CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Flooding has become a major issue of global concern threatening human security especially sustainable food production. In its recent report, the United Nations Office for Disaster Risk Reduction (UNISDR, 2015) compiled natural disasters across the globe from 1980 to 2011, and estimated a staggering figure of flood disasters at 3,455 with 2,689 storms, 470 droughts and 395 extreme temps. The report evidently depicts that floods have become one of the major causes of deaths associated with weather elements. Flood is increasingly becoming a threat to food security. Half of all flood-related deaths across the world have been found to occur in Asia (Doocy, Daniels, Parker, Dick, Kirsch,*2*013).

Despite the overwhelming challenges in the past half century, Asia has made commendable progress in attaining food security (Gill, Farrington, Anderson, Luttrell, Conway, Saxena, Later, 2003:1). During the 1950s, the food shortage challenges resulting from flooding situations in Asia seemed insurmountable; as the continent with almost half of human population, the pressure on available food was quite significant. In recent time, the phenomenon has also ravaged parts of Africa with its attendant food shortages due to production failures. Against this background, environmental issues have challenged human security and initiated forms of poverty.

Floods are the most prevalent natural calamities confronting nations regardless of their state of development. The threat by floods is gradually growing the world over. Floods have a devastating effect on lifestyle as well as critical assets. Moreover, the relationship existing between flooding and food security took the centre stage of global environmental and socio-economic discourses. Floods are most important and the most significant of all

natural disasters leading to fatalities globally. Doocy *et al.* (2013) averred that the danger of terrible losses experienced at the wake of flood can be huge. Due to unmitigated deforestation coupled with unregulated human actions around coastal regions, river beds/basins, and lake areas, the effect of deluge events on human population is assessed based on mortality rates, injury, displacement, hunger and other material losses (Pingali, 2005). Also, after a considerable amount of time, increased mortality could also be recorded as a result of infectious diseases, which follows flood experience. Factors and conditions that lead to flooding are varied, complicated, and interconnected. These include weather and human factors. In terms of weather, the elements such as torrential rainfall, massive hurricane, whirlwinds, whereas human factors include structural and infrastructural failures of levees and dams, modification of landscape which negatively prevent run-offs with waterproof surfaces as well as poor drain structures.

Scholars have warned that locations with high water levels are prone to storms and other inclement weather that generate high winds. Climate change has led to ocean rise; so are extreme monsoon with destructive storms. Floods often take place over varying timelines which can range from the very quick-like flash floods - with little warning, to the type which builds up over days or even weeks (Okoruwa, 2014). Developed countries experience flash floods and overflows with high-velocity surge giving very short duration to prepare. Such types of flood are accountable for majority of deaths. Quite distinctively, flood events around riverine sites gradually accumulating during heavy rainfall provides ample time for caution and flight from areas likely to be submerged. Occasionally, floods can also lead to secondary hazards such as mudslides in hilly spots (UNISDR, 2015).

The rapid growth in population and dynamics in farming and other land-use patterns have exposed human lives and property to flood problems. Death and incapacitation as well as indirect widespread submerged farmlands, destruction of valuable infrastructure connote the harmful impacts of flood. Human and geophysical factors are both responsible for floods. Geo-physical characteristics of river-bed zones make them more vulnerable to flood disaster than people living in the hinterland. In the past

three decades, billions of people have directly or indirectly suffered from floods, with several millions rendered homeless, thousands of deaths and injuries, as well as the enormous victims that remained undocumented (UNISDR, 2015).

At any rate, a scientific consensus exist that the global climatic change is caused by human activities. World Meteorological Organisation (WMO) and United Nations Environment Programme (UNEP) under the auspices of Intergovernmental Panel on Climate Change (IPCC) in September 2013 had a consensus confirming this fact in *The Physical Science Basis* volume of the *Fifth Assessment Report (AR5).* "The report concluded that the human impact on climate challenges system is obvious throughsteadily increasing Green House Gases (GHGs) concentrations, positive radioactive forces, observed increase in the temperature, heat trapped in the atmosphere, and understanding climatic dynamics. With a certainty level, over 95% human activities have been the major driving force behind the gradual warming since the 20th Century (Mitiku, 2012).

The Nigeria Hydrological Services Agency (NIHSA) in its 2015 Annual Flood Outlook Report, (flood disaster forecast), stated that no fewer than 10 states in the country were very susceptible to flooding. The NIHSA has statutory mandate to predict flood occurrence and to make available necessary information to the Nigerian populace particularly residents of vulnerable areas in order to enhance their preparedness towards mitigating flood and its effects. Therefore, recent researches have shown that flooding is a recurrent problem in many parts of Nigeria. Climatic zones found across Nigeria are many; such climates range from tropical maritime which are peculiar to the rainforest and coastal areas as well as other southern geographical zones, to climate found in the Sahel and the tropical hinterlands of the northern regions of the country. Many villages, farms communities, cities and towns in Nigeria have experienced flood disaster at some point, due to heavy rain falls. National flood disaster of September 2017 in Kogi State is the most recent. The 2012 flood disaster in Kogi State and many other parts of the country resulted from the release of water from Lagdo Dam by the Cameroonian government. Water, therefore, entered Nigeria from Lagdo and coursed its path into the sea via River Benue and River

Niger. The opening of Lagdo by Cameroon which took place between July 2 and September 17, 2012 led to flooding events in Nigeria. The flooding that resulted caused an extensive damage to farmlands, homes and displacement of citizens.

The attendant flood which entered Nigeria hinterland through the Benue River affected many states such as Kwara, Niger, Kogi, Nassarawa, Taraba, Adamawa, Edo, Delta, Bayelsa, Rivers and Imo. These states have all experienced significant death of residents, devastation of key assets as well as food and livestock, while increasing the number of displaced and vulnerable persons across all the affected states. The flooding therefore, not only affected food stores, it also submerged several hectares of farm lands. The secondary effects were by far more protracted especially when the affected communities' preparedness and response were poor and inadequate. As a matter of fact, in the Niger Delta communities, waters remained in homes and farms up till November 2012 (NEMA Report, 2012).

Agriculture is an essential source of livelihood among several Nigerians. However, based on flooding events around the globe, crop production and animal husbandry are severely impacted (Gill *et al.*, 2003). In most cases, after the flood disasters, federal and some state governments have alleviated the sufferings of farmers and other victims through the distribution of fertilizers and improved seedling as a form of rehabilitation and resuscitating their farms. For instance, Nigeria's Federal Ministry of Agriculture and Rural Development made available to victims of flood disaster a total of 40, 000 metric tons of food items taken from silos across the country (NIHSA, 2015). In Ghana, the government and its development partners had to rescue the farmers during flooding events of August to September, 2007 which resulted from spillage of excess water upstream from the Bagre Reservoir in Burkina Faso. Ghana's Ministry of Food and Agriculture had estimated the production loss in the tune of 144, 000 Metric Tonnes of food crops and over 70, 500 hectares of farm lands destroyed (Armah *et al.,* 2010).

In addition, after the 2012 event in Nigeria, the country's Red Cross Society, embarked on a cash transfer programme to help farmers revive their work as soon as possible.

The intervention, according to Nigeria Hydrological Service Agency (NHSA, 2015) helped to provide money to the most affected communities as it helped them to buy seeds and assets necessary to improve their livelihoods. Essentially, the effect of flood on agriculture and food security is not only huge but also challenging (NIHSA, 2015). This raises a strong connection between flood and food security. Nevertheless, what is important is how to draw this nexus. Thus, it is salient to show the extent to which flood disasters have negatively affected food security in Nigeria. Particularly, it is important to interrogate how these phenomena have affected Kogi State. This is because the state was not only affected by the flooding of 2012, it is equally critical in Nigeria's food security because of availability of surface water all through the year for planting and harvesting.

Furthermore, the damage caused by floods is aggravated by low level of awareness of the consequential effects of human activities on drainage systems; for instance, refuse dumping, erecting structures on flood plains as well as other indiscriminate actions that obstruct the free flow of water. Basically, these hydrological trends are attributable to global warming and climate change occasioned by anthropogenic activities which can be tackled by using both structural and non-structural measures. Kogi is a river-bed state and is basically a flood-prone community (NEMA Report, 2007).

This study examined the implications of flooding on food security in Kogi State. The study also examined the nexus between flood and food security. Such connections will show how and the extent to which food security has been affected by flooding. In recent time, many crops and livestock were destroyed in Kogi State. The study area is exposed to danger in the long term as the threat does not end destruction of farms and death of livestock owned by farmers. This study, therefore, focused on examining the impact of flood on food security in Kogi State, Nigeria between year 2010 and 2015. This period, particularly year 2012 witnessed the highest record of flood disaster among farming communities in Kogi State.

1.2 Statement of the Problem

Flooding has continually challenged food security across space and time. The phenomenon has created a state of food insecurity and continues to represent an enormous public policy challenge in many Third World countries in Africa. Inability to achieve food security in any nation can be a major hindrance to economic development, therefore when it is attained, is could insulate the society from starvation and undernourishment (Davies, 2009). Towards this end, all nations be it developed or developing struggle to bolster their food production capacity (Burchi, 1991). However, increasing flooding in coastal and riverine areas have continued to affect food production and food security.

Existing studies on flooding and food security have been preoccupied with understanding the concepts (Gill, *et al*., 2003; Dixit, 2003; and Bariweni *et al*., 2012). These studies have contributed in positioning the phenomena at the centre stage of global academic discourse. While the conceptual rigour is established in these studies, the connections of the phenomena are missing. Furthermore, other studies have highlighted the impacts of climate change on food security at regional and global scales (Homer-Dixon, 1994; Fischer *et al*., 2002, 2005; Gill *et al*, 2003; Parry *et al*., 2004, 2005; Tubiello and Fischer, 2006; Armah, 2010; Audu, 2014; Anthony, 2015). Yet, these studies say very little about a particular aspect of climate change - flooding, in a specific location - Kogi, on food security. Food security is seen as the availability of adequate supply of basic foodstuffs at all time (United Nations, 1975). The World Bank's view of the phenomenon according to Burchi (1991) remains relevant and has widened the scope of food security from mere availability to access while lessening the focal point to households and individuals rather than global and national perspective: "Access by all people at all times to enough food for an active, healthy life" (World Bank, 1986). In the literature, four dimensions of food security have been established, namely food availability (i.e., production and trade), stability of food supplies, access to food, and food utilisation (Gill *et al*., 2003; Burchi, 1991) which will likely be affected by climate change. Essentially, food security depends on climate and socio-economic impacts, as well as changes to trade flows, stocks and food-aid policy.

Furthermore, several other studies have underscored the nexus between climate change and food security at regional and global scales (Homer-Dixon, 1996; Fischer *et al*., 2002, 2005; Gill *et al*, 2003; Parry *et al*., 2004, 2005; Tubiello and Fischer, 2006). These studies however, say very little about a particular aspect of climate change (flooding) in a specific location (Kogi) on food security. Thus, studies on Nigeria have glossed over the extent to which flood events have impacted food security particularly in Kogi State between year 2010 and 2015.

This is particularly necessary given the geo-strategic importance of these states as the food belts of the country. Although, there are studies emphasising on how government agencies have mitigated losses of farms and farmlands (Durotoye, 1999; Lucia, 2015), there are few attempts at understanding the details of the nexus between flooding and food security. This is the gap this study filled.

1.3 Research Questions

This study is guided by the following research questions:

1. What are the causes of flooding in the study area?
2. To what extent did flooding affect food security in Kogi State during the period under study?
3. What was the impact of flooding on food security in Kogi State?
4. What was the response mechanisms put in place by different stakeholders within the period of study?

1.4 Aim/ Objectives

The aim of the study is to examine the nexus between flood disaster and food security in Kogi State, Nigeria. The specific objectives are to:

i. Examine the causes of flooding in Kogi State;
ii. Discuss the impact of flooding on food security in Kogi State between year 2010and 2015;
iii. Investigate the extent of flooding on farming communities in Kogi State most especially year 2010 to 2015; and
iv. Assess the response mechanisms put in place by different stakeholders ranging from local to the Federal Government and its agencies.

1.5 Significance of the Study

Flooding has severely threatened food security in the country in recent years. Yet, there is dearth of literature critically examining the interaction between flooding and food security. There is a growing body of literature on food security which has shown that food insecurity can be chronic or acute (Gill *et al.*, 2003; Armah *et al.*, 2010). For them, food insecurity becomes chronic when citizens of a society recurrently suffer insufficient food to meet their nutritional demands for a healthy living. Transient or acute food insecurity is usually linked to vulnerability to political, economic, climatic or seasonal blows. Such shocks can be economic in nature, such as the financial crisis which affected Asia 1997. They are political, as in Nepal in the past. Seasonal insecurity mostly occurs during the wet seasons when riverbanks overflow. This is the most common in Nigeria which took place in 2012 and has directly or indirectly affected the country. The food insecurity are usually diverse and usually interrelated, because food-insecure members lack the storage necessary to cope with unproductive seasons and therefore compelled to inhabit areas prone to disasters or areas that are unproductive (Gill *et al.*, 2003). Food insecurity regardless of its form reinforces one another. Therefore, flooding and food insecurity is a challenge to human security and an object of academic investigation. Any attempt to examine the connections between flooding and food security and how it affects individuals in Kogi State of Nigeria is significant to research and policy.

1.6 Scope of the Study

Thestudy focused prominently on the yearsKogi State experienced flooding leading to huge economic loss and destruction of farmlands particularly year 2010 to 2015. Many parts of Kogi State especially the agrarian communities suffered from floodingoccasioned by Rivers Niger and Benue breaching their banks and submerging several farming communities. The communities selected for the study include Kabawa, Egah, Edeha, Iyano, Adogo, Oguma, Ugwolawo, and Ajaka located in Lokoja, Idah, Kogi, Ibaji, Ajaokuta, Bassa, Ofu, and Igalamela/Odolu local government areas respectively in Kogi State.

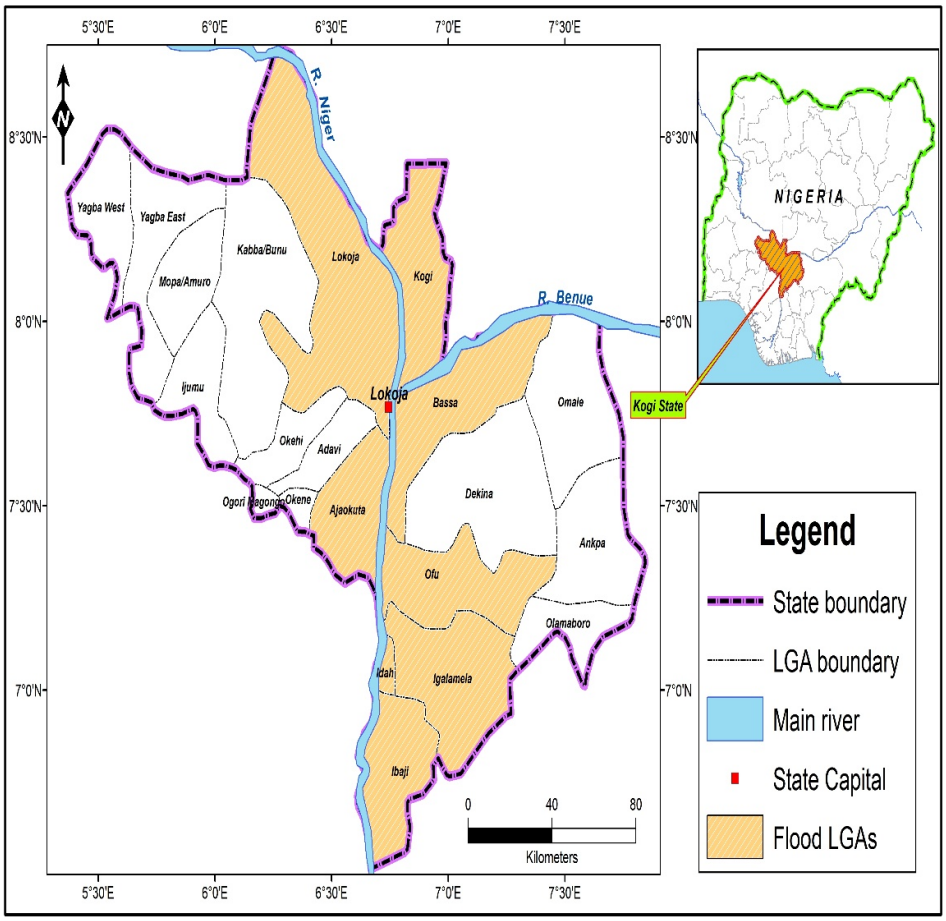

Fig.1: Map of Kogi State showing study area

1.7 Operational Definition of Terms

1. **Flood:** High water stages where water overflows its natural or artificial banks on usually dry land; for example, a river inundating its flood plain.
2. **Flood risk:** This isa combination of the probability of a flood event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity associated with a flood event.
3. **Flood disaster:** This could be described as the disruption in the normal functioning of the community as a result of rise in the height of water in excess of channel capacity causing widespread discomfort in livelihood to the extent that the affected community will need an external support to return to normalcy.
4. **Food security:** This situation occurs when all people, at all times, have physical, social and economic access to adequate, safe and healthy food that meets their nutritional needs and food preferences for an active and healthy life.
5. **Food insecurity:** This is a default of food security. It is a situation of lack of availability, accessibility and utilisation of food. During flooding events, forced uprooting increases the risk that people will fall into temporary or chronic undernourishment, defined as calorie-protein intake levels below the minimum necessary for normal growth and work.

CHAPTER TWO
LITERATURE REVIEW

2.0 Preamble

In this chapter we undertake clarification of fundamental concepts, upon which this study is situated. These concepts are: flood, flood damage, flood vulnerability and flood risk, flood disaster and food security. Thereafter, a conceptual framework that guided the study was constructed and the review of existing literature.

2.1. Conceptual Clarification

2.1.1 Flood

Generally, flood is one of the most rampant natural disasters afflicting the world (UN-Habitat, 2003). The phenomenon of flood poses multifaceted problems. This is because it could be natural and at the same time, manmade given that flooding could occur when people build or carry out human activities on waterways. However, scholars of flood events posit that the phenomenon claims more than 20,000 lives annually, and negatively affects about 75 million people globally (Smith, 1996; UN-Habitat, 2003). Sordlin (2007) argued that flooding is characterised by gathering of excessive amount of water within a space without flow. While it appears as flood in the literature, it is often interchangeably used with flooding. Both are the same thing while the former is a noun that later functions as a verb.

The *Encarta Dictionary* defines flooding as an overflow of huge body of water from its source to an erstwhile dry area. Such sources could be a river, a perforated pipe, and other reservoir of water. It further describes flood as the flow into land of water due to rising tides. Flood occurs when land which hitherto is dry becomes submerged by water due to heavy rain or overflowing of banks of rivers. Similarly, *Encyclopaedia Britannica* defines flooding as a stage whereby natural or artificial banks of water bodies and channels becomes over-flown into normally dry land thereby inundating its floodplain

(*Encyclopaedia Britannica*, 2010). Scholars have attempted understanding the phenomenon from its causation factor. Frequently, it is argued that events and phenomena of weather which culminates into excess precipitation being delivered to flood plains and drainages than they can store or absorb are the major causes of floods (Smith, 1996). Weather events that lead to floods are intense thunderstorms, storms, cyclones, snowmelts, as well as hurricanes (Hirschboeck, 1991).

Thus, flood is a natural disaster whose occurrence is tied to nature though its pattern can also be affected by human actions or inactions. Floods are characterised by height, highest overflow, areas submerged, and amount of flow. The aforementioned characteristics are essential in determining optimal use of land, bridges designs and construction, dam construction, prediction of flood events, as well as flood management and control. Floods can be categorised based on the causal agents, therefore, types of flood are categorised based on their nature. When rivers overflow their banks, such is described as river flooding. Flash floods occur as a result of heavy rainfall spanning over a short period of time. A flash flood can take place in a single tributary while the rest of the drainage basin remains dry. The suddenness of its occurrence causes a flash flood to be extremely dangerous. While an uncommon or strange inflow of water from the sea to dry land are referred to as ocean flooding, which occurs as a result of tropical storms, high tides, seismic events (such as tsunami), and large landslides. Because of the nature of disasters being occurrences that are unprepared for, not all flooding events are disasters. It has been an important means of adding essential nutrients to arable lands in some parts of the world, and to recharge dams in other parts. In such locations, the absence of such seasonal flooding events could translate to a major disaster (FEMA, n.d.). This study adopts the view that flooding is a natural catastrophe.

2.1.2 Flood Risks and Flood Vulnerability

Flood vulnerability can be described as a construct which measures the level of exposure of members of the society and their households to the risk of flooding. It is significant during assessment because it clearly shows the association between how flood is conceived theoretically and daily communal activities. Flood vulnerability helps in

understanding the best way to reduce flooding risks through informed decision making by stakeholders (Douben, 2006). Globally, vulnerability to flooding event has been predicted to escalate significantly due to developmental activities and climate change issues which have continued to be inimical to the environment (Ibim, 2011). It is impracticable to totally eliminate flooding events; however, the attendant challenges as well as hazards can be well mitigated through informed behaviours and appropriate actions. Active support from within and outside affected population or communities can go a long way in determining how successful flood management is. Studies have shown that households that are socially vulnerable or disadvantaged and river bed communities have lower levels of disaster preparedness.

Threat of flood and its attendant risks is considerable for societies globally; therefore the preventive actions to curtail dangers and hazards are becoming increasingly important. While it is possible to alleviate suffering and destruction due to floods through preventive measures, the elimination of the total risk could be futile. Crossman *et al.*, (2006:41) also pointed out that around two million households and thousands of business entities are seriously threatened in England while the floodplains located around the rugged coastline of Wales, including millions of people are at risks. In a frantic move to manage the challenge, actions targeted at managing the risks of flood have been embarked on by British authorities. Empowerment programmes through an Act of the parliament in 2010 targeted at better strengthening government agencies were mandated to develop strategies for erosion risk and flood management in England. The enactment clearly identified and spelled out the roles of organisations and other stakeholders such as water sewage companies, local authorities, highway authorities, drainage boards and other environmental agencies. The law gave them the power to act and reduce coastal erosion and also address fallout when it could not be prevented. The legal framework is expected to assist communities, organisations as well as public sector actors to achieve collaborative effort in the management of flood hazards.

In an attempt to properly situate the concepts of flood risks and flood vulnerability, scholars tried to comprehend how people distinguish risks and flood risks in particular (Oxfam, 2006). As a result, the human nature to randomly engage in risky undertakings has pushed researchers to take keener interest on how people identify with risk. Individuals tend to manage risk as a result of their inability to accurately determine with certainty the level of risk they are exposing themselves to (Adams, 1995). Risk involved in an event refers to the possibility of an individual to experience danger and its effects (Short, 1984). Notwithstanding the event or location, there is a general agreement on the fact that at the core of risk is the likelihood of an unfavourable experience with substantial consequences (Rayner and Cantor, 1987).

This definition of risk has been described as misleading at a communal or societal level because of the large scale nature as against risk found in engineering calculations during construction. Whether definitions are misleading or not, risks as a concept have certain common characteristics, which is a clear difference between possibility and reality. Researchers have continued to attempt to understand the concept of uncertainty of a situation, according to Rosa (2003: 56) who linked uncertain events to risk by defining risk as a condition where something valued by humans is in danger and the consequence of such cannot be ascertained, therefore, there is a very high relationship between risk and uncertainty. Many behavioural and psychological theories assumed uncertainty to be a critical mediator of human reactions when confronted with situations whose outcomes cannot be predetermined. Because of the psychological nature of uncertainty, it exists only in the mind. It is a condition where an individual's knowledge is incomplete; this makes it a psychological construct (Windschit and Wells, 1996).

Perception of risk has been found to be subjective in order to perceive risk correctly, an evaluation of the possibility as well as the consequence of outcomes that follow must be determined. Weinstein (1989) argued that risk perception is both cultural and social construct indicating a society's values, ideology, symbols and history. Therefore, it extends beyond an individual. Boholm (1998) states that risk perception vary, and are specific. It is based on the social environment of an individual. Therefore, risk should not

be presumed to be mere scores or ratings having similar meanings in different situations. Any theory of risk must emanate from the consciousness that everyone undertake risks in volition (Adams, 1995: 16).

Risk became an important issue in policy making in the 1960s. Martin (1989) underscores the importance of risk perception in mass opposition to technologies such as nuclear technology. Parliamentarians in Scandinavian countries like Sweden and Norway as a result started giving more attention to issues that border around risk. This effort was reflected in the manner they handled complex situations that arose than they did in the 60s when policies on technology suffered unexpected opposition. Sowby (1965) compared risk involved in smoking, driving and boarding of public transport against that of residing near nuclear plants. The approach however failed in convincing people to accept risky technologies. Starr (1969) found out societies are more willing to undertake risks in as much as it has a substantial benefit associated with it. His work led to greater interest in issues bordering on management and control of risk, and further led to probe of how people accept, tolerate and view risks. Experts have underscored the fact that risk perception can be a constraint to logical decision making as individuals often perceive risk even when none exists.

Psychologists since 1970s have experimented people's reactions to risks especially in decision making using lotteries and gambles. Through these efforts, concepts that are abstract were measured through scaling of psychological procedures (Lopes, 1983; Lopes, 1995). All these research work underscored people's preference as far as lotteries and other forms of gambles are concerned. They however showed these forms of risks are unique and unrelated to others (Waerneryd, 1996).

Research has also found that people tolerate risks more substantially when they engage in voluntary actions. This has been associated to a belief of being in control as it is believed lesser risks are involved when it is controlled personally. Brun (1994) defined risk as being insufficiently in control. As people often believe they are in charge than they actually are. By displaying what is referred to as 'control illusion', thinking the choice of numbers by oneself guarantees success or certainty in winning a lottery (Langer, 1975).

Just as an individual feel more secured or less risk when driving self as against being a passenger (McKenna, 1993). Regardless of the educational status, age and other demographic information of an individual (being a man or a woman), unrealistic optimism often comes into play (Weinstein, 1987). Also, individuals generally assume the possibility of negative outcome or events happening to them are lesser when they operate within a group; a view which has been described as being unrealistic. Douglas (1985) posited the most outstanding result on risk research where he posited that the immunity sense displayed by individuals is strong but unjustifiably subjective.

Another critical angle the concept of risk must be viewed from is the level of risk tolerance suffered as a result of an individual to accurately perceive risk involved in his or her actions leading to engaging in higher risk behaviours. When it becomes habitual to engage in risky endeavours, it becomes more tolerable. Many researchers have developed models in support of these. These theoretical perspectives apply to those who have chosen to live and work permanently at the river-bed communities.

In the Nigerian case, it could be posited that, low level of government-sponsored public awareness campaign on the dangers of living in flood-prone zone, might be a contributing factor to the increasing population of those living and working at river-bed communities.

At whatever scale of analysis, many studies have canvassed the necessity of analysing risk perception of a person on a broader account based on social, cultural and environmental explanations by not limiting analyses to mere psychological perception (Weyman and Kelly, 1999). In this regard, the approach by government bodies be it local, state, or federal on safety goes a long way in determining risk perception and safety precautions taken by people in river-bed communities. When government at any level displays high commitment in ensuring safety of the people, risk management system is also positively affected which can go a long way in reducing vulnerability to flood disaster (O'Toole, 2002). Slovic (1987), while highlighting perception of risk refer to intuitive judgement of risk of an individual or group in a situation where there exists inadequate and vague information. As a result of this assertion, it can be averred that persons in a society often access their risk exposure to flood and other environmental disasters differently. This is

blamed on the quality and amount of information on the possibility of hazardous event occurring on disaster impact alleviation measures, among others. This is against the backdrop that such residence might have diverse background and experience in terms of inhabiting flood plain areas. In the same vein, leaders and other emergency stakeholders such as politicians, emergency workers, etc., may handle disaster situations likewise differently. Experts handling flood protection events must ensure information is structured in a manner that it is easily understood and its effectiveness in ensuring measures are optimised. Politicians due to their political interest may be more open to populating floodplain regions with a view to enhance development. Therefore, any measures recommended on flood risk control may be judged against this preference, which might lead to inhabitants having diverse approach to reducing their flood risk. Other inhabitants might see no reason to act at all believing flood mitigating duties are only the preserve of policy makers.

Blaikie *et al* (1994) are of the opinion that vulnerability analysis emerged from various socio-economic attempts to manage disasters and everyday life hazards. They further stated that a society is deemed to be socially vulnerable when members of the society display characteristics to show they lack the capability to accurately predict occurrence of hazards, cope with it, resist it and recover from its impact on their daily living.

Blaikie (1994) identified five components of vulnerability as initial well-being, livelihood resilience, self-protection, social protection and social capital. He described initial well-being as the appraisal of the initial physical and mental state of a member of a society in their daily life before the disruption of a disastrous event. Such initial well-being status determines the capacity of people to survive illnesses and cope with injuries sustained during disastrous events such as floods. Livelihood resilience is the ability of a person or family to deal with the outcome of any hazard as well as re-establishing their revenue or living lifestyle which includes employment, investments, social security, among others. Self-protection has to do with the readiness of individuals and groups within a social system to use their knowledge possessed about the risks and hazards in their environments to provide adequate safety measures to reduce or checkmate such hazardous occurrence.

The success of achieving this is dependent on the level of knowledge and the capability to implement measures against the risks. Societal protection refers to the social structures put in place by members of the society and the willpower of such structures which come in the form of political, social, individual or household contribution to safeguarding the system against hazards. Such political and social structures are exemplified by governmental and non-governmental organisations such as CBOs, NGOs, CSOs, Fire departments, Civil Defence, NEMA, among others. Social capitalhas to do with intangible or non-physical security provided by community groups to enhance individual resilience. Such form of security may however negatively impact or reduce such personal resilience. This is because soft security has to do with cohesion, rivalry or competition that exists among groups or individuals capable of enhancing or hindering rescue and recovery efforts. Most support networks found in churches, mosques, clubs and/or other support group provide humanitarian assistance to victims of crisis and other natural disasters regardless of their status as members or non-members (Abdul-Akeem, 2012). All the aforementioned though are largely determined by political, social and economic processes. And if these are not well considered, they may complicate the severity and the impact of hazards as they are usually interrelated.

Vulnerability concept can be interpreted in diverse ways and is oriented to how the issue of disaster risk is perceived. There are diverse school of thoughts that defined and structured the term vulnerability (Birkmann, 2006, Adedeji *et al*., 2012). This study defines vulnerability as the likelihood of individuals to get injured, maimed, or killed, due to the effects of disaster directly or indirectly. The World Bank in one of its development report inferred that inadequate capability to lessen the effects of disasters is a primary problem bedevilling developing countries, even though safety is not guaranteed in many countries across the globe (World Bank, 2004). The United Nations (2009) opine that the poor feel the impact of natural hazards the most, and that difference in being vulnerable to natural disasters or hazards occur as a result of the huge gaps in resource accessibility as well as capabilities for reducing risk often linked to poverty and socio-cultural division.

During disasters, those that are mostly affected include children, women, and the elderly people as against the male folks (Hannan, 2002; Adedeji *et al*, 2012). Gurenko (2004) however stated that the vulnerable group amongst urban inhabitants occupy the weak ecosystems and they usually experience very grave environmental challenge as flood. Due to the fact that the country is ill prepared for disastrous events, hence the damage experienced during flood events cannot be overemphasised. The government at the local level fails to provide adequate infrastructure for disaster mitigation and management to many of the riverine inhabitants, including inadequate planning measures in river bed regions. Hence, the areas are susceptible to flood risk and diseases risk. In the Nigerian State, many stakeholders especially in policy formulation for sustainable growth and research studies are concerned about disaster mitigation and management in the river bed regions (UN-Habitat, 2003, 2010; Adedeji *et al*, 2012).

As regards the socio-economic characteristics of vulnerability, one has to consider risk perception. In other words, being prepared for any disastrous event, as aforementioned as regards indicators of social susceptibility is of great significance. If perhaps in an area, they perceive the risk to flood as low because of the fact that flooding hardly ever occurs or because the level of flood protection is high, and as such, many of the inhabitants are not prepared for any flood event, the outcome of such would be that they would not be adequately prepared to reduce the risk of such flood events. On the other hand, if the inhabitants perceive flood risk as high due to the fact that they often experience flood events some time, then their level of preparedness for any flood event will be high (Baan and Klijn, 2004). It can be inferred from these that in areas where they perceive flood risk as low coupled with low level of preparedness to manage flooding, the inhabitants would experience above average flood damage, hence high level of vulnerability to flooding. Nonetheless, other school of thoughts speculates that the total flood damage of flood events is dependent on the susceptibility of both the socio-economic and ecological systems affected, and this is generally defined on the likelihood to get hurt by a disastrous occurrence (Cutter, 1996; Mitchell, 1989). Any element that is at risk of being exposed to any harmful event is more susceptible; as the more it is being exposed to any hazard, the

more it is vulnerable to the effects. Thus, when analysing flood vulnerability, information as regards the stated indicators such as element-at-risk indicators, vulnerability indicators and exposure indicators are needed. Parenthetically, both natural and social science indicators are very important. With regard to exposure indicators Alexander (1993 and Heyman *et al*., (1991) identified two types. while one gives information about the category of exposure of the diverse elements that are at risk, the second gives information on the location, closeness to river, elevation, among others, of the diverse elements- at-risks. In total, all the indicators give information about the rate of occurrence of floods and different elements exposed to the threat of flooding.

When considering analysis of flood vulnerability in river-bed and hazardous areas, those at the most risk include individuals, families, industries, physical and public infrastructures, economic production, landscapes, fauna and flora, etc., while the extent of the highest possible flood damage is calculated in financial and non-financial units. Alexander (1993) referred to it as the damage potential.

Green *et al*., (1994: 47) revealed that numerous studies were conducted as regards social systems vulnerability and several indicators were proposed such as the level of awareness and preparedness of inhabitants and regions, individuals insured against flood damage, individuals prepared for management of disasters, families protected against effects of flooding through technical method, in addition to quality of both flood protection methods and organisations involved in the management of disasters.

Blaikie *et al.*, (1994), Watts and Bohle (1993), Hewitt (1997), and Smith (2001) aver that the capability of people and the social system to deal with flood impacts is in correlation to socio-economic indicators and coping indicators which include demographic information, vulnerable groups, level of poverty, social relations, race, among others. Gasser and Snitofsky (1990), and Platt (1990) identified flood-specific weaknesses, communication systems, drinking water and energy supplies, as well as energy waste water treatment as technical susceptibility indicators.

Furthermore, recovery indicators measure the ability of stakeholders to overcome the outcomes of hazards as well as re-establishing earlier conditions. These indicators include aid from governments, private donors and friends, social systems cohesion, affected families and communities' monetary reserves, and the substitutability of lost items. Additionally, physical or time units are used in measuring the long-term effects of flood on the living standard and the general health conditions of those affected by flood events.

2.1.3 Flood Damage

Flood damage indicates every variety of damage as a result of flood. It includes several negative effects on individual's health and property, as well as damaging effects on physical infrastructures, industrial production, cultural legacy, environmental systems, and the economy's competitive strength. The damages incurred are usually measured in both monetary and non-monetary terms. Also, effects of flood damage can either be direct or indirect. While direct flood damage include every variety of harm related to physical contact of flood water to individuals, their property and surroundings, indirect flood damage occurs as a result of flooding and interferes with both economic and social activities. Examples include: inadequate energy and telecommunication materials, higher food prices, reduced productivity, reduction in real estate costs close to flood plains, loss of time and profits as a result of traffic disruption, decreased competitiveness, failure of economic production, reduced market and public services, among others (Smith and Ward, 1998:34; Green *et al*., 1994:39).

The UNDP (2007) states that preventive strategies are more valuable if the political will, capability, priorities, legal and institutional frameworks, policies and planned activities are put into consideration and synchronised properly (Akanbi, 2015). Diverse methods can be used to sensitise individuals that stay in flood-prone areas about the impending dangers they will encounter and the best way to respond to such. This can be done in conjunction with local technical knowledge so as to increase their level of confidence as well as give them the courage to take necessary actions in any event of danger. This will go a long way

in facilitating and fostering increased involvement of the local community to deal with any disastrous occurrence.

To tackle the subject matter of preparedness, one has to proffer an answer to the issue of the ability of the Nigerian State to in totality effectively manage natural and human-made disasters. The Global Facility for Disaster Reduction and Recovery (GFDRR) is saddled with the responsibility of helping Third World nations lessen being susceptible to natural hazards in addition to adapting to climate change. Though, less than 20 African nations are at present involved, excluding Nigeria. In 1981, the Ecological fund was created through the 1981 Federation Account Act and it was modified by Decrees 36 of 1984 and 106 of 1992, and is facing a number of challenges (Adedeji *et al*, 2012).

A country's developmental stage determines the level of preparedness and the ability to manage disasters; equally important is the balance connecting the sectors, institutions, and structures' strengths and imperfections (Etkin *et al*., 2003; International Council for Science, 2008; Adedeji *et al*., 2012). Members of a community perceive disaster in diverse ways and different methods are developed to surmount flood events. However, the capabilities to manage effects of disaster are different and are dependent on social structures such as being poor or rich, gender differences, being young or old, being indigenous or non-indigenous, etc. Many of the inhabitants in flood-prone areas have made efforts to move out of the affected areas to more habitable places, though the huge amount of rent makes it a difficult venture.

Adeoti (1998) conceptualised coping mechanisms. According to him, economic coping mechanism has to do with diversification and financial activities in addition to community strategies that are linked to materials, goods and resources. However, he defined the technological/structural coping mechanism as those structural activities engaged by families that live in flood-prone areas so as to deal with flood loss and/or damage. Such mechanism include constructing houses to avert flood or by using materials that is able to reduce flood loss and/or damage.

Adeoti (1998) further submitted that nations have identified that there is need to create an understandable regulatory agenda which is aimed at preventing, managing and reducing disasters all over the world. Different steps implemented rightly would improve the capability to confront natural disasters, flooding inclusive. There are different levels of capacity building such as the individual and institutional levels, as well as the systemic level. Individual capacity is dependent on the performance of human resources as well as on the availability of resources, including requisite knowledge and skills. The capacity question is focused on every aspect of the emergency management system at both the local and national levels, in addition to assessing the socio-cultural, political, environmental and economic factors which have an effect on being vulnerable to hazards. The institutional level focuses generally on organisational performance and management capabilities and includes an organisation that has the mandate to manage flood, while the systemic level centres on creating an enabling environment for individuals and organisations to operate, and should include the regulatory, general policy, accountability and financial frameworks (Akanbi, 2015). In addition, Olowu (2010) and Adedeji *et al.*,(2012) emphasised that in many Third World nations, particularly in Africa, failed state infrastructures, lack of suitable legal and policy frameworks, as well as insufficient funds make them more susceptible to the violent effects of significant disasters.

In Nigeria, disaster or crisis management is at the budding stage in spite of the fact that in 1906, for instance, there was the initial effort to manage disasters in the country through the creation of the Police Fire Brigade, but now referred to as the Federal Fire Services with diverse functions ranging from fire fighting roles to safeguarding lives and property of the populace, in addition to providing humanitarian services in cases of disasters (Adedeji *et al*., 2012). In 1999, through Act 12 as amended by Act 50, the National Emergency Management Agency (NEMA) was created with the responsibility of managing disasters in the country (Adedeji *et al*., 2012). The organisation has put in place measures to educate the general public to raise their awareness level and lessen the impacts of hazards in the country.

In addition, NEMA has established structures for detecting, responding and combating disasters quickly. It is better to prevent disaster because in the case of any eventuality, if there are no adequate measures to contain it, the resources of the affected country will bear the consequences to contain it. In Nigeria, for instance, state governments are mandated to create their SEMAs so as to harmonise the role of FEMAs (Adedeji et al., 2012). Akanbi (2015) submitted that through the activities of SEMAs, many states in the federation would be viewed as keenly involved in management of disaster and preparing in advance to the untoward incidents. Currently, very few states have taken the initiative, while some other states have not empowered their SEMAs appropriately to be functionally self-regulating and proactive in the discharge of their duties. It should be noted that having an understanding of the spatial aspect of flood disaster and initiating disaster preparedness measures to alleviate people's distress cannot be overemphasised.

2.1.4 Flood Disaster

Flood disaster is a disastrous event as a result of increased occurrence of intense rain within a short time, as well as encroaching waterways indiscriminately, insufficient gullies, in addition to inadequate maintenance of drainage systems (NDMG, 2008). Globally, it has been estimated that flood had claimed thousands of human lives and created billions of dollars damages annually (Smith 2001, Holway and Burby, 1993). Between the 70s and 90s, flooding had affected billions of individuals, thousands of fatalities, in addition to leaving millions of individuals without a roof over their heads (Kundzewicz *et al*., 2002). According to Smith (2001), flooding is estimated to be responsible for one-third of every global disaster. Flood occurs frequently and of every environmental hazard, it is extensive and of diverse types and scale. Also, flooding causes enormous losses on an annual basis in causing damages and disruptions to businesses, economic well-being, infrastructures, public health, and services. According to the United Nations Statistics Division(UNSTATS,2011), continuous information on natural hazards suggested that flood events and windstorms which cause flooding have been without doubt the most common reason for natural disaster globally over a century (Few *et al*.,

2004). According IFRC (2003), between 1993 and 2002, flooding had affected millions of individuals globally than any other disasters, be it natural or technological, in totality.

Pavel (2003) submitted that human beings had resided in floodplains over a thousand years so as to cultivate food, as well as make use of the flat landscape for settlements, including gaining access easily to safe water and using rivers for transport purpose. Riverine flood is a natural occurrence, with inhabitants benefitting from flood events. In the Nile, in Egypt for instance, the natural yearly flood added essential nutrients to irrigated soils.

At present, human beings are predisposed to flood risk due to their encroaching on flood plains as well as inadequate flood response plan. Flood events are complex and they occur due to diverse individual vulnerabilities, unsuitable development plan and unpredictable climate. To a considerable extent, flooding can be predicted, excluding flash floods whose magnitude and nature are not predictable (ADPC, 2005).

When considering disaster magnitude, it is not determined by only floodwater but the vulnerability pattern as well needs to be considered. Flood not only has an impact on peoples' lives but the sources of revenue of the less privileged are equally affected. These individuals who are already susceptible to disasters and health challenges, including famine, cyclones, food insecurity, ethno-religious conflicts, unwillingly reside in risky places and cultivate food on floodplains.

2.1.5 Food Security

> ....the world now produces enough food to feed its population. The problem is not simply technical. It is a political and social problem. It is a problem of access to food supplies, of distribution, and of entitlement. Above all it is a problem of political will (Boutros Boutros-Ghali, Conference on Overcoming Global Hunger, Washington DC, 30 November, 1993).

The quotation above opens the lack of political will by leaders globally to make food available and accessible to the people. Apart from this obvious fact, food security is also affected in an extreme sense by climatic changes. Food security is a situation whereby every individual at every time have both physical and economic access to adequate, safe, and healthy food so as to meet their nutritional needs as well as food preferences for a healthy and active living (FAO, 1996a). Ericksen (2008) is of the opinion that even though production is a significant factor that contributes to food security, other factors that deal with having access to food in addition to food utilisation are equally of importance. Focus has remain narrow and on mere agronomic viewpoint. Gregory *et al.* (2005) indicated that discussions have largely avoided broader matters bordering on food production shortfalls and have remained relatively unexplored

Since food is an essential and fundamental human need, the world evolved several societal structures, for example, laws and regulations, trade and commerce arrangement, customs and ceremonies, so as to reduce vulnerabilities of food production. Food is a critical part of culture as well as serving nutritional requirements. Food can serve as a pointer to what the past looked like as against the present, reflecting epochal transformation, and highlight the peculiarities of various races, groups and tribe (Chan, 2010). Daily activities such as hunting for games, food gathering, agriculture, fishing, ranching, among others, today and historically, are efforts intentionally targeted to securing food. These labours have determined the method we exploited and overexploited natural resources over the years. The foremost reason for the conversion of land has also been linked to demand for food. According to Chan (2005), this has led to alteration of about 70% of Mediterranean forests, 70% of tropical forests and 60% of temperate broadleaved forests to farming and grazing lands. To this effect, fish stocks worldwide have declined by 25% over the last 50 years (Mullon *et al.*, 2005).

Major scientific and technical advancements in the production of food were undertaken due to the need to feed an ever increasing human demand. ‘Green revolution’ saw cultivation increasing globally between the 1940s and the late 1970s. These achievements were hinged on a series of research, development, and technology transfer initiatives.

North America, Europe, followed by Asia experienced rapid progress (Hazell, 2009). In animal sciences and fisheries, numerous developments were also experienced. Dyson (1996) averred that globally, food production for many years has surpassed demand, as excess food is currently produced to feed the world. Increasing production, initially through expansion and intensification recently (Gregory *et al*., 2002), has proved to be a helpful approach for food production. unfortunately, since the end of the last century, many have abused the enormous food supply such that obesity has become a problem worldwide (Dyson, 1996), In spite of successes recorded in food production surpassing *per capita* need globally, experiences has continued to proof increasing food alone hardly translate to food security for all. Another dimension is the nutritional value of food produced. Considering the fact that a number of individuals say about two billion is iron-deficient globally, FAO estimation could be a gross underestimate (Pinstrup-Andersen, 2009).

There are well-documented records on the nexus between food system and the environment. Drought, climate, soils and water availability and other certain environmental elements such as flood have long been accepted as main determinants of the capability in producing food in certain locations, and an extensive array of both farming and fishing strategies are developed in line with the different environmental situations globally. Impacts of food production, processing, and distribution on the environment have an effect on the availability of, and accessibility to food.

The impacts of food systems on the environment are being perceived at moderate local spatial levels. Soil erosion, for instance, as a result of serious crop production gave rise to the siltation of close water courses as well as contamination of ground, surface and sub-surface water supplies by agricultural chemicals, which did not go further than local water sources. Nevertheless, the actions of human beings in the search for what to eat have altered the environment – in fact the changing of the environment now affects an entire region, and even at worldwide scale. Generally speaking these large scale changes can be isolated into two general classifications. The first one includes principal changes to significant earth frameworks and capacities which work at the worldwide level, for

example, atmosphere and nitrogen cycling. The second one is concerned about the frequency of changes in the environment locally, which is extensive and considered as a universal occurrence. Issues now given attention and addressed over large areas include degradation of fresh water sources and soil erosion.

As stated above, food security is governed by production, availability of, and having access to food. Access to food includes considering both the economic and physiological potentials, in terms of the dietary quality and food availability which depends on both production as well as distribution. According to Atkins and Bowler (2001), analysing food systems has been helpful in spotting and integrating the links between a rangeof things, in addition to paying attention to production, harvesting, storage, processing, distribution and consumption. This approach encourages a comprehensive understanding of the 'impacts' and 'feedbacks' links between food provision and environment. In addition, it encourages identifying where technical and policy interventions may prove helpful.

Varying coping and adaptation strategies for the provision of food depends on the level by which individuals and communities are susceptible to climate-induced disasters. Essentially, diverse biophysical and socio-economic factors that work interactively control food provision at both the temporal and spatial levels. The stated factors eventually determine the vulnerability of food systems to either biophysical or socio-economic change. While biophysical factors consist of climate, weather conditions and site-related natural resources such as soils, water availability, coral reefs, among others, the socio-economic factors comprise contemporary aquaculture, agriculture, and fisheries management such as operations timing, nutrient and pest management, population density, in addition to demand for food products to be consumed locally and for trade, availability in terms of markets, storage and distribution, and accessibility in terms of social and political controls, wealth, exploitation rights, and fairness.

Arising from the foregoing, food security can be conceptualised as a state where every individual at any point in time have access to sufficient food so as to meet their nutritional needs for healthy living. FAO (2003) views it as a supple notion which reflects the many

attempts to define it in policies and researches; hence there exists several definitions of food security. Maxwell and Smith in 1992 estimated more than 200 definitions (Spring, 2009); moreover additional definitions are formulated up till now (Defra, 2006). However, a general definition adopted during the World Food assembly held in 1996 viewed food security as a state where all individuals at any point in time have both physical and economic access to adequate, safe, and nourishing food in order to meet food preferences and nutritional requirements for a healthy and active life. This concept is built on Sen's (1981) study that established that food shortage arises not just when there is inadequate food, but also occurs when disparities are built into food distribution mechanisms.

This definition not only brings in a broad variety of issues that are connected to fully comprehending food security, but a number of keywords, for example, 'agriculture' and 'food production' that are expected to be in the definition were notincorporated. Hence, emphasis was on having increased access to food for every one rather than increased production of food. Majority of current concepts of food security viewed having access to food as the crucial feature. The definitions are obviously important in elevating the summary of several factors that contribute to food security besides food production. The dietary and food safety elements feature clearly, as also the functions of affluence and food costs which emphasises the primary important idea of 'affordability'. Other elements such as the idea of 'preferences', the idea of 'all people' are more intrinsic: the idea of 'preferences' entails not just what we love to consume, but equally important is the role food plays in our socio-cultural norms. In addition, the notion of 'all individuals at every time' means equitable allocation in society as well as stability of sufficiency. In addition, though not clear in the definition of food security, spatial levels that are higher than agricultural plots are implied: having 'physical access' brings in significant issues such as that of storage, proximity, and distribution, which in turn signifies the value of food trade both locally and globally.

The idea of food security from an 'industrialised world' perspective is connected to 'developing world' issues. However, rather than being within the purview of governmental departments and national agencies that are concerned with domestic

programmes, it has been within the limits of development organisations. Lately, 'food security' in the United Kingdom and other industrialised world has not been a main concern in policy topics. For example, since World War II, only few government papers in their title included 'food security'. However, of recent, there is on the increase an understanding of the extent of future needs: by the year 2030, fifty percent extra food will be needed and by 2050, probably 100% extra meat will be needed (Godfray *et al.,* 2010b). FAO (2008b) however submitted that between 2007 and 2008, food price hike made a number of hungry individuals within a few weeks rise suddenly from 40 million to more than a billion.

In a number of meetings, the idea of food security has been given much attention. According to Paillard *et al*., (2011) and *The Times* (14 January 2011), they stated that while a few individuals have argued that the world will be able to feed the predicted 2050 populace of nine billion individuals, majority however had a contrary view of its uncertainty. Hence, the issue of food security have speedily risen from societal, science, and policy agendas in several countries and are now topics of exceptional issues in important government documents, scientific journals, as well as foremost high-circulation media outfits such as the *Time* and the*Economist*.

The different tiers of government suddenly began to issue statements as regards food security in opposition to food production and agricultural development; the media in return passed the message across to civil societies, thus it enhanced political interest. The G8 heads of state in their statement held in July agreed "to act with the scale and urgency needed to achieve sustainable global food security" (G8, 2009). As a result of this, food security is now a frequent topic seen in researches, titles of research proposals, journals, books, science papers. In spite of the World Food meeting held in 1996, the issue of food production is given much attention rather than the food security notion which is broader. When addressing the issue of food security, it is important to view it from a broader perspective than from a narrow view, and to be included is the significant part that food production plays.

According to the Royal Society (2009), in food security, the food production aspect is given prominence in foremost scientific researches. In the United Kingdom in 1843, the Rothamsted Experimental Station was created, while in Germany, during the late 19th Century there was a rapid expansion of commercial plant-breeding (Harwood, 2005). Regardless of this fact, there is an urgent need to focus on food production considering its usual demand. Nevertheless, to satisfy its growing demand poses enormous problems, to sustain food production, in addition to the terrestrial and water ecosystems, including the societal services provided (Tilman *et al*., 2002).

According to Gregory and Ingram (2000) and Foresight (2011), being aware of the negative environmental outcomes of modern food production processes, obviously the needed gains are to be made in a more environmentally-benign way. Hence, focus of research is on the production system as against the plant or animal factors in quest of increasing the efficiency by which inputs such as water and nitrogen are used, and decreasing negative externalities such as GHGs, soil degradation, water pollution, and biodiversity loss (van Ittersum and Rabbinge, 1997; Gregory *et al*., 2002).

At the moment, as the climate change programme is gathering momentum, research on effects of food production is rapidly increasing. According to Parry *et al*., (2004), Parry *et al*., (2005), and Foresight, (2011) climate change has an effect on crop growth across the globe, with the most damaging effects expected in Third World nations as a result of droughts and flooding. A change in average temperature as well as precipitation patterns and amounts will impact positively and negatively on yields and/or alter costs of production, dependent on the location. Increased climate extremes are worrisome as any increase in droughts or long-lasting elevated temperature at vital phases of crop growth will be overwhelming and pose a major fear if prevalent. Through the stress of heat, farm animals and fisheries will be directly affected directly, while indirectly through effects on grazing and other feed stocks. Change in climate will also indirectly impact food production through water demands and alterations to pests and diseases (Gregory *et al*., 1999).

Researches on agriculture is now geared to addressing issues bordering on twin aims of food production at the same time as reducing the negative environmental views. However, the main aim of many researches is on food production boost. The emphasis on the continuous research on food production is not a surprise as it is a long-established and on-going venture. In spite of the fact that globally at present, there is enough production of food for every one; the figure of individuals that are currently food-insecure internationally confirmed that our knowledge and approaches are not enough. To tackle the broader food security programme, it requires developing new approaches, tools and concepts. According to Lobell *et al*., (2011), farm produce are currently being affected by rise in temperatures which is harmful. Increases in flood and droughts occurrence have an effect on both food storage and its distribution systems in addition to contributing to high prices of food in worldwide markets; this is evidenced in Pakistan in the year 2010, and in the 2010 Australian drought.

To develop a broader food security agenda, researches in the humanities and economics for many decades have been tackling the broader viewpoints on food security. Ever since the early 70s, socio-economic aspects have been found significant in farming systems study. Duckham and Masefield (1970) opined that the importance of research and technology to farming systems can be considered only when one is aware of the ecological and economic factors that operate on such a system. According to Maxwell (1996), ever since the 1974 World Food summit, studies have been paying attention to livelihoods at both individual and household levels, a significant determinant of food security in relation to the necessity of many to acquire food, several other studies such as that of Johnston (1984) and FAO (2009a) have laid emphasis on the role of food costs and institutions (Maxwell, 1995; Karanja, 1996).

The above activities were nonetheless basically separated from research by the biophysical community, however, Liverman and Kapadia (2010) and the United Kingdom Global Food Security Programme (2011) assumed that given the numerous aspects of food security, there is the need for both interdisciplinary and trans-disciplinary approaches. According to Pálsson *et al*., (2011), research on food security is actually a very good case

in point that necessitates a great deal of improved interdisciplinary discipline, with the humanities, social sciences, and economics playing significant roles, as well as the biophysical sciences; accepting this acknowledges the inputs of several different fields. For the purpose of this study, the work subscribes to the notion that food provision is fundamentally governed by availability, access, affordability and utilisation of food. Flood events at river-bed communities affect calculus of food security from both provision and access points of view. Access to food encompasses both economic and physiological potentials (in terms of the dietary quality) as well as food availability. Meanwhile, food availability depends on both production and distribution; while food production is a function of the yield for each unit area as well as the harvested area.

Atkins and Bowler (2001) stated developing studies that border on food systems assisted in identifying and integrating the links between several activities such as from cultivation to plate, including food production, harvest, storage, as well as food processing, distribution and consumption. However, studies on these activities were inadequate, there arose the need for innovative and interdisciplinary frameworks, in combination with studies on the outcomes of the activities for the deep-rooted food security elements, in terms of *food availability*, food *accessibility* and *food utilisation*, which all require being stable eventually (FAO, 1996b). A conceptual framework needs to be developed so as to bridge areas of discipline. According to Thompson *et al*., (2007), conceptual framework is important in areas of management interventions, as well as development strategies and policies, by discovering several issues that stakeholders particularly involved in food security debate need to tackle. With knowledge expansion on the operation of the food system as against only the agricultural component, it was very obvious that several stakeholders operate across a broad array of levels. According to Schilpzand *et al*., (2010), it became apparent that the role of 'non-state actors' globally cannot be overemphasised and it requires engaging them.

2.2 Conceptual Framework

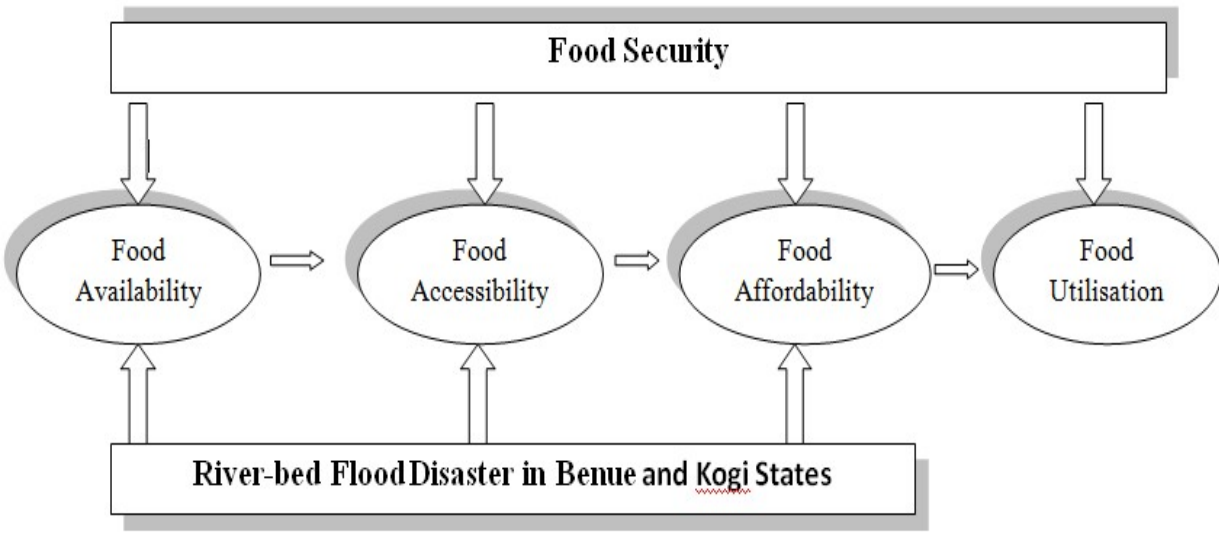

Fig.2: River-bed Flood Disaster in Kogi State

Source: Framework was constructed by the Researcher

The conceptual framework captures the four dimensions of food security which include food availability, food accessibility, food affordability and food utilisation to illustrate the relationship between flooding and food security. In this context, food availability refers to the physical existence of food be it from subsistent or commercial production. Food accessibility within the context of food security presupposes that all household and persons in those households have adequate income to acquire food both in terms of quality and quantity. Food accessibility according to Riely *et al*., (1995), is a function of the social, physical, and policy environments which establish how successfully families are capable of utilising their income so as to meet their food security goals. Flood disaster affects three components of food security namely food accessibility, availability and affordability. Flood event does not directly impact on food utilisation, which is essentially about the dietary value, social value, and food safety dimension of food security. The study, therefore, focused on the extent to which flood events in Kogi State impacted the three elements of food security - accessibility, availability and affordability. In terms of food access, the study investigated how flood event have affected affordability, allocation, and preference; and for food availability, the study examined how flood events have disrupted food production, distribution, and exchange systems.

2.3 Theoretical Framework

There are two theory-building areas to which this research will contribute.

2.3.1 The Theory of Cause and Effect

This study is hinged on Bergman and Collins (2004) Cause and Effect Theory. The Theory also referred to as causality or causation theory stipulates that there is no accident in nature and in the life of an individual. According to the theory, for each effect, there is an exact cause, similarly, for every cause, there is an exact effect. Actions, behaviours and thoughts produce exact effects that manifests and create one's life as one knows it. In short, it stated that there are no mishaps in the world; theeffects created in our individual lives are a direct consequence of causesthat emanate from inside us. Theorists such as

David Hume believed both the cause and effect actually exists together rather than sequentially, other schools of thought believed that change in actions, leads to a corresponding change in one's life and when an individual transform his actions, thoughts and ways of dealing with a situation, such will create a brand new destiny and reality.

Against this background, the Cause and Effect Theory is upheld in view of the fact that the exposure of Kogi State residents to the vagaries of weather- especially flooding can easily be adduced to certain actions (causes) and inactions in their day-to-day interaction with the environment. Though the causes of climate change can be performed at a location and its pain felt many kilometres away even across international borders. The government and residents of the state under study have also acted in a manner to predispose themselves to flooding and other adverse weather due to excessive deforestation, building on water ways, inadequate and poor drainage system, unrestricted production of Green House Gases (GHG) through ceaseless burning of fossil fuels, among other practices.

2.3.2 The Malthusian Theory of Population

The study is also hinged on the Malthusian theory by Thomas Malthus (1766 -1834). Malthus proposed that population increases at a faster rate than food supply that is available for its needs. Every time a comparative gain takes place in food production due to innovations and advanced technologies over growth in population, a high rate of population increase is enthused. Eventually, growth in population will surpass the agricultural production growth and will collapse as a result of excessive pressure on renewable and non- renewable resources leading to food shortages. According to Malthus theory, if the population grows at a much faster rate than food production, such growth is checked eventually by a process referred to as the Malthusian crisis or catastrophe as represented by devastating famine, disease, hurricanes, flood and war (Boyer, 1989).

It is succinct to state that the gains of economic prosperity achieved by Nigeria and by extension Kogi State has directly impacted wealth creation and enhanced standard of living of Kogi residents. Against this background, the people seek better living and as

expected use more and more overstretched man-made and natural resources available especially land. As more structures and infrastructure such as houses, dams and others are developed, the environment is being pushed to the brink of unsustainability with its attendant adverse effects. Food insecurity cannot be averted when floods, desertification and hurricanes ravages an entire city and destroys several hectares of farmland and agricultural infrastructure along its path.

2.3 Climate Change

It is becoming glaring that the world's climate is changing at a startling rate and as stated in the report of the Intergovernmental Panel on Climate Change (IPCC, 2007), it states that climate change is currently unambiguously obvious based on evidences from scientific remarks on increases in ocean temperatures and global average air (Odjugo, 2010). To this end, the literature on climate change has focused on understanding what climate change really means. They have focused on the concept and scarcely discussed its connection with flooding and food security. This neglected aspect is an object of academic investigation.

According to the WHO (2003), climate change is any important changes in climate measures, for example, temperature, rainfall, wind speed, among others, that takes place for decades or a much longer period. Globally, climate is showing different signs such as that of a shift, getting warmer, with more rainfall and climate extremes. Possible outcomes of climate change are expected to comprise more changeable weather conditions, heat waves that are stronger and last longer, more recurrent heavy rains, recurrent and severe droughts, severe weather events such as tropical cyclones, flooding as well as increased sea levels and air pollution.

The idea of climate change, therefore, has challenged human existence and raises the question of a possible connection between climate change and human security. According to Stern (2006), there is a close and complex connection between the environment and human security. Many aspect of human security is linked to individuals' access to natural

resources and susceptibilities to environmental change; also many aspect of environmental change is either directly or indirectly affected by the activities of human beings as well as conflicts. Unexpected disasters and dawdling environmental changes are likely to cause conflicts, most especially in circumstances where individuals are already susceptible in addition to a situation where the social, economic, cultural and political contexts aggravate existing tensions. In IPCC's 2007 report on past overview of climate science, it is necessary to have an understanding of climate system before understanding what climate change means.

According to Stern (2006), climate means the average weather as well as variances in temperature, rainfall and storm over a certain time. The earth's climate system as a matter of fact evolves over time as a result of natural occurrence and individual influence. For example, global warming is a case in point where increased utilisation and circulation of GHGs which in part trap long-wave radiation to the surface of the earth have led to an earth surface that is warmer. In sequence, this provides warmth to nearby environments and brings about fast melting glaciers, which has an impact on every level of the climate system (Le Treut, Herve and Somerville, 2006; Richard *et al*., 2007). Climate change over time then leads to disruption of the usual operation of the ecosystem that interrelates with persons, and in consequence, it affects accessibility to certain essential resources meant for their continued existence.

When an ecosystem is being disrupted from performing its normal function as a result of climate change, climate change disasters take place, such as flooding, unpredictable weather seasons, and long-lasting dry spells in some regions. In effect, what is visualised is serious droughts and food shortage, coupled with infertile farmlands as a result of shortage of water and, in a few cases such as that of Sudan, extended wastelands. However, climate change hazards are hardly ever the mere cause of vicious conflicts. Bruce *et al.*, (2007) maintained that the increased proofs of these disasters are reflected in every phase of conflict cycle, in terms of causing the occurrence as well as propagation of violence to weakening the prospect for peace and security. Few *et al.*, (2004) posit that

despite the fact that information on latest flood tendencies is uncertain, worldwide trends in sea levels and temperatures nowadays provide strong proof of a climate change signature. Houghton *et al*., (2001) and McCarthy *et al.*, (2001) stated that over the next century, annual average near-surface temperatures the world over have been predicted to increase from 1.4°C to 5.8°C, hence bringing about increase in flood disaster in some areas due to rise in sea level as well as alterations in seasonal rainfall or windstorms pattern.

Climate change makes weather conditions less predictable. Though cynics and pessimists waste their time over the fact that people are accountable for climate change, strong evidence has been presented that this world will experience an array of both positive and negative climatic impacts which eventually will have an effect on millions of lives. Some areas will get drier through rapid desertification, while other areas will get wet and warm, therefore, improving situations and lengthening the planting seasons. The outcomes of climate change in terms of droughts, rainfall changes, desertification, as well as other weather episodes, particularly affect societies where individuals rely on the environment to make a livelihood and where they do not have the ability to adapt, cope, or prevent unexpected or slower methodical modifications (Bronkhorst, 2011).

Uneven weather patterns that are influenced by intense precipitation in some areas and intense sunlight in others bring about environmental degradation by lessening the environmental situations required for the survival of human beings. Suhrke (1993) underscores the tensions in Sudan region owing to the desert expansion. He further analysed that desert expansion do not manifest in vacuity, but is rather noticeable where individuals are forced to look for alternative source of income in a socio-ecological system (Suhrke, 1993). This study is extremely similar to the view of Saferworld (2007) considering northern Kenya, and Walker's (2006) viewpoint on the Senegal's dry stretches. Climate-related disasters provide helpful facts about environmental changes, however, to investigate how the disasters have an effect on the behaviour of individuals in terms of choices and actions of individuals in quest for their living are vital. Climate

change brings about degradation in the environment which impacts existing natural resources.

A debate on the facts about environmental change has been ongoing for decades. In 1997 December, fifty-five parties signed the Kyoto Protocol under the backing of the United Nations. The protocol committed signatories to reducing CO_2 and other GHGs and was in particular opposed by the United States partially on the condition that it was simply climatological charlatanism and that it would threaten the American lifestyle. In the year 1992, the Rio 'Earth Summit' assembled on a discussion basis so as to review the way forward. The United States was opposed to the spectre of rules on industrial production and novelty rather than on climate destruction. The environmentalists were securitised and not the environment (Dalby, 1996). Noticeable modifications in environmental situations in previous years have made popular the debate on threats associated with environmental modification. Other scholars and Homer-Dixon (1991, 1994) have drawn important conclusion as regards the environmental situations that can be related to inter-state conflict. Other researchers who have disagreed that other factors such as socio-economic factors condition the extent to which 'resource' (environmental) insufficiency can be linked to security issues have tinged this study (Commission on Human Security, 2003).

Environmental insecurity is reliant on individuals and societies' resilience to environmental shocks, and includes transportation of merchandise or production crash as a result of environmental damage, as well as having economic robustness required to comprehend economic downturns in relation to agricultural production. On personal level, environmental insecurity is as a result of environmental damage of homes, neighbourhoods, and/or local infrastructures. Economic disaster also results to contacting diseases and undernourishment. Additionally, the susceptibility of the government both at the state and local levels to disasters caused by environmental modifications frequently has direct penalty for both local groups and individuals by failure of services or life- and therapeutic infrastructures. Dalby (2002) stated that by this means, the North-South element and a chain of complex developmental enquiries are more and more associated

with the nexus between climate and security, and should be connected to the enquiry about technology one after the other. The rich and developed world is here regarded as the primary culprit in terms of provoking environment destruction to which the developing world is particularly exposed, and therefore insecure.

This version of post-national security links it directly to the rise of human insecurity. More complex is the horizon of re-nationalisation which is implied by the North-South tension. The Developing World's climate generated insecurity has recently shown signs of reversing its flow. On the one hand, it is closely related to the expanding migration flows from developing to developed societies (Allenby, 2000). Climate alterations create devastating problems for a previously poor population. Flood is an outcome of climate alteration from rise in sea level and inadequate infrastructural plan of the drainage structure. For instance, the Southern part of the country has a tendency to be flooded, particularly, Lagos State, which is noted to be one metre above sea level (Agbo, 2011). This has an implication on human health and diseases such as typhoid fever, malaria, cholera, pneumonia, and diarrhoea, which could manifest.

The world's climate is expected to change as activities of individuals alter the chemical composition of the environment by the increase in GHGs mainly nitrous oxide, carbon dioxide, methane, and CFCS. Greenhouse gases happen naturally in the environment as well as due to the actions and inactions of individuals. Water vapour, methane, carbon dioxide, nitrous oxide, among others are naturally occurring GHGs. Ever since the start of the industrial uprising, atmospheric concentrations of CO_2 have risen by almost 30%, while methane concentrations have extremely doubled, with an increase of roughly 15% nitrous oxide concentrations. These rises in concentrations have improved the heat-trapping capacity of the earth's environment.

New analyses have suggested that the worldwide mean sea level has increased over the last century by 10-25cm. This range as reported by IPCC (1992) is a little on the high side. However, the report by IPCC (1992) showed that the sea thermal growth is an outcome of

global warming. This thermal growth over the last century is calculated to be between 2cm and 7 cm. Extensive observations of alterations in the sub-surface sea temperature are in support of these calculations. Observational statistics indicate that internationally, there is a general withdrawal of glaciers through this century. Global warming ought to on the average raise the thawing rates of ice caps and glaciers, therefore bringing about rise in the sea level. On the basis of the models and observations, current analyses suggested that this enhanced thawing may perhaps have enlarged the sea level by roughly 2cm to 5cm in the past century. The alterations in future sea levels will not happen equally around the world.

Brun (1977) aptly explained the relationship between insignificant sea rise and catastrophic inundation of low dry lands. He reported that the sea rise since the Holocene commenced has been about 100cm. Though the change in sea height might seem minute, such rise could lead to dire inundations. Putting it in perspective, he posited a sea level rise of one foot (0.3m) can result in the flooding height of around 100ft (40m). Considering the already dire situation of inundation in coastal plain and lowlands, this portends even greater erosion and aggravation of the problem.

2.4 Flood and its Impacts

Citing flooding as the most rampant hazard will not be wrong. It is easily blamed for the deaths of tens of thousands, while adversely affecting millions of other people world-wide in terms of livelihood and well-being (Smith, 1996). Existing studies on floods have often discussed the phenomenon neglecting its impacts. Natural tragedy such as quake, floods, typhoon, and hurricanes inflict serious damage and so seem to be bad for the economy. For firms, natural calamity destroy tangible asset such as building and equipment – as well as human capital thereby making nonsense of production capabilities and projections. International organisations have deployed the use of data and statistics to estimate the economic cost and effects of floods and other disasters. The systematic collation of data has not only helped to determine the impact of flood and other natural disasters across the globe, especially in Third World countries. UNISDR has been at the fore front of assisting

poor countries especially in Africa to develop databases for the losses incurred economically and otherwise to natural disasters.

For natural catastrophe such as flood to occur, it must be connected to nature regardless of whether its pattern was determined by human actions or not. It can be in terms of height, bill sacking, area inundated, and bulk of flow. These measurements are critical to the adequate use of land, construction and design of bridges, dams and determining and management of flood situations. Green measures of flood control include the channels improvement, protective levee design and construction and reservoirs as well as indirectly, establishment of forest conservation measures to reduce the flow and absorb runoff from storms. This is premised on the fact that the volume of discharge capacity varied from seasons to seasons and year to year. An example that readily comes to the fore is flash flood. Flash food is a sudden unexpected flow of either muddy or gushing water through a canyon or gulch. Though it is rather uncommon and of comparatively short duration, which usually results from the swift melting of ice on mountain and summer thunderstorm. Flash floods are very unpredictable and can happen in a certain spot while surrounding areas remain unaffected. These natures make it a deadly occurrence.

For centuries, man has settled within and around valleys to take advantage of its agricultural potentials while establishing settlements in higher and flat grounds. The valley also provides access to water (Pavel, 2003). Despite the frequent inundations and other inconveniences, populations over the years have adapted and made the maximum use possible from it as described in the ancient Egypt. The damage potentials of flooding have become enhanced as humans continue to encroach on the flood plains without adequate plans for the flood waters as done in ancient Egypt.

Normal flood events are expected and usually accepted in several regions of the world because they provide fertile soils, water and serve as a means of transportation. On the contrary, flooding when unanticipated and with extreme regularity brings about death, damage to both livelihoods and the environment. In earlier decades, flood patterns across

every continent are changing, and becoming more recurrent, severe and unpredictable for native districts, especially as issues that border on growth and poverty have made many individuals reside in unbefitting environments that are always susceptible to flood. A report by IPCC (2007) foretells that intense rainfall which is expected to increase in occurrence will enhance the risk to flooding. As such, the flood events will have an effect on lives and livelihoods in human abodes in every area like the coastal zones, mountains and river deltas. Flood events are on the increase in urban districts and this brings about serious challenges for less privileged.

The lifestyle of poor members of communities affected by flood is often the hardest hit. The vulnerable population despite been affected by other natural calamities have incurable affliction like HIV/AIDS, famines, and cycles of conflicts are often forced to inhabit hazard prone environments such as flood plains. Du *et al* (2010) averred the implications of flood can be far reaching as they are wide ranging, depending on certain factors (health impacts of floods).

Tom Dailey and Beth Cole in 2008, monitored impact of extreme flooding on wildlife in Missouri. Birds such as turkey, quail, pheasant and other avian populations were negatively affected. He further explained how the nest and young birds drowned and suffered chill for weeks after hatching till matured enough to grow natural insulation. Fossorial animals living and storing food materials under the ground suffered- as a result of ground saturation and depletion of needed oxygen from rock cracks and soil pores.Wild animals and plants could also be affected in the forest due to extreme circumstances, while habitats are forcefully modified for animals in the wild (Cleber and Joao, 2012).

Du et al (2011) while explaining the short, medium and long term impacts of floods on human health and well-being cited drowning, hypothermia, injuries and attack by animals that might have been flooded out of their natural habitats. Risks associated with the health of patients forcefully moved from where they are convalescing, workers health. Infected injuries, complication of simple health issues, poisoning, mental health crises, diseases,

and malnutrition are medium term flooding effect. Chronic ailments, loss of body parts, depression due to loss of loved ones and property, as well as poverty can result in the long term health challenges of flood victims. Health and well-being cited drowning, hypothermia, injuries and attack by animals that might have been flooded out of their natural habitats. Risks associated with the health of patients forcefully moved from where they are convalescing, workers health. Infected injuries, complication of simple health issues, poisoning, mental health crises, diseases, and malnutrition are medium term flooding effect. Chronic ailments, loss of body parts, depression due to loss of loved ones and property, as well as poverty can result in the long term health challenges of flood victims.`

Floodplains are essential to the support system of the ecosystems both physically and biologically. This area represents a boundary between aquatic and terrestrial ecosystems. Larger population of plant and animals inhabit the section of an ecosystem due to the prolific nature of the area due to rich soil with high nutrients. In arid regions, such areas provide an essential source of vegetation with adequate water while also functioning as a rest point for species migrating from one place to another (Tocker and Stanford, 2002).

Loss of life is usually higher in emergencies caused by flash floods due to short period or zero warning and preparation time for those inhabiting the affected area. The figure of large scale flood emergencies since 1990s exceeds total occurrences from 1950-80s combined, a period of three decades. Over 1,000 deaths were recorded due to less than two dozen floods in the 90s and the economic losses well exceeded a billion Dollars. Kundzewicz *et al*, (2002) estimated the total annual economic loss as a result of destructions has increased by 2.9% per annum since then especially when vital economic parameters are duly considered.

Caution must be exercised when inspecting losses due to disaster so as not use statistics based on mere value recorded. Climatological data like number of rainy days and 2-day precipitation have all increased considerably a phenomenon, partially blamed for the rise

in flood destruction impact and losses. Pielke and Downton (2000) reported that societal and human factors are largely attributed.

At present, human beings are predisposed to flood risk due to their encroaching on flood plains as well as inadequate flood response plan. Flood events are complex and they occur due to diverse individual vulnerabilities, unsuitable development plan and unpredictable climate. To a considerable extent, flooding can be predicted, excluding flash floods whose magnitude and nature are not predictable (ADPC, 2005). When considering disaster magnitude, it is not determined by only floodwater but the vulnerability pattern as well needs to be considered. Flood not only has an impact on peoples' lives but the sources of revenue of the less privileged are equally affected. These individuals who are already susceptible to disasters and health challenges, including famine, cyclones, food insecurity, ethno-religious conflicts, unwillingly reside in risky places and cultivate food on floodplains.

According to Dunne and Leopold (1978), floodplains are areas of lowland that border the channels of all water courses. Two major systems work conjointly so that floodplains are formed. When a river flows, it will shift horizontally across the landscape and create a chain of bends in the waterway. The velocity of water in channels is fastest down the cut or outside bank of the meander resulting to bank erosion. Equally, along the inside bank or point bar, the velocity of water is slow and lets sediments to be deposited. Over time, the continuous sediment deposition alongside the associated expansion of point bars forms what is referred to as the floodplain. Also, floodplain is formed when a channel overflows when there is high flow. Kusler and Larson (1993) submit that because the areas are regularly submerged by high flows of water, they give several important environmental functions. Among the functions provided are; a natural way to control flood and erosion, recharging the supply of groundwater, in addition to sustaining the quality of water, among others.

2.5 Human Security

Flooding is a human security issue (UN-Habitat, 2003). The literature on disaster and development studies has often neglected this strong connection. The nexus between emergencies such as flooding and the welfare of man has been laid bare in the literature.There is a paucity of literature drawing a relationship between human security and flooding. A fundamental neglect in this area is how flooding is a human security issue. The security of man is constrained by these environmental hazards which represents threat to their survival by exposing humans, fauna and flora to vulnerabilities and deprive them of sustenance of their livelihoods. Though, military security challenge is the main focus of all nations' security architecture. However, freedom from harm and destruction occasioned by flood and other disasters remains a vital part of contemporary non-military security architecture. These disasters due to extreme insecurity they pose deserve more attention if human security must be guaranteed (Suhrke, 1999). Attempt to guarantee human security therefore, seek to prevent vulnerabilities and develop coping mechanism for individuals, communities, organisations, and governments against effect of natural hazards. It represents a veritable platform for human and community's protection against unforeseen disasters that are out of their control (Dankelman, 2008).

Security against natural phenomena such as flood is increasingly becoming new paradigm highlighting for vulnerabilities globally. It underscores the need to view national security from individuals as referents rather than the society or state. It is a people-focused security model that can guarantee national or global security. Human security seek to ensure lives are free of encumbrances and personal goals fulfilled (Ogata and Sen, 2003). This encompasses its personal, economic, health, environmental, communal, as well as political safety.

Multidisciplinary understanding of what human security represents emerged sequel to the Cold War. It was conceptualised by research areas such as strategic security studies, human rights, international relations, and developmental studies. The United Nations report on human development of 1994 became a milestone as far as ensuring a want and

fear-free world for all individuals as a best route to global peace (UNEP, 1994). The consensus among proponents of human security which transferred focus from state-centred to people-centred paradigm also argued against focusing on state borders to being more concerned about the people within the borders.

Preservation of functions of floodplains while growing the population and settlement can be quite tough. Inhabitants chose residing in floodplains rather than safer areas due to more benefits they derive which outweighs the risks they perceived. In this sense, the management of flooding which challenges a critical aspect of human security- food security - is crucial in ensuring human freedom.

2.6 Relationship between Flooding and Food Security

Food security has been the most pressing social and political debate since 2007. The phenomenon has been challenged on several fronts including lack of political will to make food available and increasing changes in climatic conditions. Several studies have emerged examining different issues that have led to global food crisis (Gill *et al*, 2003; Armah *et al*, 2010; FAO, 2010).Studies on Nigeria discussing food security have glossed over the extent to which flood events have impacted food security and challenged human security. This is in spite of the fact that flooding events in Kogi State have negatively affected food security and severely threatened human security. As a matter of fact, FAO in its report of 2010 estimated that about a billion individuals could not guarantee adequate nutrition globally. This led to conferring issues of food security more attention and importance in developmental economics and studies.The discourses in development literature, however, have discussed flooding activities and food security as though there is no connection on how one influences the other (Armah *et al*, 2010).

Nevertheless, several of these researches have highlighted the effects of climate dynamics on global food security (Fischer *et al*., 2002b, 2005b; Parry *et al*., 2004, 2005; Tubiello and Fischer, 2006). Yet, these studies have neglected a particular aspect of the climate

change called flooding. Thus, the nexus of these phenomena is scarcely discussed. To understand the connections, there is need to understand climate change itself. The activities of man as far as food production, its supply and its consumption, has been blamed for the rise in atmospheric temperature and other environmental changes. Issues such as flood disaster, green house gases emissions, are responsible for these environmental changes (Vitousek *et al*., 1997; Steffen *et al*., 2004). Though change in climatic patterns may result in beneficial impact to some sections of the globe, particularly locations with temperature above 55°C located around the northern latitude. To some parts of the world, these changes are bound to be associated with complications in achieving food security. These are more pronounced in the developing world particularly in sub-Saharan Africa.

Three main points have been advanced for why Sahara, sub-Saharan Africa, and other tropical countries abound to be significantly affected by fluctuations in precipitation and temperature patterns. In the Southern Africa as a case study, warmer and drier environments have been predicted through various climatic assessments (Hulme *et al*., 2001, Scholes and Biggs, 2004). IPCC (2001) and Tyson *et al.*, (2002b) also indicated extreme events such as droughts and inundations will be more frequent and intense. Secondly, due to the over-reliance on agriculture and natural mineral resources by Third World economies, the impact of climate change will be more profound with poverty levels worsened as well as exposing their fragile ecosystems (Stern, 2006). Thirdly, crop productivity will be hampered just as its supply will be negatively impacted because people of poorer countries lack the coping mechanism to sustain their farming methods and their primary food sources.

Recently, Nigeria has continued to experience myriad challenges ranging from economic recession, political strives, and social conflicts. In the face of all these challenges is the silent problem of climate change which has tilted the nation towards hunger, and volatility (El-Lada, 2014). According to Etuonovbe (2011), despite the fact that flood and other natural disasters are not the leading claimer of lives; it affects and displaces more people

than other emergencies. He further claimed not less than 20% of the total population of the country are exposed and at the mercy of a form of flood or another. Flood which has been experienced in Ogun and Lagos States have destroyed homes, affected business activities, and exposed the people to communicable diseases such as cholera, diarrhoea, and other water-borne epidemics. The pattern of flooding in Nigeria is similar with that experienced in other parts of the world. Thousands of acres of cultivated arable lands have been washed off; dam bursts are rampant causing deaths and destruction of property in both urban and rural settlements.

Etuonovbe (2011) cited Kagara Village in the Northern state of Sokoto, which suffered an immerse loss as the entire village including their homes, crops in the field, and all in their storage were completely flooded. A report put the death toll at about 50 in about 50 villages, while about 150, 000 persons were internally displaced. Apart from the hardship often experienced in Nigeria due to flood, especially by women, school children, Awosika (2001) reviewed essential services such as communication, transportation, and hospital services and stated that they are usually interrupted while businesses are also paralysed.

The problem of overdependence on rain-fed systems of agriculture in Kogi State erratic precipitations often result in devastating impacts on provision of food on Kogi residents, individuals, economies and livelihoods. According to Devereux, (2007) food insecurity in contemporary societies can be attributed to “New famine”. He described it as thinking which reallocate the tasks of clarifying production failures as well as entitlement failures so as to comprehending response failures.

The North Central political zone of Nigeria contends with what is termed entitlement failure occurring sequentially in complex web of production failure, labour and markets failure, and finally, transfers failure. Floods triggered by weather situations culminate in harvest failures as well as to shocks on the economies of local communities. Also, intervention which could have mitigated the upset by safeguarding production shocks from escalating into full-blown food insecurity. However, the region continues to rely

mostly on unreliable early-warning mechanism and emergency response systems. A farmer whose production fails is forced to resort to other casual sources of income to augment families' welfare. Devereux (2007) indicated off-farm jobs, to generate income or food that will cover part or the entire gap between the household's crop production and household food needs.

Floods effect on rural and peri-urban labour markets is usually in the negative because it disrupts agricultural production as well as the entire rural economy. "Derived destitution" can result when flood reduces the consumption and supply of certain goods and services,' communities whose residents demand such are facing threats to the source of revenue and depend directly or indirectly on agriculture (Dercon and Krishnan, 2004; and Quisumbing, 2003).

Due to the seriousness of the crisis which flood can result into, stakeholders' especially political leaders take drastic political measures. The Kogi State Assembly will soon amend the state's environmental and town planning laws to adequately address flood issue. The flood of 2012 that devastated some states including Kogi State became a blessing in disguise as it served as a springboard for possibility thinking, involving the inputs of local and international experts assembled by the Minister of Agriculture to think through on how to produce massively to make up for whatever food shortage was occasioned by the flood.

This statement was made during a visit to flash flood disaster areas in Lokoja to assess the level of devastation in the town. The speaker identified building of structures on waterways as one of the major causes of flooding in the area. According to him, there is dire need to enforce town planning and environmental laws to address the perennial flooding. He said there was also need to reposition the town planning sub-sector for better and efficient service delivery (*Premium Times*Tuesday, June 26, 2018).NEMA (2012) approximated loss of arable crops ranging from yam, sweet potato, cassava to rice, maize

and sorghum to be around a third of total expected outputs with losses significantly affecting the family income of the farm households and might result in food insecurity in Nigeria in general, Shoddy coordination of relieve efforts when disasters have already struck also led to poor identification and rehabilitation effort of the victims of disaster, which may cause distribution of the reparation materials to become counter-productive as the most vulnerable may not benefit as much as the affluent during sharing.

According to Harmer *et al*., (2012), the most damaging impact of corruption is the diversion of basic resources from the poor. Humanitarian assistance aims to save lives and alleviate the suffering of people in times of crisis, yet these noble objectives do not immunize it from corruption. Closely related to the issue of corruption is the role of political factors in administration of compensation. Targeting of assistance for the people creates incentives for political leaders, local elites and local relief committees charged with distribution of beneficiary lists for assistance through cronyism, nepotism or tribalism (Harvey and Bailey, 2011). Another challenge to proper targeting of compensation is the issue of coordination processes and policies. Related to this, is the fact that response effort may be marked by poor communication and information flow. A general concern regarding administration of compensation is that without clear information regarding the number of how many people suffered, how much they lost, etc., it may be difficult to properly help those that suffered the losses. Lack of infrastructure (poor road networks and lack of communication facilities) may also make it difficult to reach the poor for assistance during disasters (Chilambe, 2008).

Many northern states in Nigeria were scientifically and systematically selected for the dry season incentivised irrigated rice production, a project that committed 264,000 hectares of farmlands to dry season rice production, yielding about 1.1 million metric tons of rice within five months, keeping the farmers busy at a time of the year they were traditionally idle, and putting more money into their pockets. The dry season intervention, being the first of such an attempt, arose out of the panic scenario that was painted by many economic analysts after the flood. It was an emergency response then, with limited time to

plan and execute, a chosen line of decision, taken instead of succumbing to self-serving suggestions coming from traders who would rather that Nigeria import food to make up for perceived losses arising from the flood.

In 2012 alone, 30 out of 36 states suffered devastating floods. Six years later, the effect of food production and security continues to reverberate across the federation as the scamper for more stable land for agricultural and other allied uses intensified by farmers, processors, and marketers. However, the Nigerian Meteorological Agency (NIMET) had warned of imminent heavy rainfall as well as its attendant flooding but the warnings were ignored and not acted upon. If such attitude persist since there is no research to confirm if there has been change of attitude by farmers and other stakeholders. Food insecurity is bound to persist for a long time to come. Publicity and other enlightenment programmes have continued to be inadequate so as to reduce damages and risks of losses especially in areas close to river banks.

According to food security and vulnerability survey conducted between 2012 and 2016 in Northern states of Nigeria such as Zamfara, Yobe, Sokoto, Taraba, Kaduna, Borno, Bauchi and others such as Kano, Kebbi, Katsina, Plateau, Adamawa, Gombe, Jigawa, among others, with the aim of providing estimates using food security indicators as a determinant of status of livelihoods. The survey revealed livelihoods' vulnerabilities and threats to food security remain significant across all the sixteen states sampled in the survey albeit at different level from one state to another. When these data are put into perspective, it becomes evident that food insecurity remains a challenge to the well-being of Nigerians (FAO, 2016). Flash flooding has also been predicted even when normal rainfall is experienced across the northern states. This indicates more proactive measures and better coordination of disaster and emergency efforts (*Vanguard*, 2012).

2.7 Deforestation, Flooding and Food Security

As far back as the 1930s, the United Nations issued early warning on desert encroachments in Sub-Saharan Africa. This propelled researchers and scientists in Nigeria to focus more attention to the devastating impact of ecological problems associated with

deforestation in the country. It was established that studies on flooding and food security have been preoccupied with understanding the concepts and neglecting their connections (Gill*et al*, 2003; Kwak and Kondoh, 2008; Jeb and Aggarwal, 2008; Adeoye *et al*, 2009; Armah, 2010).

Deforestation is the socio-economic and agricultural activities leading to the destruction of trees and the disturbance of the natural ecosystem of the forests. This is common across the world due to societal growth and development. Globally, deforestation has been fingered to threaten the economy, livelihood and cultural integrity of forest dependent people. It leads to rapid erosion, siltation, desertification, drought and flooding.

Ibrahim (2015) in Annan (2013) averred that as wind current, vapourisation and solar energy absorption becomes more and more adversely affected due to deforestation, the impact on local and global climate become devastating. Rapid deforestation is now a major problem affecting the daily lives of Nigerians through its effects. The valuable services afforded by forests such as erosion prevention, flood control, water treatment, fisheries protection and pollination functions that are critical to the extremely vulnerable are lost rapidly. This is because degradation of the ecosystems within forest area as a result of deforestation has significant deleterious ecological consequences on the immediate forest environment as well as creating distortion in distant environment. For instance, farmlands strategically established to be irrigated from water from forest highlands become susceptible to flooding if the trees making up the forest have been felled.

Such occurrence could lead to physical as well as genetic damages to the fauna and floras in such areas. Indiscriminate felling of trees and substantial developments along the River Niger and River Benue has led to serious environmental hazards (BBC, 2018). In many states concerned, especially in Kogi and Nassarawa States, it is common to see all manners of informal activities along the river banks such as land use activities and construction on floodplains doubled over the years. Nasarawa State Emergency Management Agency (NSEMA) also estimated that new unregulated land development, poor town planning, informal activities around the floodplains as well as non-existent

environmental impact assessment of such activities along the Niger River is responsible for vulnerability of the region to flood.

By the third quarter of 2018, it was reported that floods had killed over 200 people while several other thousands were displaced. The National Emergency Management Agency (NEMA) data showed the figure rose dramatically as a state of emergency was declared in four of the worst-hit states like Kogi, Niger, Anambra and Delta. The reality of Nigeria hosting two large rivers has its consequences, entering the country from the north-west is the River Niger and the River Benue flowing into Nigeria from the East via Cameroon. The indiscriminate human activities and interaction along their banks across West Africa has continued to impact the environment negatively.

These two immense waterways meet in central Nigeria and then flow south as a single river on to the Atlantic Ocean. And Nigeria's flooding occurs along these two rivers as their banks overflow in the rainy season. The major hazards being experienced in Nigeria includes land degradation, flooding, erosion, deforestation, desertification and climatic drought. Flooding in Nigeria has been due to natural and artificial factors. Flooding has been experienced in the Niger through Benue basin and Sokoto-basin in the flooding years of 1987, 1991 and 1994 and this affected agricultural landuse to a great extent (Etuonovbe, 2011).

The recurrent episode of flooding in Nigeria especially the North Central geo-political zone forced concerned governmental and non-governmental organisations to interrogate environmental management practices in the region. Scholars inferred that agricultural production practices, deforestation, flooding, among other factors cause severe climate change which has also been linked to food insecurity in some Sub-Sahara African (SSA) countries (Bamwesigye *et al.,*2019). Around 13 million hectares of forests are annually lost to various forms of deforestation, resulting in major food security consequences for SSA countries through the resulting climate change (Lawrence and Vandecar, 2015). Therefore, this can be related to the fact that forests are habitats to a variety of shrub,

small and large animals as well as source of unending supply of firewood for energy to millions of poor Africans. Over 200 million continue to regrettably face food insecurity due to inclement climate among other factors.

Deforestation practices in various countries across Sub Saharan Africa indicate that the region could face severe food insecurity in the near future since there are already signs of shortage in food production. Nigerian Meteorological Agency states that perennial flooding with increasing intensity annually wreaks havoc on not only lives and property but food security across Nigeria. Nigeria which is a deforestation hotspot shared common characteristics of being hunger zones, thereby highlighting deforestation as a critical factor threatening her food security.

It is ironic that with the population of Nigeria expected to increase by more than 50 percent within the next two decades, climate-induced food losses continue to increase (FAO, 2011). In Assessment Capacities Project (ACAPS) 2018 Briefing Note, it is reported that a total of 122,653 hectares of agricultural land were flooded across 12 states and 50 LGAs in the Southern and North-Central Nigeria,with fishermen and petty trader equally indirectly affected. Tersoo and Ogochukwu (2014) reported that in Nigeria, forest cover is depleted at a rate of 3.3% per annum due to the unabated demand for charcoal and wood fuel. The primary tropical forest cover is already decimated by up to 97% for decades.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Research Design

The study adopted case study and survey design methods. The case study research design that was adopted followed Bamigboye *et al.*, (2007) case study design description which involved investigating why, when and how phenomenon evolved and specific trend within a case. Also, the survey research design was used to quantify the effects of a phenomenon. In this study, the survey design was used to interrogate the extent to which flooding or flood disaster has affected food security in farming communities in Kogi State.

3.2 Study Area

The study was carried out in Kogi State of North Central Nigeria. The study covered eight Local Government Areas (LGAs) in the state. Kogi State has a population of about 3, 278,487 in the 2006 census. It is popularly called the confluence state because the confluence of River Niger and River Benue is at its capital, Lokoja. It has coordinates 7' 30'N and 6'42'E. Agriculture is the mainstay of the economy of Kogi State. Given the proximity of the state in the river belt of Nigeria and having agriculture as the primary economy, increased and constant volume of rain has in the past resulted in flooding and has affected the farming communities Therefore, the choice of the State is informed by the severity of the flood in the area, as it is situated close to the bank of Rivers Niger and Benue. In Kogi State, the farming communities selected for the study include Kabawa, Egah, Edeha, Iyano, Adogo, Oguma, Ugwolawo, and Ajaka located in Lokoja, Idah, Kogi, Ibaji, Ajaokuta, Bassa, Ofu, and Igalamela/Odolu local government areas respectively.

3.3 Study Population

The study population comprised farming communities in eight local government areas in Kogi State.The study population comprised Kabawa community in Lokoja LGA, with a population of 8998; Egah community in Idah LGA with a population of 2489; Edeha community in Kogi LGA with a population of 7506; Iyano community in Ibaji LGA with an estimated population of 6991; Adogo community in Ajaokuta LGA with a population of 4510; Oguma community in Bassa LGA with a population of 1206; Ugwolawo community in Ofu LGA with a population of 6014; andAjaka community in Igalamela/Odolu LGA with a population of 3986. This brings the total number of the study population to 41, 170 people. The above communities were selected because records from NEMA and State Ministry of Agriculure, Kogi State revealed that they were more affected by flood disaster than other communities during the flood incidences recorded between year 2010 and 2015. This is represented in the table below:

Table 3.1: Distribution of the Study Population

S/N	State	Senatorial District	LGAs	Commu-nities	Study Pop.	Sample Pop.	Gender	
							M	F
1	Kogi	Kogi West	Lokoja	Kabawa	8998	900	620	280
2	Kogi	Kogi East	Idah	Egah	2489	250	130	120
3	Kogi	Kogi West	Kogi	Edeha	7506	750	403	347
4	Kogi	Kogi East	Ibaji	Iyano	6991	700	420	280
5	Kogi	Kogi Central	Ajaokuta	Adogo	4510	450	250	200
6	Kogi	Kogi East	Bassa	Oguma	1206	120	70	50
7	Kogi	Kogi East	Ofu	Ugwolawo	6014	600	361	239
8	Kogi	Kogi East	Igalamela/ Odolu	Ajaka	3986	400	266	134
	Total		**-**	**-**	**41, 700**	**4,170**	**2520**	**1650**

Source: National Population Commission, 2012

3.4 Sample Size

A total of four thousand, one hundred and seventy (4, 170) respondents which represents 10 per cent of the study population were sampled using various instruments in the study. However, those selected had earlier lodge complaints and captured in the register of Ministry of Agriculture, Kogi State. This is necessary because the whole population could not be reached; therefore, this enabled the researcher to study a relatively small part of the population (10 per cent) and yet obtained data that are representative of the whole.

3.5 Sampling Technique

The study utilised multi-stage samplingtechnique to select the respondents from the study population using stratified sampling. This method of sampling is very apt because the population is divided into groups (strata) consisting of market women, farmers, transport workers and landlords in eight local governments in Kogi State. According to Yusuf (2003: 136), given a sampling frame, the population is divided into groups (strata) according to an important selected characteristic of location, occupation or gender of the units to be sampled.

3.6 Sources of Data

This study used both primary and secondary sources of data. The primary sources of data included focus group discussions (FGDs), in-depth interviews (IDIs), key informant interviews (KIIs) and researcher's observation. On the other hand, secondary sources of data included published and unpublished reports from the Ministry of Agriculture and Water Resources, National Bureau of Statistics, Ministry of Environment, and National Emergency Management Agency.

3.7 Methods of Data Collection

Data was collected using in-depth interviews (IDIs), focus group discussions (FGDs) and key informant interviews (KIIs). Data collected from IDIs, FGDs and KIIs were used to complement the researcher's personal observation. Both quantitative and qualitative methods were used. Quantitative method utilised the administration of questionnaire while

the qualitative method used in-depth interviews (IDIs), focus group discussions (FGDs) and key informant interviews (KIIs).

Sixteen In-Depth-Interviews (IDIs) were conducted with various stakeholders and executives of relevant associations in the study area. In each community, eight community leaders were interviewed, two members of the National Union of Road Transport Workers (NURTW), werealso interviewed, as well as two market men from Community farmers association, and four market women from theMarket women association respectively.A total of sixteen Focus Group Discussions (FGDs) were carried out. Each focus group comprised two members drawn from farmers in the affected eight farming communities. In addition, twelve Key Informants' Interviews (KIIs) were conducted. Critical stakeholders on the issues relating to flood and food security were engaged. They were drawn from local, state and Federal Government agencies.Interviewees include three officials of Nigeria Metrological Agency (NIMET), two officials from Federal Inland Waterways, two staff of Federal Ministry of Agriculture, and three from their state counterpart, as well as one personnel each from National Emergency Management Authority (NEMA) and State Emergency Management Authority (SEMA).

3.8 Instruments of Data Collection

Four different instruments were used in carrying out this study. They are structured questionnaire, in-depth interview (IDI) guide, focus group discussion (FGD) guide and key informant interview (KII) guide. The interview schedule was in the form of semi-structured and open-ended questions designed to cover all the objectives of the study. One interview guide containing four major issues with at least three main questions addressed in each of the four issues was used for FGDs, IDIs and KIIs and was complemented by the researcher's personal observations.

3.9 Psychometric properties of the Instrument

Reliability of an instrument can be described as the rate of consistencies of a measuring tools which is capable of yielding the same result over a period of time even when the instrument is been handled by different investigator.

Validityis the extent at which an instrument measured what it was purportedly designed to measure over a period of time which encompasses reliability.

Reliability of the questionnaire was ascertained through the process of multiple assessors' evaluation which implies that the content of the questionnaire were validated through face validity and content validity among experts in related field of study. Similarly, the questionnaire was pilot tested having achieve the reliabilityand viability report at 85 percentage acceptance. A Crobach's alpha coefficient of 0.80 was obtained which indicates that instrument is highly reliable and valid for data collection. All these processes took place prior the main data collection for the study.

3.10 Method of Data Analysis

Qualitative data collected through IDIs, KIIs and FGDs were transcribed, pooled together and categorised into themes based on the objectives of the study. They were then content analysed and interpreted thematically using narrative and descriptive styles. The quantitative data were explored through statistical software package for the social science (SPSS). Also, secondary data collected were subjected to descriptive statistics which include simple percentage, frequency distribution and charts. However, based on the objective of the study, inferential statistics which include; Multiple Regression and Analysis of Variance (ANOVA) were utilized for the analysis of objectives 1 and 2 respectively. The essence of the data collected through questionnaire for this study is to corroborate or refute assertions observed or arrived at during interviews and focus group discussions. Only questionnaires that were fully filled were used while all unanswered were discarded.

3.11 Ethical Consideration

In the process of carrying out this research work, care was taken to ensure that the various rights and freedom of individual respondents were adequately respected and protected. No respondent was placed under duress, fear or favour of any sort. Informed consent of individual respondents; secrecy and confidentiality of respondents, and the integrity of

individual respondents were respected. All these were emphasised in order to ensure truthful, reliable and quality information.

CHAPTER FOUR
DATA ANALYSIS, RESEARCH FINDINGS AND DISCUSSION OF FINDINGS

This section presents the results of the analysis of the responses of the in-depth interviews (IDIs), key informant interviews (KIIs) and focus group discussions (FGDs) conducted with various stakeholders; community leaders, members of the National Union of Road Transport Workers (NURTW), market men and women, officials of Nigeria Metrological Agency (NIMET), officials of Federal Inland Waterways, staffs of Federal Ministry of Agriculture and State Ministry of Agriculture, personnel of National Emergency Management Authority (NEMA) and State Emergency Management Authority (SEMA).

International organisations concerned with agricultural development such as IFAD and FAO estimated that over a billion people find it extremely difficult to meet their most basic needs for sufficient food daily. The largest proportions of this vulnerable population are poor women, children and other susceptible population within local populations in rural communities mostly inhabiting marginal land and depending on rain-fed system of production which makes them vulnerable to floods, drought and other climatic hazards (Ludi, 2009).

This study investigated the nexus between flood disaster and food security in Kogi State, Nigeria. This section of the field report detailed the analysis of data collected. It examined the causes of flooding in general, and flooding in Kogi State, in particular. The relationship between flooding and food security in the study area was systematically interrogated. Also, the study investigated the extent of the 2012 flooding on farming communities in Kogi State as well as the response mechanisms put in place by different stakeholders ranging from local to the Federal Government and its agencies. Based on the research questions that were raised, and answers provided, the data gathered were discussed in relation to the specific research objectives. Inferences were deduced from the data generated on each research question following a content analysis of responses.

4.1 Research Question One: What are the causes of flooding in the study area?

i. Causes of Flooding in Kogi State

Climatic changes, rainfall, improper drainage, water released from dam in Cameroon, indiscriminate waste disposal and act of God caused flooding in Kogi State. Heavy or torrential rains cause flooding across the globe (Sinclair and Pegram, 2003). Also, surgefrom sea tides combined with wind induced by storm and heavy rainfall are common causes of flooding. Theron (2007) studied the causes of flooding in New Brunswick, Canada using field observation and analysis of climate data and observed that physical structural failures such as dams, ponds, levees, and weather elements such as tsunamis, high tides, snowmelts, intense rainfall often lead to flood. However, in this study, one of the community leaders indicated that intense rainfall was responsible for the flood experienced in Lokoja in 2012. In his words, "First of all, when we have much rainfall and our dams like Kanji Dam become over-flooded, so by the time it is released, it causes flood" (Interview at Kabawa Market, December 17, 2016).

It was affirmed that heavy rainfall was responsible for flooding in Lokoja. Heavy rainfall is a derivative of global warming, thunder storm and sea tidal surges. The chief security officer at Kabawa; Lokoja Local Government stated that: "Global warming was the major cause of flooding" (Interview at Kabawa, December 17, 2016).

The interviewee confirmed that climate change caused flooding in Kogi State. UNISDR (2015) studied the causes of flooding in the United States using data on climate and field observation and noted that flood can be caused by excess moisture resulting from continuous rainfall or snowmelts which exceeds natural river channel capacity. According to Green *et al*., (2006), rainfall and other climatic elements are generally responsible for flood with rainfall being the primary and the most important causative agent. Parry *et al.*, (2004) also stated that floods are often secondary events of a climatic hazard such as tsunami or hurricanes.

Flooding linked to rivers occur when the discharge from rivers increase leading to saturation of the flood plain. When this occurs, such river overflow their banks leading to flood at a stage referred to as bank full stage. When this combines with heavy rains,

such flows turn torrential quickly. Urban area flooding has a lot to do about geographical features of a location such as being on a relatively flat terrain or a valley with inadequate drainage structure to prevent retention of moisture. When such location being an urban centre is constrained by block drainages, inappropriate sewage disposal, flooding is always imminent. Urban flooding as a phenomenon is a regular occurrence in Nigeria especially in cities such as Lagos, Warri, Ibadan, Aba and Maiduguri, among others. Raining seasons in Nigeria are characterised by gusts of wind as a result of tropical storms leading to torrential rains with its attendant flash floods. The Nigerian State is vulnerable to both artificial and natural disasters especially floods with several hectares of arable lands being submerged, dams destroyed and overflowing of drainages which endangers the populace lives and property while leading to economic losses to the government.

Tubiello and Fischer (2006) found that river flooding is chiefly manifested through the shape of the watershed, the characteristics of the eventual runoff, the configuration of the terrain within watersheds, the orientation of the rivers, the conditions and properties of soil and rocks, among others. Asa river catchment was understudied by researchers for a period of seven years and they discovered that the river experiences high rate of precipitation and sediments per annum. The discovery was connected to the usual rise in water level, intensity and duration of rainfall which often leads to flooding in Ilorin basin areas (Jimoh and Alao, 2009). Improper drainage construction often results to flooding around the study area. In the opinion of the Director of Search and Rescue:

> Pathway of water has been blocked whether intentional or unintentionally. What I mean by intentionally is dumping of refuse, unintentionally could be natural situation which could make a river overflow its bank when it rains. Flooding is as a result of urbanisation where the upper part of the river is converted into housing units thereby shrinking the water ways that usually would be available for run-offs (KII with Dr. Pius Aseta, Director, Nigeria Metrological Agency, Lokoja onDecember 28, 2016).

Mordi (2011) stated that flood is also a recurring challenge in India with several millions of Indians affected within a period of fifty years. Devereux (2007) while deploying the ‘entitlement approach’ by Amartya Sen to study food scarcity in Malawi

concluded that government policy and responses can be used to insulate the state from the breakdown of labour-based, trade-based, production-based, and transfer-based entitlements. Extensive rain scarcity can negatively affect optimum utilisation of hydropower infrastructures while frequent flooding events can lead to rise in investments and other expenditures of the state on the provision and rehabilitation of devastated physical infrastructures (World Bank, 2007; Garnaut, 2008).

According to Baan and Kljin (2004), human factors and urbanisation are great contributors to flooding. They stated that as urbanisation progresses, buildings, tarred roads and other impervious composite surfaces replace natural ones which allow infiltration and percolation through their pores. The consequence according to Baan *et al* (2004) is such that a huge amount of water which should have been absorbed and percolated through the spaces within the soil or used up by fauna species is immediately available for surface runoff which ends up in streams and rivers, thus generating excess water for flooding. The possibility of urbanisation contributing to flooding in urban settings like Lokoja and Ayangba cannot be ruled out even though majority of the respondents did not think along this line of thought.

Similar to this study, Bateman *et al* (1991) studied flooding in Norwich using combined methodology of field survey, questionnaire survey and interviews. Their results revealed that flooding risk in the future are likely to be greater due to certain factors ranging from poorly constructed buildings, with inadequately narrow drainage system, to flood prevention structures currently in use. All these inadequacies when combined with inadequate planning of homes and other commercial structures sited on flood plains, and low-lying coastal zones. The possibility of extensive flooding around urban areas cannot be overemphasised.

Blaikie *et al.*, (1994) recommended a management system of flooding challenges encountered to be sustainable, while using data collected on climate, physical structures (drainage and other infrastructures) and policies on town planning coupled with evidences from field works as well as review of documents and discussion with stakeholders. The study revealed that the uncontrollable growth in urbanisation and poorly enforced planning regulations rather than torrential rainfall were primarily responsible for flooding in Lagos State, Nigeria. They noted that the flood in the area

is attributed to heavy downpour such that water could not be controlled in the channel and the fact that the channel and drainages were blocked. The result in Kogi State is almost the same with this study. In what seems like wildfire, Kogi State was also affected by this problem in 2012 when scores of communities particularly those located in Lokoja, Ibaji and Kogi were submerged by raging flood displacing hundreds of thousands inhabitants, destroying farmlands and sweeping away homes. A total of 46 communities were impacted in Kogi Local Government Area (Anugwara *et al*., 2013).

From the above and analysis of quantitative data from the survey, the causes of flooding in the period under the purview of this study are generalised as lack of flora and forest due to the fact that surface runoffs are hindered by trees and vegetation types, as roots of trees take up water from the soil. When surface runoffs are high, it means that there is inadequate flora, which could result to flood. Also, when rivers are bordered by steep canals, it may result to inundation when there is overflow of the riverbank due to heavy downpour that causes high surface overflow. In urban regions, drainage basins use water-resistant concretes that prevent flooding. In some countries, the drainage structure directs water to rivers or sewage treatment plants. Factors that lead to flooding in such cases in point include intense rain in that does not last long or inadequate drainage networks and defective drain. In addition, other causes of flood events are placing physical infrastructures such as car parks in unsuitable locations or houses in unsuitable spots which makes rain not to drain away as expected. In downstream areas for instance, flood could occur due to breakdown of water maims and reservoirs, pumping stations, dams, as well as other industrial activities and physical structures.

4.2 Research Question Two: To what extent did flooding affect food security in Kogi State during the period under study?

The extent of the 2012 flood was categorised into primary and secondary effects. Physical damage on infrastructures such as vehicles, bridges, sewage systems, buildings, canals and roadways were considered primary effects. A Post-Disaster Needs Assessment (PDNA) conducted at the request and direction of the Federal

Republic of Nigeria with technicalsupports from the World Bank, the European Union, and the United Nations highlighted the impact of the flood as follows:

S/N	Physical Assets Destroyed	Unit
1	Home/Buildings	143,446
2	Farmlands	2500 Hectares
3	Livestock	47,526
4	Community Markets	18
5	Bridges	12
6	Access Roads	24

Source: NEMA Post-Disaster Needs Assessment Report, 2013.

On the other hand, contaminated water supplies resulting to unclean drinking water, unhygienic conditions and the spread of water-borne diseases are seen as secondary effects. As such many people were affected by the effects of these flooding, including diverse 'receptors' such as infrastructures, farm lands, play grounds and the natural world. Flooding can also cause deaths in severe cases. One farmer commented that:

> Flood affected the farming system largely, in the sense that it caused a lot of havoc to the society, and you know when there is excess of rain, the farm and the flood cannot work together in the sense that it causes a lot of loss because many people lost their houses, lost their farms. Even it kept majority of us homeless. Today there is no way we can talk about farming to be a friend to flood, it's totally no. And that is why as at then we were not even happy with what happened in this place (FGD with farmers, Egah, Kogi LGA on January28, 2017).

Table 4.4: The Chronology and Magnitude of Flood on River Niger/Benue Confluence between 1923 and 2012

S/N	YEARS	FLOOD HEIGHT (METRE)
1.	2012	10.0
2.	1950	6.0
3.	1923	5.5
4.	1968	5.0
5.	1967	4.0
6.	1994	4.0
7.	1934	3.7
8.	2010	3.5
9.	2014	3.0
10.	2007	2.8
11.	2006	2.4
12.	2008	2.0

Source: Federal Inland Waterway Authority, Lokoja (2016)

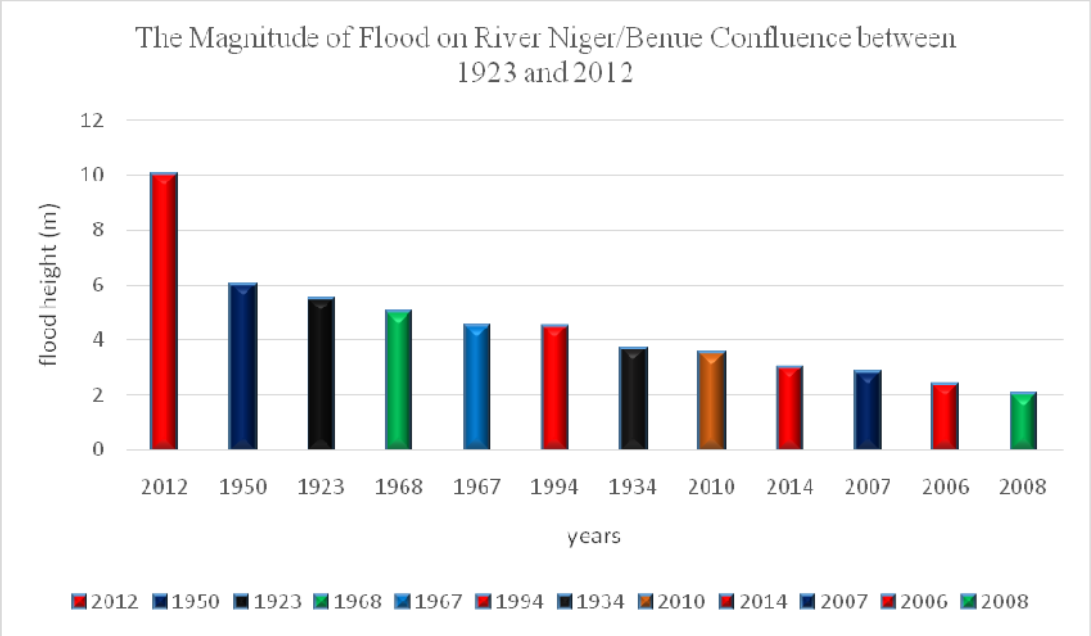

Fig. 6: The Magnitude of Flood on River Niger/Benue Confluence between 1923 and 2012

Plate 4: Record of calibration of Flood Magnitude between 1923 and 2012

Source: Federal Inland Waterway Authority, Lokoja. (2016)

It can be inferred that flood has serious unpleasant impact on the farming community. Ludi (2009) defined flood vulnerability "as the measure of exposure of an individual, households, groups, communities or an area to risk of falling victim to flooding". He further averred in the following words: "Flood vulnerability factor is seen as a function of geographical (topographical and hydrological) characteristics of spatial location of activities or settlements. Globally, flood risk is expected to increase substantially in subsequent years as a result of both climate change and continued socio-economic development activities that are unfriendly to the environment".

Okoruwa (2014) while stressing on the effects of flooding stated that many people lost their lives to flood in the year 1988 in the month of August. In addition, thousands of houses were destroyed as well as thousands of farmlands during the collapse of the Bagauda Dam as a result of flooding. Another instance of flooding was that of the Ogunpa River in Ibadan, the Oyo State capital where many lives and property worth millions of Naira were destroyed. The effects of flooding can be devastating such as paralysing economic activities in the country as well as causing damage to major roads, especially those linked to other states, which makes it difficult for people to go about their daily activities.

According to Okoruwa (2014), "....incidence of flooding can never be eliminated entirely, but the hazards or consequences of flooding can be properly mitigated by appropriate behaviours and actions. Successful flood risk management is dependent upon the active support of all the affected communities that receive direct flood impact and those directly at risk, coupled with the civil authorities and the wider community and its leaders, as well as governments of national and international communities." He further indicated that studies have revealed that socially vulnerable, disadvantaged households or river bed communities have lower levels of disaster preparedness. Effect of flooding on farming in the area of study is massive. The head of vigilante group and member of staff of Waterway Inland Authority commented that:

> It is a severe event. It is not even cropping only; some of the farmers have fish ponds across the river there. It affected them too because water carried away their fish. Second, it also displaces them from where they are living (KII with Mr. Yinus Lawal, an official,

Waterway Inland Authority, Lokoja on January 26, 2017).

The gravity of flooding on the farming community is disastrous as revealed by the response enumerated above. In many nations and communities across the world, flood risk is a major menace; therefore there it necessitates reducing the effects and hazard, even though the risk cannot be totally eliminated. This is in agreement with Calow, *et al*., (2002) who pointed out the dangers of flood risk in the U.K., stating further that about two million households and hundreds of business properties in England and Wales are located along flood plains which can endanger the populace running into millions of inhabitants. Calow, *et al*., (2002) also stated that there are authorities in charge of diverse flood risk management activities. An example of such is England's Flood and Water Management Act of 2010 that authorises the Environmental Agency to apply, develop, as well as maintain and monitor a scheme for the management of flood and coastal erosion.

Sadiq (2012) and Bariweni *et al* (2012) are of the view that in flood incidents, physical damage to property such as the costs of damages to goods and possessions, loss of income and services in the after-effects of the flood and clean-up costs are part of the tangible losses that result. While on the other hand, intangible losses such as increased levels of physical, emotional and psychological health problems which the flood-affected individuals suffer from cannot be quantified in terms of the monetary value (Turton, 2001). Natural disasters like fire, floods and mudslides in general, impact human beings, livestock, infrastructure, and transportation systems, as well as energy, food, and water supplies. The affected people would likely face greater challenges than others. The impact of the floods on agriculture was more felt in Lokoja and Makurdi as most of the crops in these areas were washed away and/or submerged.

For the past thirty years, the effects of flood have increased from being remarkable to a national threat that results to losing lives as well as properties. Nonetheless, there is no comprehensive information on the losses that urban residents and victims of flood sustain. However, information from existing records indicates that Nigerians have suffered severe destruction as a result of recurrent natural disasters, such as collapsed residential and schools' buildings, bridges, electric poles, including submerged

farmlands and market places. Flood has an overwhelming impact on individuals, physical infrastructures, crops, plants and animals. As flood waters did not recede for prolonged period, wage options were not available in these areas. When we compared the wage situation before and after, the wages have declined. Second spell of heavy rains in the study area resulted in flash floods causing massive devastation in over 25 villages and thousands of acres of farm land. The water levels in the river began to rise rapidly from 43ft, the first warning mark, and in a couple of days it reached 61 feet. The overflowing streams cut the road connectivity to several villages in and around the state. Continuous downpour and heavy rainfall ranging from 6 cms – 10 cms is recorded across the district during the later four days (Odeh, 2014).

In case of floods and other natural disasters, victims do not have any option to gather required food items except borrowing money. According to a key informant, though, borrowing money is not a new phenomenon among farmers, during the recent floods, majority of households had borrowed money from local money lenders. The loan compels the borrower to work in the fields of lender at subsidised daily wage which is often decided by the lender alone. This kind of forced borrowing has a negative double impact on the borrowers in the form of limiting their wage seeking options and reducing the payment as wages. Most of the residents did not experience immediate adverse impact of the floods on health. In the study area, people have reported health problems cropping up after the flood shock. However, the effects are expected to manifest when the water recede and stagnate. In view of the expectation in the increase in disease, there is a need to put in place some epidemic preparedness measures in all the affected communities. Floods posed a high risk of water contamination in the study area. The communities had high risk of water contamination as running springs and streams, which are the major source of drinking water, had the risk of contamination. The effects of floods on infrastructure were severe in the study area and long stretches of roads were damaged in Lokoja area completely delinking connectivity between villages for some period. Roads and bridges were destroyed. The damaged infrastructure impacted negatively on the delivery of services such as health, agriculture and education in these areas.

The net impact of flood was seen in the form of changes in social systems. Floods have impacted food habits as they have shifted to low quality food. As a result of flood and

non-availability of sufficient stocks of groceries at household level, they have shifted to widely available leafy vegetables which were seldom consumed before. On the other hand, one of the focus group discussant stated that:

> .... A hungry man they say is an angry man. The flood that came destroyed our rice mill which is the only source of our income here. All of us here were up to 25 women in a cooperative milling centre. Since then, we cannot eat good food, we cannot go anywhere. Right now, there is quarrel between me and my husband and our children because there is no money (FGD with farmers, Ajaokuta LGA on December 28, 2016).

The study revealed that farming and the community are generally affected by the flooding. There has not been any positive impact of flooding on farming in the study area. Flood is seen as a major challenge in some cities in the country. Ibadan has experienced several flood disasters between 1963 and 1990 (Odeh, 2014). In the early 70s, the city of Lagos experienced the first flood and up till now, flood has become recurrent in Lagos State. However, earlier studies recorder significant flood events in 1988 in some regions of the country such as Bauchi, Borno, Kano and Jigawa, while in 1999, Bayelsa, Delta and Niger States recorded risky flood events (Odeh, 2014). Ever since the occurrence of flood events in the aforementioned states, flooding still constitutes a threat in the Nigerian State.

According to Odeh (2014), over 20 states in Nigeria were affected by floods, while the impact was disastrous in Oyo, Lagos, Borno, Jigawa, Taraba Kano, Niger and Yobe States where the highest toll of casualties were recorded. Thousands of homes in roughly one hundred communities were flooded; over a million inhabitants were dispossessed. From reports, thousands of people, especially women and children, who are regarded as the most vulnerable, died as a result of the floods. Also, earlier studies indicated that many land areas were submerged; industries and business establishments were paralysed, while traffic and communications were interrupted as a result of the flood occurrence (Folorunsho and Awosika, 2001).

Flooding, generally, is counterproductive to human activities; though occasionally beneficial. Nature is believed to derive some benefits from natural flood events; the

benefits are far more than the adverse outcomes. Floods however become a disaster when it occurs in areas of important human development as well as regions populated by human beings (Bariweni *et al*, 2012).

Clay (2002) states that: "For farmers that maintain their crops along rivers, they should not feel threatened by yearly flooding. It gives their farm lands better soil consistencies and keeps their land fertile resulting to better harvests each year. Instead of preventing the natural flow of river floods, it might be beneficial in the long run to allow the flood waters to encroach into their lands".

However, in the area of study, some respondents expressed that both arable and agro-forestry farmlands were swept away, while for some weeks, schools and market places were inundated, in addition to destruction of bridges, electric poles, as well as destruction of flora and fauna during the flood. Mordi (2013) summarised the flood incidences in the central North between 10 and 11 July, 2012 in the following words:

> Lokoja counted 10 dead. From the rains which cascaded on the state continuously for 17 hours, residents, businesses, and the government count their losses, as flood water rendered thousands homeless, cars damaged, and shops and roads filled with silts. All public schools and private ones were closed. At least 10 persons drowned in a canal because they could not distinguish between the roads and the drainage channels. A woman and her baby aged few months. Thousands of others were sacked. Some are temporally sheltered in churches and mosques. Collapsed and buried a teenager in the rumble, a man died instantly when a fence fell on him, 22-yr old boy was retrieved from sewage cistern. Five girls were found dead in a restaurant on Akpaku. Rainfall made them to pass the night in a poorly ventilated room where they inhaled fumes". Channels Television did not air its Sunrise Daily News package as its presenters could not make their ways to studio. Rhythm 97.7fm was temporarily shut down. Submerged vehicles, generators and equipment, major markets were deserted. (*The Tell*: Nigerian Independent Weekly, July 25, pp. 54 -63).

Similarly, a farmer lamented:

> We really encountered so many problems as a result of the flood that leads to starvation because water overflew our yam, farms and rice. We don't have access to roads. (IDI with Mrs. Ada James, a farmer, Ajaka, Igalamela/Odolu LGA on December 18, 2016).

In the same vein, another respondent also lamented on the devastating effect of flood on farming activities:

> To a large extent, flood affected the whole farm. When water flood yams farm, they soak and the yield will be zero. There are also some species of rice that are completely submerged by water. Animals were also submerged by the water (IDI with Mr. Lukman Idris, a farmer, Iyano, Ibaji LGA on December 15, 2016).

Flood risks are obstacles to rational decision making in developmental agenda of a nation. Risk as defined by Tebrügge and Bohmsen (1998) is "a measure of the probability and severity of adverse effects". It means that risk constitutes adding up how liable an incident can happen, and when it happens, how terrible the consequences will be. Risk can be expressed as follows: Risk is a product of vulnerability and hazard underpinned with capacity to cope of a given community. Similarly, one market woman stated on flood risk as follows:

> Since the issue of flood came into existence, I have never seen that kind of flood because my village is also situated around the riverine area. So, it was simply devastating; loss of lives and loss of property. We hope we will not have that kind of situation again (IDI with Hajia Aminat Bello, a food vendor, Adogo, Ajaokuta LGA on December 14, 2016).

The flood incident risk differs from one community to the other depending on the level of devastation. A school of thought believes that it is likely that an individual possesses the skill to precisely assess risk on the basis of the likelihood of an incident to occur as well as the possible outcomes of an incident, so far an individual is eager to bear high

risks. The ‘thrill seekers’ proves that a high risk tolerance level is not of necessity tied to a low risk perception ability. Study and literature have suggested that to put off risk-taking behaviours, sensitisation should be on risk-prone behaviours and tolerance.

Due to specific cultural leanings on flood risks, different stakeholders saddled with the responsibility of dealing with flood protection and management as well as other post flooding events handle flood hazards in diverse ways. While emergency professionals may attempt to enhance information at their disposal and ensure that the data collated on flood risks are updated and scientific so as to guarantee maximum preventive measures. Politicians, on the other hand, focus more on developmental agenda and tend to encourage more inhabitants and business organisations into flood plain regions. As a result of this disparity, the two actors may object to measures that does not satisfy their area of interest in flood risk management.

Individual residents of flood plain regions often employ personal measures to reduce the degree of their exposure to flood risk while others might be indifferent as a result of their perception and believe that such private personal individual effort will have little or no impact as flood management and protection should be a responsibility of the government and other policy makers. Due to the numerous views of members of the society on risk, a well-designed communication model must be deployed on risk perception, especially flood risk, and encouraged at the policy formulation level. When disparities or perceptions of members of the public become more defined and debatable, it can facilitate the evolution of acceptable flood protection strategies and thereby increase its adoption and effectiveness.

Stevens *et al*, (2003) are of the opinion that current studies particularly in developed countries lay emphasis on the significance of an individual’s susceptibility to risks than to retain a narrow focus on the risks. Akanbi (2015) averred that people play significant role in determining vulnerability to flood and other hazards when they display competence and flexibility. However, when they resign to state of victimhood and hopelessness, such society is bound to be incapable of confronting the vulnerability challenge and as a result, evade solving the problem.

Blaikie *et al* (1994) are of the opinion that vulnerability analysis emerged from various socio-economic attempts to manage disasters and everyday life hazards. They further stated that a society is deemed to be socially vulnerable when members of the society display characteristics to show they lack the capability to accurately predict occurrence of hazards, cope with it, resist it and recover from its impact on their daily living.

Blaikie (1994) identified five components of vulnerability as initial well-being, livelihood resilience, self-protection, social protection and social capital. He described initial well-being as the appraisal of the initial physical and mental state of a member of a society in their daily life before the disruption of a disastrous event. Such initial well-being status determines the capacity of people to survive illnesses and cope with injuries sustained during disastrous events such as floods. Livelihood resilience is the ability of a person or family to deal with the outcome of any hazard as well as re-establishing their revenue or living lifestyle which includes employment, investments, social security, among others. Self-protection has to do with the readiness of individuals and groups within a social system to use their knowledge possessed about the risks and hazards in their environments to provide adequate safety measures to reduce or checkmate such hazardous occurrence. The success of achieving this is dependent on the level of knowledge and the capability to implement measures against the risks. Societal protection refers to the social structures put in place by members of the society and the willpower of such structures which come in the form of political, social, individual or household contribution to safeguarding the system against hazards. Such political and social structures are exemplified by governmental and non-governmental organisations such as CBOs, NGOs, CSOs, fire departments, Civil Defence, NEMA, among others. Social capitalhas to do with intangible or non-physical security provided by community groups to enhance individual resilience. Such form of security may however negatively impact or reduce such personal resilience. This is because soft security has to do with cohesion, rivalry or competition that exists among groups or individuals capable of enhancing or hindering rescue and recovery efforts. Most support networks found in churches, mosques, clubs and/or other support group provide humanitarian assistance to victims of crisis and other natural disasters regardless of their status as members or non-members (Abdul-Akeem, 2012).

The World Bank (1986) has declared through its report that no nation can be declared as totally immune from natural disasters, however, the seeming limitation of most developing countries continues to show deficiency in capacity to limit the impact and the burden of hazards. OECD (2003) also indicated disaster consequences are graver on the poorer nations than developed ones. The difference observed in level of vulnerability is caused by the amount of resources available and technical know-how of citizens which confers the ability to reduce the impact of the risk as represented by poverty and socio-cultural classes. Women, the physically challenged, children and the aged continue to represent the most vulnerable group when they share the consequences of disasters with their male counterparts (Ellis, 2002). The destruction and other negative impacts created when flooding occur indicates the level of preparedness of the people, the government, structures and institutions against emergencies. Flood is an important environmental challenge confronting the urban population who characteristically cram themselves into susceptible ecosystems which are prone to severe disasters.

Riverine populations are more affected by the risks of flood when the local government saddled with responsibility to provide infrastructures and establish mechanisms for reducing risks of disasters through proper planning lacks capacity. As sustainable development becomes more important focus of study and policy making in Nigeria, stakeholders have become more aware of the consequences of inadequate planning especially in vulnerable areas such as riverine communities. Large chunk of river bed areas are left exposed to the vagaries of intense storm and floods with its attendant risk of diseases (UN, 1975).

Baan and Klijn (2004) reported that people are better aware and prepared for flood risk when they endure intense flooding regularly. This goes a long way to making them seek information and become better prepared. It is a proven fact that societies with below average perception and preparedness of flood risk suffer extensive damages often beyond average when flood events occur. Basically, the elements such as vulnerable persons, weak households, organisations, industries, buildings (private and public), fragile infrastructures, at risk of flooding must be given greater attention when undertaking analysis of vulnerability to flood. Other critical elements at risk include critical cultural asset, ecological flora and fauna species, and other important

landscapes around riverbed areas. Alexander (1993) attempted the use of damage potential to be used when considering the magnitude of devastation likely to be suffered in the event of flooding. He suggested the magnitude of the damage is best estimated in monetary and non-monetary units when determining the maximum damage possible.

Furthermore, a number of research works have focused primarily on social systems vulnerability in a broader sense with proposal in the following context: firstly, the need to target individuals and communities which reflect same for threatened people and communities affected by disasters. This includes households safeguarded from the impacts of flood through physical measures, total population insured against flood damages, the size of emergency and disaster management team, and the capacity of disaster and emergency organisations, as well as the strategies for flood protection (Green *et al*., 1994: 47). This is followed by the ability of social systems and people to endure flood impacts which is correlated to their socio-economic status. Socio-economic status include the following: gender, education, general information on age, social relations, structure, institutional development, poverty, race, proportion of population with special needs (children, elderly) among others (Blaikie *et al*., 1994).

Elsner *et al.*, (2003) observe that when flood affects basic infrastructures and means of sustenance of a population such that it hampers their supply of basic daily needs, the impact of such flood is deemed significant. Technical systems such as wholesome water supply, communication infrastructures, electricity supply, and water treatment plants when incapable of withstanding impacts of flood are referred to as technical susceptibility of the social system. Thirdly, social susceptibility relates to the ability of stakeholders such as local governments and other relevant institutions to adequately restore normalcy by re-establishing conditions of living before flood. Indicators of quick recovery include the following: savings and other financial back- ups of households affected, replacement of lost properties, support system available in the social system, and support from external bodies such as humanitarian organisations, friends, government and donors. Among others, indicators refer to the financial reserves of affected households and communities, the substitutability of lost items, the cohesion of social systems, and the external support provided by friends, the government and private donors. In the long term, the effects of flood on living

standards and health of victims is better measured in physical or time units. Time unit is shown by the amount of time required to restore the condition that existed before flood and other disastrous events.

In the Nigerian case, it could be posited that, low level of government sponsored public awareness campaign on the dangers of living in flood-prone zone, might be a contributing factor to the increasing population of those living and working at river-bed communities. At whatever scale of analysis, many studies have canvassed the need to take into account broader explanations of risks which borders on risk behaviour based on social, environmental and cultural explanations rather than psychological analysis of a single individual risk perception (Pingali *et al,* 2005). Regarding safety leadership, the approach to safety by government bodies be it local, state or at the central can go a long way in determining the perception of risk and safety amongst the people in river-bed communities.

4.3 Research Question Three: What was the impact of flooding on food security in Kogi State?

The term food security entails individuals at every point in time having social, physical, and economic access to adequate, harmless, and healthy food which supplies the needed nutritional requirements as well as food preferences so as to live happily and healthily (FAO, 2002). According to Schmidhuber and Tubiello (2007), food security requires that the entire population should have adequate financial and non-financial resources to sufficient food quality and quantity, and not only to availability of food. Flooding affects every aspect of food security, as food security not only depends on flood, but indirectly depends on other variables such as socio-economic status. This section of the study analyses the result of the nexus between flooding and food security measured in four variables namely, availability, accessibility, affordability and utilisation.

1. Impact of Flooding on Food Security in terms of Food Availability

Findings revealed that there was an inverse relationship between flood and food availability. This implies that as flooding rate increases, food availability decreases. According to the Kogi State Ministry of Agriculture, arable crops harvested in 2012 suffered a significant decrease when compared to the previous years. One of the respondents noted that, “Foods are no more available in the community; we often eat what we see as against what we want” (Interview at Lokoja market, January 15, 2017). It was implied that flood led to non- availability of food. As a result of the flood in Kogi State, it was established that people did not have access to their farms due to the flood. Those engaged in farming were displaced from their farms and transporting what was available became impossible as well. There was, however, access to food donated by some NGOs to those who were severely affected.

Plate 1: A farm destroyed by flood at Iyano (Ibaji LGA), Kogi State, 2012
Source: Kogi State Ministry of Agriculture

In line with Schmidhuber and Tubiello (2007), flood has a direct effect on availability of food through varying agro-ecological situations and an indirect effect through growth and income distribution. When there is increase in appropriate cropland in higher latitudes and decrease in budding cropland in lower latitudes, it brings about changes in land suitability. When there is increased occurrence and severe rainfall for some time, there would be changes in weather situations. When crop yields and local food supplies fluctuate, it would invariably have an effect on food supplies and food security. In semi-arid and sub-humid areas in sub-Saharan Africa of which Kogi State falls within, flooding is prominent and will probably bring about reduction in yields as well as livestock reduction and productivity. Also, in South Asia, one of the poorest regions with a high level of constant malnutrition, in any case of flood events, a high level of instability will take place.

Clay (2002) and Barrett (2005) studied the relationships between flood and food availability. Their result revealed that a much larger group will be at risk in the future with climate change likely to result in non-availability of food, higher winter rainfall, more intense summer storms and rising sea level. According to Barrett (2005), there are several effects of flood which makes it difficult to manage flood events, among which are the expected rise in sea levels which can affect flood risks in coastal cities. Also, increased occurrence of heavy rainfall worsens the risks of devastating flood events in some parts of the world as well as climate change which can possibly change flood regimes by melting of glaciers in the world's cold regions.

Bariweni, Tawari and Abowei (2012) documented that flooding causes food insecurity and climate change causes flood. This is so because a warmer climate leads to intense precipitation, as sea levels will continually rise around seashores, while there will be frequent intense sea levels as well as tempest. Pretty *et al*., (2006) observed that "climate change and sea level rise will impact seriously upon the natural environment and human society in the coastal zones. In Morocco, for example, the coastal zone forms one of the main socio-economic areas of the country with more than 60% of the population inhabiting the coastal cities as well as incorporating 90% of the industry, making them more susceptible to flooding" (Theron, 2007).

Flooding can at times be to an advantage. It has been revealed from earlier studies that during flood events, fish and crabs were often seen in some compounds submerged. Also, it is believed that large quantity of water results to surge in fish and sea populations as well as discovery of new spawning areas as soon as flooding stops. This in the short run impacts on reducing the effects of flooding to a reasonable extent. One of the farmers explained that:

Flood has reduced my yield and made life very difficult for my family.

> I cannot access my farm because water is everywhere. I have nothing to sell in the market (IDI with Mr. John Abbah, a farmer, Ofu, Kogi LGA on December 14, 2016).

It is shown that flood has negative influence on food security as it impedes food availability, accessibility as well as utilisation. Food security entails individuals at every point in time having social, physical, and economic access to adequate, harmless, and healthy food which supplies the needed nutritional requirements as well as food preferences so as to live happily and healthily (FAO, 1996).

Table 4.1a: Summary of Multiple Regressions Differences in the yield of some farm produce before and after the flood in Kogi State

Model	R	R Square	AdjR Square	Durbin-Watson	Sig	F	**β**	**t**	**P-value**
1	.620	.385	.282	2.360	<.001	3.754	.620	10.937	<.001

a Predictors: (Constant), LGA
b Dependent Variable: flooding effect on farm produce

Table 4.1a indicate that flooding has varying impact on farm produce among selected local government area at {R=.620, R^2=.385, Adj R^2=.282, DW=2.360; F(1.7)=3.754; P<0.001 }

Further description analysis showed that the effect of flooding was significantly more higher on farm produce in Igalamela and Ajaokuta Local government areas of Kogi state than other covered local government areas as in this study comparably.

However, findings from the explanatory factor revealed that flooding during 2012 contributed significantly about 62 per cent overall negative effect to the food availability at {P=.62; t =10.937; P<.001}.

These results suggest that flooding will continue cause great havoc to the state and threat to national food security. Thus, the findings have proven to be theoretical and practically relevant.

Table 4.1b: Differences in the yield of some farm produce before and after the flood in Kogi State

Areas Kogi State		Reference standard(100%)	Before the flood (%)	After the flood (%)	Percentage of reduction in the yield. (%)
1.	Lokoja	100	85	30	25.5
2.	Kogi	100	80	40	32
3.	Ibaji	100	70	35	24.5
4.	Idah	100	75	40	30
5.	Ofu	100	80	40	32
6.	Ajaokuta	100	75	55	41.25
7.	Bassa	100	72	48	34.56
8.	Igalamela	100	82	45	36.90

Source: Kogi State Ministry of Agriculture

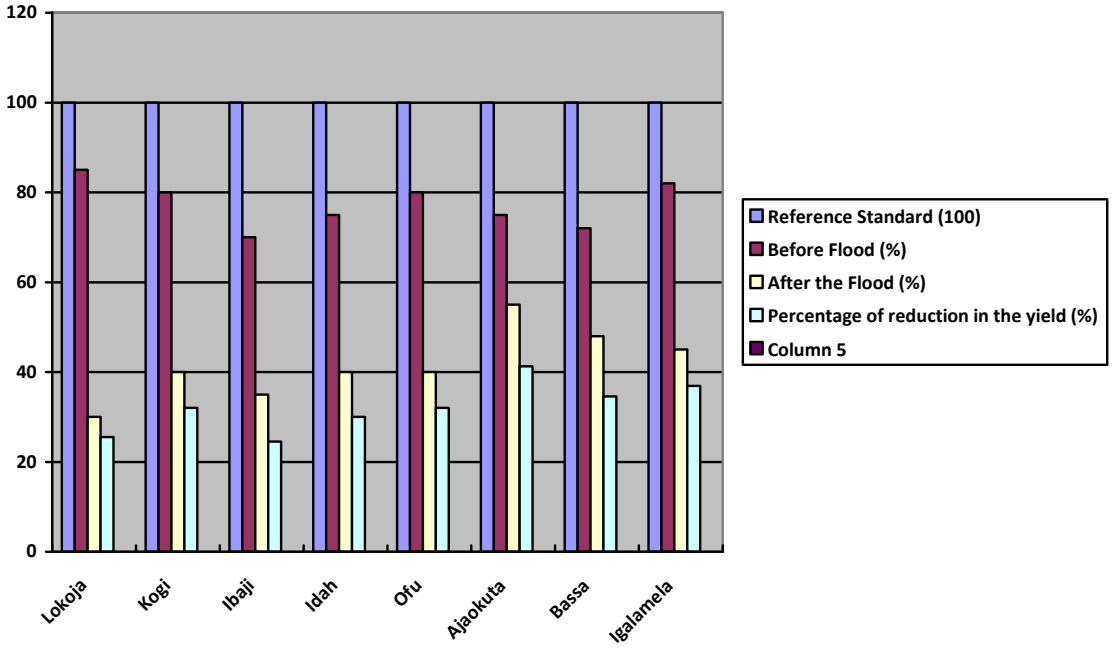

Fig.3: Percentage reductions in the yield of some farm produce in Kogi State

2. Impact of Flooding on Food Accessibility

There was an inverse relationship between flooding and food accessibility in the study area. This implies that as flood rate increases, food accessibility decreases. Food insecurity is measured as the non- accessibility of required amounts of 2100k calories of food per day during the period of occurrence of floods. Records of Kogi State Ministry of Agriculture showed that crop yield in 2012 fell to 560 metric tonnes representing 41.2% of the total yield when compared with 1,360 metric tonnes recorded the previous year.

Plate 2: A picture showing difficulties in accessing food in Kogi State

Food security as defined is when food is accessible to every individual for a healthy living at every point in time (FAO and WHO, 1992 cited in Ellis, 2002). In other words, when food in sufficient quantity and quality is accessible to most of the inhabitants for a healthy living at every point in time, a country can be said to be food-secure (Reutlinger, 1983). According to Davies (2009), it can be inferred from the definition that there should be availability of food to people such that some satisfactory stage of dietary standards needed by the body such as calorie, protein and minerals can be met. The essential basics of food security include food accessibility and possessing the capacity to acquire food (Adeoti, 1989). A farmer complained that:

> Here in Buruku, we really encountered so many problems as a result of the flood which led to starvation because water overflew our yam farms, our rice was wasted because of the flood. We don't have access to roads. Even the few that were there, we don't have access (FGD with farmers at Iyano, Ibaji LGA on December 21, 2016).

Flood actually caused food insecurity in the study area as predicted at the beginning of the study. Elsner *et al,* (2003) suggested the accessibility of adequate amount of food of the right quality which is provided by means of household production or by importation. Food accessibility as earlier mentioned is when people have access to adequate resources or in other words, entitlements so as to acquire the right food for a healthy living. As aforementioned, when a country is food secure, it means that the inhabitants, families or individuals should have access to sufficient food at every point in time. In the event of any crisis such as financial crisis or natural hazards as well as seasonal food insecurity, they must have access to food. The notion of stability is regarded as the availability and access elements of food security. However, Ellis (2002) opines that even though production is an essential dimension that contributes to food security, other factors that deals with having access to food is equally significant.

Having access to adequate foodstuff at every point in time so as to maintain a stable growth of food consumption as well as offsetting variations in production and costs is vital in food security. An analysis by FAO in 1983 was on food access where a definition on the balance between the demand and supply side of food security

equation emanated thus: “Ensuring that all people at all times have both physical and economic access to the basic food that they need” (FAO, 2006). The revised definition in food security analysis included the family and individual levels, including the national and regional levels of aggregation. A market woman stated that:

> As the flood happen, many of our things that we plant spoilt, water has taken over the things and spoil them. Like our rice, our cassava, our pepper, our tomato and yams, vegetables. All these things I mention were not accessible due to flood (IDI with Mrs. Chinyere Onuha, a market woman, Ajaka,Igalamela/Odolu LGA on December 16, 2016).

It can be inferred that food accessibility is very poor due to flooding. Folorunsho and Awosika (2014) predicted that flood may affect food supply in Kogi State. According to Folorunsho *et al.*, (2014) study, the 2012 flood affected a large proportion of regions within Nigeria that produced yam, cassava and sweet potatoes, which are the major tuber food crops in the country. Roughly 27.9% of yam producing regions were affected and 21.6% of cassava producing regions, at the same time as 17.2% of sweet potato producing regions got affected.

Table 4.2a:ANOVA showing Estimated Quantity of some Farm Produce Lost during 2012 Flood (Metric Tonnes), Kogi State

S/N	Source	SS	DF	MS	F	P value
1	Lokoja	1210.500	6	201.750	91.460	.000
2	Kogi	1030.000	5	206.000	17.009	.000
3	Idah	1174.500	6	195.750	45.276	.000
4	Ibaji	1174.500	5	234.900	57.527	.000
5	Ofu	910.500	6	151.750	7.644	.000
6	Ajaokuta	837.000	5	167.400	17.331	.001
7	Bassa	1032.000	5	206.400	17.200	.000
8	Igalamela	1032.000	5	206.400	17.200	.000

DV: Farm produce lost to flooding (Metric Tonnes, 2012)

Note:

DF: Degree of Freedom

MS: Mean square

SS: Sum of Squares

F: F ratio

P value: level of statistical significance

The results presented in Table 4.2a indicate that there were significant losses in the farm produce during 2012 flood in Kogi State which is estimated using F-test statistics. The total estimated quantity of farm produce lost were calculated for Yam, Maize, Rice and Cassava production at ($p<.001$). However, the result obtained from the ANOVAshowed that estimated quantity of farm produce were lost significantly on the aggregated weights, while all the selected local government areas experienced above a hundred per cent losses dueto flood. Therefore, flood contributed to loss of farm produce in Kogi State during 2012 evaluation.

Table 4.2b: Estimated Quantity of some Farm Produce Lost during 2012 Flood (Metric Tonnes), Kogi State

LGA	***Yam***		%age	***Maize***		%age	***Rice***		%age	***Cassava***		%age
	B	***A***		***B***	***A***		***B***	***A***		***B***	***A***	
Lokoja	2.5	2	25%	0.3	0.3	11%	0.6	0.5	25%	2.6	2.1	24%
Kogi	2.1	1.7	21%	0.7	0.6	21%	1.1	0.8	40%	2.5	2.0	23%
Idah	3.5	2.6	33%	1.5	1.1	39%	0.5	0.4	20%	3.1	2.4	28%
Ibaji	2.1	1.7	21%	1.0	0.8	29%	0.3	0.3	15%	2.8	2.2	25%
Ofu	1.2	1	17%	0.6	0.5	25%	0.9	0.7	25%	2.5	2.0	22.5%
Ajaokuta	2.3	1.8	30%	0.5	0.4	20%	1.2	0.9	32%	3.2	2.5	28%
Bassa	1.9	1.5	25%	0.8	0.6	30%	0.5	0.4	14%	2.9	2.3	26%
Igalamela	2.2	1.7	28%	0.6	0.5	25%	1.0	0.8	29%	2.6	2.1	23.5%
Total	**14**			**4.8**			**4.8**			**17.6**		

Source: Kogi State Ministry of Agriculture

Key: B- Before; **A-** After

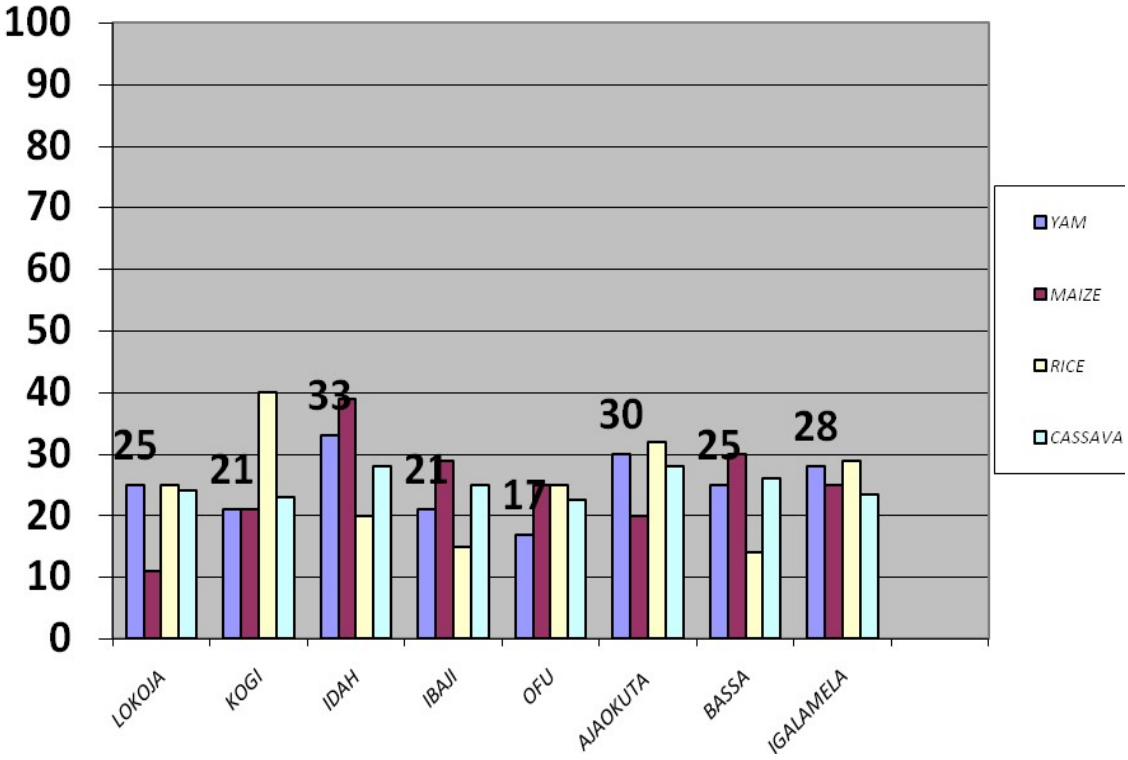

Fig.4:Estimated Quantity of some Farm Produce Lost during 2012 Flood (Metric Tonnes) in Kogi State

Source: Kogi State Ministry of Agriculture

Jimoh and Alao (2009) study revealed that of the five major cereal food crops that were produced in the country, the affected areas included those producing rice, maize and sorghum, however, the areas producing millet and cowpea were unaffected by the 2012 flood. In addition, roughly 31.4%, 20.1% and 14% of regions producing rice, maize, and sorghum respectively were ravaged by the 2012 flood. Shortage of rice may possibly be experienced in some states of the country such as in Kogi, Benue, Kwara, Taraba, Anambra, Delta, Imo, among others. While other states such as Ondo, Bauchi, Abuja, Kaduna, Abia, Enugu, among others may possibly experience excess rice yield because of adequate rainfall. Maize had already been harvested in the South while the north was at the period of harvesting when the 2012 flood happened between September and October.

3. Impact of Flooding on Food Affordability

It was found that flooding has negative impact on food affordability. This means that affordability of food during flood is difficult. A respondent who is NURTW member complained on the impact of flood:

> We really suffered a lot of setback here. There was no money, there was no food. There was fuel scarcity. There were no passengers here for us to convey to Lokoja. Even those that were about to go to Ofu, they could not (IDI with Mr. Idris Yahaya, a transporter, Ugwolawo, Ofu LGA on December 19, 2016).

The statement above showed that residents were not productive during flood period. This makes ability to afford basic needs very difficult. In 1986, a report by the World Bank on "Poverty and Hunger" emphasised on the relationship between food affordability and food insecurity (Clay, 2002). In the report, the difference between chronic (constant) food insecurity and transitory (temporary) food insecurity was introduced. While constant food insecurity involves challenges of continuous or structural poverty and low wages, temporary food insecurity involves periods of intensified pressure caused by natural disasters, economic collapse or conflict.

The FAO's (1996) definition emphasises the many dimensions of food security which includes food access, availability, affordability, food use and stability. It has enabled policy responses focused on the promotion and recovery of livelihood options. Initially

made popular by scholars such as Carlow, MacDonald, Nicol, Robins, and Kebede (2002), livelihood approaches are now fundamental to international organisations' development programmes. They are increasingly applied in emergency contexts and include the concepts of vulnerability, risk coping and risk management. In short, as the link between food affordability, starvation and crop failure becomes a thing of the past, the analysis of food insecurity as a social and political construct has emerged (Devereux, 2007).

In recent times, both ethical and human rights' dimensions of food security are been considered. The UN Declaration of Human Rights in 1948 initially recognised the 'Right to Food.' The World Food Summit delegates in 1996 formally adopted the 'Right to Adequate Food' which was a landmark accomplishment. It focuses on the likelihood of a rights-based approach to food security. At present, more than 40 countries enshrined in their constitution the right to food, while FAO estimated that the right to food may possibly be judicial in several countries (McClain-Nhlapo, 2004).

An Intergovernmental Working Group under the patronage of FAO in 2004 gave a detailed set of voluntary guidelines that supports the progressive realisation of the right to adequate food in the context of national food security. Food insecurity which is inadequate access to sufficient food can be constant or transitory. Chronic food insecurity occurs as a result of inadequate resources to either produce or buy food and the diet is constantly insufficient (Adeoti, 1989). Elements of food security include availability, accessibility and affordability which encompass an extensive scope of interconnected fiscal and socio-political factors that challenges Africa's ability to tackle food security. Majority of the residents in the flood affected areas could not meet up with the daily required calories during the flood. They shifted to low quality food intake. Commenting on this, a committee member on flood disaster in Kogi LGA stated that:

> When you talk of flood in relation to food affordability, when there is flood it affects the crops definitely ... cassava will stay like 6 months, maize will stay like 3 months and rice will stay like 5 or 7 months. When there is flood, the flood will also affect the farm produce. It is a bad relationship because the flood affects the farm produce. Some that are not even ready to be harvested, the flood wears them away. Even too much flood will not even make farmers have access to their farms when

> they are even thinking of how to rescue themselves from the flooded area, they cannot even think of farming and the farm produce any longer... So since they cannot have access to the farm produce, you discover that they don't even have food to eat. (IDI with Alhaji Yakub Wahab, a landlord, Edeha, Kogi LGA on January 18, 2017).

In line with Dixit (2003), the study found an inverse relationship between food security and flooding. His discovery was in a study conducted among internally displayed persons (IDPs) in Iran. Floods damage farm yields which adversely affect national harvest. It also reduces family and nationwide food availability as well as agricultural proceeds from the sale of crops. Poor harvests have an impact on food security and livelihoods. A diversified household and economies are less susceptible to the direct effects of droughts and floods, on the condition that their other sources of income do not correlate with rainfall or directly or indirectly depend on agriculture.

Studying 20 African countries, Theron (2007) concluded that floods had several socio-economic (affordability) and political implications and some of these included the displacement of people. Sinclair and Pengram (2003) are of the opinion that floods cannot be prevented but their overwhelming impacts can be minimised if early warnings are presented. Ninno, *et al.,* (2003) studied the floods in Bangladesh and concluded that the floods have affected food security of millions of households. Mitiku *et al* (2012) computed food security index using FGT model and revealed that about 36 percent of Shashemene district in Ethiopia are food insecure. In a similar study in North West region of Ethiopia, Ramakrishna *et al* (2002) found that 37 percent households are food unsecured. Past Chairman of Edeha Local Government explained that:

> Yes we have a challenge, because once there is enough food, then no hunger, but with the destruction of food stuff in the LGA, we have a challenge. So the food affordability is very poor. Yes, a serious threat to food security (IDI with Mallam Ibrahim Wada, a community leader, Edeha, Kogi LGA on January 19, 2017).

Table 4.3: Estimated prices of foodstuffs in the study area before and after the 2012 Flood, Kogi State

LGA	Yam	%a	Rice	%a	Maize	%a	Cassava	%a

	(10tubers)		ge Price	(Mudu)		ge Price	(Mudu)		ge Price	(gari) Mudu		ge Price
	Before N	After N	%	Before N	After N	%	Before N	After N	%	Before N	After N	%
Lokoja	**2400**	**4100**	**70.8**	**700**	**860**	**22.8**	**350**	**500**	**42.8**	**150**	**210**	**40**
Kogi	**2200**	**3600**	**63.6**	**650**	**780**	**20**	**300**	**450**	**50**	**130**	**170**	**30.7**
Idah	**1900**	**2700**	**42.1**	**550**	**700**	**27.3**	**280**	**380**	**35.7**	**110**	**140**	**27.2**
Ibaji	**2700**	**4700**	**74**	**750**	**900**	**20**	**400**	**550**	**37.5**	**120**	**150**	**25**
Ofu	**2500**	**4200**	**68**	**800**	**960**	**20**	**450**	**600**	**33**	**200**	**260**	**30**
Ajaokuta	**2300**	**3700**	**60.8**	**750**	**880**	**17.3**	**400**	**550**	**37.5**	**180**	**220**	**22.2**
Bassa	**2000**	**2800**	**40**	**650**	**800**	**23**	**380**	**480**	**26.3**	**160**	**180**	**12.5**
Igalamela	**2800**	**4800**	**71.4**	**850**	**1000**	**17.6**	**500**	**650**	**30**	**170**	**200**	**17.6**

Source: Kogi State Ministry of Agriculture, January 2017

Note: "Mudu" is the local measurement scale for grains

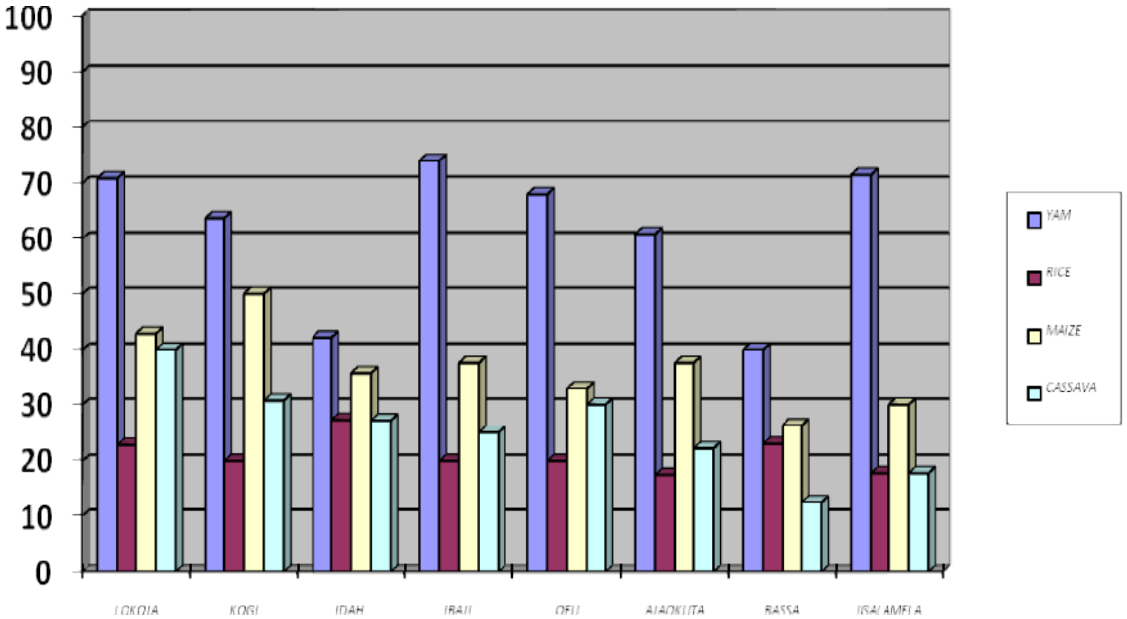

Fig. 5: Percentage price hike of farm produce after the flood in Kogi State

4. Flooding and Food Utilisation

Food utilisation borders on access to sufficient meals, wholesome water, prepared in a clean environment such that the sustained consumption leads to a level of well-being, such that all nutritional and physiological requirements are satisfied. This definition underscores the fact that non-food factors (such as healthy environment, etc) are critical in attaining food security. Food utilisation has also been described as the use of food such that the consumer absorbs maximum secure essential nutrients from the meal consumed. Food utilisation is further hinged upon the method used in preparation, its dietary value, and the social significance which determines when it is served, eaten, and for what occasion. Also, the pre-harvest activities of agricultural produce used as raw materials, the safe handling during supply, which preserves the quality and the aseptic nature to meetright standard for human consumption are also essential in ensuring adequate food utilisation. There exists negative relationship between flooding and food utilisation. This means food utilisation is poor during flooding. Flooding can sufficiently alter the dietary systems and bring forth new problems especially in the supply and safe handling of food. The two factors are sufficient to affect the nutritional state of the food in several ways. A respondent noted in the following words:

> ....food utilisation, I think has a negative relationship with flood. When there is flood, and this flood hits the crops, it destroys the crops, when the crops are destroyed, it reduces the quantity of whichever crop that were affected in the market and invariably it may result into scarcity of such crop in the market. And as a result, the reduction of the volume of this crop in the market will result in the hike in the price of this commodity in the market and make it unaffordable for people to consume, to purchase and invariably inflation will set in. Flood never brings any good, especially this river flooding. In most cases it doesn't bring anything good to the community that is affected. It affects everything in a big way (IDI with Mrs. Ruth Ameh, a market leader, Oguma, Bassa LGA on January 19, 2017).

Plate 3: Rotten yams

Another respondent noted that “The 2012 flooding destroyed crops to the extent that even tuber crops decayed in the soil, so we had low yield of crops” (FGD at Iyano, October 16, 2016). It is clear from these statements that flood does no good to the affected area despite its positive benefit as stated earlier. Some of the residents in the two states had to evacuate their homes due to flood whose cause was the release of water from Cameroon dam. Most of the inhabitants are capitalising on the catastrophe to make quick money. However, there was a positive effect of the flood on their trade, as some of the fishermen noted that there was no need for them to paddle their canoes to the far end of the river before they will catch fish. This is because when there is increase in the water level of a river, there is a tendency for more fishes to swim onto dry land. As such, fishes are constantly plentiful in rainy seasons, while fishing in a flooded river is very hectic as tidal waves may possibly affect how the canoe moves. Hunters in the affected areas also claimed that as a result of the flood, their set traps caught more animals. This was because while the flood was rolling forward, animals run away from it and was caught by their already set traps to dry land.

Drainage channels and other run off passages experienced blockage while others became narrowed as a result of structural development by urban dwellers. All are guilty of violating environmental laws. Flood certainly would not have been as worse if adequate run-off channels were provided or maintained. There is still a pervasive ignorance of drainage as a critical infrastructure to maintain long-term security of the community. It must be emphasised that annual flooding could be converted to useful purposes, as it has been used to promote and sustain communities located along river valleys. Such feat led to the rise of Egypt Medieval civilisation which depended solely on fertile silts that settled along Egypt flood plains to thrive (Ludi *et al,* 2009). Hence, natural disasters such as flood can be engineered to drive development.

The risk of inhabiting flood plains can be cancelled out if efforts are made to convert the incessant floods to better use. This is one of the only means of adequately meeting the Millennium Development Goals in vulnerable societies. After all, global warming is a worldwide problem. Findings revealed contrary relationship between flooding and food utilisation. This was corroborated by Egah village head in Idah LGA:

> Yes, let me say there is, because what actually happen when flood occurs like this, you see that the food we produce, especially the food the farms produce in this area will be taken away by flood. So to buy will be hard.... and to afford it, the capital to afford from the market will be something very hard for us, costly for us. You see that the farm produce we now consume, when the flood happen, or take place again, we will find it very difficult to get food. Then you don't even have money (IDI with Mallam Adom Maku, the village head,Egah, Idah LGA on January 21, 2017).

Food security has been the most pressing social and political debate since 2007. The phenomenon has been challenged on several fronts including lack of political will to make food available and increasing changes in climatic conditions. Several studies have emerged examining different issues that have led to global food crisis (Alexander, 1993; Gill *et al*, 2003; FOA, 2010). As a matter of fact, FOA in its report of 2008 estimated that there were nearly 925 million food insecure people in the world. The number is above that of 2007 as a result of the rise in food price as well as the overall economic crisis. Therefore, food security is a crucial topic within the broader fields of development economics and development studies. The discourses in development literature, however, have discussed flooding activities and food security as though there is no connection on how one influences the other (Fischer *et al,* 2002).

Nevertheless, several of these studies have highlighted the negative effects of climate change on attainment of food sufficiency at worldwide and local levels (Fischer *et al.,* 2002, 2005; Parry *et al*., 2004, 2005; Tubiello and Fischer, 2006). However, these studies have neglected a particular aspect of climate change called flooding. Thus, the nexus of these phenomena is scarcely discussed. To understand the connections, we need to understand climate change itself. Climate change has to do with human actions linked to food production, supply and its consumption, which leads to environmental changes, giving rise to global and local changes in the weather pattern. Such changes range from rising flood disasters, extreme weather situations, among others.

Climate change is capable of benefitting some locations around the world, especially those around 55° northern latitudes and above. There is growing concern that overall, these changes and especially those associated with climate, will further make difficult

achieving food security for those in the developing world (Stevens *et al*., 2003; Shah, Fischer, and van Velthuizen, 2008). The reason for this is because of the usually envisaged harmful effect on agriculture, especially in tropical and sub-tropical countries (Fischer *et al*., 2001 and Parry *et al*., 2004). Three reasons account for this fact. To begin with, in several regions of the developing world, they are predisposed to considerable changes in both temperature and precipitation types. Homer-Dixon (1996) while assessing climate of South Africa concluded that the area will be either warm or dry; with a prediction of temperature increase of between 2 and 5°C in upcoming decades (IITA, 2012), in addition to a growing unpredictable rain with the area getting usually dry around the east, particularly (Wiggins, 2008). There is also an expected rise in the occurrence and intensity of flooding and drought events (IPCC, 2007). Secondly, according to Rashid (2002), developing economies are especially sensitive to the direct effects of weather change considering their reliance on agriculture, geographic exposure and ecosystems, as well as high rate of poverty. Thirdly, a number of individuals in the Third World directly rely on agriculture as the main source of food; hence, any negative effect on crop output at the local level will have an effect on food supply and crop production.

4.4 Research Question Four: What was the response mechanisms put in place by different stakeholders within the period of study?

i. Distribution of Relief Materials

Provision of relief materials such as mattresses, bags of rice, and sanitary materials dominated response mechanism by Federal Government (NEMA) and other agencies. NEMA and some Non-Governmental Organisations (NGOs) often provide education on flood to the affected communities. Cameroonian government provided money and seedling for the farmers and medical attention to those that were displaced. After the 2012 floods, institutions and government agencies saw the need to put in place adequate flood prevention measures. Some well-meaning agencies also contributed farming inputs to help farmers restart their lives after the devastating flood. One of the respondents explained:

> It is true when such things happen they will not fold their arms and be looking. Government, NGOs and religious bodies will not fold their arms, everybody will come for assistance and we appreciate all of them, they tried their best. As my people said and myself, I saw it they provided relief materials like bed sheets, mattress, foodstuffs, medical and also security. Like the issue of Banda that they said was cut off that time; you can see how they build that place now. The village is not there before they now brought them to this side now. You can see the embankment government is building now against such oncoming flood. It's only God that is competent, whatever man do just do because of God, you will never praise human being. But they tried their best in the distribution of the relief materials (IDI with Mr. Jonnes Oberd, a landlord, Iyano Ibaji LGA on January 23, 2017).

The Kogi State Government of Nigeria assisted internally displaced farmers by distributing hybrid cassava stems, farming inputs and yam seedling, to alleviate their sufferings. Several workshops were organised in different parts of the country to brainstorm on flood management technique that would be at par with global best practices. The flood impact, control and mitigation approaches recommended include proper drainage systems, building of buffer dams in strategic areas, prevent the construction of houses along waterways and other natural drainages, prevention of

siltation along creeks, and other water bodies through dredging, setting up of an effective and adequately planned preparedness mechanism, conduct sensitisation and enlightenment programmes. Such programmes must also include periodic monitoring of soil and water levels, grassroots mobilisation through weather reports, periodic rescue drills, self-help and re-orientation of communities to enhance their survival (Federal University, Otueke, 2013).

In order to prevent the reoccurring tragedies occasioned by flood caused by rainstorms and poor living habits, the government at different levels must intensify efforts in rehabilitating drainage channels along major roads and neighbourhoods such that all encumbrances are removed. The ministries and other state departments must be adequately equipped with resources to enforce and carry out their mandates across the state of the federation. Enforcement must also be carried out using all available approaches in order to be effective. This may include using punitive or sanctions, persuasive approach among others. Other stakeholders especially manufacturing farms, business offices, hospitals, schools must be included in the strategy to ensure channels and erosion passages and other immediate environment are maintained, clear and free of debris (Odeh, 2014).

In every state of the federation, it is essential to make obligatory the monthly sanitation exercise on a continuous basis. Also, all concerned should make sure their abodes, work places, environments are adequately cleaned, and all forms of wastes should be properly disposed, while spoilt or neglected utensils, piece of equipment are adequately disposed in the right channels and not on water ways. Government at the various levels should provide adequate measures to stem flooding in the cities. They should make sure there is continuous dredging and re-dredging of channels and all illegal structures on the path of waterways should be destroyed, while there should be enforcement of greenery near channels, rivers, and streams.

Similar to the above proposition, the Federal Government launched the early warning system after flood disasters in major cities like Lagos, Kano and Kaduna. This system was upgraded in 2014. Flood warning systems were installed by the Federal Ministry of Environment all over Nigeria as well as four automated flood early warning facilities in some river basins. Community-based flood warning systems were also

installed in about 12 states across the country including Kogi State. Another community leader in Kogi local government explained the effort of the authority in response to flood disaster:

> Seriously that period of flood, the NGOs they did their best because they were able to make primary schools IDP camps and they brought relief materials for them and they were treated as expected. On the side of the government they made sure that they provided security to those that are staying in the IDP camp. So those two arms tried their best in those areas. They came with their medical equipment; they were checking the internally displaced people there. Then some NGOs brought relief materials. They brought mattresses, and cartons of indomie which Dangote gave. It was well distributed but the thing did not go round but we were able to achieve up to 90%, which we believe we have tried (IDI with Mr. Ramon Abdul-Wahab, a community leader, Oguma community, Bassa LGA on January 26, 2017).

2. Government Policy and Strategies

This makes the Federal Government to put in place certain preventive measures through various agencies. With the intention of alerting members of the public on the dangers of flooding, the Federal Government equipped the Nigerian Meteorological Agency (NIMET) to enable it provide accurate weather forecast. Also, the sum of N17 billion was released to the affected states and other relevant stakeholders to cushion effects of the 2012 floods. There are plans to build dams in Taraba State such as the Kashimbilla/Gamovo multipurpose dam, Ose Dam and hydropower project to accommodate the excessive flow of water from Cameroon anytime it happens. The dams will serve the purpose of mitigating flood, generate electricity, create employment, improve irrigation and boost agricultural production in Nigeria (Anugwara & Emakpe, 2013). The government has made efforts to relocate people in regions that are prone to flood. Forty communities were relocated by government authorities to safer places. A villager explained how local authority responded:

> The State government had a plan to rehabilitate the flood affected victims. Relief materials were distributed to the victims but not effectively carried out. A particular NGO, I cannot remember the

> name, donated a speed boat to carry people. Religious bodies also participated. They brought relief materials, individual, philanthropists also donated relief materials: food, clothing, mattress and roofing sheets. NEMA is the agency through which the government supplied the materials (IDI with Mr. Idris Hassan, a resident, Ugwolawu community, Ofu LGA on January 26, 2017).

The Kogi State Government advised residents of communities along the river banks to relocate sequel to a warning that water would be released from Kainji and Jebba Dams. The government also called on the people of the state to clear water channels for water to flow freely and to avoid flooding (Anugwara & Emakpe, 2013). According to a respondent:

> The lessons learnt from the 2012 flood helped Agencies like the Red Cross to improve its emergency response. The Nigerian Red Cross trained 22,000 volunteers and stocked warehouses with relief materials. The National Environmental Management Agency urged dam management officials to lower water levels early enough and should not wait for water levels to breach the dams before releasing it in order to minimise flooding risks. Flood prone communities were trained and provided with basic equipment to aid quick evacuation (KII with Mr. Olawale Stephen, an official, NEMA on January 26, 2017).

The National Space Research and Development Agency (NASRDA), produced a floodplain and vulnerability map that was used by the National Emergency Management Agency (NEMA) to rehabilitate those the 2012 flood affected (Odeh, 2012). Also, the National Emergency Management Agency (NEMA) organised a pre-flood awareness campaign for relevant stakeholders in Ilorin, Kwara State capital in North Central Nigeria. Participants were advised to heed early warning signals and desist from blocking waterways through illegal dumping of refuse while the state government was implored to clear all waste bins across the state for a cleaner and healthier environment (Akanbi, 2015).

The studied community also adopted coping mechanism such as creation of water channels, sand bag and frequent sand removal of blocked drainages. Oxfam (2006)

averred that a policy was put in place which is in line with government policy on National Flood and Coastal Erosion Risk Management strategy for England (FCERM, 2010) and other related issues, and this policy put in place a legal framework to assist organisations, local authorities, highway establishments, sanitation agencies, communities, sewage companies, water corporations, as well as the public sector to harmoniously work towards managing flood and coastal erosion risks. All these bodies work in harmony to lessen flood and coastal erosion risks, in addition to managing its outcomes.

When government at any level is committed to safeguarding its citizens, they perceive safety management optimistically, giving rise to less vulnerability to flood disaster (Sinclair *et al*, 2003). According to the World Economic Forum **(**2007), the notion of risk perception refers to the intuitive risk judgments of individuals and social groups in the context of limited and uncertain information. These judgments vary between individuals due to different levels of information and uncertainty, due to different intuitive behaviour, and also due to specific power constellations and positions of interest. As a consequence, the individuals of a community may assess the risk of being flooded very differently, because they do not have the same information about the probability of flood hazard events in their region, about flood mitigation measures and their effectiveness, and they perhaps have a different historical background regarding the experience of living in a floodplain and of being flooded.

The UNDP (2007) states that preventive strategies are more valuable if the political will, capability, priorities, legal and institutional frameworks, policies and planned activities are put into consideration and synchronised properly (Akanbi, 2015). Diverse methods can be used to sensitise individuals that stay in flood-prone areas about the impending dangers they will encounter and the best way to respond to such. This can be done in conjunction with local technical knowledge so as to increase their level of confidence as well as give them the courage to take necessary actions in any event of danger. This will go a long way in facilitating and fostering increased involvement of the local community to deal with any disastrous occurrence.

Akanbi (2015) submitted that to tackle the subject matter of preparedness, one has to proffer an answer to the issue of the ability of the Nigerian State to in totality

effectively manage natural and human-made disasters. The Global Facility for Disaster Reduction and Recovery (GFDRR) is saddled with the responsibility of helping Third World nations lessen being susceptible to natural hazards in addition to adapting to climate change. Though, less than 20 African nations are at present involved, excluding Nigeria. In 1981, the Ecological Fund was created through the 1981 Federation Account Act and it was modified by Decrees 36 of 1984 and 106 of 1992, and is facing a number of challenges. Akanbi (2015:44) states that "the level of preparedness and the capability to reduce vulnerability to disaster largely depends on the developmental stage of a country or a community and the balance between the strengths and imperfections in the functioning of its sectors, structures and institutions."

Disaster is viewed by community members differently and there are different efforts put in place to surmount flood events. The ability to manage the effect of disaster differs and depends on the social groups such as being poor or rich, native or non-native, being young or old, sex type, whether male or female, among others. However, there are numerous ways employed by the indigenous people to manage negative flood impacts such as social, economic, as well as technological/structural coping mechanisms as suggested by Akanbi (2015).

Adeoti (1998) conceptualised the coping mechanisms. According to him, economic coping mechanism has to do with diversification and financial activities in addition to community strategies that are linked to materials, goods and resources. However, he defined the technological/structural coping mechanism as those structural activities engaged by families that live in flood-prone areas so as to deal with flood loss and/or damage. Such mechanism include constructing houses to avert flood or by using materials that is able to reduce flood loss and/or damage.

Adeoti (1998) further submitted that nations have identified that there is need to create an understandable regulatory agenda which is aimed at preventing, managing and reducing disasters all over the world. Different steps implemented rightly would improve the capability to confront natural disasters, flooding inclusive. There are different levels of capacity building such as the individual and institutional levels, as well as the systemic level. Individual capacity is dependent on the performance of

human resources as well as on the availability of resources, including requisite knowledge and skills. The capacity question is focused on every aspect of the emergency management system at both the local and national levels, in addition to assessing the socio-cultural, political, environmental and economic factors which have an effect on being vulnerable to hazards.

The institutional level focuses generally on organisational performance and management capabilities and includes an organisation that has the mandate to manage flood, while the systemic level centres on creating an enabling environment for individuals and organisations to operate, and should include the regulatory, general policy, accountability and financial frameworks (Akanbi, 2015). In addition, Akanbi (2015) emphasised that in many Third World nations, particularly in Africa, failed state infrastructures, lack of suitable legal and policy frameworks, and insufficient funds make them more susceptible to the violent effects of significant disasters. He opined further in the following words:

> Disaster management is still at infancy stage in Nigeria despite the fact that the year 1906 marks the earliest efforts at disaster management in Nigeria with the establishment of the Police Fire Brigade (now Federal Fire Services) with functions beyond fire fighting role to saving of lives, properties and provision of humanitarian services in emergencies. By 1999, the National Emergency Management Agency (NEMA) was established via Act 12 as amended by Act 50 of 1999, to manage disasters in Nigeria. NEMA was set up to tackle disaster related issues through the establishment of concrete structures and measures (Akanbi, 2015:49).
>
> Such measures as the education of the public in order to raise their level of awareness and reduce the effects of disasters in Nigeria, the Agency has put in place structures that enable it detect, respond and combat disasters in a timely manner. Prevention is better and cheaper in disaster management due to the fact that if care is not taken, once there is a disaster the entire budget of a country may be diverted to contain it. State governments in Nigeria have been encouraged to establish their own separate State Emergency Management Agencies (SEMAs) to complement the role of the federal agency in their areas (Akanbi, 2015).

Akanbi (2015) submitted that through the activities of SEMAs, many states in the federation would be viewed as keenly involved in management of disaster and preparing in advance to the untoward incidents. Currently, very few states have taken the initiative, while some other states have not empowered their SEMAs appropriately to be functionally self-regulating and proactive in the discharge of their duties. It should be noted that having an understanding of the spatial aspect of flood disaster and initiating disaster preparedness measures to alleviate people's distress cannot be overemphasised. Nigeria agreed to build similar dams along the river to suck up excess water being released from Lagdo. In 1981, the Nigerian government designed a buffer dam which it called Dasin Hausa dam located in Dasin village in Adamawa State.

The dam was intended to reduce the effect of flooding from Lagdo, generate 300mw of electricity and irrigate about 1,500 hectares of farmland. It was also meant to provide navigational route through the Benue River to the Niger Delta. The Nigerian government failed to fulfil the plan and paid the consequence with the 2012 floods. Anugwara *et al*, (2013) suggests that the government should review the 1981 feasibility report that brought out the idea of dam on the Nigerian side, and build more dams because a single dam is not sufficient to control excess water from Lagdo dam. The experts need to take into cognisance the fact that there are more villages along the Benue River and excess rainfall due to climate change.

The Presidential committee for flood relief and rehabilitation organised a fundraising dinner in November 2012 to raise funds for flood victims. The sum of US$70 million was realised in pledges but the impact of these funds in the lives of victims remain questionable. PM news Nigeria (2012) reports that while Lagdo dam was responsible for the 2012 floods, another disaster waiting to happen is from Lake Nyos in Cameroon. Lake Nyos which is not far from Cameroon's volcanic region and covers a distance of 1,500km from the Gulf of Guinea through South Western Cameroon and into Northern Nigeria and Northern Cameroon would collapse in the next five to ten years. The 2012 flood disasters could have been avoided if Nigeria had kept to the initial agreement between Nigeria and Cameroon over 30 years ago (Odeh, 2014).

An interagency food security and agriculture assessment organised in 2013 found that the 2012 flood may have eroded the food security of many although the impact may

not be felt immediately (Odeh, 2014). In a media lecture organised in Abuja, the nation's capital, the president of the Nigerian Union of Journalist was of the view that Nigeria was yet to recover from the devastations caused by the 2012 floods. He blamed the government for poor coordination and handling of resolutions reached after international meetings as the resolutions and warnings that emanated from summits such as the summit on climate change that took place in South Africa in 2001 are never heeded (Odeh, 2014). Findings of this study therefore cast a doubt as to the preparedness of the people and stakeholders should similar or worse disaster occur in the future.

4.5 Questionnaire Administration and Response Rate

A total of 4,170 copies of the questionnaire were administered to farmers, market women, road transport workers, and civil servants in Kogi State and 4,045 copies of the questionnaire were returned, with a response rate of 97%.

Table 4.5: Questionnaire Administration and Response Rate

Questionnaire	Frequency	Percentage (%)
Number questionnaires administered	4170	100%
Number questionnaire returned	4045	97%

4.6 Demographic Information of Respondents

This section presents the breakdown of respondents used for this study based on gender, age range, and occupation. Table 4.6.1 shows the distribution of respondents by gender, age, and occupation. In Kogi State, 60% of the respondents were males as compared to 40% females. The age range of 34-41 ranked highest with 35%. As regards occupation, farmers were 50%, market women were 28%, while road transport workers and civil servants accounted for the remaining 22%.

Table 4.6.1: Distribution of the Respondents by Gender, Age and Occupation in Kogi State

Gender	**Frequency**	**Percentage (%)**
Male	2427	60.0
Female	1618	40.0
Total	**4045**	**100.0**
Age		
Age (Years)	**Frequency**	**Percentage (%)**
18-25	607	15.0
26-33	404	10.0
34-41	1416	35.0
42-47	1214	30.0
50+	404	10.0
Total	**4045**	**100.0**
Occupation		
Occupation	**Frequency**	**Percentage (%)**
Farmers	2023	50.0
Market women	1133	28.0
Road Transport workers	404	10.0
Civil servants	485	12.0
Total	**4045**	**100.0**

4.7 Causes of Flooding in Kogi State

On causes of flooding in Kogi State, 70% attributed it to excessive rainfall, release of water from dam, lack of drainage system and wrong disposal of refuse.

Table 4.7: Causes of Flooding in Kogi State

S/N	ITEMS Knowledge about causes of flooding:	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Excessive rainfall	-----	607 (15%)	------	-----
b.	Release of water from dam	------	202 (5%)	------	------
c.	Lack of drainage system	------	202 (5%)	-------	-------
d.	Wrong disposal of refuse	------	202 (5%)	-------	-------
e.	All of the above	2832 (70%)	---------	-------	--------
f.	None of the above	------	-------	--------	--------

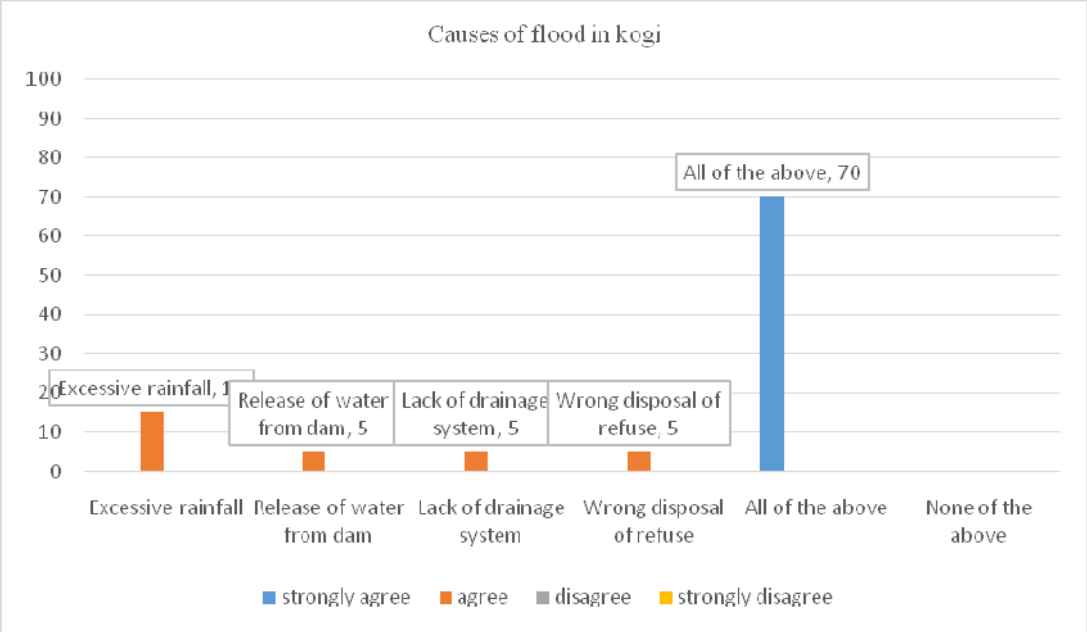

Fig.7: Causes of Flood in Kogi State

4.8 Relationship between Flooding and Food Availability in Kogi State

On how flooding has affected the household and community, 40% of the respondents claimed that there was decrease in food production during flooding.

Table 4.8 Relationship between Flooding and Food Availability in Kogi State

S/N	ITEMS Flooding has affected my household and community in the following way:	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Flooding is said to improve the availability of farm produce.	------	-----	-----	1416 (35%)
b.	There was decrease in food production during flooding in your community.	1618 (40%)	------	------	-----
c.	Wanton destruction of harvested farm produce was experienced.	1011 (25%)	-----	-----	----

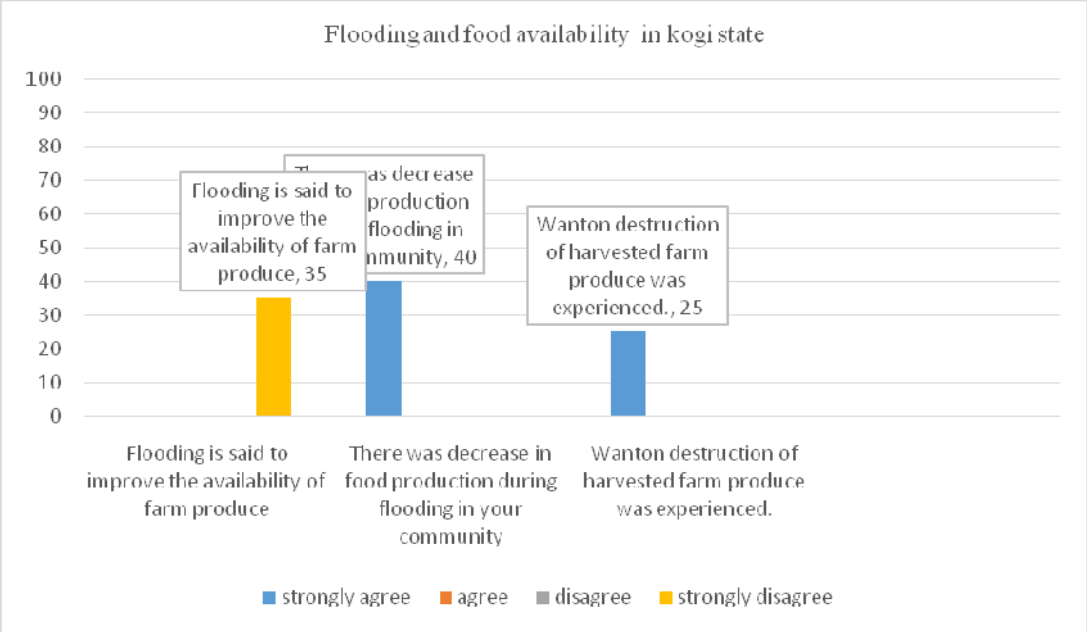

Fig. 8: Flooding and food availability in Kogi State

4.9.1 Relationship between Flooding and Food Accessibility in Kogi State

On impact of flooding on food security in terms of food accessibility, 50% of the respondents in Kogi State strongly agreed that there was lack of access to farm produce during flooding.

Table 4.9.1 Relationship between Flooding and Food Accessibility in Kogi State

S/N	ITEMS Flooding has affected my household and community in the following way:	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	There was lack of access to farm produce during flooding.	2023 (50%)	----	-----	-----
b.	During the flooding we had access to much food in our families and communities.	------	------	-----	405 (10%)
c.	Many feeder roads were destroyed and it was difficult to move farm produce from one community to the other.	1618 (40%)	------	------	------

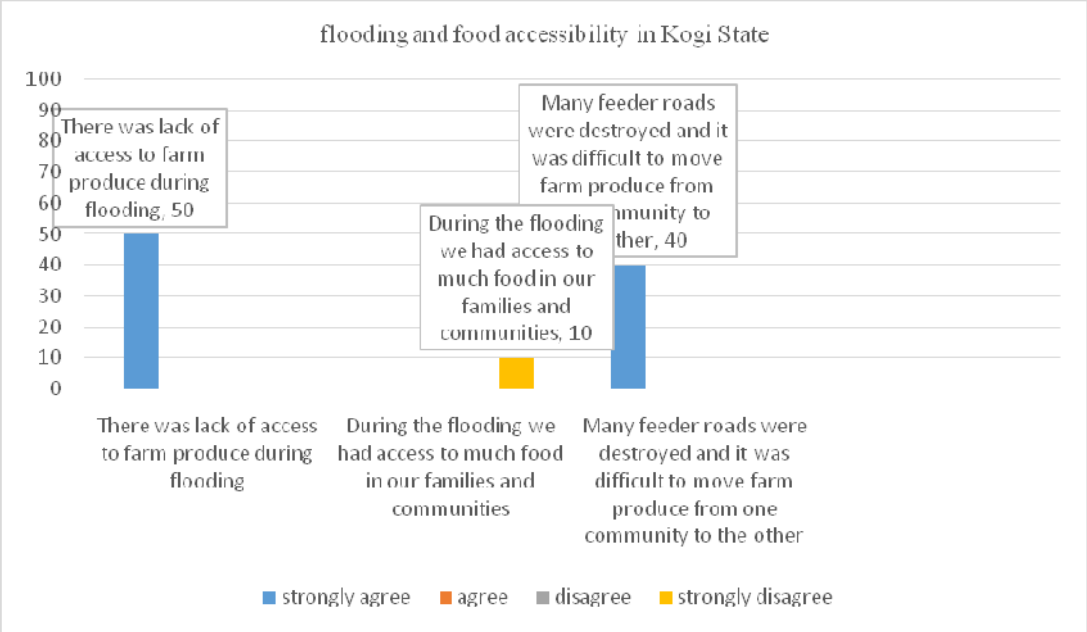

Fig. 9: Flooding and Food Accessibility in Kogi State

4.9.2 Relationship between Flooding and Food Affordability in Kogi State

On impact of flooding on food security in terms of food affordability, 80% of the respondents strongly agreed that market prices of foodstuffs were higher during incessant flooding in Kogi State.

Table 4.9.2 Relationship between Flooding and Food Affordability in Kogi State

S/N	ITEMS Flooding has affected my household and community in the following way:	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Farm produce are cheaper during flooding in your community.	------	-----	----	405 (10%)
b.	Prices of food are generally stable during flooding in your community.	-----	-----	----	405 (10%)
c.	Market prices of foodstuffs are higher during incessant flooding in your community.	3235 (80%)	----	-----	-----

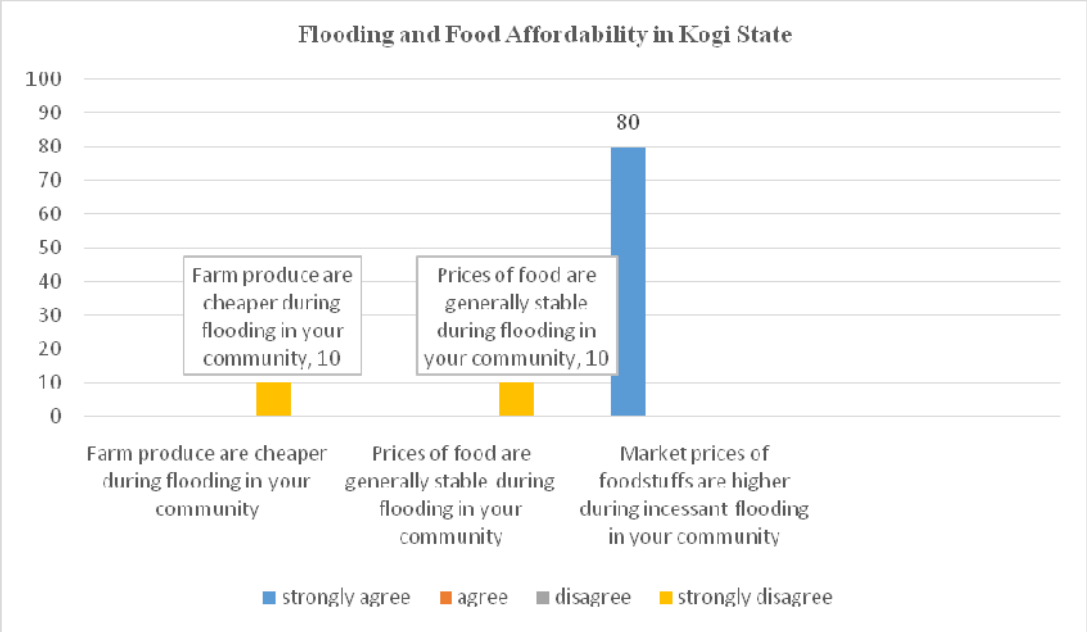

Fig. 10: Flooding and Food Affordability in Kogi State

4.9.3 Relationship between Flooding and Food Utilisation in Kogi State

On impact of flooding on food security in terms of food utilisation, 70% of the respondents in Kogi State strongly agreed that there was destruction of storage facilities during flooding in their community.

Table 4.9.3: Relationship between Flooding and Food Utilisation in Kogi State

S/N	ITEMS Flooding has affected my household and community in the following way:	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Food utilisation is made better during flooding in your community.	------	------	-----	607 (15%)
b.	Flood has no effect on stored farm produce.	------	------	-----	607 (15%)
c.	There was destruction of storage facilities during flooding in your community	2831 (70%)	------	-----	-----

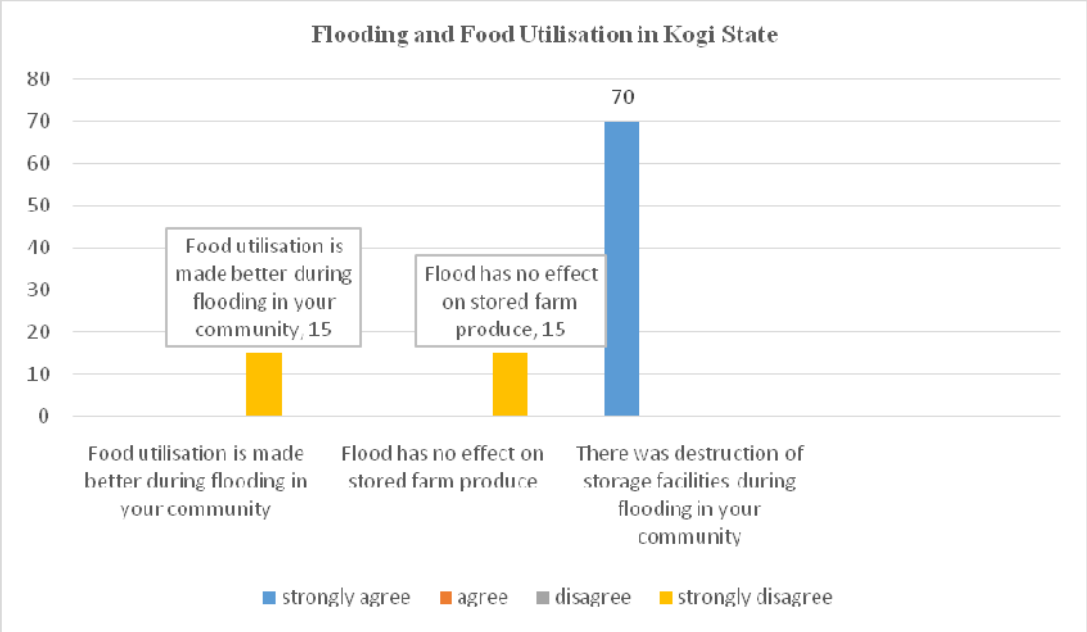

Fig. 11: Flooding and Food Utilisation in Kogi State

4.9.4 Extent of the 2012 Flooding on Farming Communities in Kogi State

On extent of the 2012 flooding on farming communities in Kogi State, 75% of the respondents strongly agreed that flooding is known to be destructive to farming activities in their community as reflected in Table 4.9.4.

Also, on the extent of flooding on farming communities in Kogi State, some of the respondents described it as mild; others said it was moderate, while a high percentage perceived it as being severe as reflected in Table 4.9.5.

Table 4.9.4: Extent of the 2012 Flooding on Farming Communities in Kogi State

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Flooding is known to be destructive to farming activities in your community	3034 (75%)	------	------	-----
b.	During the period of the flood, transportation and movement of people from one place to the other was negatively affected	1011 (25%)	------	-----	------

Table 4.9.5: Extent of Flooding on Farming Communities in Kogi State

S/N	ITEMS Flooding between 2010 and 2015 in your community can be described as…….	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Mild	------	--------	------	202 (5%)
b.	Moderate	-------	1011 (25%)	-------	------
c.	Severe	2832 (70%)	------	--------	-------

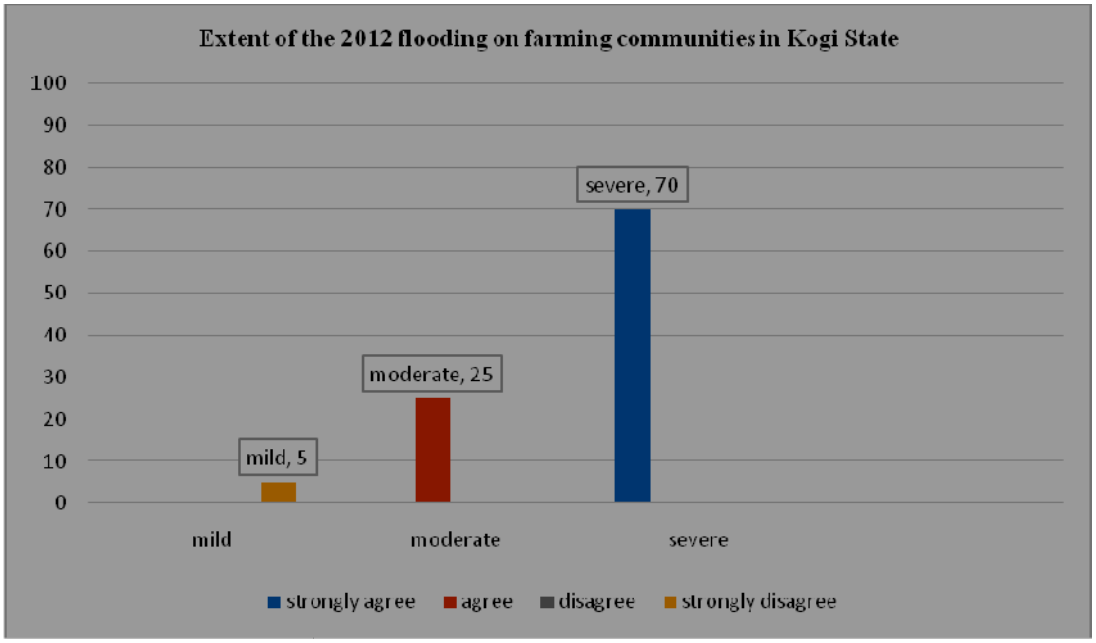

Fig. 12: Extent of the 2012 Flooding on Farming Communities in Kogi State

Flooding between 2010 and 2015 in Kogi State was described as severe (70%), while 70% of the respondents also strongly agreed that flooding led to the destruction of farmlands, houses and public infrastructure as reflected in Table 4.9.6.

Table 4.9.6: Flooding destruction between 2010 and 2015 in Kogi State

S/N	ITEMS Flooding between 2010 and 2015 in your community led to the destruction of:	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Farmlands	------	1214 (30%)	-----	-----
b.	Houses	-----	------	------	------
c.	Public infrastructure	------	------	------	------
d.	All of the above	2831 (70%)	------	-----	------
e.	None of the above	------	-----	-----	------

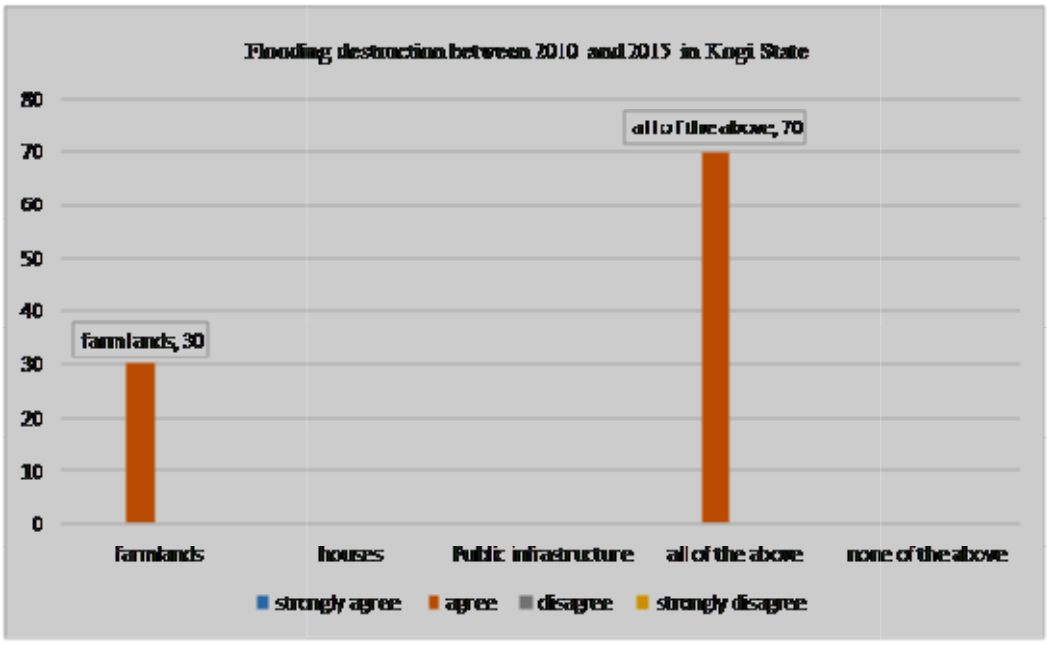

Fig.13: Flooding destruction between 2010 and 2015 in Kogi State

As shown in Table 4.9.7, all the respondents in Kogi State strongly agreed that year 2012 experienced the most serious flooding.

Table 4.9.7: Year that experienced the most serious flooding in Kogi State

S/N	ITEMS Which year experienced the most serious flooding?	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	2010	-----	------	-----	------
b.	2011	------	-----	------	-------
c.	2012	4045 (100%)	--------	------	-----
d.	2013	------	-----	-----	------
e.	2014	------	------	------	------
f.	2015	------	------	------	------

On the rate of loss in farming communities in Kogi State as shown in Table 4.9.8, the rate of loss was found to be extremely high (80%).This was calculated based on the numbers of respondents that answered section G, item 13 of the questionnaires which is a total of 4,044 out of 4,170.

Table 4.9.8: Rate of loss on farming communities in Kogi State

S/N	ITEMS How would you rate your loss?	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Extremely High (entire farmland)	3235 (80%)	------	------	-------
b.	Very High	------	405 (10%)	-----	------
c.	High	-------	405 (10%)	-----	------
d.	Low	------	-----	----	-------

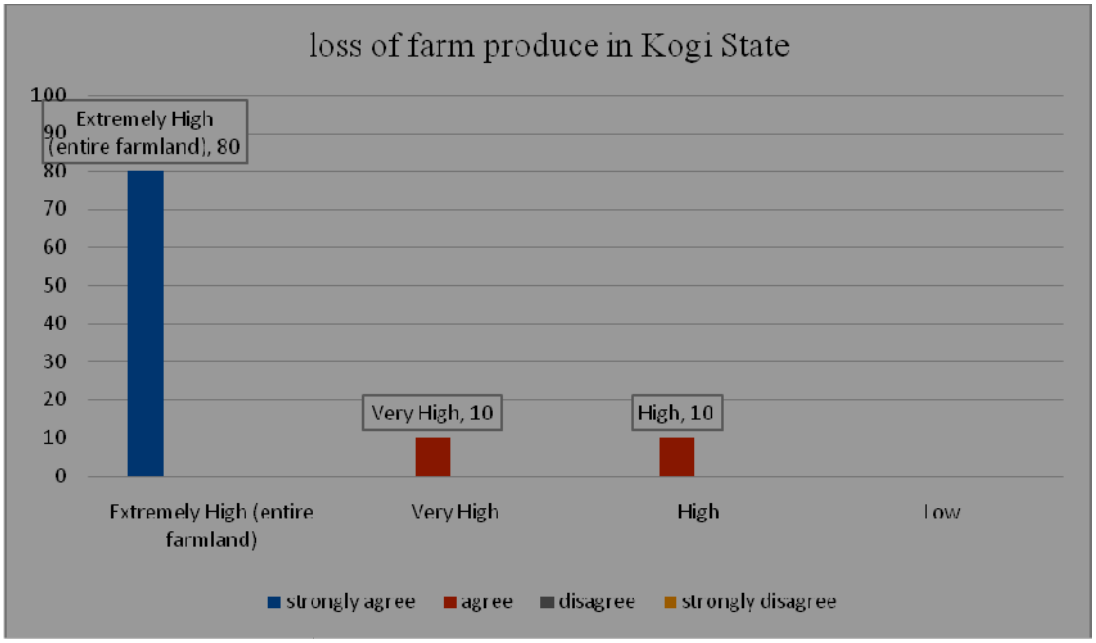

Fig.14: Loss of Farm Produce in Kogi State

4.9.9 Response Mechanisms put in place by different Stakeholders in Kogi State

On response mechanisms put in place by different stakeholders in Kogi State, 40% of the respondents strongly disagreed that the government and non-governmental organisations have been able to provide permanent solution to the perennial flooding.

Table 4.9.9: Response mechanisms put in place by different stakeholders in Kogi State

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	During the flood between 2010 and 2015, the victims were abandoned by Government and Non-Govt. Organisations	------	-----	-----	607 (15%)
b.	The relief materials were enough to help the victims of flood disaster in your community	-----	-----	607 (15%)	-----
c.	Every victim of flood disaster between 2010 and 2015 in your community had a fair share of the relief materials	-----	----	1213 (30%)	------
d.	The government and non-governmental organisations have been able to provide permanent solution to the perennial flooding in your community	-----	------	------	1618 (40%)

4.9.10 Flooding and Farm Yield in Kogi State

Annual yield for yam before flooding was found to be between 2000 and 3000 (40%), while after flooding, yam was found to be less than 1000 tubers as reflected in Table 4.9.11

Table 4.9.10: Annual Yield for Yam before flooding in Kogi State

S/N	ITEMS a. Your annual yield for yam before flooding was:	
A	Less than 1000 tubers	-----
B	1000-2000	809 (20%)
C	2000-3000	1618 (40%)
D	3000-4000	1011 (25%)
E	Above 4000	607 (15%)

Table 4.9.11:Annual Yield for Yam after flooding in Kogi State

S/N	MEASUREMENT b. Your annual yield for yam after flooding was:	
A	Less than 1000 tubers	3236 (80%)
B	1000-2000	809 (20%)
C	2000-3000	-----
D	3000-4000	-------
D	Above 4000	--------

Annual yield for rice, maize and cassava (*garri*) before flooding was 70% (20-30 bags), 50% (above 40 bags), and 55% (30-40 bags) respectively, while after flooding, it was found to be 70% (10-20 bags), 40% (10-20 bags) and 80% (10-20 bags), as reflected in the Tables 4.9.12 and 4.9.13.

Table 4.9.12:Annual Yield for Rice, Maize and Cassava (*garri*) before Flooding in Kogi State

S/N	Measurement a. Your annual yield for rice, maize and cassava (*garri*) before flooding was:	Rice	Maize	Cassava (*garri*)
A	Less than 10 bags	-----	----	-----
B	10-20 bags	405 (10%)	-----	-----
C	20-30 bags	2831 (70%)	809 (20%)	1214 (30%)
D	30-40 bags	809 (20%)	1214 (30%)	2224 (55%)
E	Above 40 bags	-----	2022 (50%)	607 (15%)

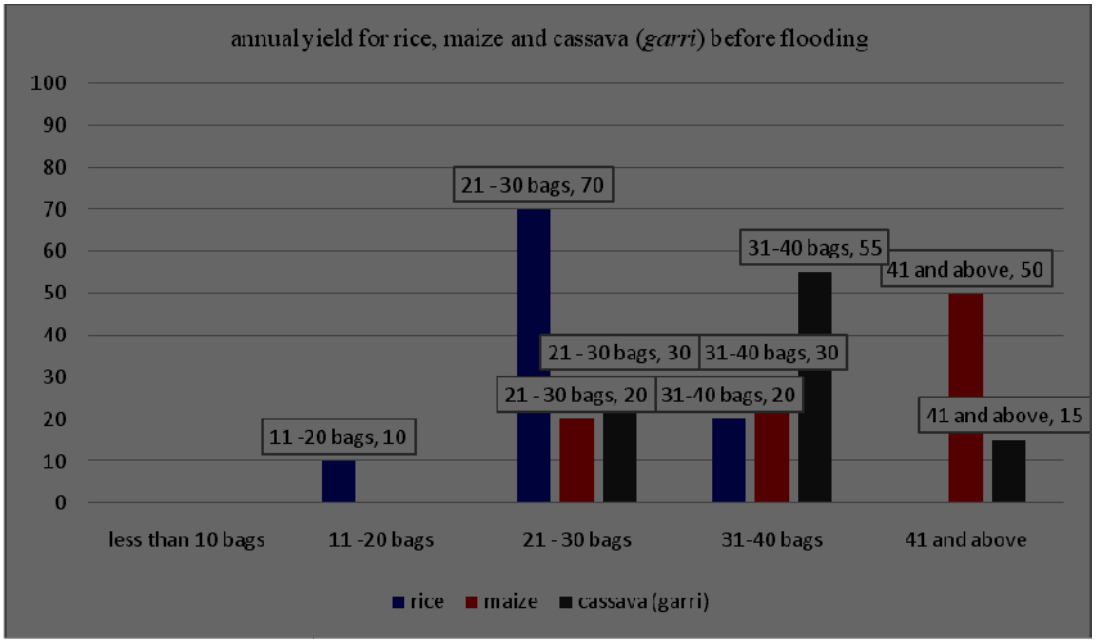

Fig.15:Annual Yield for Rice, Maize and Cassava (*garri*) before Flooding

Table 4.9.13:Annual Yield for Rice, Maize and Cassava (*garri*) after Flooding in Kogi State

S/N	Measurement b. Your annual yield for rice, maize and cassava (*garri*) after flooding was:	Rice	Maize	Cassava (*garri*)
A	Less than 10 bags	607 (15%)	1214 (30%)	-----
B	10-20 bags	2831 (70%)	1617 (40%)	3236 (80%)
C	20-30 bags	607 (15%)	1214 (30%)	809 (20%)
D	30-40 bags	-----	-----	----
E	Above 40 bags	-----	-----	------

From the study, it was inferred that both male which represents 60 per cent and female which represents 40 percent of the respondents in the selected farming communities were affected by flood disaster within the period of study.Interviewees identified extensive soil excavation by local builders, inadequate drainages and indiscriminate waste disposal as factors that contributed to flooding. Majority of farmers affirmed that flooding affected food availability, accessibility, affordability and utilisation. Records from Kogi State Ministry of Agriculture showed that yield in 2012 alone decreased by 560 metric tonnes from 1,360 metric tonnes when compared with the previous year. A total number of 3,344 of the farmers affirmed that their farm produce and livestocks were destroyed. This was corroborated by reports from NEMA Post Disaster Needs Assessment, which showed that homes, farmlands, livestocks, community markets, bridges and access roads were destroyed. Majority of respondents opined that government and non-governmental organisations provided them with temporary relief materials, though they were inadequate in meeting the immediate needs of the farmers.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS, AND CONCLUSION

5.1 Summary

The study provided empirical evidence for causes of flooding and supports other previous findings on impact of flood on food security. The result of the research revealed that the people were not well prepared in advance on flood management and control activities. They therefore watched helplessly as human and animal lives were lost, their entire sources of livelihood, their homesteads, sources of good water supply, roads and other infrastructure were all destroyed by the ravaging floods and the area infested by snakes, flies and other disease vectors.

5.2 Recommendations

Response mechanism by Government and its agencies was acknowledged. It was concluded that most of the interventions did not get to the hand of the flood victims. Although the government responded to the flood disaster in some ways or the other, some agencies and individuals still believed that the government needs to do more. However, to improve food security and livelihoods status among the studied communities, the following initiatives are recommended as contribution to policy framework and implementation for individuals and government:

1. Floods occasioned by climate change have become an inevitable reality, therefore groups and communities living and farming around the river banks should identify higher plains where they can temporarily relocate to during floods in order to guide against becoming victim to floods.

2. Civil society and agencies working on the environment should incorporate disaster risk management including flood risk, particularly about early warning signal, preparedness and early response in their advocacy.

3. A thorough review and painstaking implementation of policies on flood mitigation, management and identification of flood zones. This must be followed up ensuring adoption, participation and assimilation by the people of Kogi State and other riverine areas in the country.
4. Utilising local administrative structures and peculiarity with a view to developing unique flood prevention strategies as well as timely warnings, relocation, land use plan, fumigation, in addition to establishing clearance for water ways and channels for drainage among other actions.
5. Mobilising the local people so as to be better equipped, empowered and resilient to the natural disaster peculiar to their environment, while curbing the tendency of rural-urban migration practices especially among the youths in the area. Grouping into cooperative societies of people inhabiting riverine communities so as to facilitate capacity building engender support and joint benefits by aggregating resources, sharing of information and robust participation of the people in programmes designed for their welfare.
6. The Ministry of Agriculture through the cooperative groups in the riverine communities should provide quick maturing crop and animal species, as well as other inputs to farmers, while also providing extension services and quick harvest and storage mechanisms and facilities so as to encourage the community members to expand, improve and cultivate more agricultural areas during the dry season so as to enhance their living condition and food security.
7. Government and other agencies should work on early warning mechanisms and educate households about the possible disastrous impacts of floods and other calamities and make them aware of resilient mechanisms of thwarting food insecurity and also train them in coping mechanisms in the event of such disasters.
8. Food security has to be addressed using a multi-sectoral approach to mitigate the disastrous impacts of floods. The inter-linkages between various socio-economic

factors have to be addressed to determine how flood disasters affect attainment of food security.

9. Dredging of Rivers Niger and Benue will go a long way to enhance water retaining capacity.
10. Construction of buffer dam along Rivers Niger and Benue will further limit the likelihood of flood due to release of excess water.
11. Feeder roads should be constructed in order to facilitate the evacuation of farm produce from various farms to the nearest market.

5.3 Conclusion

In rain dependent agricultural economy, erratic rainfall causing unexpected floods can create devastating impacts on food security of the people and their livelihoods. Floods are the most common natural disaster causing loss of lives and economic damage in various parts across the globe. They result in loss of property, destruction of the environment and many times lead to loss of lives. The burden of floods is often in different dimensions which could be social, economic, and environmental in nature. The negative and positive consequences of flood differ in magnitude, location as well as depending on the peculiar vulnerabilities and value of the natural and constructed environments affected.

Floods impact on infrastructure were severe in the study area as the surroundings were completely marooned and long stretches of roads were damaged completely delinking the other side of the world for some period. The damaged infrastructure impacted services delivery such as education, agriculture and health in the study area negatively. Agriculture and livestock got severely affected during floods. Food stocks with the households dwindled resulting in food shortages. As a result, the households were not able to feed themselves and their children sufficiently. Added to this, less responsive public distribution system, declining wages and increasing borrowing by the households worsened the food security situation. Floods have impacted the social systems and food habits too. In addition, they have posed a high risk of water contamination in the affected areas. In the study area, the people experienced a decline in their earnings, crops were destroyed and there was constrained access to food.

The study suggests that severity of the floods and food security are positively associated. As expected, flood and food availability, accessibility and utilisation were found to be negatively associated. This clearly demonstrates the importance of wage employment in addressing the food security issue in the tribal areas.

Due to incessant rains and sudden floods, the study area was affected with several health problems including the rise in malaria incidents. The occurrence of floods resulted in increase in borrowing. Changed food habits and food insecurity are also positively associated as the households shifted to lesser quality of food to support their families during the period of floods.

There is need for the Government to earmark realistic financial, human and material resources to secure areas that are prone to incessant flooding. This is to be done in a manner that such incidents are prevented across built up areas during and after rains, so as to ascertain the floatability of new suburbs. Physical and town planners as well as policy formulators understand natural disasters like floods are destructive, while occurring unexpectedly, occasionally and otherwise. These points to the need for serious planning and forecast of likelihood of a disaster cannot be over-emphasised. There is need for improved urban planning and sustainable environmental management coupled with accelerated development for sustainable growth, effort to intensify flood control and management, irrigation and climate change initiatives. There is need for environmental sensitisation and education on radio, newspapers, television, magazines, in every public forum and at all levels of education.

5.4 Limitation of the Study

Food security is multi-faceted, this study confined itself to the impact of flood on food security, however, all other factors could not be examined, for example, soil chemistry, climate change, pest infestation etc. Language barrier was also a challenge, but indigenous interpreters were hired for effective communication.

5.5 Contribution to Knowledge

There has been series of studies on environment and flood in general. However, none has examined the critical impact of flood and food security; against this background, the work has significantly contributed to the body of knowledge in terms of the nexus between food security and flooding.

5.6 Suggestions for Further Research

To have a more comprehensive understanding on food security, dimensions of soil chemistry and climate change phenomenon should be explored. This study should be carried out in all the geopolitical zones of the country to allow comparison of data as pertaining to the prevailing situations across the country.

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APPENDIX I

INSTITUTE FOR PEACE & STRATEGIC STUDIES
UNIVERSITY OF IBADAN, IBADAN

Dear respondent,
This Questionnaire is designed to elicit information on flood disaster and food security in Kogi State, Nigeria. It will be highly appreciated if you answer the questions raised in this questionnaire as honestly as possible. Please, be assured that all responses will be treated with confidentiality and used only for academic purposes. Your anonymity is guaranteed as you are not required to write your name on the questionnaire. Please, answer all questions. Note that there is no right or wrong answer. Your timely response in filing this questionnaire will be highly appreciated.
Thank you very much.
Yours faithfully,

Adesoji E. Adeoye
Matric No.: 29425

Section A: Demographic data
Instruction: Please answer all the questions listed below.

1. State: ……
2. Gender: Male [ ] Female [ ]
3. Age (in complete years):18-25 [ ], 26-33 [ ], 34-41 [ ], 42-47 [ ], 50+ [ ]
4. Marital Status: a. Single [ ] b. Married [ ] separated [ ]
   c. Divorced [ ] d. Widowed [ ]
5. Occupation:……

Section B: Causes of flooding

Please, respond to the following questions on causes of flooding by ticking Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree SD)

6. Knowledge about causes of flooding:

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Excessive rainfall				
b.	Release of water from dam				
c.	Lack of drainage system				
d.	Wrong disposal of refuse				
e.	All of the above				
f.	None of the above				

Section C: Relationship between Flooding and Food Availability

Please, respond to the following questions on relationship between flooding and food security in terms of food availability by ticking Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

7a. Flooding has affected my household and community in the following way:

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Flooding is said to improve the availability of farm produce.				
b.	There was decrease in food production during flooding in your community.				
c.	Wanton destruction of harvested farm produce was experienced.				

Section D: Relationship between Flooding and Food Accessibility

Please, respond to the following questions on relationship between flooding and food security in terms of food accessibility by ticking Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

7b. Flooding has affected my household and community in the following way:

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	There was lack of access to farm produce during flooding.				
b.	During the flooding we had access to much food in our families and communities.				
c.	Many feeder roads were destroyed and it was difficult to move farm produce from one community to the other.				

Section E: Relationship between Flooding and Food Affordability

Please, respond to the following questions on relationship between flooding and food security in terms of food affordability by ticking Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

7c. Flooding has affected my household and community in the following way:

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Farm produce are cheaper during flooding in your community.				
b.	Prices of food are generally stable during flooding in your community.				
c.	Market prices of foodstuffs are higher during incessant flooding in your community.				

Section F: Relationship between Flooding and Food Utilisation

Please, respond to the following questions on relationship between flooding and food security in terms of food utilisation by ticking Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

7d. Flooding has affected my household and community in the following way:

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Food utilisation is made better during flooding in your community.				
b.	Flood has no effect on stored farm produce.				
c.	There was destruction of storage facilities during flooding in your community				

Section G: Extent of the 2012 flooding on farming communities

Please, respond to the following questions onExtent of the 2012 flooding on farming communities by ticking Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
8.	Flooding is known to be destructive to farming activities in your community				
9.	During the period of the flood, transportation and movement of people from one place to the other was negatively affected				

10. Flooding between 2010 and 2015 in your community can be described as……

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Mild				
b.	Moderate				
c.	Severe				

11. Flooding between 2010 and 2015 in your community led to the destruction of:

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Farmlands				
b.	Houses				
c.	Public infrastructure				
d.	All of the above				
e.	None of the above				

12. Which year experienced the most serious flooding?

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	2010				
b.	2011				
c.	2012				
d.	2013				
e.	2014				
f.	2015				

13. How would you rate your loss?

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE`	STRONGLY DISAGREE
a.	Extremely High (entire farmland)				
b.	Very High				
c.	High				
d.	Low				

Section H: Response mechanisms put in place by different stakeholders

Please, respond to the following questions onresponse mechanisms put in place by different stakeholders by ticking Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

S/N	ITEMS	STRONGLY AGREE	AGREE	DISAGREE `	STRONGLY DISAGREE
14	During the flood between 2010 and 2015, the victims were abandoned by Government and Non-Govt. Organisations				
15	The relief materials were enough to help the victims of flood disaster in your community				
16	Every victim of flood disaster between 2010 and 2015 in your community had a fair share of the relief materials				
17	The government and non-governmental organisations have been able to provide permanent solution to the perennial flooding in your community				

Section I: Flooding and farm yield

Please, respond to the following questions onflooding and farm yield by ticking as appropriate

18a. Your annual yield for yam before flooding was:

S/N	ITEMS	
A	Less than 1000 tubers	
B	1000-2000	
C	2000-3000	
D	3000-4000	
D	Above 4000	

Please, respond to the following questions onflooding and farm yield by ticking as appropriate.

18b. Your annual yield for yam after flooding was:

S/N	MEASUREMENT	
A	Less than 1000 tubers	
B	1000-2000	
C	2000-3000	
D	3000-4000	
D	Above 4000	

Please, respond to the following questions on flooding and farm yield by ticking as appropriate

19a. Your annual yield for rice, maize and cassava (*garri*) before flooding was:

S/N	Measurement	Rice	Maize	Cassava (*garri*)	
A	Less than 10 bags				
B	10-20 bags				
C	20-30 bags				
D	30-40 bags				
E	Above 40 bags				

Please, respond to the following questions on flooding and farm yield by ticking as appropriate

19b. Your annual yield for rice, maize and cassava (*garri*) after flooding was:

S/N	Measurement	Rice	Maize	Cassava (*garri*)
A	Less than 10 bags			
B	10-20 bags			
C	20-30 bags			
D	30-40 bags			
E	Above 40 bags			

APPENDIX II

Focus Group Discussion (FGD) Guide with Farmers affected by the 2012 Flood Disaster

1. What are the causes of flood?
2. Can your system of farming cause flood?
3. What are the human practices that can lead to flood?
4. When flood happens, how does it affect food accessibility and affordability?
5. What is the effect of the flood on farm produce?
6. What is the effect of the flood on business?
7. What are the response mechanisms put in place by the stakeholders?

APPENDIX III

In-Depth Interview Guide with Farmers

1. I learnt you are the head of the farmers' association in this village?
2. Tell us briefly what happened in 2012 concerning the flood that devastated Kogi State vis-a- vis your farm lands.
3. Are you saying that the flood destroyed your farm lands?
4. Was your farm produce that year very low or not?
5. Is it true that you could not have access to harvest your farm produce during the flood?
6. What happened to the cost of your farm produce that year? Was it cheaper or very expensive?

APPENDIX IV

Focus Group Discussion Guide with Market Women

1. What are the causes of flood?

2. Is there any relationship between flood and food security?

3. What is the impact of flood on your business?

4. Did the Government make any move to rehabilitate you?

5. If there is an effort to relocate you, are you willing to leave?

6. Was there a drainage constructed in the market to prevent reoccurrence?

APPENDIX V

In-Depth Interview Guide with Market Women

1. Are you the leader of all these women?

2. What are the articles you sell in this market?

3. Can you tell us a little bit of your experience when the flood happened?

4. As a trader, how were you able to transport your goods during the period?

5. Was the cost of food items higher or lesser after the flood?

6. The things you used to buy from the farm, were they still available?

7. How did you keep your business running during the period of the flood?

APPENDIX VI

Focus Group Discussion (FGD) Guide with NURTW

1. Are you involved with the transportation of people from one village to another?

2. How was your business affected during this period?

3. What are the efforts of government, religious leaders, churches, mosques, voluntary organisations, to reduce your problem?

4. Has there been any measure put in place to prevent reoccurrence?

APPENDIX VII

In-Depth Interview Guide with NURTW

1. Can you tell me a little bit of your experience when the flood happened?

2. What is the impact of the flood on your family?

3. What was done by the government, NGOs, religious bodies to support you?

4. What is your advice to the government on flood issue?

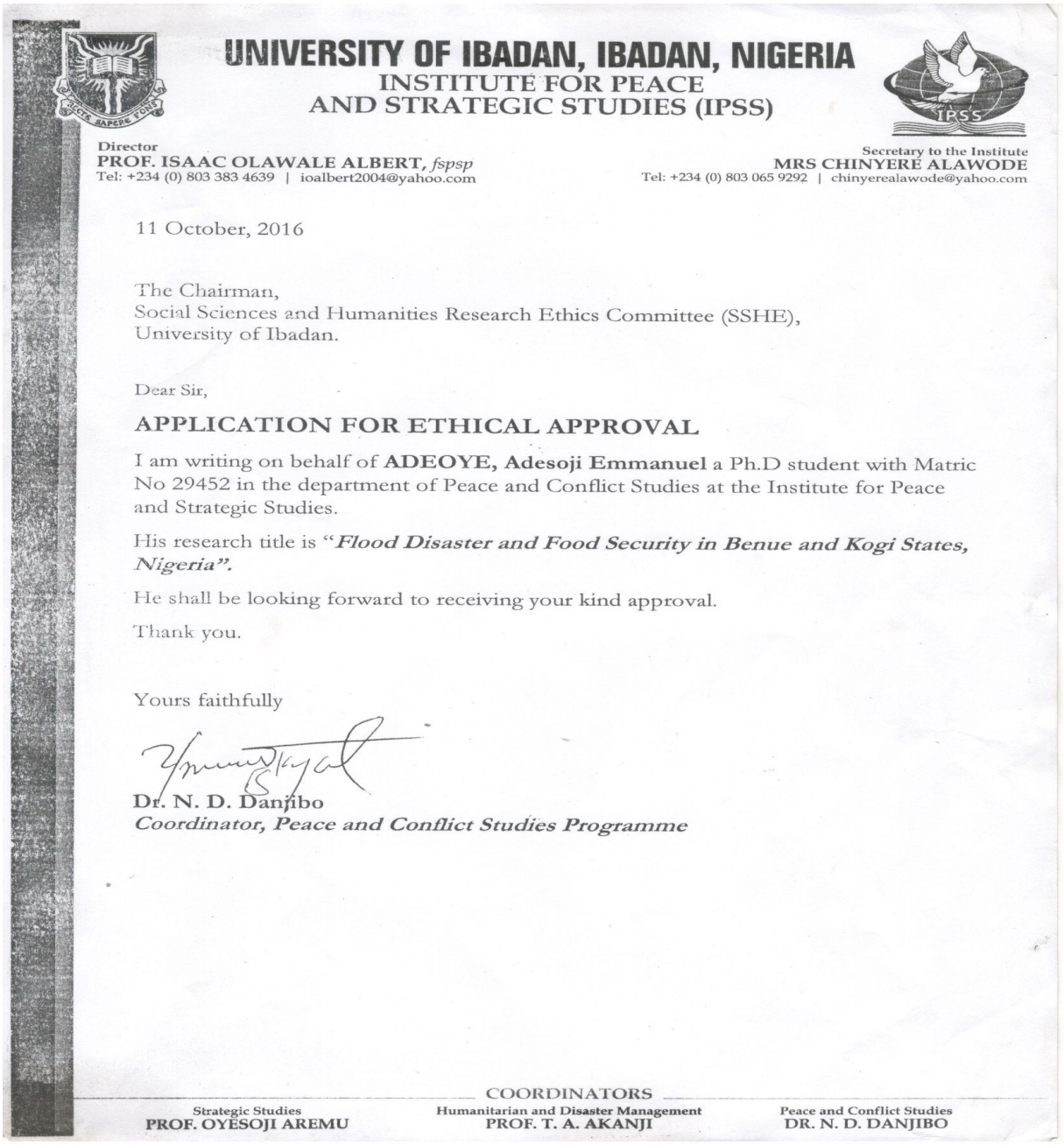
APPENDIX VIII

Key Informant Interview Guide

1. What are the causes of flooding that you are aware of?
2. What are the human practices that can cause flooding?
3. Is there any relationship between flooding and food security?
4. Which impact is more pronounced - the negative or the positive?
5. Are you saying that despite the impact of the flooding, security of food was not affected?
6. What are the response mechanisms put in place by the stakeholders?
7. What intervention assistance was offered by government to the flood victims?
8. What are the things provided to flood victims in order to help them?

APPENDIX IX

Ethical Approval



UNIVERSITY OF IBADAN, IBADAN, NIGERIA
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11 October, 2016

The Chairman,
Social Sciences and Humanities Research Ethics Committee (SSHE),
University of Ibadan.

Dear Sir,

APPLICATION FOR ETHICAL APPROVAL

I am writing on behalf of **ADEOYE, Adesoji Emmanuel** a Ph.D student with Matric No 29452 in the department of Peace and Conflict Studies at the Institute for Peace and Strategic Studies.

His research title is "***Flood Disaster and Food Security in Benue and Kogi States, Nigeria".***

He shall be looking forward to receiving your kind approval.

Thank you.

Yours faithfully

Dr. N. D. Danjibo
Coordinator, Peace and Conflict Studies Programme

COORDINATORS

Strategic Studies	Humanitarian and Disaster Management	Peace and Conflict Studies
PROF. OYESOJI AREMU	PROF. T. A. AKANJI	DR. N. D. DANJIBO

APPENDIX X

Certificate of completion at Centre for Bioethics and Research

Center for Bioethics & Research

Thursday, October 26, 2017

NHREC/TR/02/06/2007a

Certificate

In recognition of successful completion of Center for Bioethics and Research, Nigeria and the University of Miami, Florida online course

This certifies that

Adesoji Emmanuel Adeoye

AS A SOCIAL AND BEHAVIOURAL STUDENT

- *reviewed regulatory and informational documents on human-subject protection*
- *passed a quiz on the responsible conduct of human studies*
- *signed a statement of commitment to the protection of the rights and welfare of human subjects participating in research.*

Dr. Clement A. Adebamowo
BM ChB (Hons), FWACS FACS ScD
Director, Center for Bioethics and Research

Cc: Program Administrator

102, Basorun Road, Ashi, Ibadan.
P.O. Box 29822, Secretariat Post Office, Ibadan, Oyo State, Nigeria.
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APPENDIX XI

Plate 5: Researcher with participants after the Focus Group Discussion in Ofu, Kogi State

Plate 6: Researcher with participants after the Focus Group Discussion in Ofu, Kogi State

Plate 7: Researcher with participants after the Focus Group Discussion in Ofu, Kogi State

Plate 8: Researcher with participants after the Focus Group Discussion in Ofu, Kogi State

APPENDIX XII

Plate 9: Researcher with participants after the Focus Group Discussion in Lokoja, Kogi State

Plate 10: Researcher with participants after the Focus Group Discussion in Lokoja, Kogi State

APPENDIX XIII

Plate 11: Researcher with a participant during an In-depth Interview (IDI) in Kogi State

Plate 12: Researcher with a participant during an In-depth Interview (IDI) in Kogi State

Plate 13: Researcher with a participant during an In-depth Interview (IDI) in Kogi State

APPENDIX XIV

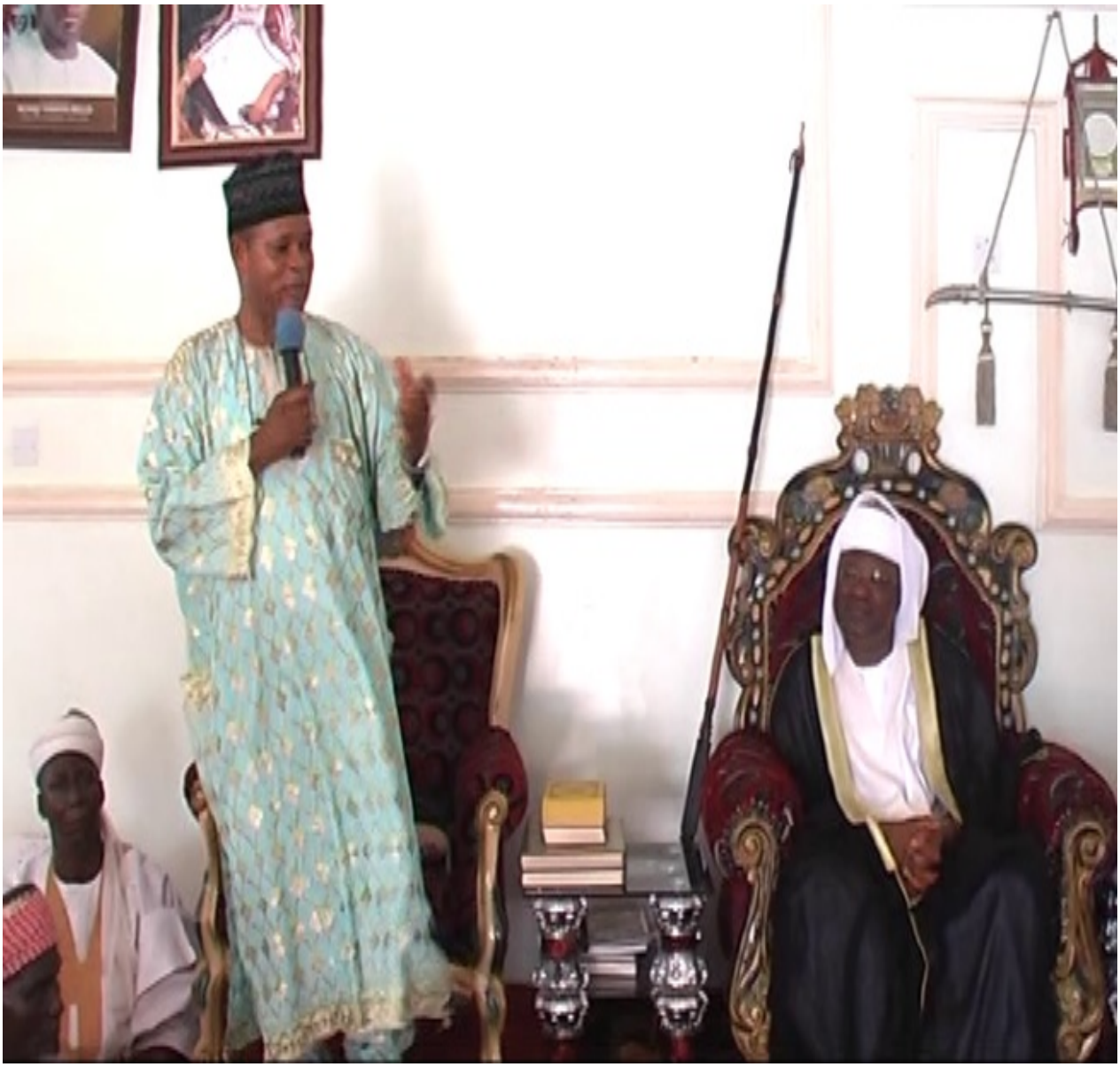

Plate 14: Researcher with a participant during a Key Informant Interview (KII) in Ibaji, Kogi State

Plate 15: Researcher with a participant during a Key Informant Interview (KII) in Ibaji, Kogi State

APPENDIX XV

Plate 16: Researcher with a participant during a Key Informant Interview (KII) in Igalamela, Kogi State

APPENDIX XVI

Plate 17: Researcher with a participant during a Key Informant Interview (KII) in Bassa, Kogi State

APPENDIX XVII

Plate 18: Researcher with a participant during a Key Informant Interview (KII) in Bassa, Kogi State

Plate 19: Researcher with a participant during a Key Informant Interview (KII) in Bassa, Kogi State

Plate 20: Researcher with a participant during a Key Informant Interview (KII) in Bassa, Kogi State

APPENDIX XVIII

Plate 21: Ajaokuta Local Government Area

APPENDIX XIX

Plate 22: Bassa Local Government Area

APPENDIX XX

Plate 23: Ofu Local Government Area

APPENDIX XXI

Plate 24: Igalamela Local Government

APPENDIX XXII

Plate 25: Researcher with participants after the Focus Group Discussion in Ibaji, Kogi State

APPENDIX XXIII

Plate 26: Researcher with participants after the Focus Group Discussion in Idah, Kogi State

APPENDIX XXIV

Plate 27: Researcher with participants after the Focus Group Discussion in Ofu, Kogi State

APPENDIX XXV

Plate 28: Researcher with a participant during a Key Informant Interview (KII) in Ajaokuta, Kogi State

APPENDIX XXVI

Plate 29: Researcher with participantsafter a Focus Group Discussion (FGD) in Igalamela, Kogi State

APPENDIX XXVII

Plate 30: Researcher inspecting record of calibration of Flood Magnitude

APPENDIX XXVIII

Plate 31: Researcher with participantsafter a Focus Group Discussion (FGD) in Igalamela, Kogi State

APPENDIX XXIX

Plate 32: Researcher with participantsafter a Focus Group Discussion (FGD) in Lokoja, Kogi State

APPENDIX XXX

Plate 33: Researcher with participantsafter a Focus Group Discussion (FGD) in Lokoja, Kogi State

APPENDIX XXXI

Plate 34: Researcher with a participant during a Key Informant Interview (KII) in Bassa, Kogi State

APPENDIX XXXII

Plate 35: Researcher with a participant during a Key Informant Interview (KII) in Ibaji, Kogi State