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Topic

IMPACT ASSESSMENT OF FLOOD DISASTER ON LIVELIHOODS OF FARMERS IN SELECTED FARMING COMMUNITIES IN OKE-OGUN REGION OF OYO STATE, NIGERIA

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DEDICATION

This project is dedicated to God Almighty, the all Sufficient God, the glorious God, the Ancient of Days, the lion of the tribe of Judah, Chief Shepherd, Rose of Sharon, Prince of peace, Mediator, Omnipresent, Omnipotent, Omniscience, Redeemer, Saviour, True vine, the lily of the valley, Good master, Eternal God, God of justice, King of kings, Lord of lords, Immutable, Indispensable, Indomitable, Reliable, the Creator, Unchangeable God, the Vine, how wonderful and amiable you are. Glory be to your name.

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ACCRONYMS

DFID: Department for International Development

GPS: Global Positioning System

ILO: International Labour Organisation

IPCC: Intergovernmental Panel on Climate Change

ISDR: International Strategy for Disaster Reduction

LGA: Local Government Area

OONP: Old Oyo National Park

SL: Sustainable Livelihood

UN: United Nations

UNDP: United Nations Development Programme

UNEP: United Nations Environmental Programme

WASCAL: West African Science Service Centre on Climate Change and Adapted Land use

WRI: World Resources Institute

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ABSTRACT

Oke-Ogun Area of Oyo State, which is widely known as the food basket of South-Western Nigeria, is a flood prone area exacerbated by climate variability. Therefore, this study was carried out mainly to assess the impact of flood disasters on the livelihoods of farmers in Oke-Ogun Region of Oyo state, Nigeria. The data collected through in-depth interview, structured questionnaires, Focused Group Discussions and portable GPS were subjected to analysis, using descriptive and inferential statistics. The results reveal that farmland's close proximity to river/stream, limited drainage system, frequent heavy rainfall, limited supports from external bodies during flooding are some of the factors that make the farmers vulnerable to flood disasters. The study also revealed that flooding has huge impact on their farmlands and limited impact on their houses. Furthermore, the study finds that the farmers have very low coping mechanisms as most of them do not have access to insurance facilities and do lack timely and precise flood early warning systems, flood local signs and community flood management committees. The study stresses a significant association between farmers' vulnerabilities and their livelihoods and recommended that government and relevant agencies should provide adequate drainage system, weather forecast, insurance facilities, and timely and precise flood early warning system to reduce farmers' vulnerabilities to flood disasters and enhance their livelihoods.

KEY WORDS

Vulnerability, flood, disasters, farmers, livelihoods, coping mechanisms, Oke-Ogun

RESUME

La région d'Oke-Ogun située dans l'état d'Oyo, qui est largement reconnu comme le grenier alimentaire du Sud-Ouest du Nigeria, est une zone sujette à l'inondation aggravée par la variabilité climatique. Pour cette raison, cette étude a été réalisée principalement pour évaluer l'impact des inondations sur les moyens de subsistance des agriculteurs dans la Région d'Oke-Ogun, Etat d'Oyo au Nigeria. Les données collectées au travers des interviews, questionnaires, discussions de groupe et utilisation de GPS portable ont été soumises à l'analyse, utilisant les statistiques descriptives et déductives. Les résultats révèlent que la proximité de terres agricoles à la rivière /ruisseau, le système de drainage limité, les fréquentes pluies diluviennes, supports limités des organismes externes pendant les inondations sont quelques-uns des facteurs qui rendent les agriculteurs vulnérables aux catastrophes d'inondation. L'étude a également révélé que l'inondation a un énorme impact sur leurs terres et un impact limité sur leurs maisons. En outre, l'étude révèle que les agriculteurs ont des mécanismes d'adaptation très faibles, car la plupart d'entre eux n'ont pas accès aux produits d'assurance et manquent de systèmes rapides et précises d'alerte aux inondations, des signes locaux d'inondation et des comités de gestion communautaire des précoce des inondations. L'étude accentue une relation significative entre la vulnérabilité des agriculteurs et leurs moyens de subsistance et recommande que le gouvernement et les agences appropriées fournissent le système de drainage adéquat, les prévisions météorologiques, les produits d'assurance, et le système d'alerte précoce en temps opportun et précis afin de réduire les vulnérabilités des agriculteurs aux catastrophes d'inondations et pour améliorer leurs moyens de subsistance.

MOTS CLES

Vulnérabilité, inondation, catastrophes, agriculteurs, subsistances, mécanismes d'ajustement, Oke-Ogun.

CHAPTER ONE

INTRODUCTION

1.1 Statement of Problem

European Union (2007) defines flood as a temporal covering of land by water, not covered by water before the incidence. A flood happens when a stream runs out of its confines and submerges surrounding areas (Stephen, 2011). The frequency and severity of extreme weather events and natural disasters have increased in the past decades worldwide (Diffenbaugh et al. 2005, Solomon et al. 2007). Although some anticipated impacts of climate change are positive in certain areas, developing countries are most likely to suffer from its negative impacts (IPCC 2001). Flood is one of the main factors that prevent Africa populations from escaping poverty level (Action Aid, 2006).

Flooding has catastrophic effects on human livelihoods sometimes. Impact of floods is more noticeable in low-lying areas due to fast growth in population, poor governance, decaying infrastructure and lack of proper environmental planning and management (Odufuwa et al. 2012). The impacts of flood disaster on both individuals and communities can have social, economic and environmental consequences which may be negative or positive (Apan *et al,* 2010). According to Ajayi (2012), the immediate impacts of flooding include loss of human life, damage to properties, destruction of crops, loss of livestock, and deterioration of health conditions owing to waterborne diseases. As communication links and infrastructure such as power plants, roads and bridges are damaged and disrupted, some economic activities may come to standstill. People are forced to leave their homes and normal life is disrupted. Similarly, disruption to industry can lead to loss of livelihoods (Ajayi, 2012).

Intergovernmental Panel on Climate Change (2007) made it clear that climate variation is taking place. According to IPCC projections, rainfall in the very humid regions of southern Nigeria is expected to increase. This may be accompanied by increase in cloudiness and rainfall intensity, particularly during severe storms, which may result in shifts in geographical patterns of precipitation and changes in the sustainability of the environment and management of resources. IPCC (2007).

In Nigeria, flooding occurs in three main forms: river flooding, urban flooding and coastal flooding (Gwary, 2008; Adeoti, 2010). Flash flooding destroys farm produce e.g. crop, rice paddy, fruit tree and vegetables thereby posing the risk of hunger to those engaged in subsistence farming and great loss to those engaged at a commercial scale (Kolawole *et al*. 2011).

Among the factors responsible for flood disaster include indiscriminate dumping of refuse inside the stream, river channels, inside the surface drains, along the road side and dumping of municipal wastes on the flood plain (Sarah, 2007). James, (2000) claimed that poor urbanization like construction of building along flood plains, large scale encroachment into the river flood plains and large scale road construction with excessive land reclamation which lead to flood disaster. Ajayi (2012) reported that construction of structures along river course led to major flood disasters in Oyo State. Similarly, inadequacy and poor maintenance of drainage facilities in flood **(**Ajayi *et al,* 2012**).**

Farmers are facing a lot of challenges due to climate variation and it may not be clear in empirical terms what loss farmers incur but it is known to cause more harm than good to their production (Alade & Ademola 2013).

Furthermore, many studies have been conducted on flood disaster, vulnerability assessment, impact assessment and livelihood assessment. Many of these studies concludes that flood is becoming more frequent, especially in agricultural sector (IPCC 2007;UNEP 2006; Manuamorn et al. 2009). Due to the fact that flood reduces income and possession of secondary occupations, many people living in flood prone areas see migration as an option (Odjugo 2012; Oyekale *et al* 2013). Aderogba et al (2012) states that occurrences of floods in the cities, towns and villages of Nigeria in recent times have been of a great concern and challenge to the people, governments and researchers (Aderogba, 2012 and Aderogba et al 2012). There have been journalistic and non-quantitative reports on flood for several parts of Nigeria including Oyo State. But they are superficial and lack directions for professionals, policy makers and concentrated on cities and towns (Aderogba, 2012).

Above all, there is none, of recent, to describe the magnitude and seriousness of flood disaster in most of the farming communities in Oke-Ogun area of Oyo State, Nigeria. It is against this background that this research work aims at assessing impacts of flood disaster on livelihoods of farmers in some selected farming communities of Oke-Ogun, Oyo State, Nigeria.

1.2 Research Questions

i. What are the factors that make the farmers vulnerable to flood disaster?
ii. What are the farmers' livelihoods that are prone to flood disaster?
iii. What are the coping mechanisms of farmers with flood impacts?
iv. What is the relationship between vulnerability and livelihoods of the farmers?

1.3 Objectives

The main objective of this research is to assess the impact of flood disasters on the livelihoods of farmers in selected rural communities in the Oke-Ogun Region of Oyo State, Nigeria.

Specific objectives are to:

i. examine factors that make the farmers vulnerable to flood disasters;
ii. identify farmers' livelihoods that are prone to flood disaster;
iii. examine the coping mechanisms of farmers with flood impacts;
iv. assess the relationship between vulnerability and livelihoods of the farmers

1.4 Hypotheses

i. There is no significant relationship between proximity to river/stream and losses suffered from flooding
ii. There is no significant variations in the impact of flooding among communities

1.5 Plan of the Thesis

Chapter 1 discusses research problem, justification of the study, research objectives, research questions and hypotheses. Chapter 2 provides the conceptual basis for the research and a review of relevant literature. Chapter 3 deals with materials and methods. Chapter 4 presents the results, while Chapter 5 states the conclusion and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Concepts of Hazard and Disaster

Hazard describes the potential occurrence of natural, socio-natural or anthropogenic events that may have physical, social, economic and environmental impact in a given location and over a period of time. Thus, hazard is defined by the potentiality of geodynamics or hydro-meteorological processes to cause effects upon exposed elements. Furthermore, the concept of hazard emphasizes that any defined hazard is given form and meaning by interaction with social systems, and similarly, social systems are influenced by their actual and perceived hazard context (Birkmann et al. 2013). Natural hazards such as hurricanes, earthquakes, droughts or storm floods can cause extensive human and economic losses. However, it is debated that natural hazards cannot be catastrophic by themselves, but can only be when they affect human lives and assets (Birkmann. 2006).

The term disaster is often defined as a social condition whereby the normal functioning of a social system is severely interrupted by the levels of loss, damage and impact suffered (Alexander , 2000; Birkmann 2006). However, disaster can also be a catalyst for change (Birkmann et al. 2010). Crises and disasters can also serve as catalysts for reorganization and learning processes in communities or societies, often accelerating underlying policy and social trajectories (Pelling and Dill 2010). Globally, disasters have one of the most disastrous effects on economic development, livelihoods, agriculture, and health, social and human life. Disasters are seen to be sudden, accidental event that leads to injuries and deaths (Musah *et al*. 2003). Many natural disasters in the world today result in significant loss of lives and properties. These natural disasters include floods, hurricanes and typhoons, earthquakes and tornadoes. Tsunamis, wildfires, volcanic eruptions and landslides are among the other natural forces that sometimes cause disasters (Musah *et al*. 2013).

2.2 Flood Disaster

Flooding can be described as an overflowing of water on an area normally dry. Nott (2006) says that a flood event cannot be considered to be a natural hazard unless there is a threat to

human life and/or property. Floods are the most common natural disaster leading to loss of life and economic damage in various parts across the globe (Ramakrishna *et al*, 2014). Flood disaster is one of the environmental crises that must be contended with in this century (Bariweni *et al*, 2012). The most vulnerable landscapes for floods are low-lying parts of flood plans, low-lying coasts and deltas, small basins subject to flash floods. Rivers offer transport links, fertile plains, water source, recreational amenities, and an attractive place of settlements for human populations that generate flooding as well. In addition, Floods become a major natural hazard because of the high human population densities that inhabit these lands. Floods are the most costly and wide reaching of all natural hazards. They account for up to 50,000 deaths and adversely affect some 75 million people on average worldwide every year (Nott 2006). Disease outbreak after flooding is common especially in less developed countries. Malaria and Typhoid outbreaks after floods in tropical countries are also common. It is estimated that 300 million people live in areas that are affected by floods in India and Bangladesh (Nott 2006). Zahiran, *et al*. (2008) noted that floods are the most lethal kind of hydro-meteorological disasters in the United Sates

According to Nott (2006), are caused by climatological forces, and human activities (such as vegetation clearing and urban development). The most common causes of floods are climate related, most notably rainfall. Prolonged rainfall events are the commonest cause of flooding worldwide. Nott (2006) further noted that physical damage to property is one of the major causes for tangible loss in floods. This includes loss of income or services after the floods, the damage to goods and possessions and clean-up costs. Some impacts of floods are intangible and are difficult to place a monetary figure on. Intangible losses also include increased levels of physical, emotional and psychological health problems suffered by flood-affected people. Floods had many socio-economic and political implications which led to a wide range of complex issues. Some of the immediate consequences include the people's displacement, the destruction of infrastructure such as houses and roads, damage to farms and crops and loss of cattle and livestock. The destruction of roads and other infrastructure delay on-going development initiatives and political processes (Theron 2007).

According to Ariyabandu and Wickramasinghe (2005), some groups are more vulnerable to floods than others. Although vulnerability is not just poverty, but the poor tend to be the most vulnerable due to their lack of choices. The influences of both poverty and development process on people's vulnerability to disaster are now well established. Ethnicity, class, gender,

disability and age are some of the factors contributing to people's vulnerability. They further noted that because vulnerability plays such an important part in why natural hazards become human disasters, it is worth spending time to examine the characteristics of vulnerability. Conditions of vulnerability are a combination of factors that include poor living conditions, lack of power, exposure to risk and the lack of capacity to cope with shocks and adverse situations. They also noted that floods also cause loss of soil fertility which can reduce future harvests. In the long-term, affected areas had to deal with the spread of infections and water-borne diseases such as, cholera, dysentery and diarrhoea which increase the need for safe drinking water and the provision of water purification tablets.

Nevertheless, floods have some positive impacts as in many natural systems; they play an important role in the maintenance of key ecosystem functions and biodiversity. They link the river with the land surrounding it, recharge groundwater systems, fill wetlands, increase the connectivity between aquatic habitats, and move both sediments and nutrients around the landscape, and into the marine environment. For many species, floods trigger breeding events, migration, and dispersal. These natural systems are resilient to the effects of all but the largest floods (Iwena, 2012). The environmental benefits from flooding as well as it helps the economy through things such as increased fish production, recharge of groundwater resources, and maintenance of recreational environments (Jeffrey, 2010).

Theron (2007) indicated that at least 20 countries in Africa are usually affected by floods. These countries include: Algeria, Berlin, Burkina Faso, Cote d'Ivoire, Ethiopia, Gambia, Ghana, Guinea, Kenya, Liberia, Mali, Mauritania, Nigeria, Rwanda, Senegal, Sierra Leone, Sudan, Togo and Uganda. It was estimated that approximately 300 people in 20 countries had died in floods during a period of two (2) months, noting that the inaccessibility of the affected areas had made it difficult to accurately access the death toll.

Rashid (2000) concluded that women and children are the most vulnerable during the occurrence of floods. Sinclair and Pengram (2003) have stated that floods cannot be prevented but their devastating effects can be minimized if the advanced warnings are available.

2.3 Flood Disaster and Food Security

Flooding has significant impacts on global and regional food production, particularly the common stable food crops performance in tropical sub-humid climatic zone (Eni et al., 2011). In terms of declines in agricultural production and uncertain climate that significantly affects food security, agriculture remains one of the most vulnerable sectors to outcomes of climate change such as flooding and drought in Africa (McCusker, 2006). Yet, agriculture is an important source of livelihoods. An average of 70% of the population lives by farming; 40% of all exports earnings come from agriculture, and about one-third of the national income in Africa is generated by agriculture (McCusker, 2006, Yaro, 2004). The people in African countries are those most dependent on rain-fed subsistence agriculture for food, jobs and income, and hence the most vulnerable to changes in climate. (Yaro, 2004).

According to Douglas *et al* (2005), flooding in major agricultural production areas can lead to widespread damage to crops and fencing and loss of livestock. Crop losses, as a result of rain damage, waterlogged soils, and delays in harvesting, are further intensified by transport problems due to flooded roads and damaged infrastructure. The flow-on effects of reduced agricultural production can often impact well outside the production area as food prices increase due to shortages in supply. On the other hand, flood events can result in long-term benefits to agricultural production by recharging water resource storages, especially in drier, inland areas, and by rejuvenating soil fertility by silt deposition. There is also a perception that agricultural intensification and other changes in land management practices may have increased the risk of flooding (Printer, 2009). The extent of a flood has a direct relationship for the recovery times of crops, pastures and the social and economic dislocation impact to populations (Mmom & Aifesehi, 2013).

The occurrences of flood disasters have often led to reduced crop yield levels and disruptions in agricultural production, especially in the most vulnerable and least prepared countries. Future development prognosis is that climate change impacts on agriculture are likely to increase due to greater climate variability, and increased frequency and intensity of extreme events from changes in average climatic conditions. If these occur, climatic changes would reshape the geography of agricultural land worldwide (Adeola, 2014).

2.4 Climate Change and Flood Disaster

Climate change is no longer news, as different studies have elaborately discussed global attention that is being drawn to its threats on the survival of natural resources and human livelihood; particularly agriculture and food security at macro and household levels (Adamu and Oladele, 2010; Deji *et. al*, 2010; Obinna, 2010; Simonelli,2008; and Intergovernmental Panel on Climate Change IPCC, 2007). Climate change is one of the primary causes of flood disaster (Bariweni *et al*, 2012). Sub-Sahara Africa is seen to be most vulnerable to climate variability, including flooding (UNEP 2006: Armah et al., 2012). Climate change portends greater variations in the rainfall patterns and some changes have already been assessed in West Africa (Araya and Stroosnijder, 2011). Climate change is, therefore, likely to increase flood risk significantly and progressively over time. Particularly, increased risk will be low-lying coastal areas, as sea levels rise and areas not currently prone to fluvial to significantly experience higher risk of flooding from surface runoff and overwhelmed drainage systems (Bariweni *et al,* 2012).

West Africa is highly vulnerable to climate change and associated with natural hazards such as floods due to interactions of climate change and non-climatic stressors exacerbating the vulnerability of the region, particularly its agricultural system (IPCC, 2014b). The frequency and severity of floods in some parts of West Africa have increased considerably over the last decade (Armah *et al*, 2012). The poorest persons in African countries are those most dependent on rain-fed subsistence agriculture for food, jobs and income, and hence the most vulnerable to changes in climate (Yaro, 2004).

According to IRIN (2008), thousands of people were affected after flash floods submerged hundreds of hectares of farmland in the north-eastern region of Africa, and displacing hundreds of families in 2008. The families which were supported by about 1,200 flooded farmlands had their livelihoods and food security disrupted.

However, one good thing about the river overflows is that as the flood waters flow into the river banks, sand, silt and debris are deposited into the surrounding land which make the land more fertile. The organic materials and minerals deposited by the river water make the soil more fertile and productive (Bariweni *et al,* 2012, Abowei and Sikoki, 2005). During the last several decades, temperatures have increased across the globe, and there has been an increased occurrence of heavy rainfall events and floods (Adeola, 2014).

2.5 Concept of Rural Livelihood

A livelihood comprises of capabilities, assets (including both material and social resources) and activities required for a means of living (ILO, 2006; DFID, 1999). Livelihood can be represented as a whole of dynamic and constant interactions between actors and five vital capitals, i.e., human, natural, physical, financial, and social capital. These capitals constitute livelihood building blocks (Carney, 1998). In Africa, about 70 per cent of the population lives and earn their living in rural communities, 40 per cent of all exports earnings come from agriculture, and about one-third of the national income is generated by agriculture. Yet, it is one of the most vulnerable sectors to climate change in terms of decline in agricultural production and uncertain climate that significantly affect food security. The most vulnerable or the poorest people in Africa are those who depend on rain-fed subsistence agriculture for food, jobs and income, and hence the most vulnerable to climate changes (Frederick et al. 2010, IPCC, 2007). In rain dependent agricultural economies, erratic rainfall causing unexpected floods can create devastating impacts on food security of the people and their livelihoods (IPCC, 2007; Ramakrishna et al, 2014).

Onset of floods could also lead to incidence of disease which potentially could lower labour available for non-agriculture activities and also reduce non-agriculture income that community members earn. Consequently, resulting in decrease in household income. The destruction of crops by the floods makes it imperative for the rural community members to shift dependence on agriculture income to non-agriculture income or diversify their agricultural livelihoods. Flood events simultaneously trigger reduction in food production (farms are destroyed and agriculture lands become inundated and unsuitable for cultivation for most of the staple foods within the affected rural communities leading to reduction in household income) and outbreak of diseases such as cholera. It must be emphasized that existence of bad sanitation practices within the rural communities also feed into the outbreak of the disease. Infected individuals in most cases, lack the capacity to contribute to non-agriculture labour. This reduces non-agriculture labour and ultimately reduces the income that the individuals would have gained from engaging in non-agriculture activities (Armah et al., 2010).

2.6 Concept of Vulnerability

The IPCC (2007), define vulnerability as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes". Concerning climate change vulnerability, it refers to the state of susceptibility to harm from exposure to climate hazards, and the ability of a unit of analysis to cope with, and recover from, such exposure as well as manage incremental and long-term change in climate (UNDP, 2010). The International Strategy for Disaster Reduction (UN/ISDR) defines vulnerability as "The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards (UN/ISDR, 2004). Vulnerability can also be defined as the potentiality of exposed elements such as physical or capital assets, as well as human beings and their livelihoods, to experience harm and suffer damage and loss when impacted by single or compound hazard events (Cannon, 2006; Blaikie et al. 1996; UNISDR 2004, 2009; Birkmann 2006a, b, c; Cutter et al. 2003; Cutter and Finch 2008; Cutter et al. 2008).

The elements of vulnerability are: exposure, susceptibility or sensitivity, and resilience or adaptive capacity, although different disciplines and authors set different attention and opinion between and within these categories (Birkmann and Wisner, 2006; O'Brien et al., 2004; Adger, 2006; Smit and Wandel, 2006).

Exposure deals more with the impact side of vulnerability, while susceptibility and resilience emphasize the internal condition of the affected society. Exposure identifies the parts of a system (people, houses, infrastructure, etc.), which are at risk of being affected by a natural hazard (Thywissen, 2006). Sensitivity or susceptibility mainly relates to the internal structure of a society and the livelihoods within this society, which shape the ability of people to cope with and recover from hazards. Resilience, as the third category, is originating in ecology (Holling, 1973), and has later been used to feature socio-ecological systems, taking into account of the mutual dependence of the resilience of ecological and social systems through the dependence of communities on ecosystem services (Adger, 2000). It also explains the ability of groups to cope with different types of external disturbances.

2.7 Vulnerability of Rural Farmers to Flooding

In the event of floods, socioeconomic life and livelihood of the affected people are distorted. In most, cases farmlands and livestock the major sources of people's livelihood are submerged. Property worth millions of dollars are lost in the event of flood and in most cases the people are displaced for several weeks, only to return home to start life afresh. Flood losses are devastating as many never get recovered after the flood recedes. Vulnerable communities suffer great losses in events of flood, especially when the flood is unprecedented. Hunger, famine, diseases and epidemics outbreak are usually resultant impact of flood (Mmom & Aifesehi, 2013). A decline in food production can lead to starvation which may, in some cases, last for several months after each episode of floods. Starvation, together with a decline in environmental quality resulting from flood related damage, fuels the desire for migrating out of these rural areas (Armah et al., 2010). Human activities have tended to exacerbate flooding and its impacts on agriculture and livelihoods in some communities in Nigeria (Nzeadibe *et al*, 2011).

Furthermore, there is a growing evidence that rural sector is much more than just farming (Manig, 1991; Csaki*et al.*, 2000). In this sense, rural livelihoods are not just only limited to income derived solely from farming but also a holistic way of looking on their livelihood strategies (Ashraf et al., 2013). Scoones (1998) and Ellis (2000) considered agricultural intensification, livelihood diversification, and migration as the three core livelihood strategies. In addition, multiple employments can also be a potential livelihood strategy on part of the rural people when the farm does not provide an adequate amount of income to the peasant families (Upton, 1996). For instance, in Pakistani, rural households commonly depend on farm sources (agriculture) for major portion of their income (Lodhi *et al.,* 2006). Also, Climate change is expected to have severe environmental, economic and social impacts on Nigeria, particularly on rural farmers whose livelihoods depend largely on rain-fed agriculture (Udeh and Ati, 2014).

In addition, when food production increases, the risk of starvation is minimized. Less starvation implies that individuals become less susceptible to diseases and this makes more labour available for agriculture activities. More agriculture activities lead to a rise in food production which, in turn, facilitates the likelihood of seed storage. Food production and non-agriculture income feed into household income which in turn influences the means of livelihood of rural communities. When the means of livelihood in the rural community grinds down, it triggers

exodus of community members into urban centres in search of new and better income opportunities; eventually this situation reduces the agricultural labour force (Armah et al., 2010).

In sum, various working definitions and concepts of flood disaster and rural livelihoods help in dealing with negative impacts of flood disaster on the livelihoods of farmers. Hence, their reviews, facilitate the better understanding of the subject matter and development of my methodology.

CHAPTER THREE

MATERIALS AND METHODS

3.1 The Study Area

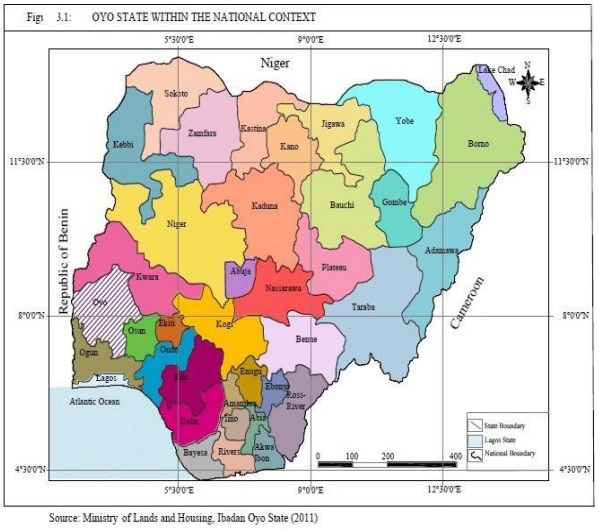
3.1.1 Location and Sampling Technique

The study was carried out in Oke Ogun Area, northern part of Oyo State, Nigeria with Longitude 3^0 20' E and Latitude 8^0 40' N, with mean elevation of 400 m above sea level. The area experiences two seasons: the wet season runs from March to October while the dry season falls between November and February. The area is flood prone area. Oke Ogun comprises of ten local governments out of the thirty-three Local Governments Areas (LGAs) in the state which are Atisbo, Orelope, Itesiwaju, Iwajowa, Irepo, Kajola, Olorunsogo, Iseyin, Saki West and Saki East. It has a land area of 15,190,322 square kilometer and shares boundaries with Kwara State in the north east, Ibarapa to the south east, Benin Republic to the West and Ogbomoso and Atiba to the East (Alade & Ademola, 2013).

Furthermore, purposive sampling technique was used to select three local government areas because these areas are prone to flooding. Two communities were randomly selected from each local government area, making a total of six communities. Snowball technique was used to select farmers in each community. A total of three hundred respondents were interviewed, using structured interview schedule and questionnaire depicted in Table 3.1

Table 3.1. Local government and communities selected

Local Government	Communities Selected	Number of Farmers Interviewed
Atisbo	Ago-Are	50
	Tede	50
Saki East	Oje-Owode	50
	Ago-Amodu/ Sepeteri	50
Saki West	Agolabi	50
	Saki	50



Source: Ministry of Lands and Housing, Ibadan Oyo State (2011)

Figure 3.1. Map of Nigeria showing Oyo State

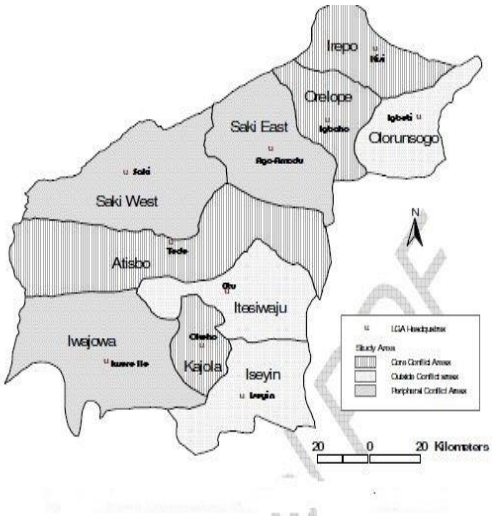


Figure 3.2. Map showing Local Governments in Oke-Ogun

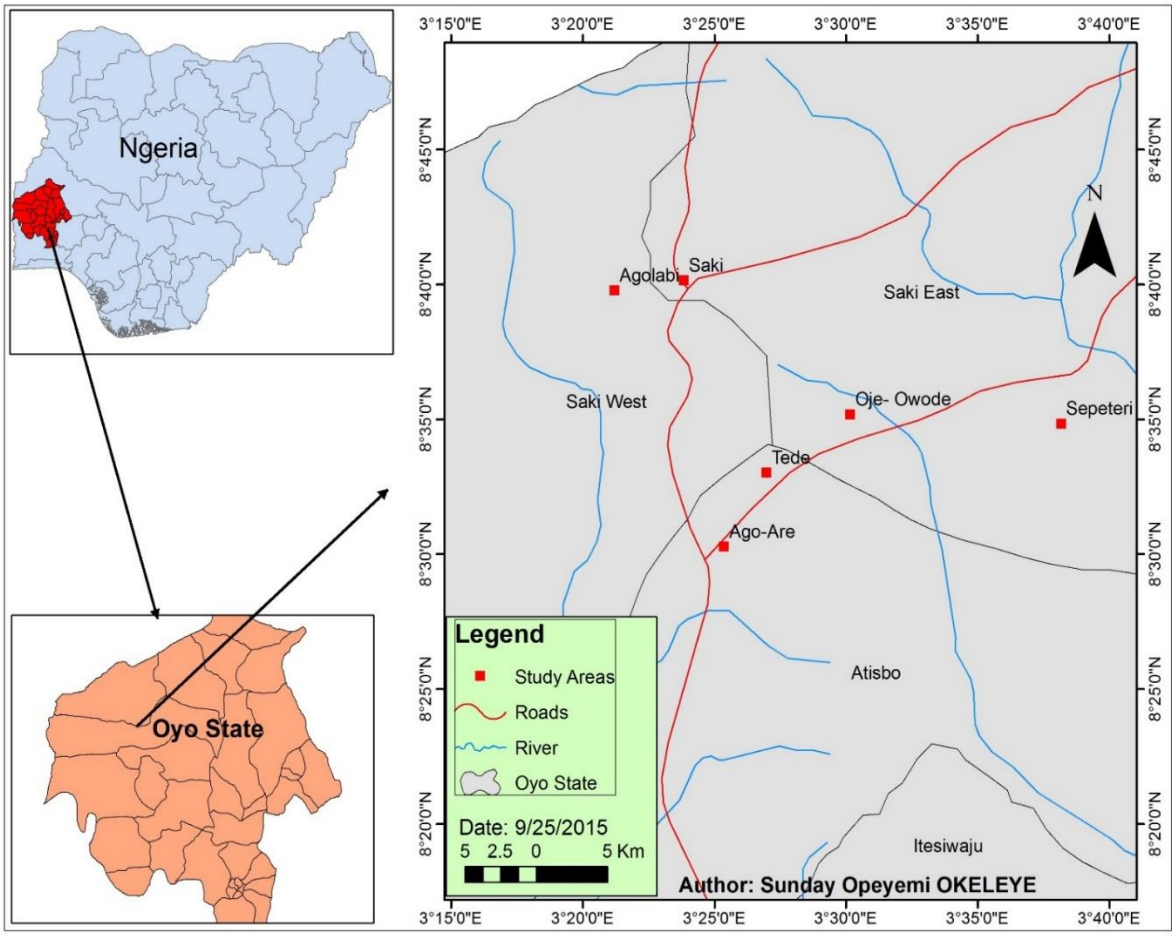


Figure 3.3. Map showing the study area

Plate 1: Gradient in one of the study areas (22/07/2015)

Source: Field survey, 2015

Plate 2: Picture showing slopy farmland (08/07/2015)

Source: Field survey, 2015

3.1.2 Population and Economic Characteristics of the Study Area

Oke-Ogun has an estimated population of 1,579,940 and dominated by the Yorubas, Hausas, Tivs, Egede, Fulani and Pinrapinra. The area is endowed with expanse of land suitable for cultivation of yam, cassava, millet, cowpea, shear, locust bean and rearing of animals like poultry, cattle, sheep and goat. It is primarily an agrarian community with about 480 communities but they also engage in some income generating activities like hunting, fishing, food processing transportation and businesses. The area serves as the food basket of South-western Nigeria and Oyo State and it is about 80km from Ibadan, the capital of the State (Alade & Ademola, 2013; Adebajo, 2014; Kasali et al. 2009).

3.1.3 Climate and Vegetation

The study area falls within the wooded savanna (also called derived savanna) that is dominated by mixture of forest and woodland interspersed with tall grasses and fire-resistant trees. The tree cover is as much as 40%. This zone continues to expand to the south as more forest land is degraded (Bucini and Lambin, 2002; Hoffmann and Jackson, 2000). The protected forest of the Old Oyo National Park (OONP) is the most significant forest block in the study area. A number of other forest reserves that exist have been significantly degraded by uncontrolled human activities. The area is also a very important headwater for several important river, including the Teshi, Moshi, Asa, Oro and Kampe rivers that flow into the Niger River and Ogun, Ofiki, Oba and Oyan rivers which flow southwards towards the Atlantic Ocean (Fasona *et al*., 2013). The wooded savanna is characterized by a sub-humid Koppen's *Aw* climate [*an* equatorial savanna where minimum precipitation is less than 60mm in dry season (Kottek *et al*., 2006)]. Population density is relatively high and survival for large rural communities depends on small-holder rain-fed agriculture (Afiesimama *et al*., 2006; Odekunle *et al*., 2005).

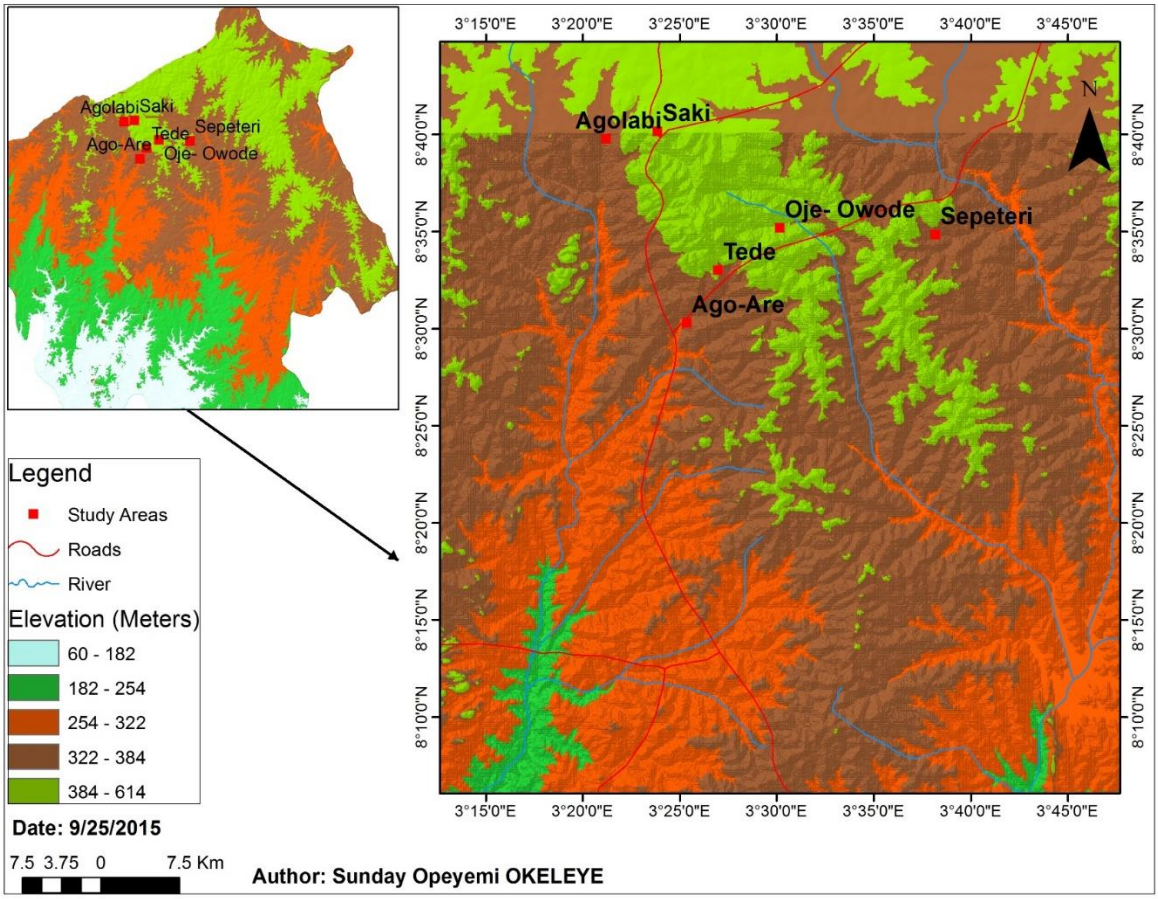


Figure 3.4. Map showing elevation of the study area

3.2 Methods

3.2.1 Conceptual Framework

3.2.1.1 The SUST Model

Developed by Turner *et al*. in 2003, this model defines vulnerability in terms of exposure, sensitivity and resilience. Moreover, vulnerability is viewed in the context of a joint or coupled human–environmental system (Turner *et al*, 2003; Birkmann, 2006). The framework recognises the interaction of the multiple interacting perturbations, stressors and stresses. It also examines vulnerability within the broader and closely linked human–environment context. This framework is a good model for assessing vulnerability because it considers factors and changes outside the local environment without forgetting adaptation concept (Turner et al., 2003; Kasperson, 2005; Birkmann, 2006).

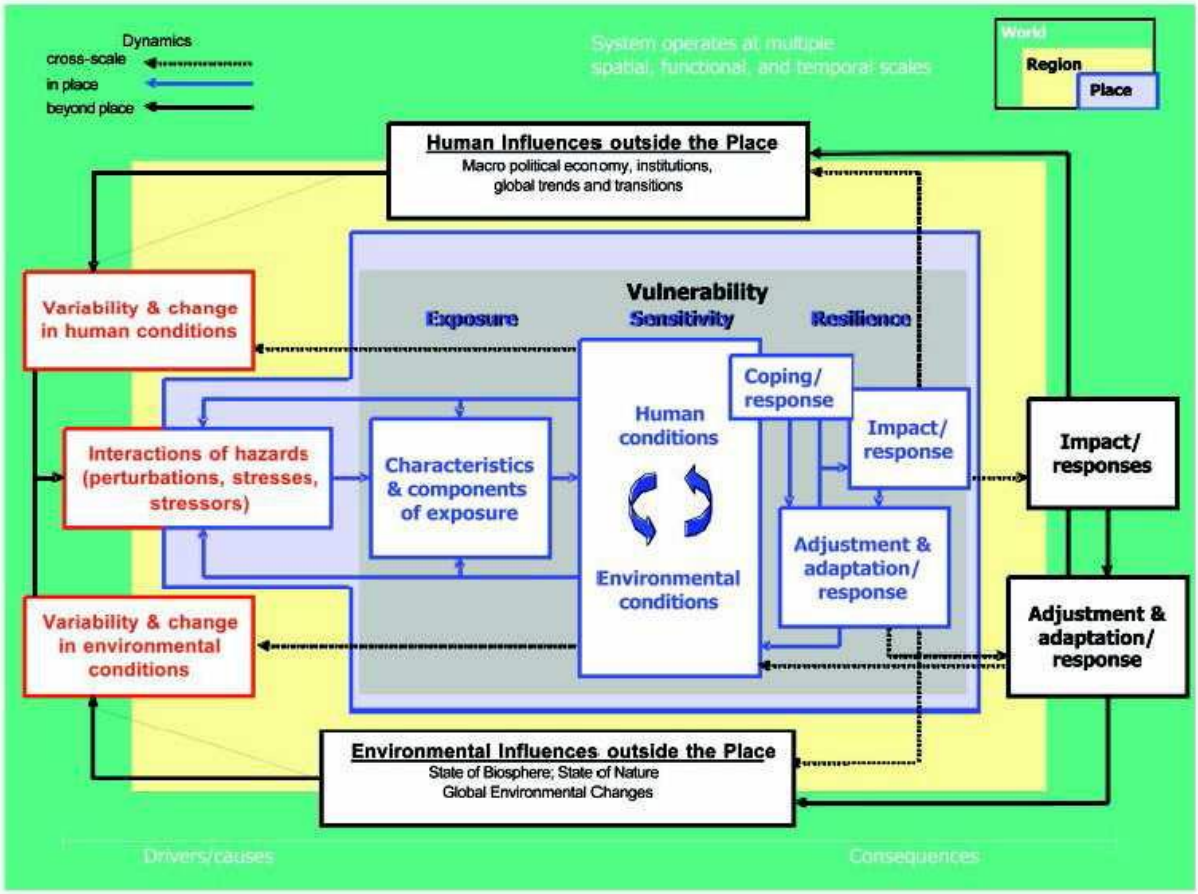


Figure 3.5. The SUST model

Source: (Turner *et al.* 2003)

3.2.1.2 The Sustainable Livelihoods Framework

This model was developed by Birkmann in 2006. The framework can be seen as a vulnerability assessment model (Birkmann, 2006). This model describes vulnerability as a function of shocks, trends and seasonality, which influence livelihood assets. The livelihood includes human, natural, financial, social and physical capitals of the people. According to the framework, the livelihood assets interact with the structures and processes, which encompass level of government, private sector, laws, policies culture and institutions. Interactions between vulnerability, livelihood assets and transforming structures and processes, through livelihood strategies, produce livelihood outcomes. The livelihood outcomes include more incomes, improved well-being, reduced vulnerability, improved food security and more sustainable use of natural resources.

The framework lay emphasis on the structural transformation in the governmental system or private sector and respective processes (laws, culture) which influence the vulnerability

context, and accessibility to livelihood assets of people. The main objective of the approach was to provide an approach that sees people and communities on the basis of their daily needs, instead of implementing ready-made, general interventions and solutions, without taking into account various abilities of the poor people. (Birkmann, 2006).

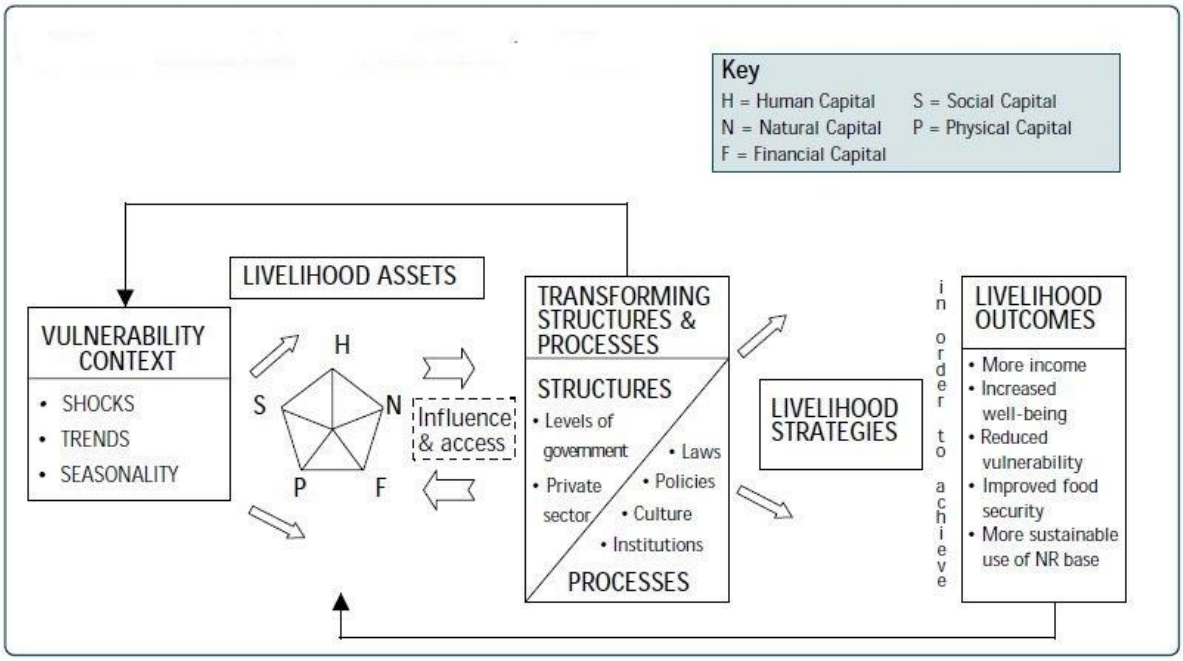


Figure 3.6. The Sustainable Livelihoods Framework

Source: DFID, 1999

3.2.2 Vulnerability Assessment

The questionnaire was designed to capture the different factors contributing to vulnerability on the local level according to the framework by Turner et al. (2003a). To be within the scope of this study, we omitted various external effects, which are not part of the system under consideration. Furthermore, we deploy Turner Framework to analyze the linkages and feedbacks between the socioeconomic and the environmental system with the aim of generating a comprehensive picture of the vulnerability of the community under consideration.

Also, we use the asset categories of the Sustainable Livelihoods (SL) Framework (DFID, 2001) to ensure that all five different categories (physical, natural, social, financial, human) are considered. Although the general and broad approach of Sustainable Framework can only be used for analyzing the vulnerability to natural hazards, but it can nevertheless serve as a

valuable complement and checklist for other frameworks in order to capture sensitivity and coping capacity of vulnerable people (Birkmann, 2006; Twigg, 2001).

Vulnerability analysis indicators were developed according to the different categories of the framework as indicated in Fig. 3.5. The indicators, which are listed in Table 3.2, focus on financial assets and occupational activities. Although there is an ever- increasing emphasis on non-monetary issues when dealing with livelihoods, vulnerability, and poverty, it is uncontested that income and all other types of financial resources, which households use to achieve their livelihood objectives, are still of utmost importance for livelihoods (UNDP, 2007; DFID, 2001).

The information from the questionnaires and the distance measurements using portable GPS served as input for statistical analysis to show prevalent vulnerabilities of different communities after flooding.

All data were first scanned for their statistical distribution by using EpiData, SPSS and Excel softwares. After comparing the means of several variables with regard to different groups of households, specific statistical tests were used and cross-tabulated to check if there are significant relationships among various variables.

Table 3.2. Indicators used for analyzing vulnerability following the framework by Turner et al. (2003a).

Vulnerability

Susceptibility

- Location of farmland
- Availability of drainage system
- Frequency of flood occurrence
- Farmland soil type

Exposure

- Size of farmland
- Causes of flooding in the area
- Time it takes for flood water to totally dry up
- Number of flood occurrences in the past 5 years
- Depth of water during the last flooding

Resilience (impact, coping/response, adaptation)

- Existence of past flood warnings
- Clarity of flood warning messages
- Availability of supports from external bodies during flooding
- Level of awareness of government's land regulations

3.3 Data Collection

The required information used for this study was obtained from the primary source, using a semi-structured questionnaire covering all aspects of the study. The information were collected using well-structured interview schedule prepared in English language but in most times interpreted in Yoruba (a language understood and spoken by the villagers) during interview. Joint interview was sometimes used in order to get inputs from as many respondents as possible and to save the farmers of the fatigue of being interviewed.

Plate 3: The Researcher with some farmers after an FGD session (21/07/2015)

3.4 Data Analysis

In order to achieve the objectives and test the hypotheses set for the study, the data collected were subjected to appropriate statistical analyses. Quantitative data obtained through the interview schedule and questionnaires were subjected to both descriptive and inferential statistics. The descriptive analysis used includes frequency count, percentages, mean, standard deviation, pie chart and bar chart, while the inferential statistics used was cross- tabulations and the accompanying chi square tests.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Socioeconomic Characteristics of Respondents

Results of the analysis presented in Table 4.1 shows that majority of the respondents are male (75.7%). This shows that majority of people who engage in farming activities in the study area are males, confirming the predominance of males in farming in the rural areas of Nigeria (Kasali et al., 2009). There are cultural beliefs that the leader of a household is a male as it is the case in Oke-Ogun. This assumption appears clearly during the focus group when females refused to talk first before males. Thus, they did not want to give different opinions from males.

With respect to ages, 7% of respondents are 30 years of age or below as it can be seen in Table 4.1, while more than two-thirds fall within the age bracket 31-60 years and 13.7% are above 60 years of age. This indicates that a large proportion of the farmers are ageing and may become more vulnerable to shocks and hazards of farming. This confirms the findings that the higher the percentage of elderly in the community, the higher the vulnerability Muller *et al.* 2011, Steinführer and Kuhlicke, 2007; Thieken *et al*. 2007 and Birkmann *et al.* 2008. Diminishing strength reduction in agility to impact response.

Furthermore, Table 4.1 shows that majority of the respondents are Yorubas (90%), followed by Hausas (7%), Ibos (1%) and other minor tribes like Tivs, Egedes and Togolese constitute the remaining 2%. This is in agreement with Alade and Ademola's (2013) analysis of the socioeconomic characteristics of Oke-Ogun. It is equally an indication that there would be high family connection rate which is an essential component of low vulnerability (Kasali et al., 2009).

Also, majority of the respondents (as shown in Table 4.1) are married (81.3%), while 9.3% of them are single; 4.3% of them are divorced/separated, while 5.0% of them are widow/widower. This means that most of the respondents will likely have many people looking to them for living.

In addition, Table 4.1 indicates that close to half of the total number of respondents (47.7%) have between 6-10 number of people in their household's unit family. The maximum household size is 30 and the minimum is 1; the average household size is 7. The predominance of agriculture as major occupation prompts polygamy and large family size to provide cheaper

labour on farm. Household size is one of the major determinants of vulnerability level. That is, the higher the household size, the higher the level vulnerability because of the ability to cater for the needs of the large family size (Muller *et al.* 2011 and Martens and Ramm 2007).

Also, level of education is very important as it enhances translation of early warning information into meaningful informed decision. Less educated people are more vulnerable to impact of flood disaster than the literates (Fekete 2010; Schneiderbauer 2007, Haki *et al*. 2004 and Steinführer and Kuhlicke 2007). Table 4.1 shows that close to one-third (27.5%) of respondents have no formal education, 17.1% have primary education, 24.8% have secondary education and 31.1% have tertiary education. This low educational status in rural area is characteristic of most rural farming population in Nigeria as no specific formal education skill is needed for sedentary agriculture. However, their low level of formal education can impair cogent decision when flood disaster strikes.

Table 4.1. Distribution of respondents by socio-economic characteristics

Variables	Frequency	Percentage
Sex		
Male	227	75.7
Female	73	24.3
Total	**300**	**100**
Age		
Less than 31 years	21	7.0
31-60 years	238	79.3
61 years and above	41	13.7
Total	**300**	**100**
Ethnic group		
Hausa	21	7.0
Ibo	3	1.0
Yoruba	270	90.0
Others	6	2.0
Total	**300**	**100**
Marital status		
Single	28	9.3
Married	244	81.3
Divorced/Separate	13	4.3
Widow/Widower	15	5.0
Total	**300**	**100**
Household position		
Head	216	72.0
Wife	67	22.3
Child	17	5.7
Total	**300**	**100**
Household size		
1-5	104	34.7
6-10	143	47.7
>10	48	16.0
No response	5	1.7
Total	**300**	**100**
Level of education		
No formal education	82	27.3
Primary school education	51	17.0
Secondary school education	74	24.7
NCE/OND	59	19.7
HND/BSc	30	10.0
PGD/MSc	2	0.7
No response	2	0.7
Total	**300**	**100**

Source: Field survey, 2015

4.1.1 Existing Assets of the Respondents

Table 4.2 shows that the respondents engage in food crops, cash crops and livestock productions. The major food crop cultivated include: maize, yam, cassava, tobacco, millet, vegetable, beans, soybeans, melon and water melon. Tobacco production is the most lucrative farming activities in the study area with an average annual income of ₦1,184,381 (about $5921) annually and this is as a result of supports received by farmers from British Tobacco Companies instituted in Oke-Ogun Area. Also, lucrative crops include: water melon, soybeans, maize, cassava and beans with an average annual income of ₦1,073,784, ₦1,064,514, ₦871,328, ₦752,827, ₦675305.1 and ₦662,833, respectively. Least average annual income products are: millet, vegetable, melon and yam with average annual income of ₦345,346, ₦416,776, ₦551,531 and ₦579,191, respectively. This is because some of the farmers cultivate more than one type of crops. In addition, Table 4.2 indicates that livestock production is also common in the area, although most of them practise extensive system of livestock like goat, sheep and poultry production is done on a small scale. Farmers in the study area generate average annual income of ₦1,138,533 which is about $5692. These huge assets can facilitate their mitigation to negative impacts of flood disaster.

Table 4.2. Existing Assets of the Respondents

Crop	< 1Ha (%)	1-5 Ha (%)	6-10 Ha (%)	>10 Ha (%)	**Average Annual Income (₦)**
Maize	26.1	65.6	5.8	2.5	**752827**
Yam	59.0	37.6	2.8	0.6	**579191**
Cassava	34.5	58.2	5.6	1.7	**675305**
Tobacco	51.5	39.5	0.0	0.0	**1184381**
Millet	74.1	25.9	0.0	0.0	**345346**
Vegetable	57.7	41.3	1.0	0.0	**416777**
Beans	72.7	25.5	1.8	0.0	**662833**
Soybeans	59.4	40.6	0.0	0.0	**871328**
Melon	73.5	26.5	0.0	0.0	**551530.6**
Water Melon	64.9	24.3	5.4	2.7	**1064514**
Cash Crops	29.6	64.8	0.0	5.6	**1073784**
Average Annual Income From Livestock Production					**1138533**

Source: Field survey, 2015

4.2 Farmers' Vulnerability to Flood Disaster

4.2.1 Susceptibility

Susceptibility or fragility could be seen as the predisposition of elements at risk (social and ecological) to suffer harm. Although susceptibility and fragility imply subtle differences in various concepts, they can be used synonymously within the meta-framework in order to emphasize the core differences between exposure, susceptibility and lack of resilience. In this context, susceptibility (or fragility) can be calculated and addressed independent of exposure.

According to Balica (2007), the farmland proximity to river/stream determines how susceptible to flood disaster a farm is. Farmlands that are near to river/stream are more vulnerable to flood disaster than those that are far away from river/stream. Figure 4.1 shows that more than half (50.5%) of the respondents have their farms located less than 1km from river/stream, 33% of them have their farms located 1-2km away from river/stream, 4.7% of them have their farms located 2.1-3km away from river/stream, 2.7% of them have their farms located more than 3km from it. Only 9.1% of the farmers do not situate their farms near stream/river. This might increase their vulnerability to flood disaster when river/stream overflows.

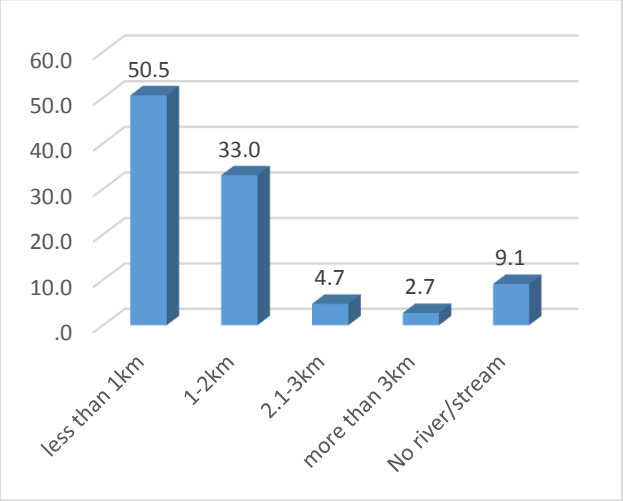


Figure 4.1. Farmland close proximity to stream/river

Source: Field survey, 2015

Furthermore, availability of drainage system facilitates free flow of water and reduces the occurrence of flooding. Figure 4.2 shows that most of the respondents (86.7%) do not have

drainage system on their farms, while only 13.3% of the respondents have drainage system. So most of the farmers in the study areas are susceptible to flood disaster. Clearly, this situation might increase their vulnerability to flood disaster (Winsemius *et al*. 2013). Another very important factor is accessibility to drainage system. Accordance to Malik (2011) and Ahmed (2011) the higher the accessibility to drainage, the lower the rate of vulnerability.

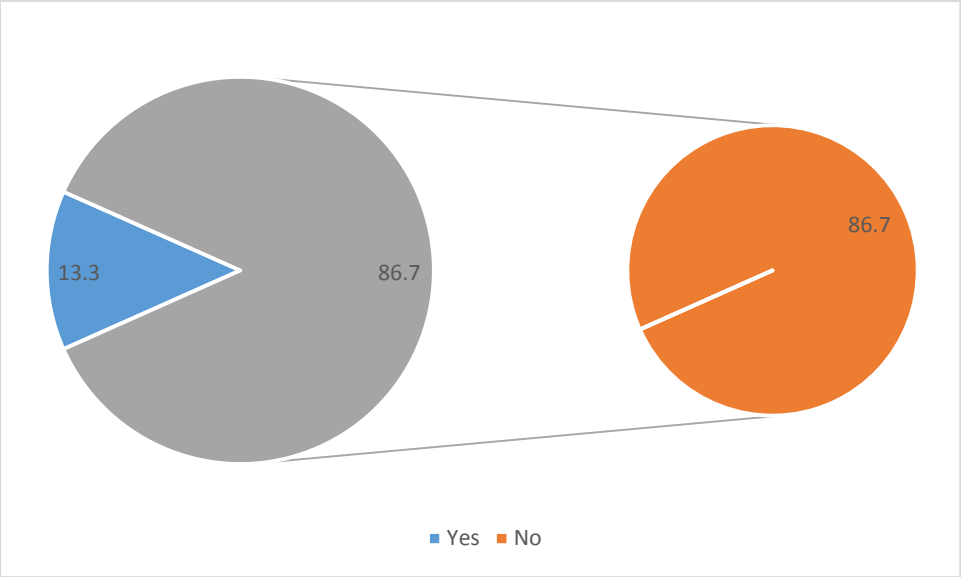


Figure 4.2. Availability of drainage system

Source: Field survey, 2015

Also, according to Winsemius *et al.* (2013) and Field *et al*. (2011), places where flood occurrence is frequent are more vulnerable to flood disaster. As shown in Figure 4.3, most of the respondents (81%) said they have experienced flooding events in their lives while 19% of them said they have never experienced flooding before. However, majority of them (70.4%) said they do experience flooding occasionally, 14% of them said they do experience it every raining season and 15.6% of them said they only experience it once. This is in agreement with Afiesimama's (2008) findings on rainfall anomalies in Nigeria (Afiesimama, 2008). According to him, there is declining rainfall over Nigeria in this decade. Since heavy rainfall is the major cause of flooding in the study area. This should be a concern in agricultural practices and water resource management in the country. This factor might reduce their vulnerability to flood disaster.

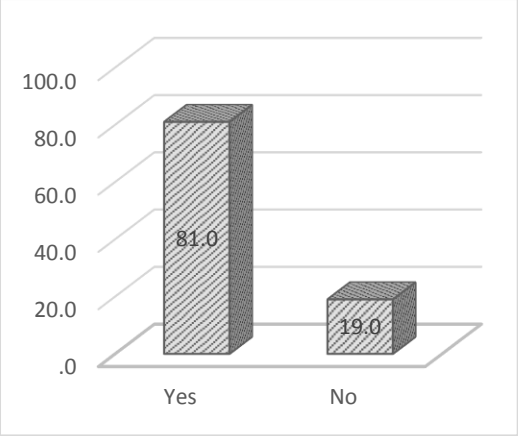


Figure 4.3. Past flood occurrence

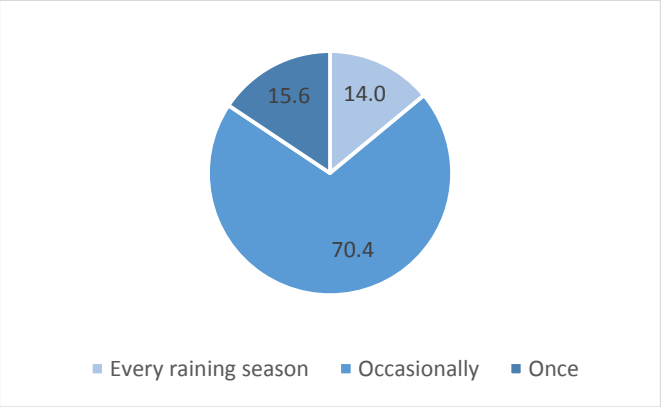


Figure 4.4. Frequency of flood occurrence in the past 5 years

Source: Field survey, 2015

In addition, Kasali *et al*. (2009) are of the opinion that the finer the soil, the more vulnerable a community is. According to Figure 4.5 below, almost half (49.8%) of the respondents said they have silt/medium type of soil, while the rest of them either have clay/heavy (16%) or sandy/light (15.7%) types of soil. This shows that most of these farmers have good soil types that are suitable for agricultural purpose and less vulnerable to flood disaster.

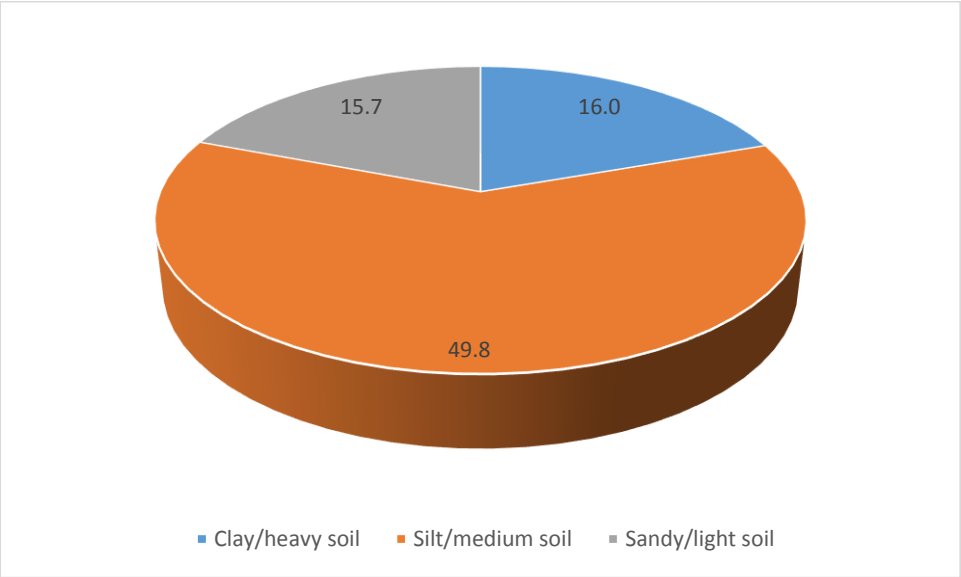


Figure 4.5. Farmland soil type

Source: Field survey, 2015

4.2.2 Exposure

Exposure can be described as the extent to which a unit of assessment falls within the geographical range of a hazard event. Exposure does not only extend to fixed physical attributes of social systems (infrastructure); it equally includes human systems (livelihoods, economies, cultures) that are spatially bound to specific resources and practices that may also be exposed. Exposure is then qualified in terms of spatial and temporal patterns.

Size of farmland is very germane in determining vulnerability of any farming community to flood disaster (Balica, 2012; Fekete, 2010; Bowen and Riley, 2003). Balica, Fekete, Bowen and Riley subscribe to the idea that the larger the farm size, the lower the rate of vulnerability and vice-versa. Table 4.3 reveals that 6.8% of the respondents have farm size less than 1 hectare, 56.8% of the farmers have farm size ranging from 1-5 hectares and 23.6% have farm size within 6-10 hectares, while the rest have farmland size more than 10 hectares. This means that most of them have relatively large size of farmland which might make them suffer more losses during flooding.

Table 4.3. Size of farmland

Size of farmland (Hectare)	Frequency	Percentage
Less than 1	20	6.8
1-5	168	56.8
6-10	71	23.6
11-15	16	5
16-20	9	3
More than 20	11	4.8
Total	296	100

Source: Field survey, 2015

In addition, the study area is known for heavy rainfalls and this is in agreement with the opinion of most of the respondents (75%) who attribute flood disasters in the study area to heavy rainfall, while (22.4%) attribute them to river overflow. 2.6% identify other causes, including canalization, deforestation, erosion and water runoff and soil hard pan (Figure 4.6).

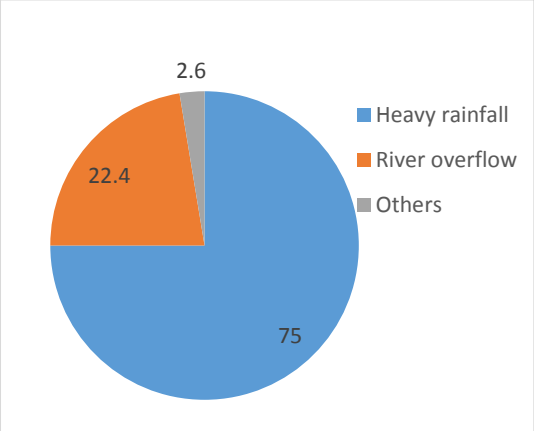


Figure 4.6. Causes of flood disaster

Plate 4: Ogun/Oshun Lake which is one of the major causes of flooding when overflowed (22/07/2015)

Source: Field survey, 2015

Also, Figure 4.7 reveals that 95.5% of the respondents claim that flood water takes 1-10 days before it can totally dry up, while the rest states that it takes more than 10 days for the flood water to totally dry up. This lengthy period of time it takes the flood water to totally dry up increases the vulnerability of the farmers in the areas. This may also be accompanied by health-related implications: stagnant water facilitates mosquito breeding and water borne diseases like malaria, cholera and typhoid.

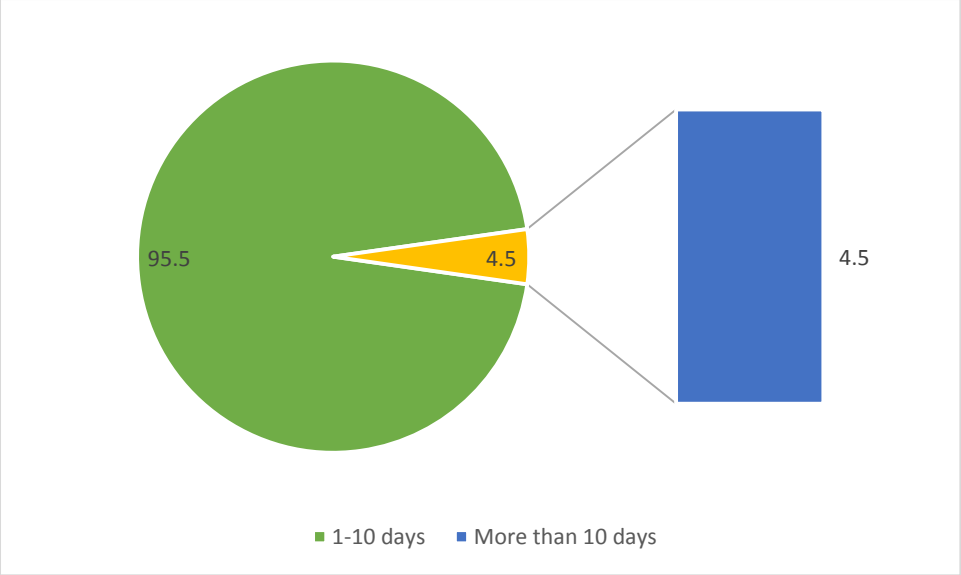


Figure 4.7. Time it takes for flood water to totally dry up

Source: Field survey, 2015

Furthermore, according to Balica (2007) and Muller (2011), taking action towards reducing negative impact of flood disaster as a result of lessons learnt from past occurrences reduce people's susceptibility to flood disaster. Figure 4.8 shows that 90.6% of the respondents say that flood has occurred 1-5 times in the last five years. On the average, floods occur every year around the areas. Past experience is very essential in preparing, responding and mitigating flood disaster because people usually learn from past experiences.

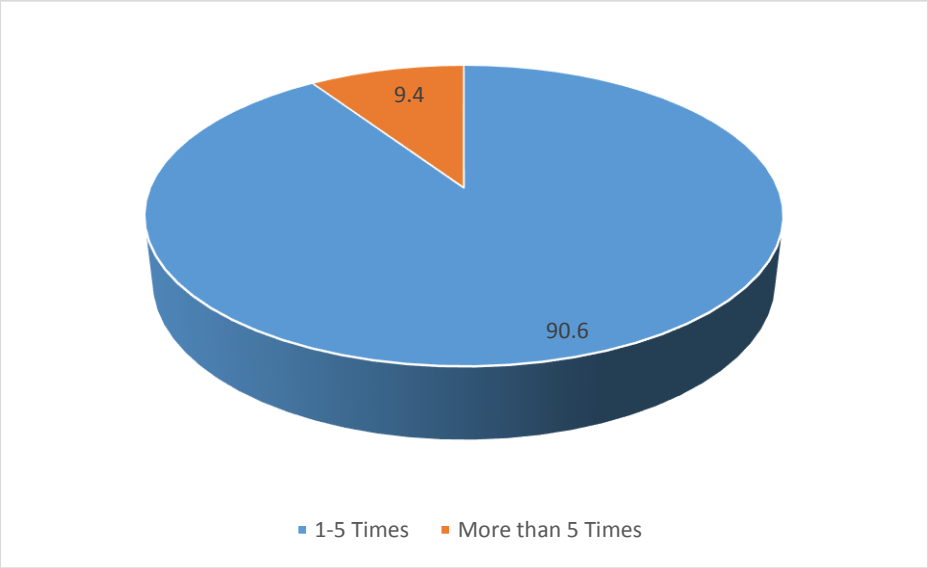


Figure 4.8. Number of flood occurrences in the past five years

Source: Field survey, 2015

Also, depth of flood water can determine how long it will take for flood water to totally dry up and this can also determine how long it will take farmers to return to farm for their various crops cultivation which can, in turn, affect their livelihoods. 98.4% of the respondents (Figure 4.9), say that flood water depth during the last flooding was 1-5m. This shows that the average depth of flood water was relatively high and this increases their exposure to flood disaster.

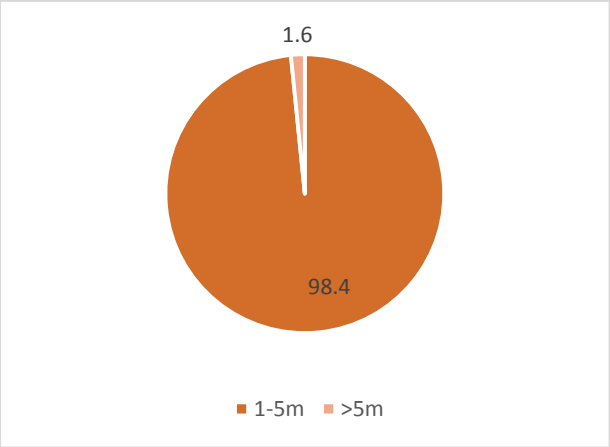


Figure 4.9. Depth of flood water during the last flooding

Plate 5: Picture indicating depth of flood water during one of the recent floodings (21/07/2015)

Source: Field survey, 2015

4.2.3 Resilience

Resilience is the ability to recover from or adjust easily to misfortune or change. Resilience is important in dealing with disasters among rural communities in developing countries (McSweeney and Coomes 2011), in growing the wealth of the poor (WRI 2008), or in livelihood and land-use choices among farmers in relation to the sensitivity to future market and environmental shocks (Eakin and Wehbe 2009). Small-scale farmers can deliver benefits and services for poverty alleviation (Be´ne´ et al., 2007, 2009b; Allison et al., 2011). Resilient small-scale farmers can do so in an unpredictable environment and contexts of change by absorbing stress, reorganising, and adapting to disturbance while still delivering benefits for poverty alleviation (Andrew and Evans, 2011).

Figure 4.10 shows that 86.8% of respondents have received flood warnings in the past, while 13.2% of the respondents indicate that they have never received such warnings. The high proportion of respondents that have received flood warnings they have adequate contacts with

extension service agents. This indicates a good working relationship between them and farmers and suggests that flood risk reduction strategies are effectively communicated to the farmers through agricultural extension services.

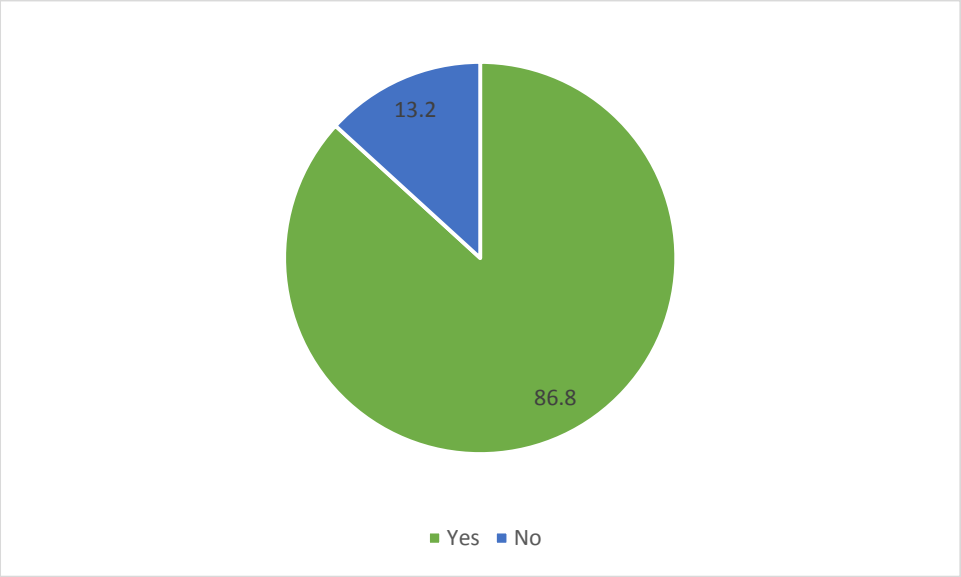


Figure 4.10. Existence of past flood warning

Source: Field survey, 2015

Furthermore, external networks must be reinforced constantly by the exchange of gifts or domestic work if they are to provide essential access to resources from outside the village during times of difficulty. Larger households are in a better position to initiate and maintain informal networks because they could continue to maintain household function in working the land (Osbar et al. 2010).

In addition, there are land use policies in Nigeria monitored by various ministries and departments of Nigeria government such as Ministries of Agriculture and Environment. The policies place all lands under the custody of government, and prohibit deforestation, among others. However, as it can be seen from Figure 4.11, more than half (52.2%) of the respondents are not aware of government land regulation while 47.8% of them are aware of them. The average level of education of farmers and high level of interaction between them and extension officers might explain the awareness of the 47.8% about land regulations by the government.

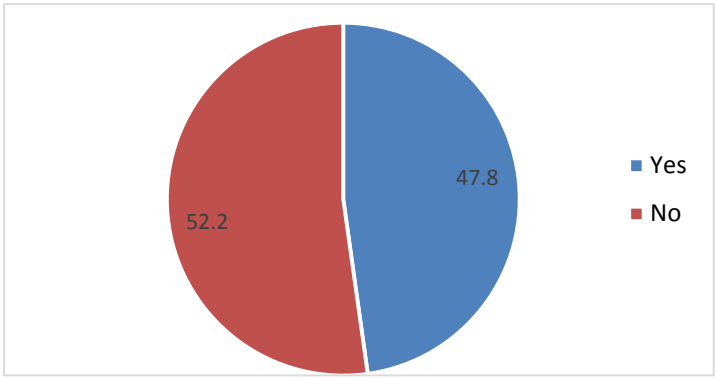


Figure 4.11. Awareness on government land regulation

Source: Field survey, 2015

4.3 Farmers' Livelihoods that are Prone to Flood Disaster

Winsemius et al. (2013) establish a strong positive relationship between proximity of assets to floodplains and their vulnerability to flood disaster. Access to assets can have a major influence on choice of livelihood strategies. The more choice and flexibility that people have in their livelihood strategies, the greater their ability to withstand – or adapt to – the shocks and stresses of disaster. Figure 4.12 indicates that flood mostly (61.8%) causes damage to farms and only have little effects on their houses. This might be due to the distance of their houses from river/stream as most of the farmers in this area rely on rain-fed agriculture and water from river/stream for their agricultural activities. Also, according to Cutter et al. (2003) and Muller et al (2011), there is a positive relationship between the quality of the building materials used and the vulnerability of such building to flood. In other words, the poorer the quality of the building materials used, the higher the vulnerability of such a building to flood disaster. According to some of the experts and farmers interviewed, because poor building materials (mud and old roofing sheets) are used to construct most houses in the study area, most of them are affected by windstorms.

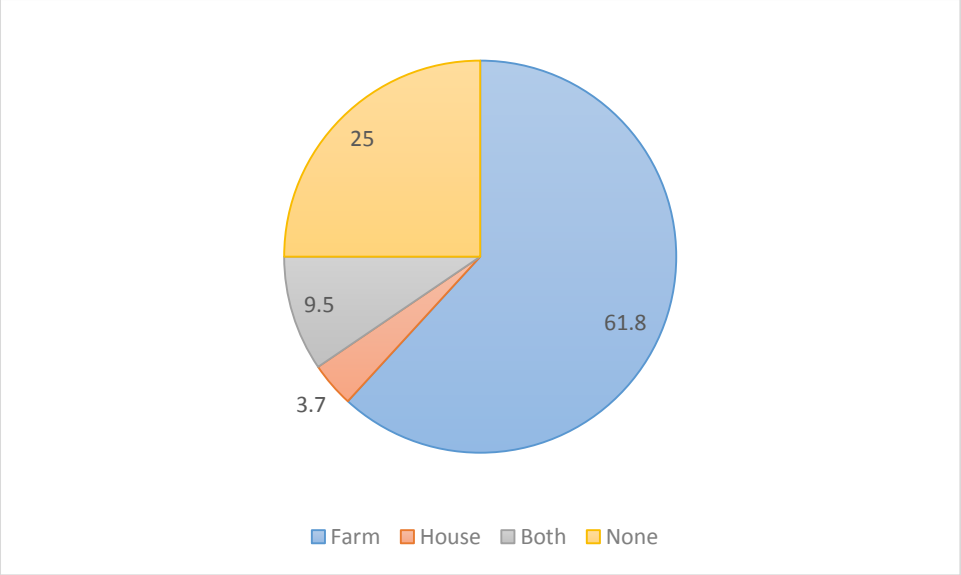


Figure 4.12. Livelihoods prone to flood disaster

Source: Field survey, 2015

Plate 6: One of the flooded farmlands during recent flooding, Plate 7: Some of the fish ponds washed away during recent flooding (21/07/2015)

Source: Field survey, 2015

4.3.1 Variations in the Occurrence of Flooding Among Communities.

Winsemius et al. (2013) are of the opinion that there is positive relationship between flooding occurrence in a community and its vulnerability to flood disaster. Data in Table 4.4 show that most of the respondents in Tede, Oje-Owode, Ago-Amodu/Sepeteri and Saki say they only experience flooding occasionally, while 86.5% of the respondents in Ago-Are say they experience flood occasionally. On the contrary, however, most of the respondents (74.0%) in

Agolabi say they experience flood disaster often and this makes them more vulnerable to flood disaster than the rest of the other farming communities surveyed.

Table 4.4. Variations in the occurrence of flooding among communities

	Frequency Of Flooding Occurrence	
Name of Village	Often (%)	Occasionally (%)
Ago-Are	13.5	86.5
Tede	0.0	100.0
Oje-Owode	0.0	100.0
Ago-Amodu/Sepeteri	0.0	100.0
Agolabi	74.0	26.0
Saki	0.0	100.0
TOTAL	**14.7**	**85.3**

Source: Field survey, 2015

4.3.2 Variations in the Impact of Flooding on Livelihoods among Communities

Data in Table 4.5 reveals that flood disaster has very high impact on the farm and livelihood of Agolabi, Saki and Ago-Are, while it has little impact on Oje-Owode, Tede and Ago-Amodu/Sepeteri farming communities. This results from different levels of exposure, susceptibility, resilience and adaptive capacities of these communities as explained earlier in this chapter. It can also be inferred from this Table that Agolabi community is the most vulnerable, followed by Saki, Ago-Are communities, while Ago-Amodu/Sepeteri community is the least vulnerable to flood disaster followed by Tede and Oje-Owode communities.

Table 4.5. Variations in the impact of flooding among communities

	Effect of Flood Disaster on Farm and Livelihood			
NAME OF VILLAGE	EXTREMELY HIGH (%)	HIGH (%)	LOW (%)	NO EFFECT (%)
Ago-Are	20.9	48.8	20.9	9.3
Tede	4.0	20.0	60.0	16.0
Oje-Owode	24.0	24.0	50.0	2.0
Ago-Amodu/Sepeteri	6.1	18.4	67.3	8.2
Agolabi	34.0	48.0	18.0	0.0
Saki	12.0	58.0	24.0	6.0

Source: Field survey, 2015

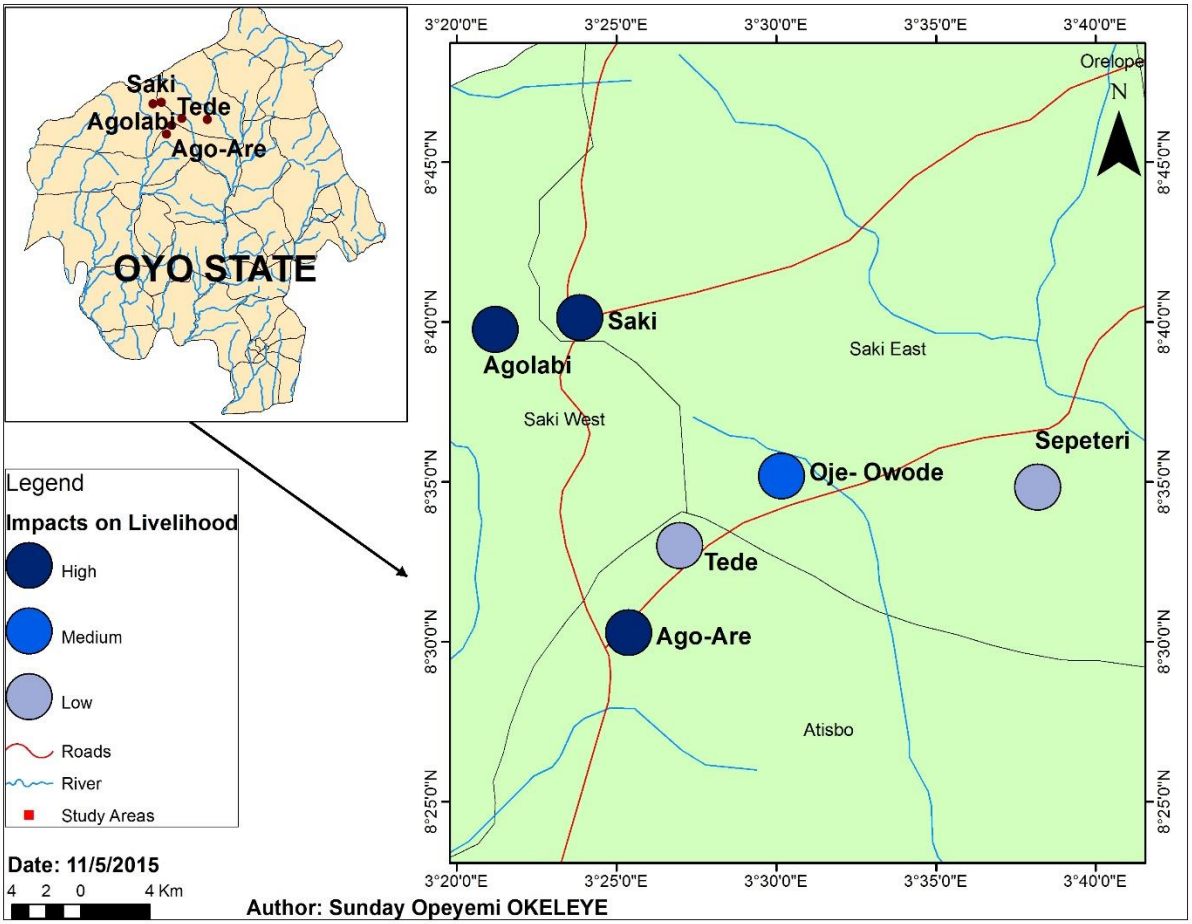


Figure 4.13. Levels of impacts of flood disaster on livelihoods of farmers

4.3.3 Losses Suffered in Different Communities in Recent Flood Disasters

Table 4.6 indicates that Agolabi, Saki, Tede, Ago-Are and Oje-Owode suffered most losses in recent flood disasters, while Ago-Amodu/Sepeteri suffered only suffered a little. This might be due to the differences in their levels of vulnerability and some other factors discussed in this chapter. Also, it would be seen from the Table that most farmers in Agolabi community suffered losses that are more than ₦500,000 (approximately $2,500) which makes this community the most affected by flood disaster in recent times. Also, most farmers in other communities like Tede, Oje-Owode, Saki and Ago-Are suffered losses that are less than ₦110,000 in the recent flood disasters.

Table 4.6. Losses suffered in different communities in recent flood disasters

	FARMING COMMUNITIES						
LOSS SUFFERED (₦)	AGO-ARE	TEDE	OJE-OWODE	AGO-AMODU/SEPETERI	AGOLABI	SAKI	**TOTAL**
<110,000	8.2	13.9	10.1	1.5	2.9	9.6	**46.2**
110,000-200,000	4.8	1.0	1.0	2.9	1.4	3.4	**14.4**
210,000-300,000	0.5	0.5	0.5	1.0	0.0	4.3	**6.7**
310,000-400,000	0.5	0.0	1.0	0.0	0.5	2.4	**4.3**
410,000-500,000	0.0	0.5	1.0	0.5	0.5	1.9	**4.3**
>500,000	1.0	0.5	0.5	3.4	18.3	0.5	**24.0**
TOTAL	**14.9**	**16.3**	**13.9**	**9.2**	**23.6**	**22.1**	**100.0**

Source: Field survey, 2015

4.4 Farmers' Coping Mechanisms to Flood Disaster

Coping mechanisms are ways in which a community or a system learns from the past disasters and changes existing practices for potential future changes in hazards as well as vulnerability contexts. Sound decision-making that anticipates, prepares for, and responds to disaster depends on information about the full range of possible consequences and associated probabilities. Such decisions often include a risk management perspective. Because risk is a function of probability and consequences, information on the tails of the distribution of outcomes can be especially important. Low-probability outcomes can have significant impacts, particularly when characterized by large magnitude, long persistence, broad prevalence, and/or

irreversibility. Mastrandrea et al. (2010), Kabir (2012); Ashraf et al. (2013) argue that involvement in other non-farming activities will reduce people's vulnerabilities to negative impact of both natural and man-made disasters like flooding. Table 4.7 indicates that most of the farmers (83.6%) have other income generating activities which can make them less vulnerable and be able to withstand shocks from flood disasters. Furthermore, Ashraf et al. (2013), argue that effective communication system and accessibility to early warning system reduce vulnerability as they make people to respond easily and prepare for disaster. However, Table 4.10 reveals that 3.8% say there is community flood management and 5.2% only have insurance facilities against flood disaster. These results show that the adaptive capacity of the farmers is relatively low

Table 4.7. Farmers' coping mechanisms to flood disaster

ADAPTIVE CAPACITY COMPONENTS	YES (%)	NO (%)
Other Sources of Income	83.6	16.4
Availability of Flood Early Warning System	24.5	75.5
Availability of Flood Disaster Local Sign	13.2	86.8
Availability of Community Flood Management Committee	3.8	96.2
Availability of Insurance Facilities	5.2	94.8

Source: Field survey, 2015

4.4.1 Management of Flooding at Community Levels

Data in Table 4.8 shows that all the farming communities in the study area have little to no community flood management committee that can make them prepare, respond and recover from impacts of flood disaster on their livelihoods. Most of the experts and farmers interviewed said there has been nobody to tell them about the importance of having community flood management committee. Consequently, they are not familiar with it and even some of the farmers admitted that they are hearing it for the very first time.

Table 4.8. Management of Flooding at Community Levels

	COMMUNITY FLOOD MANAGEMENT COMMITTEE	
NAME OF VILLAGE	YES (%)	NO (%)
Ago-Are	2.4	97.6
Tede	0.0	100.0
Oje-Owode	0.0	100.0
Ago-Amodu/Sepeteri	0.0	100.0
Agolabi	20.0	80.0
Saki	0.0	100.0
TOTAL	**3.8**	**96.2**

Source: Field survey, 2015

4.5.1. Relationship Between Villages and Farm Proximity to River/Stream

According to Balica (2007), there is a strong relationship between community proximity to water body and its vulnerability to flood disaster. The farther a community is to water body, the lower the vulnerability of such community to flood disaster and vice-versa. Data in Table 4.9 reveal that most of the respondents in Saki (91.8%), Ago-Are (73.5%) and Agolabi (60.0%) sited their farms very close to river source, increasing their flood disaster risks. However, Tede, Oje-Owode and Ago-Amodu/Sepeteri sited their farms a bit far from the river/stream and this makes them less vulnerable to negative impacts of flood disaster.

Table 4.9. Relationship between villages and farm proximity to river/stream

NAME OF VILLAGE	<1km (%)	1-2km (%)	2.1-3km (%)	>3km (%)	No River/Stream (%)
Ago-Are	73.5	14.3	6.1	2.0	4.1
Tede	28.0	46.0	6.0	2.0	18.0
Oje-Owode	26.5	53.1	14.3	2.0	4.1
Ago-Amodu/Sepeteri	24.0	44.0	2.0	4.0	26.0
Agolabi	60.0	32.0	0.0	6.0	2.0
Saki	91.8	8.2	0.0	0.0	0.0
TOTAL	**50.5**	**33.0**	**4.7**	**2.7**	**9.1**

Source: Field survey, 2015

4.5.2. Relationship between Education and Understanding of Flood Warning

According to Ashraf et al. (2013), level of education has strong relationship with flood warning clarity. Level of education facilitates the ability to read and interpret information brought by flood warning facilitators. Table 4.10 shows that the flood warnings made available to respondents before and during raining season is clear to almost all the respondents, including those who have no formal education. This may be due to their past experiences, their relationships with the flood warning facilitators and the expertise of flood warning facilitators.

Table 4.10. Relationship between level of education and flood warning clarity

	FLOOD WARNING CLARITY	
HIGHEST LEVEL OF EDUCATION	YES	NO
No Formal Education	26.0	1.2
Primary Education	15.0	0.8
Secondary Education	24.0	2.0
NCE/OND	19.7	.4
HND/BSc	10.6	0.0
PGD/MSc	1.0	0.0
TOTAL	**95.7**	**4.3**

Source: Field survey, 2015

4.5.3. Relationship between losses resulting from flood disaster and proximity to river/stream

Data in Table 4.11 show that farm locations that are very close to river/stream suffered most losses in recent flood disasters. For example, 58.5% of farmers who site their farms less than 1km from river/stream lost various amounts of money ranging from ₦110,000 (about $5,500) to ₦500,00 ($25,000) and above, while those whose farms are very farm from river/stream only suffered minimal losses.

Table 4.11. Relationship between losses suffered in recent flood disasters and proximity to river /stream

	PROXIMITY TO RIVER/STREAM					
LOSS SUFFERED (₦)	<1km	1-2km	2.1-3km	>3km	No River/Stream	**TOTAL**
<110,000	26.1	14.5	2.4	0.0	3.4	**46.4**
110,000-200,000	8.2	2.4	0.5	1.4	1.4	**14.0**
210,000-300,000	4.8	1.0	0.5	0.0	0.0	**6.8**
310,000-400,000	2.9	1.0	0.5	0.0	0.0	**4.3**
410,000-500,000	2.9	1.0	0.0	0.5	0.0	**4.3**
>500,000	13.5	7.2	0.0	1.9	1.4	**24.2**
TOTAL	**58.5**	**27.1**	**3.9**	**3.9**	**6.8**	**100.0**

Source: Field survey, 2015

4.6. Suggested Mitigation Measures by Respondents

Mitigation measures are the steps taken towards reducing negative impacts of flood disasters on the livelihoods of farmers. These include action to be taken before flooding to prepare for flooding, actions taken during flooding to respond to flooding and actions taken after flooding to recover from its negative impacts.

Data in Figure 4.14 reveal that most of the respondents (41.1%) suggested that government and relevant agencies should construct adequate and effective drainage system before flooding in order for them to prepare for it. Also, some of them called for provision of effective early warning system, provision of adequate information from agricultural extension officers, effective and efficient campaigns against indiscriminate dumping of refuse on the water ways and adequate weather forecast as ways of preparing for flooding.

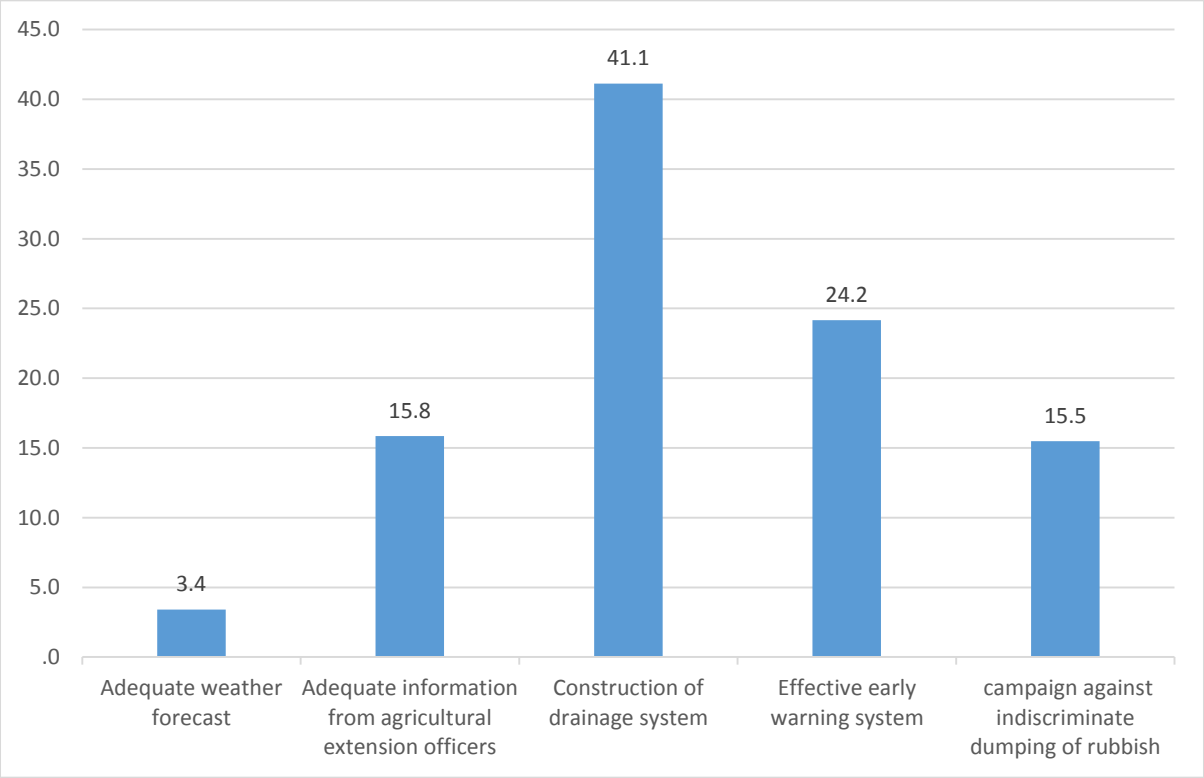


Figure 4.14. Suggested flood mitigation measures by respondents to prepare for flooding

Source: Field survey, 2015

On what should be done during flooding, Figure 4.15 reveals that most of the respondents (56.3%) suggested opening up of the waterways as one of the ways to respond to flooding when it occurs. Some also mentioned carrying out of rescue operation/evacuation flooding victims,

provision of cash and other relief materials, assistance in controlling the devastating effects of flooding and environmental sanitation of the affected areas as ways to respond to flooding.

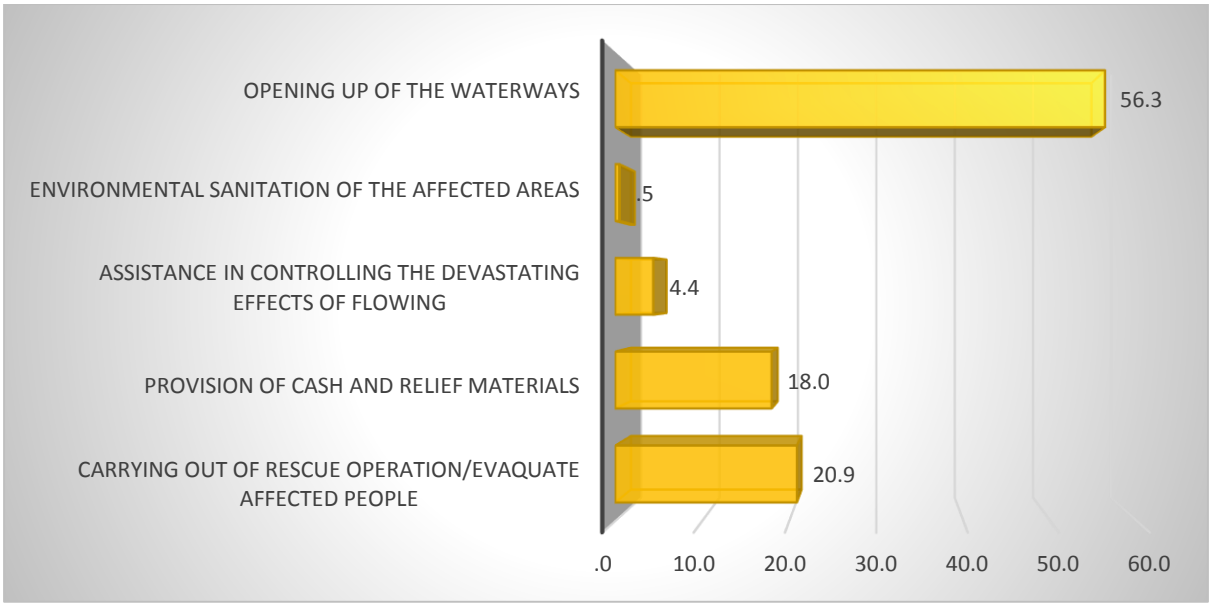


Figure 4.15. Suggested flood mitigation measures by respondents to respond to flooding

Source: Field survey, 2015

On what should be done to recover after flooding, Figure 4.16 shows that respondents' opinions on how government and other relevant agencies can come into aid in recovering from flooding whenever it happens. Most of them (48%) suggested compensation of the affected farmers as one of the ways to recover from flooding. In addition, other suggestions by the respondents include: construction of effective and efficient road and drainage system, establishment of effective resettlement scheme, provision of credit facilities and empowerment of affected farmers.

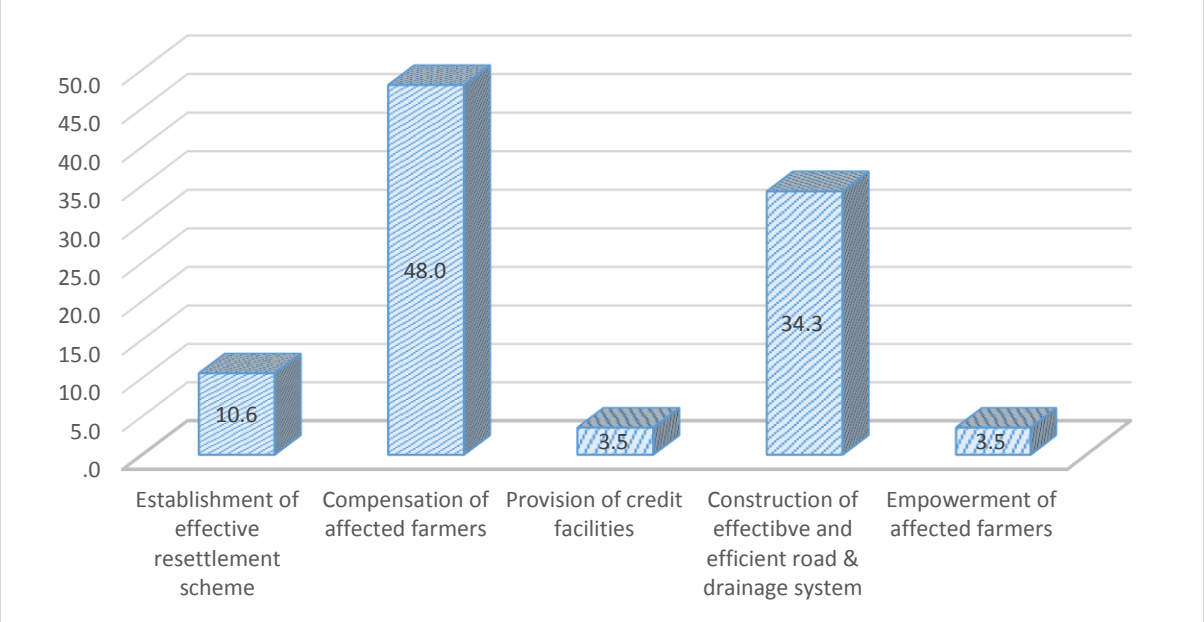


Figure 4.16. Suggested flood mitigation measures by respondents to recover from flooding

Source: Field survey, 2015

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The current incessant flooding, which is one of the outcome of variation in climate is a major threat to agriculture practices and livelihoods of farmers in Oke-Ogun Area of Oyo State. It is against this background that this research has focused on the impact assessment of flood disaster on the livelihoods of farmers in Oke-Ogun Area of Oyo State, using both primary and secondary data. Primary data collected included socio-economic characteristics of the farmers, flood and livelihoods related data. These were obtained through the use of focus group discussions, in-depth interview and semi-structured questionnaire, in addition to geographic coordinates, using portable GPS. Secondary data were sourced from relevant government agencies and parastatals.

The study showed that majority of the respondents are males, old, married, Yorubas, averagely educated, heads of their respective families, relatively large family size. They cultivate crops like maize, yam, cassava, tobacco, millet, vegetable, beans, soybeans, melon, water melon and cash crops. Furthermore, they also rear livestock like goat, cattle and sheep.

Factors that made these farmers vulnerable to negative impacts of flood disaster are measured, using exposure, susceptibility and resilience as components of vulnerability. In terms of susceptibility, it was found out that most of the farmers located their farmlands very close to river/stream, while most of them do not have good drainage system. Most of the respondents claimed that they have experienced flooding at one time or the other before. Though they claimed that the soil types in the area is good for farming, this may not totally protect them from flood vulnerability. Based on the exposure components, the major cause of flooding in the study area is heavy rainfall which takes some days to totally dry up. The depth of water during the last flooding was about 3 meters, on the average. All these factors increase their exposure to flooding. Furthermore, their limited access to supports from external bodies during flooding and low level of awareness about government's land regulations, indicate their low level of resilience. However, their resilience could be increased by the availability of flood warning. From these vulnerability components, it can be inferred that these farmers are highly vulnerable though the levels vary from one community to the other.

In addition, the results showed that farmlands are mostly affected by flooding due to their proximity to river/stream, while flooding has little impact on farmers' houses because they are very far from river/stream.

Furthermore, respondents' adaptive capacities vary from one community to the next. Most of the respondents have other sources of income, an indicator of high adaptive capacity. However, availability of flood early warning system, flood local sign, community flood management committee and insurance which make them have low adaptive capacity.

Also, the results indicated various relationships existing among the variables such as communities and farm proximity to river/stream in which communities like Saki, Ago-Are and Agolabi sited their farms very close to river/stream, while communities like Tede, Oje-Owode and Ago-Amodu/Sepeteri sited their farms a bit far from the river/stream. The results equally showed that only Agolabi has experienced flooding more regularly than others. In the same vein, none of the villages has flood management committee. Also, Agolabi, Saki, Tede, Ago-Are and Oje-Owode have suffered most losses in recent flood disaster, while Ago-Amodu/Sepeteri suffered only a little. Furthermore, flood disaster has very high impacts on the farm and livelihood of Agolabi, Saki and Ago-Are, while it has little impact on Oje-Owode, Tede and Ago-Amodu/Sepeteri farming communities. Most of the respondents who get these flood warnings fall within the age bracket 30-59: this indicates that most of them are still in their active stage of life. Also, flood warning is understood by almost all the respondents, irrespective of their educational backgrounds which might be due to their easy accessibility to extension officers who visit them from time to time. The results also indicated that farm locations that are very close to river/stream suffered most losses in the recent flood disasters. Finally, some recommendations were suggested by the respondents regarding what government and relevant agencies can do before, during and after flooding to help farmers mitigate negative impacts of flood disaster on their livelihoods. These recommendations include construction of drainage system, opening up of the water ways, and provision of relief materials after flooding etc.

5.2 Recommendations

Based on the findings of this study, the following are recommended:

1. Government should provide adequate drainage system around the farms to reduce flood disaster.
2. Adequate and effective weather broadcast should always be made available to farmers by government and other relevant agencies to reduce negative impact of flooding.
3. Adequate flood warning system should be put in place by government and other relevant agencies to reduce negative impacts of flood disaster
4. Waterways should be expanded to allow for free flow of water during heavy rainfall
5. Government and other relevant agencies/NGOs should provide support to farmers who are affected by flood disasters
6. Government and other relevant agencies should empower the farmers in order to improve their livelihoods and enhance their resilience and coping/adaptive capacities
7. Credit facilities should be provided to farmers by government and relevant agencies to improve their livelihoods
8. Farmers should always comply with government and other relevant agencies' advice on how to reduce the negative impact of flood disaster

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APPENDIX

QUESTIONNAIRE

QUESTIONNAIRE ON IMPACT ASSESSMENT OF FLOOD DISASTERS ON LIVELIHOODS OF FARMERS IN SELECTED FARMING COMMUNITIES OF OKE-OGUN AREA OF OYO STATE, NIGERIA.

INTRODUCTION

The study aims at assessing the impact of flood disaster on livelihoods of farmers in selected farming communities of Oke-Ogun Area of Oyo State, Nigeria. The data provided is for academic purpose as part of the requirement for the award of MSc in Climate Change and Human Security, Université de Lomé, Togo. The information provided would be treated with high sense of confidentiality.

PRELIMINARY

Name of the village----------

Date of interview……..

SECTION 1: SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENT/ SUSCEPTIBILITY

1. Gender (i) Male (ii) Female
2. How old were you at your last birthday? *In years* ……
3. Ethnic group ……
4. Marital status (i) Single (ii) Married (iii) Divorced/Separate (iv) Widow/Widower
5. Household position (i) Head (ii) Wife (iii) Child
6. Household size……
7. Highest level of education attained (i) No formal education (ii) Primary (iii) Secondary (iv) NCE/OND (v) HND/ BSc (vi) PGD/MSc (vii) Above MSc
8. What is the number of women in your household? ……
9. What is the number of children under 15 in your household? ……
10. What is the number of persons above 60 (elderly) in your household? ……
11. What is/are sources of your farmland ownership (tick as many as applicable) (i) Purchased (ii) Rented/leased (iii) Inherited
12. Do you have drainage system on your farm? Yes ☐ No ☐
13. Have you experienced flooding before? Yes ☐ No ☐
14. If yes, how frequent in the last 5 years? (i) Every raining season (ii) Occasionally (iii) Once
15. What is your farmland soil type? (i) Clay/heavy soil (ii) Silt/medium soil (iii) Sandy/light soil (iv) Others (specify)……

16. Does flooding cause damage to your farm? Yes ☐ No ☐
17. Does flooding cause damage to your house? Yes ☐ No ☐
18. What are the other source(s) of your income (i) None (ii) Trading (iii) Fishing (iv) Livestock rearing (5) others (please specify)……

SECTION 2: EXPOSURE

19. What is the size of your farmland(s)? .....
20. What is the proximity of your farm to river/stream: (i) less than 1km (ii) 1-2km (iii) 2.1-3km (iv) more than 3km (v) No river/stream near my farm
21. What are the causes of flooding in your area? (tick as many as are applicable (i) Heavy rainfall (ii) River overflow (iii) other, specify----------
22. Has the frequency of occurrence and impacts of flooding increase in this area when compared to last 5 years? (i) Yes (ii) No
23. How long did it take flood water to totally dry up after the flooding during the last incidence? .....
24. What is the number of flooding event in the past five years? ----------
25. What was the depth of water during the last flooding you experienced on your farm (in meters) .....

SECTION 3: RESILIENCE

26. Have you received any flood warning before? Yes ☐ No ☐
27. If yes, how often? (i) Prior to onset of raining season, (ii) During raining season (iii) All year round (iv) Others (please specify)…….
28. From which source(s) (i) Radio (ii) Television (iii) Newspaper (iv)Fellow farmers (v) Extension workers
29. Are the flood warning messages clear to you? (i) Yes (ii) No
30. If no, why? ……..
31. If your informants are extension workers, how often do they come? (i)Every week (ii) Every month (iii) Every year (iv) Occasionally
32. Is there any local sign of flooding event (i) Yes (ii) No
33. If yes, mention them……..
34. Is there community flood management committee (i) Yes (ii) No
35. If yes, are you a member? (i) Yes (ii) No
36. Do you have early warning system? (i) Yes (ii) No
37. Do you have insurance? (i) Yes (ii) No
38. If yes, by what means do you insure your farm? (i) Agricultural Insurance (ii) Cooperative Society (iii) Other (please specify)……
39. What other income-generated activities do you during flooding? ……
40. Do you receive any support from external body whenever you experience flooding? Yes ☐ No ☐

41. If yes, indicate the sources (i) Government (ii) NGOs (iii) Friends (iv) Family (v) Others (please specify) …….
42. What are the forms of support (tick as many applicable as possible) (i) Cash (ii) Relief materials (iii) Others (please specify) …….
43. Are you aware of Government Land Regulations? (i) Yes (ii) No
44. If yes, kindly explain……
45. What do you think government and other relevant agencies should do before flooding to prepare for flooding?
    ……
46. What do you think government and other relevant agencies should do during flooding to respond to flooding?
    ……
47. What do you think government and other relevant agencies should do after flooding to recover from flooding?

SECTION 4: LIVELIHOOD

48. How much did you lose during the last flooding? ……..
49. How long did it take you to return to farm after flooding? ……..
50. What is the range of your annual income in Nigeria Naira in the absence of flood?

i. Less than 100,000
ii. 101,000-200,000
iii. 201,000-300,000
iv. 301,000-400,000
v. 401,000-500,000
vi. More than 500,000

51. What is the range of your income in Nigeria Naira during flood?

i. Less than 100,000
ii. 101,000-200,000
iii. 201,000-300,000
iv. 301,000-400,000
v. 401,000-500,000
vi. More than 500,000

52. What is the effect of flood on your farm and livelihood? (1) Extremely high (2) High (3) Low (4) No effect

53. Please, indicate crops and livestock you are rearing including land area and annual income.

Crop/ Livestock	Land area/ number of livestock reared	Annual income (₦)
Maize		
Yam		
Cassava		
Tobacco		
Millet		
Vegetable		
Beans		
Soybeans		
Melon		
Water melon		
Cash crops		
Livestock		
Other crops/ Livestock		