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Article *in* International Journal of Scientific and Engineering Research · August 2016

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

Sunday Opeyemi OKELEYE*, Felix B. OLORUNFEMI , Jean Mianikpo SOGBEDJI and Mawuli AZIADEKEY

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

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1. INTRODUCTION

A flood happens when a stream runs out of its confines and submerges surrounding areas [1]. The frequency and severity of extreme weather events and natural disasters have increased in the past decades worldwide [2], [3]. Although some anticipated impacts of climate change are positive in certain areas, developing countries are most likely to suffer from its negative impacts [4]. Flood is one of the main factors that prevent Africa populations from escaping poverty level [5].

According to Ajayi [7], 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 [7].

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Intergovernmental Panel on Climate Change [8] 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. [7]

In Nigeria, flooding occurs in three main forms: river flooding, urban flooding and coastal flooding [8], [9]. 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 [10].

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 [11]. James, [12] 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 [6] 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 [6]**.** 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 [13].

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 [7], [14], [15]. 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 [16], [17]. 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. Specifically, we examine what makes farmers vulnerable to flooding, farmers' livelihoods that are prone to flood disaster, losses suffered by farmers in recent flood disasters and coping mechanisms of farmers to flood disasters

1. Conceptual Framework and 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 [18]. 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 [19].

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 [19]. However, disaster can also be a catalyst for change [20]. Crises and disasters can also serve as catalysts for reorganization and learning processes in communities or societies, often accelerating underlying policy and social trajectories [21]. 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 [22]. 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 [22].

2.2 Flood Disaster

Flooding can be described as an overflowing of water on an area normally dry. Nott [23] 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 [24]. Flood disaster is one of the environmental crises that must be contended with in this century [25]. 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 [24]. 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 [23]. Rashid [26] concluded that women and children are the most vulnerable during the occurrence of floods. Sinclair and Pengram [27] 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 [28]. 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 [29]. 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 [29], [30]. 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 [30].

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 [31], [32], [33], [7]Climate change is one of the primary causes of flood disaster [26]. Sub-Sahara Africa is seen to be most vulnerable to climate variability, including flooding [14], [34]. Climate change portends greater variations in the rainfall patterns and some changes have already been assessed in West Africa [35] .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 [24]. 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 [36]. The frequency and severity of floods in some parts of West Africa have increased considerably over the last decade [34].

2.5 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 [37]. 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 [34]. Human activities have tended to exacerbate flooding and its impacts on agriculture and livelihoods in some communities in Nigeria [38].

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 [13].

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 1

Table 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

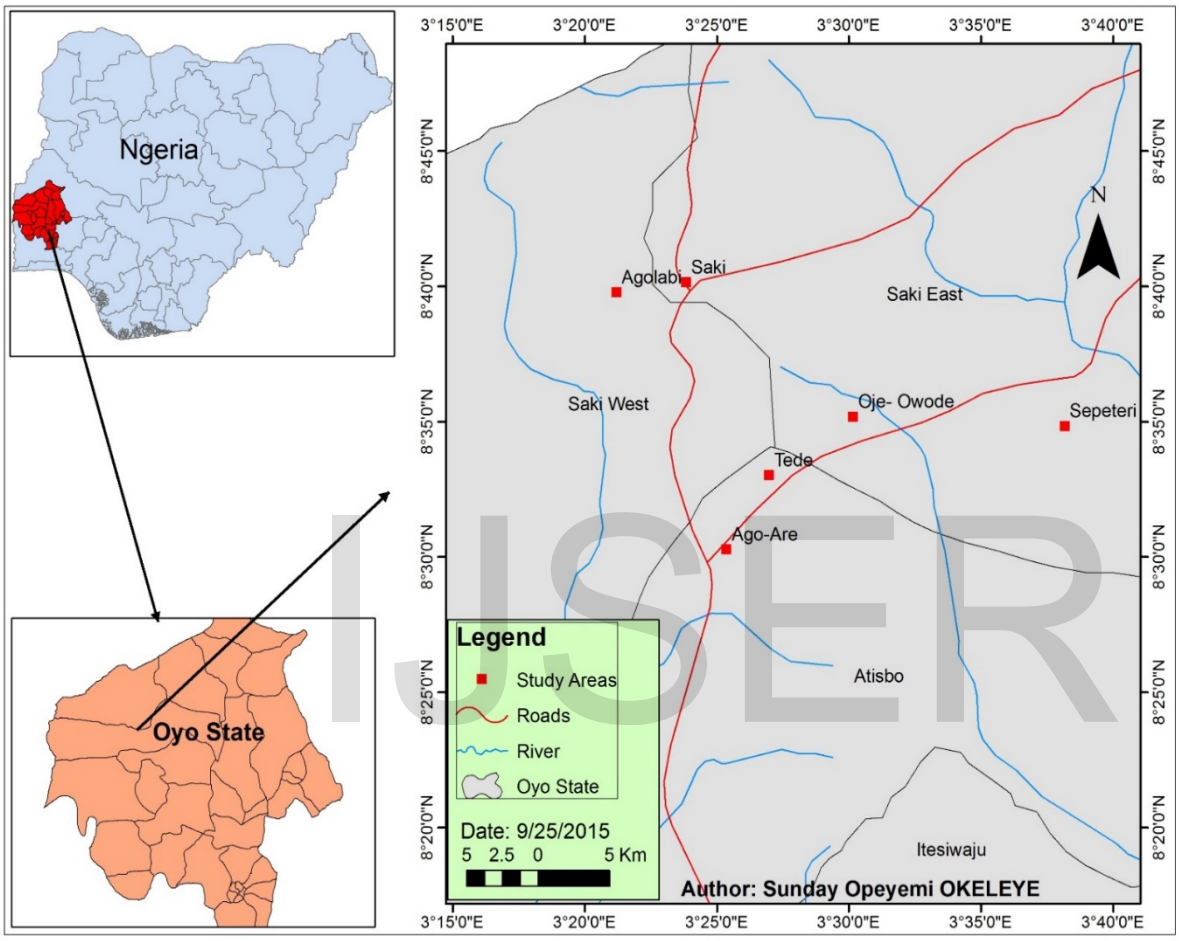


Figure 1 Map showing the study area

3.1.1 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 [13], [39], [40].

3.1.2 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, [41]. 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. The wooded savanna is characterized by asub-humid Koppen's *Aw* climate [*an* equatorial savanna where minimum precipitation is less than 60mm in dry season [42]. Population density is relatively high and survival for large rural communities depends on small-holder rain-fed agriculture [43], [44].

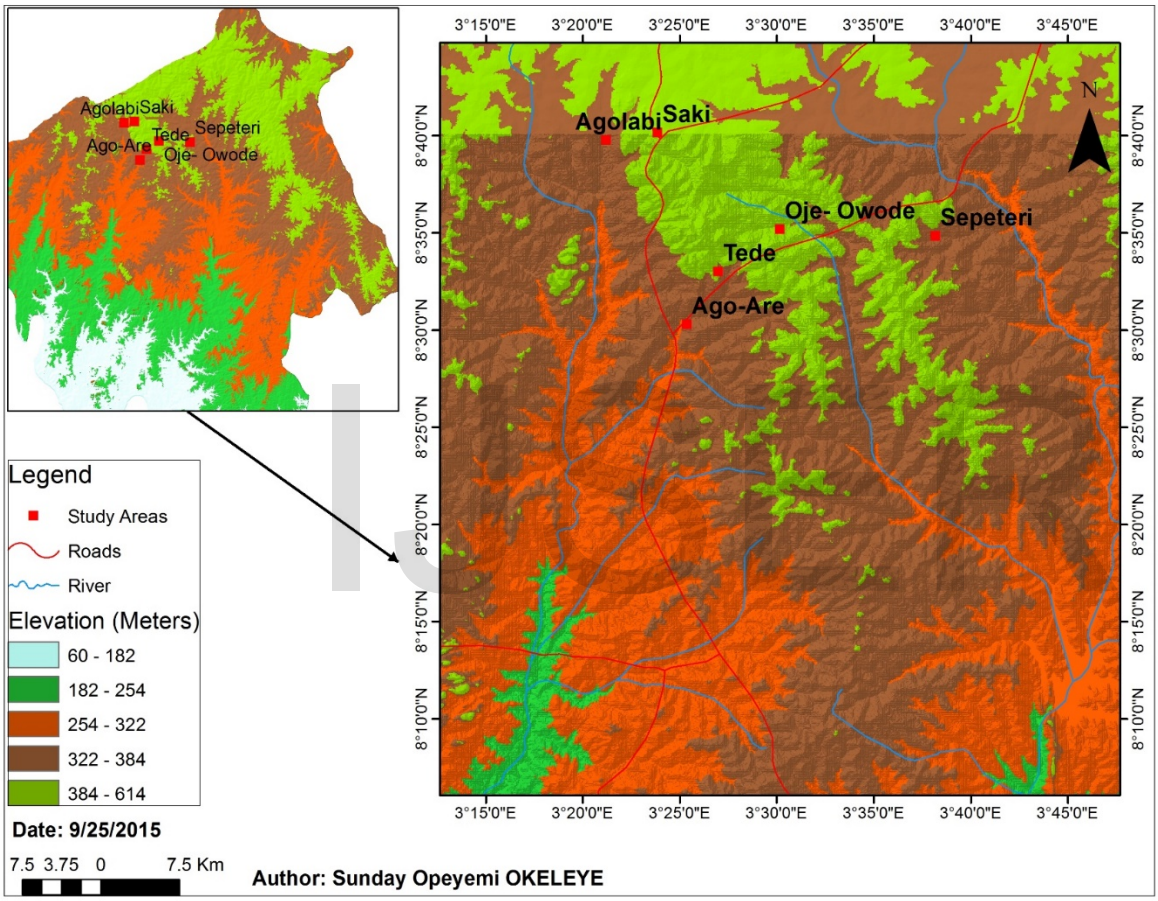


Figure 2 Map showing elevation of the study area

3.2. Methods

3.2.1. Conceptual Framework

Table 2. Indicators used for analyzing vulnerability following the framework by Turner et al. [45].

Susceptibility	Exposure	Resilience (impact, coping/response, adaptation)

• Location of farmland • Availability of drainage system • Frequency of flood occurrence • Farmland soil type	• 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	• Existence of past flood warnings • Clarity of flood warning messages • Availability of supports from external bodies during flooding

3.2 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 was 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.

3.3 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.

4 Results and Discussions

4.1 Socioeconomic Characteristics of Respondents

Results of the analysis presented in Table 3 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 [43]. With respect to ages, more than two-thirds fall within the age bracket 31-60 years and 13.7% are above 60 years of age while 7% of respondents are 30 years of age or below. This indicates that a large proportion of the farmers is 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 [46], [47], [48], [49].

Majority of the respondents are married (81.3%), while 9.3% of them are single. In addition, close to half of the total number of respondents (47.7%) has between 6-10 numbers of people in their household. The level of education is very important as it enhances translation of early warning information into meaningful decision. 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 of the respondents 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 3: Socio-Economic Characteristics of Respondents

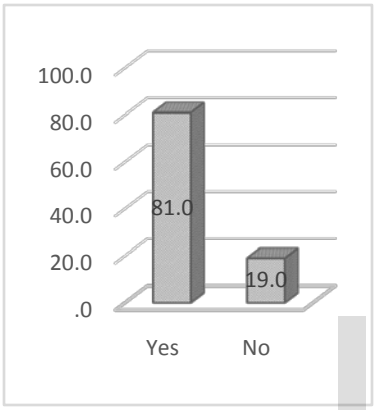
Variables	Frequency	Percentage
Sex		
Male	227	75.7
Female	73	24.3
Total	**300**	**100**
Age		
Less than 31 years	21	7.0
31-60 years	238	79.3
61 years and above	41	13.7
Total	**300**	**100**
Marital status		
Single	28	9.3
Married	244	81.3
Divorced/Separate	13	4.3
Widow/Widower	15	5.0
Total	**300**	**100**
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**

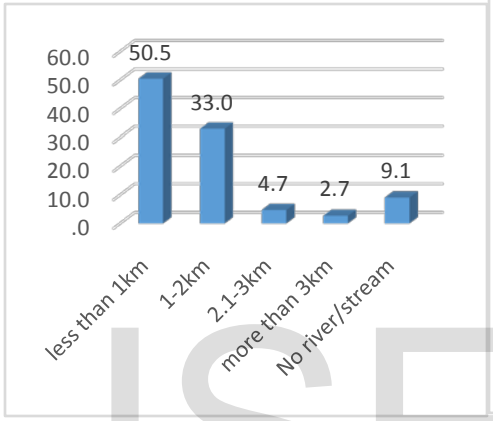
Source: Field survey, 2015

Factors that make farmers vulnerable to flood disaster

Also, according to Winsemius *et al.* [50] and Field *et al*. [51], places where flood occurrence is frequent are more vulnerable to flood disaster. As shown in Figure 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. In addition, according to [59], 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 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. Furthermore, 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 5).





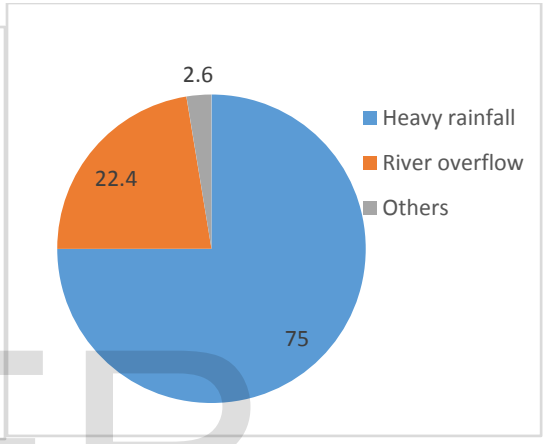


Figure 3: Past flood experience **Figure 4: Proximity to river/stream** **Figure 5: Causes of flood disaster**

Source: Field survey, 2015

4.1 Farmers' Livelihoods that are Prone to Flood Disaster

Winsemius et al. [50] 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 6 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. [52] and Muller et al [46], 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.

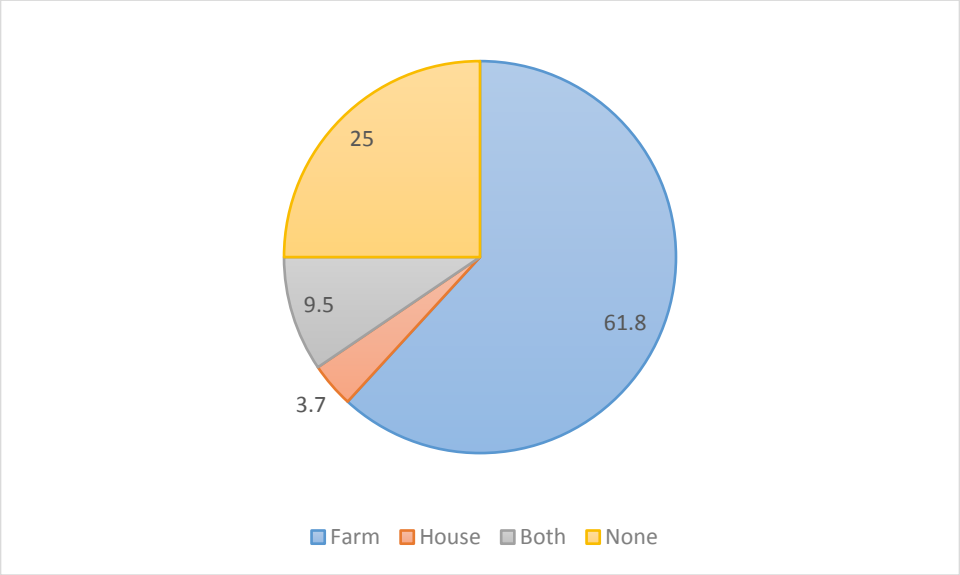


Figure 6. Livelihoods prone to flood disaster

Source: Field survey, 2015

Table 4 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. 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

4.1.1 Variations in the Occurrence of Flooding Among Communities.

Figure 7 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.. It can also be inferred from this Table that Agolabi community are the most vulnerable to flood disasters.

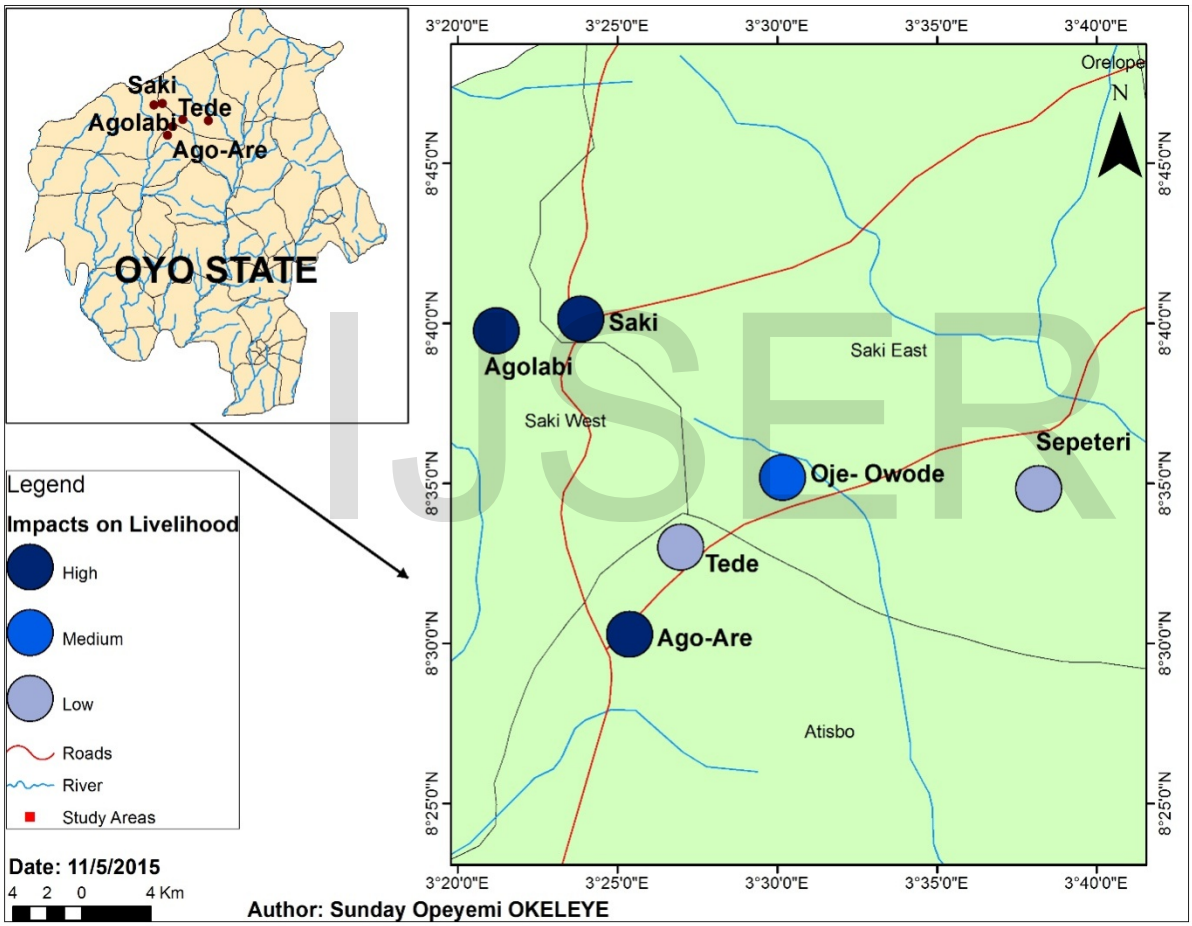


Figure 7. Levels of impacts of flood disaster on livelihoods of farmers

4.2 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. [53], [54], [55] 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. [56], 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 5. 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

Summary and 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. Factors that made these farmers vulnerable to negative impacts of flood disaster are measured, using exposure, susceptibility and resilience as components of vulnerability which showed that the farmers are highly vulnerable though their vulnerabilities vary from one community to another.

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.

Based on the findings of this study, it is recommended that government should provide adequate drainage system around the farms to reduce flood disaster, adequate and effective weather broadcast should always be made available to farmers by government and other relevant agencies to reduce negative impact of flooding, adequate flood warning system should be put in place by government and other relevant agencies to reduce negative impacts of flood disaster,

waterways should be expanded to allow for free flow of water during heavy rainfall, credit facilities should be provided to farmers by government and relevant agencies to improve their livelihoods and farmers should always comply with government and other relevant agencies' advice on how to reduce the negative impact of flood disaster.

Acknowledgments

We appreciate German Federal Ministry of Education and Research (BMBF) for sponsoring this project. We also acknowledge the contributions of management and staff of West African Science Service Centre on Climate Change and Adapted Land use (WASCAL) and University of Bonn, Germany.

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