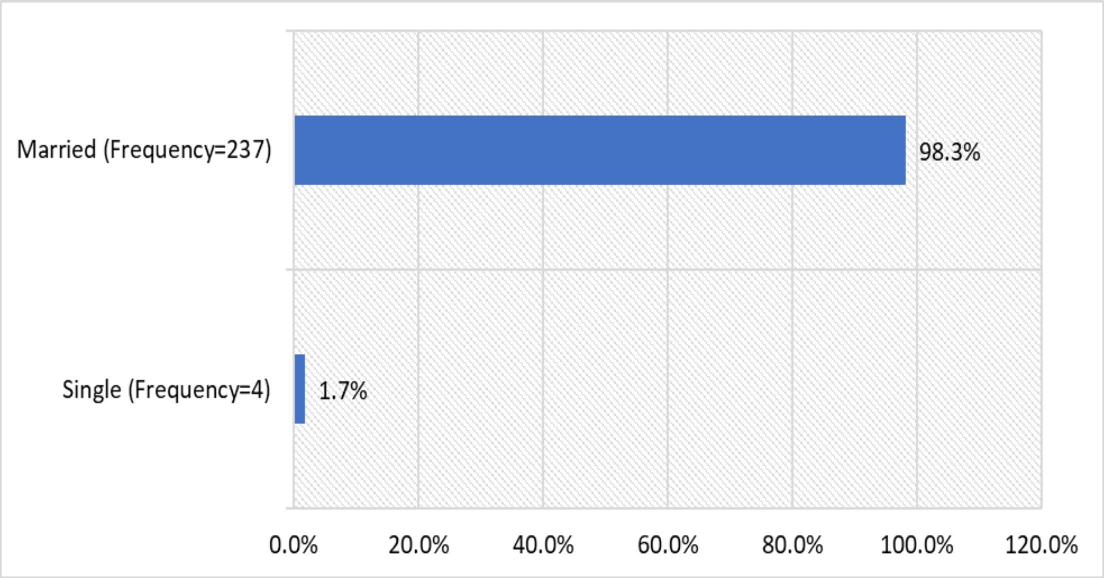

Figure 6: Distribution of respondents by marital status   Source: Field Survey, 2020

4.1.4 Distribution of Respondents by Educational Level

Findings in figure 7 prove that a little over half of the respondent 134 (55.8%) had primary education while 23 (9.6%) had tertiary education and 12 (5.0%) of them did not have any form of education at all.

The literacy level of farmers could enhance their level of understanding and desirability of adopting innovation and farm technologies or interacting with extension agents. This result conforms to the findings of Mustapha *et al*., (2012) and Olumba (2014) who jointly reported a low level of education of rice farmers.

If higher percentage of the farmers had some forms of education, it will have some implication on their knowledge, attitude and skill in coping with flooding on their rice farmland. The multiple linear regression did not show any significant relationship between educational level and coping strategies to flooding on the farmers' rice farmland.

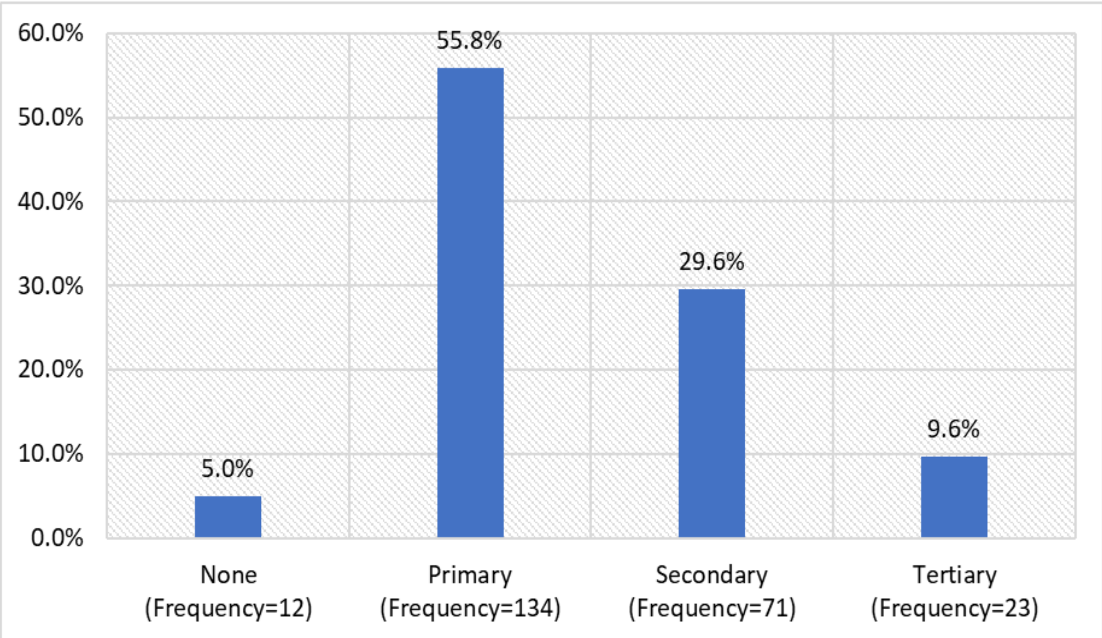

Figure 7: Distribution of respondents by educational level Source: Field Survey, 2020

4.1.5 Distribution of respondents by religion

Findings in figure 8 reveal that the majority of the rice farmers, 225 (94%), were Muslim with only a few (15%) belonging to the Christianity. There are more Muslims in rice farming than Christianity and other religion.

There was no significant relationship between religion and coping strategies as shown with multiple linear regression used.

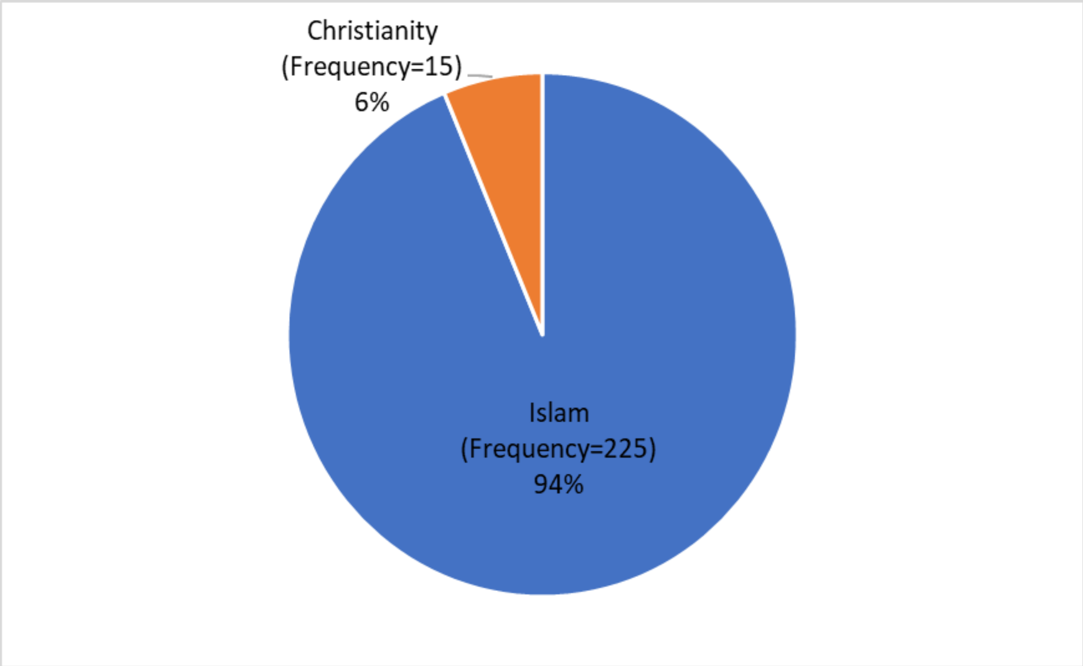

Figure 8: Distribution of respondents by religion Source: Field Survey, 2020

4.1.6 Distribution of respondents by household size

The number of people who eat from the same pot on a daily or regular basis is referred to as the household size. It embraces the male as the household head, plus the female as the wife and children plus other dependants. The household size ranged from 1-31 members as revealed by data in Figure 9.

Findings in Figure 9 reveal that a little over half of the respondents 122 (50.8%) had the household size bound from 6-10 people, while the mean household size was 10 persons.

The household size has some implications on number of family members that are used as family labour on the farm, the larger the household size, the less dependent the farmer is on hired or communal labour. The household size had a significant relationship with coping strategies as stated in figure 9 of the study.

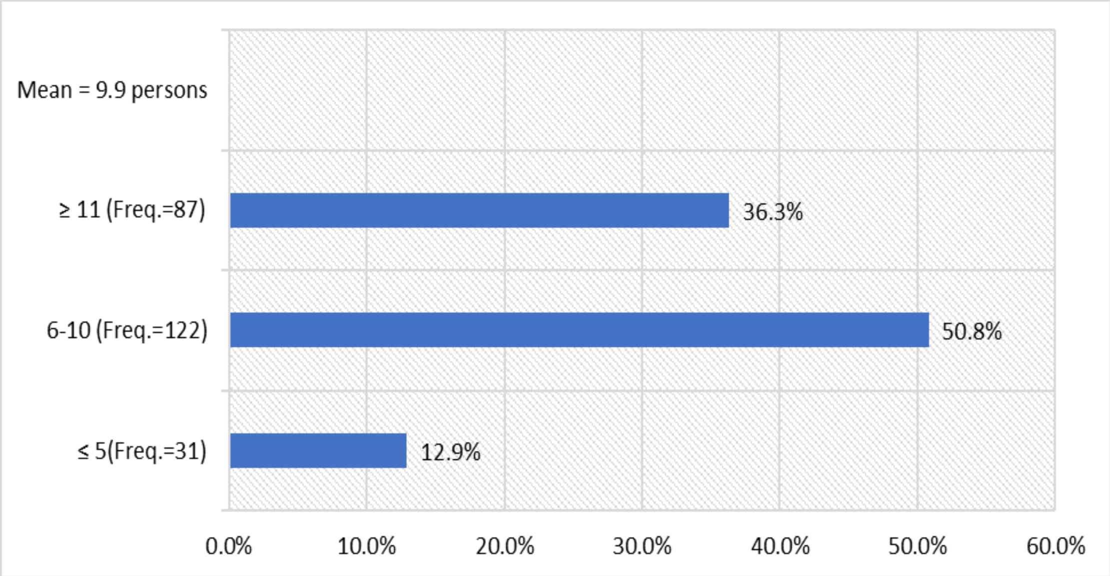

Figure 9: Distribution of respondents by household size Source: Field Survey, 2020

4.2.1: Rice production characteristics of respondents

Table 2: Rice Production Characteristics of Respondents

Variables	***Frequency***	***Percentage***	***Mean (Std Dev.) Min.-Max.***
Size of rice farm cultivated (ha)			8.1 (3.65) 2–30
1 – 10	203	84.6	
11 – 20	35	14.6	
21 – 30	2	0.8	
Experience in rice farming (years)			14.0 (9.17) 1–42
≤ 10	113	47.1	
11 – 20	91	37.9	
21 – 30	24	10.0	
31 – 40	11	4.6	
≥ 41	1	0.4	
Sources of funding for rice farming			
Personal funds	173	72.1	
Bank loan	12	5.0	
Cooperative society	55	22.9	
Annual income earned from rice farming			1,027,250.00 (993617.25) 100,000 – 15,000,000
≤ 1,000,000	189	78.8	
1,000,001 – 2,000,000	47	19.6	
≥ 2,000,001	4	1.7	

Findings in Table 2 describe the size of rice farmland cultivated by respondents. The result reveal that 203 (84.6%) of the respondents fall in the modal farm size of 1ha-10ha of the farmland. This shows that most of the respondents in the study fall into the small-scale farmer group and as a result of the area's insurgence or incidence of flood. Only 2 (0.8 percent) of the respondents own 21ha-30ha of rice farmland.

Findings in table 2 further show farmers' experience in farming. It could be seen that almost half 13 (47.1%) of the farmers put in less and equal to ten years in rice farming experience, while only 1 respondent (0.4%) farmed more and equal to 41 years of rice farming experience. Experience here as shown is a major determinant of effectiveness on the farm. The more the number of farming experience, the more matured, coordinated and precise the farmer is in coping with incidence of flooding. In the study, not many people have plenty of years farming experience.

Table 2 displayed a finding on farmers source of funding. It was reveal that nearly 173 (72.1%) of the respondents sourced fund personally, followed by 55 (22.9%) that sourced fund from cooperative society, while only 12 (5.0%) sourced funds from commercial bank. It is quite true that personal savings from rice sales was main source of funds to the farmers. Having to borrow money from cooperative and banks might not be easy especially with the incidence of flooding where and uncertainty prevails them bumper harvest from rice.

Findings in Table 2 over annual income earned from rice farming reveal that majority of the rice farmers 189 (78.8%) had annual income of less than and equal to 1,000,000 (one million naira) while only 4 (1.7%) rice farmers had more than and equal to 2,000,001 (two million naira).

Table 3: Characteristics of respondent

Ownership of land for growing rice		
Inherited	239	99.6
Rented/lease	1	0.4
Frequency of receiving extension services on rice production		
Never	1	0.4
Weekly	1	0.4
Quarterly	71	29.6
Occasionally	158	65.8
Unknown	9	3.8
Membership of rice farmers' association		
None	176	73.3
Farmer's cooperatives	30	12.5
Bawusoko	4	1.7
Rifarm	24	10.0
Bua	2	0.8
Asirogo	1	0.4
Egwafin	2	0.8
Hankurima	1	0.4
Type of farmland used for rice production		
Upland rice farm	1	0.4
Lowland rice farm	239	99.6

Table 3 shows findings on ownership of farmland for growing rice. The results reveal that factually all of the farmers 239 (99.6%) inherited their farmland from their fore-fathers showing that they can keep the farmland for a long time.

Findings in Table 3 display analysis of frequency of rice farmers receiving extension services. The result shows that a little over half of the respondents 158 (65.8%) receive extension service occasionally while only 1 (0.4%) never received extension service. The frequent visit of extension workers to rice farmers farm would assist the rice farmers in solving problems that show up once in a while.

Findings in Table 3 show information on membership of rice farmers association. The result reveal that majority of rice farmers 176 (73.3%) do not belong to any association while 30 (12.5%) farmers were members of farmers cooperatives and 24 (10.0%) were members of Rifarm Association. Belonging to one association or the other would serve as help to the rice farmers by which they could be helped collectively by the government especially in sourcing for funds and farm inputs. As part of the extension service, the rice farmers should be encouraged to join one association/cooperative or another.

Findings in Table 3 shows the type of farmland used for growing rice. The result reveals that about all the farmers 239 (99.6%) grow their rice on lowland while only 1 (0.4%) farmer use upland for rice growth. No wonder the incidence of flooding is so rampant among rice farmers since the farmers farm on lowland where excess water can easily percolate and flood their farms. But more important for their farming area, this is probably where they have higher rice growth and better yield.

Table 4: Respondents Characteristics

Topography of farmland used for rice production			
Sloppy	52	21.7	
Flat	177	73.8	
Water logged	11	4.6	
Closeness of rice farmland to river			
Very close	239	99.6	
Very far	1	0.4	
Other occupation			
None	2	0.8	
Maize production	225	93.8	
Guinea corn production	8	3.3	
Livestock production	3	1.3	
Fish farming	1	0.4	
Civil service	1	0.4	
Income from other occupation			369000.00 (231604.464)
			0-2,000,000
≤ 300,000	133	55.4	
300,001 – 600,000	80	33.3	
600,001 – 900,000	23	9.6	
≥ 900,000	4	1.7	

Source: Field Survey, 2020

Findings in Table 4 discussed the topography of rice farmland. It was reveal that the majority of rice farmers, 177 (73.8%), have flat farmland, which makes their rice farmland prone to flooding.

Information in Table 4 as show closeness of rice farmland to a river. The result reveals that nearly all the farmers 239 (99.6%) have rice farmland close to river Benue/Niger. This aid the proneness of the rice farmland to flooding every year.

Findings in Table 4 also show other occupations of the rice farmers. The result shows that 225 (93.8%) of the farmers are involved in maize production which I believe give farmers succour to balance their production when flood takes over their rice farms to make a living.

Findings in Table 4 also show the income received from other occupation. The result shows that 133 (55.4%) farmers earn less than and equal to three hundred thousand naira from other occupation; followed by 80 (33.3%) farmers earn between three hundred and one thousand and six hundred thousand from other occupation.

4.3.1: Sources of labour and farm activities

Table 5: Sources of labour and farm activities

Rice farming activities	Family labour	Hired labour	Family and hired labour
Land clearing	39(16.3)	105(43.8)	96(40.0)
Nursery	187 (77.9)	13(5.4)	40(16.7)
Planting	98(40.8)	26(10.8)	116(48.3)
Fertilizer application	191(79.6)	9(3.8)	40(16.7)
Weeding	25(10.4)	85(35.4)	130(54.2)
Bird scaring	202(84.2)	5(2.1)	33(13.8)
Pest and disease control	198(82.5)	8(3.3)	34(14.2)
Harvesting	24(10.0)	69(28.8)	147(61.3)
Cutting	18(7.5)	62(25.8)	160(66.7)
Stacking	182(75.8)	7(2.9)	51(21.3)
Threshing	97(40.4)	23(9.6)	120(50.0)
Hauling	186(77.5)	2(0.8)	52(21.7)
Drying	208(86.7)	1(0.4)	31(12.9)
Milling	71(29.6)	3(1.3)	166(69.2)
Storing	223(92.9)	1(0.4)	16(6.7)

Source: Field Survey, 2020

Findings in Table 5 describe sources of farm labour. The rice farmers used family, hired and family and hired labour in carrying out their work on all rice farm activities. But specifically, the result in Table 5 shows that family labour was prominent in storing by 223 (92.9%) farmers; drying rice by 208 (86.7%) farmers; bird scaring by 202 (84.2%) farmers; pest and disease control by 198 (82.5%) farmers; fertilizer application by 191 (79.6%) farmers; Nursery by 187 (77.9%) farmers; hauling by 186 (77.5%) farmers; stacking by 182 (75.8%) farmers; and planting by 98 (40.8%) farmers. The above activities were best carried out at family level since family labour was readily available on the rice farm. They faced the production challenges as they come since they reside near the farm.

The activities of the hired labour were seen more than in the areas of land clearing by 105 (43.8%) farmers; weeding by 85 (35.4%) farmers; harvesting by 69 (28.8%)

farmers; cutting was carried out by 62 (25.4%) farmers. These activities were handled mainly by hired labourers which might be too hard for family labour to handle.

The labour activities as revealed in Table 5 on hired and family labour. The family and hired labour were appropriate in handling certain rice farm labour. The activities both family and hired labour engaged in includes milling by 166 (69.2%) farmers; cutting by 160 (66.7%) farmers; harvesting by 147 (61.3%) farmers; weeding by 130 (54.2%) farmers; threshing by 120 (50.0%) farmers; planting by 116 (48.3%) farmers; land clearing by 96 (40.0%) farmers.

4.3.2: Sources of information and Farm activities

Findings in Table 6 described the farmers information source on rice farming. The findings reveal that the rice farmers received information through friends on weeding by 125 (52.1%) farmers; on land clearing by 111 (46.3%); on bird-scaring by 108 (45.0%) farmers; on harvesting of rice by 76 (31.7%) farmers and finally 55 (22.9%) farmers received information equally both on planting and fertilizer application. Information through friends and neighbors was made possible because of nearness and whoever hears the information first, he will mention it to the next friend or neighbor. Activities on rice farming were best sourced from friends than other sources because of the timing of such activities and the nature of the activities.

Findings in Table 6 further reveal that family remained the major source of information of the rice farmers under storage by 238 (99.2%) farmers; drying by 234 (97.5%) farmers; hauling by 232 (96.7%) farmers; stacking by 228 (95.0%) farmers; threshing by 210 (87.5%) farmers; cutting by 196 (81.7%) farmers; milling by 189 (78.8%) farmers and so forth. Information received through family is personal to them since most of these activities are carried out by the rice farmers and their families.

Another source of information is radio and television as reveal in Table 6. Just about none of the farmers received information from radio and television except for 3 (1.3%) farmers that received information on planting only. Information is difficult to source from radio and television since the majority of the farmers do not have radio/television; no access at all and in the same vein, the farmers do not have time to listen to them.

Lastly, extension agents as a source of information on rice farming activities show that very few farmers received some information only on land clearing by 40 (16.7%) farmers; planting and fertilizer application by 18 (7.5%) farmers; nursery by 13 (5.4%) farmers. It is glaring that it is very difficult to source information from extension agents as they are very few and farmers generally do not have access to them.

Table 6: Source of information on rice farming

Variable	**Frequency**	**Percentage**
Friends	51.9	21.2
Family	181.3	75.54
Radio/Television	0.2	0.09
Extension agent	7.6	3.16

Source: Field Survey, 2020

4.4.1: Period of incidence of rice farm flooding

Findings in Table 6 describe the period of incidence of rice farm flooding. Incidence of flooding reaches a peak usually in September as shown in 2017 according to 134

(55.8%) farmers; 2018 by 130 (54.2%) farmers and 2019 by 176 (73.3%) farmers. This was equally confirmed on a figure by the bars as shown in September 2017, 2018, and 2019.

Table 5: Period of incidence of rice farm flooding

Years	Months of flooding			
	August	September	October	November
	f (%)	f (%)	f (%)	f (%)
2017	104(43.3)	134(55.8)	2(0.8)	-
2018	108(45.0)	130(54.2)	1(0.4)	1(0.4)
2019	62(25.8)	176(73.3)	1(0.4)	1(0.4)

4.5.1: Reasons why they experience flooding on rice farmland in the study area

Table 6 features the reasons why they experience flooding on rice farmland in the study area. It shows that heavy or rainfall intensity cause ranked first and falls in the category of “agree” with 170 (90.8%) farmers responded, and a mean score of 4.28. Weak and unavailable flood prediction, flood control system and techniques ranked second and fall with the category of “agree” as indicated by 109 (45.4%) farmers with a mean score of 4.10. Next on the causes of flooding is releases of water from nearby dam falling in the category of “agree” as stated by 122 (50.8%) farmers with a mean score of 4.07. While poor land decree policy planning and Management i.e., poor setting of building, road construction, drainage and land use orders ranked fourth and falls in the category of “strong agreed” responded to by 82 (33.2%) farmers with a mean score of 3.93. Others are poor waste disposal causing blockage of drainage channels results into floods and my site of rice farmland placed on a slope by river side both falls in the category of "agree" responded to by 158 (65.8%) and 132 (55.0%) farmers respectively ranked 5th and 6th with a mean score of 3.3 and 3.51.

While clayey soil i.e. some soil has low infiltrating capacity especially when at peak of rainy season when topography of the land tends to aid flooding ranked 7th falling into the category of "undecided" by 98 (40.8%) farmers with a mean score of 3.21. The study here clearly showed that heavy or rainfall intensity is the most causes of flooding while clayey soil i.e. some soil has low infiltrating capacity especially when at peak of rainy season when topography of the land tends to aid flooding is the least cause of flooding in the study area.

Table 5: Reasons why they experience flooding on rice farmland in the study area

Reasons why they experience flooding	**SA**	**A**	**U**	**D**	**SD**	**Mean (SD)**	**Mean rank**
Heavy or rainfall intensity cause	69 (28.8)	170 (90.8)	1 (0.4)	0	0	4.28 (0.461)	1st
Clayey soil i.e. some soil has low infiltrating capacity especially when at peak of rainy season when topography of the land tends to aid flooding	1 (0.4)	95 (39.6)	98 (40.8)	46 (19.2)		3.21 (0.749)	7th
My site rice farmland placed on a slope by river side.	0	132 (55.0)	62 (25.8)	46 (19.2)		3.36 (0.785)	6th
Poor waste disposal-poor disposal of waste causes blockage of drainage channels results into floods	6 (2.5)	158 (65.8)	28 (11.7)	48 (20.0)		3.51 (0.838)	5th
Weak and unavailable flood prediction, flood control system and techniques	84 (35.0)	109 (45.4)	36 (15.0)	10 (4.2)	1 (0.4)	4.10 (0.834)	2nd
Poor land use policy planning and Management i.e. poor setting of building, structures, road construction, drainage and land use orders	82 (34.2)	72 (30.0)	74 (30.8)	11 (4.6)	1 (0.4)	3.93 (0.932)	4th
Release of water from	68	122	49	0	1	4.07	3rd

nearby dam	(28.3)	(50.8)	(20.4)		(0.4)	(0.723)

Note: Figures in parenthesis are percentages

4.6.1: Damage caused by flooding on the rice farmland

Findings in Table 6 describe the damages caused by flooding on rice farmland. The finding reveal that less monetary income on rice production ranked first in damage caused thus fall in the category of “strongly agree” and 156 (65.0%) farmers responded to that with a mean score of 4.64

This is followed by hinder rice farmers from crossing across the flood areas; reduction in yield; and loss of crop stands all falls in the category of “strongly agree” and ranked 2nd, 3rd, and 4th in damaged caused with 152 (63.3%) farmer, 158 (65.8%) farmers and 156 (63.0%) farmers responding respectively with a mean score of 4.63, 4.63 and 4.62 respectively.

Likewise washing away seedlings; burying of seeds both ranked 5th and 6th position and fall in the category of “agree” and have mean scores of 4.23 and 4.20 respectively. While loss of farmland ranked the least with 131 (54.6%) farmers responding and fall in the category of “undecided” with a mean score of 3.13

Table 6: Ranking order of damages caused by flooding on the rice farmland

Damage caused by flooding	SA	A	U	D	SD	Mean (SD)	Mean rank
Burying of seeds	51 (21.3)	187 (77.9)	2 (0.8)	0	0	4.20 (0.424)	6th
Washing away seedlings	57 (23.8)	180 (75.0)	3 (1.3)	0	0	4.23 (0.447)	5th
Washing away seedbeds	35 (14.6)	69 (28.8)	131 (54.6)	5 (2.1)	0	3.56 (0.763)	7th
Loss of crop stands	156 (65.0)	79 (32.9)	3 (1.3)	2 (0.8)	0	4.62 (0.558)	4th

Less customer	49 (20.4)	19 (7.9)	97 (40.4)	75 (31.3)	0	3.18 (1.087)	8th
Less monetary income on rice production	156 (65.0)	82 (34.2)	2 (0.8)	0	0	4.64 (0.498)	1st
Hinder rice farmers from crossing across the flood areas	152 (63.3)	86 (35.8)	2 (0.8)	0	0	4.63 (0.502)	2nd
Reduction in yield	158 (65.8)	77 (32.1)	4 (1.7)	1 (0.4)	0	4.63 (0.540)	3rd
Loss of farmland	21 (8.8)	38 (15.8)	131 (54.6)	50 (20.8)	0	3.13 (0.839)	9th

Note: Figures in parenthesis are percentages

4.7.1: Duration of flooding of rice farm

Findings in Table 8 below present the duration of flooding on rice farmland. Majority of the farmers 237 (98.8%) stated that flooding last more than three days. Findings in Table 8 below shows that all the respondents 240 (100%) had poor drainage design as a major factor contributing to flooding in the study area. Also, information in Table 8 reveal that majority of the respondents 208 (86.7%) present loss of crop stand as a major loss incurred due to flooding. Finding in Table 8 revealed that 57.9% (139) of the farmers revealed their experience with travelling through flooded areas which prevent them from getting to work on time.

Table 8: Duration of flooding of rice farm

Variables	Frequency	Percentages
Duration of flooding		
Three days	3	1.3
More than three days	237	98.8
Factors contributing to flooding		
Poor drainage design	240	100.0
Loss of crop stand	208	86.7
Loss of passengers	2	0.8
Less monetary income for business	18	7.5
Hinder one from crossing across flooded areas	12	5.0
Experience during movement through flooded areas		
Delay days activities	97	40.4
Prevent one from shopping or conducting business within the community	4	1.7
Prevent one from getting to work on time	139	57.9

4.8.1: Coping strategies to flooding of rice farm

Table 9: Coping strategies to flooding of rice farm

Variables	Yes	
	Frequency	**Percentage**
Planting of improved rice seedling variety	239	99.6
Adaptation and application of flood prediction by Nigeria Hydrological Services Agency (NIHSA)	239	99.6
Change of planting date	234	97.5
Change from lowlands to upland rice cropping	94	39.2
Shifting from flood-prone site to another place	115	47.9
Raising or creating barriers at the edges of the farmland	98	40.8
Improved drainage system	218	90.8

Findings in Table 9 presents farmers coping strategies to flooding of rice farmland. It was revealed that nearly all 239 (99.6%) respondents planted improved/early-maturing rice seedling variety and application of flood prediction by Nigerian Hydrological Services Agency (NIHSA) as their coping strategies to flooding of rice farmland in the study. No wonder, the rice farmers feel encouraged to continue in the rice farm business since there is always an escape route to tackle flooding problem. Further, the farmers used change of planting date and improved drainage system, as coping strategies on flooded rice farmland.

4.9.1: Constraints to adopting the coping strategies used as cushing flooding effect to flooding of rice farm

Findings in data in Table 13 describe the constraints to using the coping strategies as cushing effect to flooding. It was revealed that poor flood control and poor construction of levees and wall have 168 (70.0%) farmers fall in the category of "severe" in term of constraints to coping strategies as cushing effect to flooding with a mean score of 0.79 and 0.71 respectively. While poor construction of drainage system falls in the category of "severe" with 164 (68.3%) farmers responding with a mean score of 0.73. Finally, the analysis revealed that poor flood predictions also fall in the category of "severe" constraints to coping strategies used as cushing effect as responded by 132 (55.0%) farmers with a mean score of 0.60

Table 10: Constraints to the coping strategies used as Cushing flooding effect in order of severity

Variables	Highly severe	Severe	Not severe	Mean (Std Dev.)
	f(%)	f(%)	f(%)	
Lack of access to radio and television to guide them on weather forcast on flooding as rolled out by Nigeria Hydrological Service Agency.	6(2.5)	132(55.0)	102(42.5)	0.60(0.540)
Difficulty in accessing the needed improved seeds	11(4.6)	168(70.0)	61(25.4)	0.79(0.508)
High seeds prices	11(4.6)	168(70.0)	61(25.4)	0.79(0.508)
Poor construction of levees and wall	1(0.4)	168(70.0)	71(29.6)	0.71(0.465)
Poor construction of drainage system	6(2.5)	164(68.3)	70(29.2)	0.73(0.497)

4.10.1 HYPOTHESES TESTING

The hypotheses tested are as follows;

Hypothesis 1

H_{01}: There is no significant relationship between socio-economic characteristics of rice farmers and coping strategies used on the rice farmland.

Table 14: Multiple linear regression showing the relationship between socio-economic characteristics and coping strategies to flooding of rice farmland

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.
(Constant)	5.046	1.428		3.534	.000
Age	.098	.121	.057	.803	.423
Sex	-.437	.483	-.054	-.905	.367
Marital status	1.515	.666	.142	2.273*	.024
Educational level	.062	.064	.057	.965	.336
Religion	.457	.352	.081	1.299	.195
Rice farm size	.130	.024	.347	5.474*	.000
Household size	.080	.027	.197	2.947*	.004
Earning from rice production	7.213E-8	.000	.053	.898	.370
Number of years for rice cultivation	.020	.011	.137	1.893	.060

R Square = 0.247 = **24.7%**
Adjusted R Square = 0.218
F-value = 8.397

Table 14 summarizes the results of a linear regression showing the relationship between socioeconomic characteristics and coping strategies in rice farmland flooding. It was observed that there was a significant relationship between marital status (R= 2.273, $p<0.05$), rice farm size (R= 5.474, $p<0.05$) and household size (R= 2.947, $p<0.05$) and their coping strategies used as cushing effect flooded rice farmland.

Marital status demonstrates that farmers that are married become reliable and exhibit more wisdom in coping strategies to flooded rice farmland and also so they can have more hands to assist. Similarly, farm size is one of the damages caused by flooding and with the implementation of the coping strategies, it will increase farm size. Household size that is fairly large constitute cheap source of family labour and thus increase the adoption of coping strategies on flooded rice farmland.

Table 14 further indicated that significant relationship did not exist in age of the rice farmers, sex, educational level, religion, number of years for rice cultivation and coping strategies as cushing effect during flooding of rice farmland.

Hypothesis 2:

H_{02}: There is no significant relationship between the damage caused by flooding and their coping strategies used on rice farmers farmland.

Table 15: Chi-square test of association between damages caused by flooding and coping strategies used on rice farmers farmland

Damage caused by flooding	Chi-square value	Df	p-value	Decision at p≤0.05
Burying of seeds	91.202	16	0.000	Significant
Washing away seedlings	40.900	16	0.001	Significant
Washing away seedbeds	133.690	24	0.000	Significant
Loss of crop stands	25.475	24	0.380	Not Significant
Less customer	85.401	24	0.000	Significant

Less monetary income on rice production	29.038	16	0.024	Significant
Hinder rice farmers from crossing across the flood areas	9.536	16	0.890	Not Significant
Reduction in yield	15.684	24	0.899	Not Significant
Loss of farmland	70.758	24	0.000	Significant

Table 15 displays findings on chi-square test of association between the damage caused by flooding and their coping strategies used on rice farmers farmland. A significant association exists between some damages caused by flooding and coping strategies used on rice farmland like burying of seeds (x^2= 91.202, $P<0.05$), washing away seedling (x^2= 40.900, $P<0.05$), washing away seedbeds (x^2= 133.690, $P<0.05$), less customer (x^2= 85.401, $P<0.05$), less monetary income on rice production (x^2= 29.038, $P<0.05$) and loss of farmland (x^2= 70.758, $P<0.05$).

However, some of the damages caused by flooding did not have significant association with coping strategies e.g. loss of crop stands, hinder rice farmers from crossing the flooded areas and reduction in yield.

CHAPTER FIVE

5.0 Summary, Conclusion and Recommendations

This chapter summarizes the findings of the study, gives conclusion and makes recommendation for coping strategies associated with flooding incidence in the study area.

5.1 Summary

The main objective was to determine the incidence of flooding and coping strategies among rice farmers in Kwara State. This was achieved through the use of an interview schedule method to draw information from respondents. It was designed in a closed-ended format to extract information that is statistically valid about the incidence of flooding, flood damage, coping strategies, and the constraints to adopting coping strategies in the study area. The sample for the study was chosen using a multi-staged sampling technique. The first stage involved the purposive selection of Edu and Patigi local governments based on their location along the Niger River Bank and flood-prone places. The Local Government areas were selected using a purposive sampling technique related to the effect of flooding in the study area. In the second stage, ten villages from each Local Government areas were chosen at random from a list of affected communities. In each village, twelve (12) farmers were chosen at random making a total of one hundred and twenty (120) farmers/LGA.

Primary data was obtained by the use of an interview schedule to interview two hundred and forty (240) farmers from both Local Government Areas using a random selection method.

In addition, research questions were raised as determining the incidence of flooding, damages caused by flooding on rice farmland, coping strategies used by farmers to cushing the effect of flooding and the constraints to coping strategies used by the farmers.

The socioeconomic characteristics of the respondents shows that the minimum and maximum ages are 36 and 45 years, respectively, with a mean age of 41 years. The majority (97.1%) of the respondents were male and married (98.3%). Majority of respondents (55.8%) had a primary education as their highest level of education. Majority of the rice farmers (94%) were Muslim. Majority of the household size (50.8%) is about 6-10 people with the mean household size of 10 persons. Majority of the rice farmers (72.1%) used their personal funds as source of funding, majority (78.8%) had annual income less than one million-naira, majority (99.6%) owned their land by inheritance. Also, majority of the rice farmers (65.8%) receives extension service occasionally, majority (73.3%) do not have any membership of rice farmers' association, and majority of the farmers (99.6%) used lowland farmland and flat farmland for rice production.

Majority of rice farmers (73.8%), have flat farmland, which makes their rice farmland prone to flooding. Nearly all the farmers (99.6%) have rice farmland close to river Benue/Niger. Majority of the farmers (93.8%) are involved in maize production which give farmers succour to balance their production when flood takes over their rice farms to make a living. Majority of the farmers (55.4%) earn less than and equal to three hundred thousand naira from other occupation.

Majority used family labour as source of labour in nursery, fertilizer application, bird scaring, pest and disease control, stacking, hauling, drying and storing. Majority received information on rice farm activities through friends, family member, radio/television or extension agent.

Majority of the respondents experienced flooding mostly in September 2017, 2018 and 2019. Majority of the rice farmers agreed that heavy or rainfall intensity, rice site placed on a slopy land, poor waste disposal, weak and unavailable flood prediction and release of water from nearby dam are causes of flooding on rice farmland. Majority of the farmers strongly agreed to the causes of flooding resulting into burying of seeds, washing away seedlings while majority of the farmers strongly agreed that flooding caused loss crop stand, less monetary income on rice production, hinder rice farmers from crossing the flooded areas and reduction in yield. Majority of the respondents experienced flooding for more than three days, majority of the respondents perceived that the main factor contributing to flooding is poor drainage design, majority of the respondents believed that that loss of crop is the highest loss incur due to flooding. Nearly all the respondents believed that their experience with travelling flooded areas prevented them from getting to work on time.

Planting of improved rice seedling variety, application of flood prediction by Nigeria Hydrological Service Agency, change of planting date, shifting from flood-prone site to another place, improved drainage system, raising or crating barriers at the edges of the farmland and change from lowland to upland rice cropping were the coping strategies used by the farmers to curtail flood incidence on their farms.

Difficulty in accessing the needed improved seeds, seeds prices were on a high side and not affordable by some farmers and most farmers do not have access to radio and television to guide them on weather forcast on flooding as rolled out by Nigeria Hydrological Service Agency, poor construction of levees and wall and poor construction of drainage system were the most severe constraints to adopting the coping strategies used as cushing effect to flooding on rice farmland.

Marital status, rice farm size and household size were significantly related to the socio-economic characteristics while age, sex, education level, religion, earning from rice production and number of years for rice cultivation were not significant with coping strategies to flooding of rice farmland.

Burying of seeds, washing away seedlings, washing away seedbeds, less customer, less monetary income on rice production and loss of farmland were significantly associated with the extent of damage caused by flooding while loss of crop stands, hinder rice farmers from crossing across the flood areas and reduction in yield were not significantly related with their coping strategies used on rice farmers farmland.

5.2 Conclusion

The finding shows that rice farmers in this study area had one form of education or the other which assist them to cope with flooding. The rice farmer experience flooding most in September due to lowland rice farming and the closeness of the rice farmland to river Benue/Niger. Rice farmers make use of family labour as a means of sources of labour and received information about rice farming from friends and family members. Planting of improved rice seedling variety serves as a major coping strategies used by the farmer. Difficulty in accessing the needed improved seeds, seeds prices were on a high side and not affordable by some farmers were constraints to adopting the coping strategies used as cushing effect to flooding on rice farmland. Marital status, rice farm size and household size were significantly related to the socio-economic characteristics while age, sex, education level, religion, earning from rice production and number of years for rice cultivation were not significant with coping strategies to flooding of rice farmland. Burying of seeds, washing away seedlings, washing away seedbeds, less customer, less monetary income on rice production and loss of farmland were significantly associated with the extent of damage caused by flooding while loss of crop stands, hinder rice farmers from crossing across the flood areas and reduction in yield were not significantly associated with their coping strategies used on rice farmers farmland.

5.3 Recommendations

Based on the findings of the study, the following recommendations were made:

1. Community members should look into construction of levee and wall and also ensure that a proper drainage system is constructed. Farmers farming directly along riverine area should consider moving a little inward partly away from where the full force of flooding can impact their rice farm

2. Extension agents should access the educational status of the rice farmer so as to properly relate during visitation to farmers farm in order to teach them through seminars, workshops and use of demonstrated plots as applicable in curbing incidence of flooding among rice farmers in the study area.

3. Extension and Media organization should enlighten the farmers to listen to their radios or television more frequently especially at duration of flooding to forestall flooding on their farms. They should ensure that they apply the flood prediction given by Nigeria Hydrological Services Agency (NIHSA) and ensure proper flood control method as needs arise.

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APPENDICES

Questionnaire on Incidence of Flooding and Coping Strategies among Rice Farmers in Kwara State

Note: This questionnaire is designed to obtain information on the above topic, which is purely for academic/research purpose. All information supplied will be treated with absolute confidentiality.

Thanks for your anticipated cooperation.

Name of village: L.G.A: Phone Number:

Section 1: Describe the socio-economic status of the study area.

1. Sex: a. Male ( ) b. Female ( )
2. Age of respondent: .... years.
3. Marital Status: a. Single ( ) b. Married ( ) c. Widower ( ) d. Divorced ( ) e. Widow ( )
4. Educational level: a. Primary ( ) b. Secondary ( ) c. Polytechnic ( ) d. College of Education( ) e. Tertiary institution ( ) f. Other institution ( )
5. Religion: a. Islam ( ) b. Christianity ( ) c. Traditional ( )
6. Major Occupation: a. Rice production ( ) b. Maize Farming ( ) c. Guinea corn ( ) d. Millet ( ) e. Livestock production ( ) f. Fish farming ( ) g. Civil Service ( ) h. Other farming occupation (please specify) ....
7. Secondary Occupations: a. Rice production ( ) b. Maize Farming ( ) c. Guinea corn ( ) d. Millet ( ) e. Livestock production ( ) f. Fish farming ( ) g. Civil Service ( ) h. Other farming occupation (please specify) ……………..
8. Rice Farm Size (in heaps or hectare): _______________
9. Household size (including all dependants): _________
10. Source of Income: a. Personal funds ( ) b. Borrowed from the bank ( ) c. Borrowed from cooperative society/Association ( )
11. How much do you earn from rice production (in naira)? ____________
12. How much do you earn from other occupations (in naira)? ____________
13. How long have you been cultivating rice?.......................................Years
14. Kindly tick the appropriate sources of labour and farm activities:

Rice farming activities	Family labour	Hired labour	Both family and hired labour
Land clearing			
Nursery			
Planting			
Fertilizer application			
Weeding			
Bird scaring			
Pest and disease control			
Harvesting			
Cutting			

Stacking			
Threshing			
Hauling			
Drying			
Milling			
Storing			

15. Kindly tick the appropriate source of information and rice farming activities:

Rice farming activities	Friends	Family	Radio or Television	Extension agent
Land clearing				
Nursery				
Planting				
Fertilizer application				
Weeding				
Bird scaring				
Pest and disease control				
Harvesting				
Cutting				
Stacking				
Threshing				
Hauling				
Drying				
Milling				
Storing				

16. How frequent do you receive extension information on rice production? a. Weekly ( ) b. Fortnightly ( )
c. Monthly ( ) d. Quarterly ( ) e Occasionally ( ) f. Others (specify) ………………..

17. List association or cooperative society you belong: a. b. c. d. e. none ( )

18. Do you hold leadership positions in the association or cooperative societies? List them
a. b. c.

19. How do you own the land in which you are growing rice? a. Inheritance ( ) b. Purchase ( ) c. Lease-hold or rented ( ) d. Crop sharing arrangement ( ) e. Others (please specify) __________

20. What is the topography of the land? a. Sloppy land ( ) b. Flat land ( ) c. Undulating land ( ) d. Water logged ( )

21. Type of farmland used for rice production: a. Upland rice farm ( ) b. Lowland rice farm ( ) c. Flood-prone rice farm ( )

22. Location of farmland? a. Very close to river ( ) b. Very far from the river ( ) c. Within 10kilometre trek ( )

Section 2: Ascertain the incidence of flooding of the study area

23. Looking back to the last three years, state the frequencies of occurrence of flood in your area.

Years	April	May	June	July	August	September	October	November
2017								
2018								
2019								

Section 3: Determine the reason for flooding and damages by flooding on rice farmland in the study area.

24. Please tick as appropriate your level of agreement with the statements below as why you think they are the reason for flooding

Reason for flooding	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Heavy or rainfall intensity cause					
2. Clayey soil i.e. some soil has low infiltrating capacity especially when at peak of rainy season when topography of the land tends to aid flooding					
3. My site rice farmland placed on a slope by river side.					
4. Poor waste disposal-poor disposal of waste causes blockage of drainage channels results into floods					
5. Weak and unavailable flood prediction, flood control system and techniques					
6. Poor land use policy planning and Management i.e. poor setting of building, structures, road construction, drainage and land use orders					
7. Release of water from nearby dam					

25. Please tick as appropriate the damage caused by flooding on your rice farm.

Damage caused by flooding	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. Burying of seeds					
2. Washing away seedlings					
3. Washing away seedbeds					
4. Loss of crop stands					
5. Less customer					
6. Less monetary income on rice production					
7. Hinder rice farmers from crossing across the flood areas					
8. Reduction in yield					
9. Loss of farmland					

26. How long does the flooding usually last for? a. One day ( ) b. Two days ( ) c. Three days ( ) d. Four days ( ) e. Others (specify).............
27. What do you think is the main factor contributing to flooding? (Tick as many as applicable) a. Deforestation ( ) b. Poor drainage design ( ) c. Poor road design ( )
28. How does flooding in the region acts as a hindrance to you? a. Loss of crop stands ( ) b. Loss of costumers ( ) c. Loss of passengers ( ) d. Less monetary income for your business ( ) e. Hinders you from crossing across flooded areas

Section 4: Explore the coping strategies used as Cushing effect by farmers in the study area

29. Which of the following coping strategies do you think will reduce the problem of flooding?

Coping strategies	Yes	No
1. Planting of early-maturing rice seedling variety		
2. Application of flood prediction by Nigeria Hydrological Services Agency (NIHSA)		
3. Change of planting date		
4. Change from lowlands to upland rice cropping		
5. Shifting from flood-prone site to another place		
6. Raising or creating barriers at the edges of the farmland		
8. improved drainage system		

Section 5: Explore constraints to doing the coping strategies used as Cushing effect by farmers in the study area

30. Which of the following are constraints to doing the coping strategies?

Constraints to Coping strategies	Highly severe	Severe	Not severe
1. Lack of access to radio and television to guide them on weather forcast on flooding as rolled out by Nigeria Hydrological Service Agency.			
2. Difficulty in accessing the needed improved seeds			
3. High seeds prices			
4. Poor construction of levees and wall			
5. Poor construction of drainage system			