

**USMANU DANFODIYO UNIVERSITY, SOKOTO
(POSTGRADUATE SCHOOL)**

**ASSESSMENT OF LIVELIHOOD ASSETS OF FARMING
HOUSEHOLDS AFFECTED BY 2010 FLOOD DISASTER
IN SOKOTO STATE, NIGERIA**

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By

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DEDICATION

This dissertation is dedicated to the Almighty Allah, for giving me the opportunity to pursue M.Sc. degree in Agricultural Extension.

CERTIFICATION

This dissertation by **Tambari**, Ismaila Waziri has met the requirements for the award of the Degree of Master of Science (Agricultural Extension) of the Usmanu Danfodiyo University, Sokoto, and is approved for its contribution to knowledge.

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LISTS OF ACRONYMS

ANOVA:	Analysis of Variance
FBOs:	Faith Based Organisations
FGD:	Focus Group Discussion
FLD:	Flood Disaster
KG:	Kilogram
LGAs:	Local Government Areas
NEMA:	National Emergency Management Agency
NGOs:	Non-Governmental Organisations
NO.:	Number
PRA:	Participatory Rural Appraisal
QTY:	Quantity
S/N:	Serial Number
SQ. M:	Square Meter
UDUS:	Usmanu Danfodiyo University Sokoto
VAL.	Value
WWW:	World Wide Web

ABSTRACT

The study assessed livelihood assets of farming households affected by the 2010 flood disaster in Sokoto State, Nigeria. Purposive sampling was used in four stages to select the most flood-affected farming communities in which 178 farming households were obtained as sample size for the study. Interview schedule and checklist was used as research instruments for the study. Descriptive and inferential statistics were used to analyse the qualitative data, while participatory rural appraisal tools were used to obtain the quantitative data. Majority (63.5%) of the farming households had residential buildings that were made of mud, which made the buildings highly vulnerable to adverse effects of the 2010 flood disaster. Majority expressed that excessive rainfall (91.6%); excessive release of water (92.1%) from Bakolori, Goronyo and Lugu dams caused the 2010 flood disaster. Also, the fertile soils (46.1%), closeness to Rima and Sokoto Rivers (51.1%) utilised for lowland farming (61.2%) was the farming households' reasons for living in flood-affected areas. Livelihood assets lost to the 2010 flood disaster in all the study LGAs were estimated to be N93,605,000 million, Wamakko LGA had encountered the highest lost with mean value of N606,088 per households. Assistance (45.5%), borrowing from non-affected families (55.1%), intervention from donor groups (48.9%) and migration for livelihood alternatives (65.2%) were adopted for coping with stress caused by the 2010 flood disaster. Analysis of Variance revealed a significant difference in the extent of losses in monetary term among the study LGAs at 5% level of significance ($F\text{-Cal.} = 7.12 > F\text{-Tab.} = 1.32$). The wealth ranking revealed that the quantity of food, livestock and fish was reduced due to adverse effects of the 2010 flood disaster. Therefore, the study recommended that the concerned stakeholders should expedite actions to control the adverse effects of flood disaster in the study area.

CHAPTER ONE

1.0 INTRODUCTION

This chapter contained an introductory part that served as the foundation for the study. More specifically, the chapter demonstrated how different components were related to the study. These components include background to the study, statement of the problem, general and specific objectives of the study, hypothesis of the study, justification of the study, scope and limitations of the study as well as operationalisation of concepts used in the study.

1.1 Background to the Study

Flood means the situation of water accumulation in places that are normally submerged due to excessive rainfall, glacial outburst and dam break flow (Ismail and Mustaqim, 2013). Because of these features, flood was known to be among the oldest disaster that had threatened lives for ages ago (Ferreira, 2011). Generally, riverine areas were prone to flood (Kingsley and Christopher, 2013). For instance, the most devastated flood disaster of the 20th century occurred in 1931 in flood-prone areas of Yellow River in China that eventually led to the death of nearly four million households (National Geographic Society, 2016). However, around the world the acceleration of population growth, changes in the land-use, recurrent and persistent nature of flood coupled with the increased level of flood vulnerability were responsible for the death of up to 50,000 people, where more than 75 million households were adversely affected by flood every year (Ismail and Mustaqim, 2013). Furthermore, the occurrence of flood was primarily related to the type of precipitation and modification of physical environment that include development of housing estate and agricultural land along the river ways. This development, according to William and Mary (2006), can increase the frequency of the occurrence of flood disasters. In the recent past, from 2010 to date, every state in Nigeria was affected from environmental challenges that include flood and erosion that imposed a lot

of implications on livelihood. For instance, National Emergency Management Agency (NEMA) has named 2010 as the year of flood disaster in Nigeria, because flood disaster occurred in 23 states of Nigeria that killed 1,555 households and displaced 258,044 households out of their homes. Also, the excessive rainfall in 2010 caused Goronyo dam in Sokoto State to release its excess water in order to save the dam from collapse was among the factors that caused the 2010 flood disaster in the State where more than 50 farming communities were sub-merged by flood water (Tosin, 2010). However, the bridges and highways leading to Illela local government area and Usmanu Danfodiyo University Sokoto (UDUS) were damaged due to the adverse effects of the 2010 flood disaster, thereby making the traffic and movement of goods and services, nearly impossible for a number of undisclosed days that exposed the farming households to hardship (Ecological Fund Office, 2010 and NEMA, 2010).

1.2 Statement of the Problem

The adverse effects of the 2010 flood disaster in the study area were manifested in decline of agricultural activities especially in crop production, livestock rearing and migration of the farming households to semi-urban or urban areas in search of non-farm income generating activities. However, studies conducted on flood disaster were mostly based on socio-economic characteristics, cause and effect relationship, vulnerability and coping strategies adopted by flood victims irrespective of their occupations and losses per individual households. For instance, previous studies conducted by Nugroho and Koji (2012), Ikusemoran *et al.* (2013), Ismail and Mustaqim (2013), Victor *et al.* (2014) and Tanvir (2015) were based on vulnerability, socio-economic characteristics and coping strategies adopted by different communities in Indonesia, Nigeria, Bangladesh, Ghana and Nepal. Therefore, there is need to study the extent of which flood disaster destroyed livelihood assets at the households' level rather than at community level that was achieved by previous studies. However, the choice of the 2010 flood disaster was based on expressions made by Sokoto State Emergency Management Agency (SEMA) and other relevant stakeholders that the 2010 flood

disaster was considered to be the worst disaster that ever occurred in the State. Consequently, it is against this background that this study attempted to assess the livelihood assets of the farming households that were affected by the 2010 flood disaster. For this objective to be achieved, the study answered the following research questions:

- i. What are the socio-economic characteristics of the farming households affected by the flood?
- ii. What are the causes of the flood disaster in the study area?
- iii. What are the farming households' reasons for living in the flood-affected areas?
- iv. What is the extent of losses in monetary term of livelihood assets of the farming households affected by the flood?
- v. What are the indigenous coping strategies adopted by the farming households affected by the flood?

1.3 Objectives of the Study

The general objective of the study is to assess livelihood assets of farming households affected by 2010 flood disaster in Sokoto State, Nigeria. While, the specific objectives of the study are to:

- i. describe the socio-economic characteristics of the farming households affected by the flood.
- ii. examine the causes of the flood disaster in the study area.
- iii. identify the farming households' reasons for living in the flood-affected areas.
- iv. assess the extent of losses in monetary term of livelihood assets of the farming households affected by the flood.
- v. determine the indigenous coping strategies adopted by the farming households affected by the flood.

1.4 Hypothesis of the Study

There is no significant difference in the extent of losses in monetary term encountered by the farming households affected by the 2010 flood disaster among the study local government areas.

1.5 Justification of the Study

The study was considered to be instrumental by assessing the livelihood assets of the farming households that were affected by the 2010 flood disaster, in order to come up with recommendations that will guide against the future occurrences. However, this study was conducted based on the theoretical and methodological justifications that were achieved during the literature review. Therefore, results of the study in this regard will be added to the existing stock of knowledge, serve as a source of information to government, disaster management agencies, civil societies, flood-affected farming households as well as reference materials for further research and development for students in the institutions of higher learning in particular and the concerned general public at large.

1.6 Scope and Limitations of the Study

The scope of study was based on the assessment of livelihood assets of farming households affected by the 2010 flood disaster in Sokoto state, which was initially achieved based on the outcome of preliminary survey to the study area, discussion with relevant stakeholders and information reviewed from the secondary materials that was finally perfected by results of the study. Thus, the study was constrained with the challenges that include:

- i. Inability of the farming households to have a sound memory in giving account of issues relevant to the study. This challenge was firmly addressed during the Focus Group Discussion (FGD) where responses generated were brainstormed and triangulated.
- ii. Inability of the researcher to study all the areas affected by the 2010 flood disaster due to limited time and inadequate resources that will be used to cover the size of the study area. This challenge was solved by purposive sampling of the most flood-affected areas.

- iii. Inability of the farming households to comprehend the contents of the interview schedule that was written in English language. This challenge was further solved by involving the services of three trained enumerators who could interpret the content of the interview schedule in Hausa language.
- iv. Reluctance of the farming households to provide information that was relevant to the study. This challenge was achieved by proper orientation about the objective of the study.
- v. Suspicious manner of the officials of disaster relief agencies to release relevant information that will tremendously assist the researcher in making comparison in relation to results of the study. This challenge was overcome by presenting to the officials the introduction letter that contained the main objective of the study.

1.7 Operationalisation of Concepts

- i. Causes of flood disaster: These are the out-come due to the interaction of natural, human, environmental and institutional factors.
- ii. Disaster: This is a natural or human-induced event, occurring with or without warning that can cause widespread losses on human, material, economic and environmental resources that exceed the ability of the affected farming households to cope with its adverse effects by using their own resources.
- iii. Livelihood assets: These are the physical, financial and material properties owned by the farming households for their standard of living.
- iv. Farming households: These referred to homes that contained different family members with diversification of agricultural activities that include farming, livestock rearing and fishing. The farming households who lived together due to their common features of being closely related by birth, marriage or adoption would have among them the most senior member of the family as the households' head.

- v. Indigenous coping strategies: These are different options adopted by the farming households in order to survive from the adverse effects of flood disaster.

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter reviewed different work that was related to the specific objectives and the methodology adopted for the study, to which all the authors and sources quoted in the process of literature review are acknowledged. However, the review maintained the authors' choice of words in most cases while in some instances, little modifications and criticisms were made by the researcher in the process of review not to intentionally temper with the authors' original work, but to appreciate its contributions to knowledge, scholarship and literally work in totality.

2.1 The Socio-Economic Characteristics of the Farming Households Affected by Flood Disaster

Different socio-economic characteristics of the farming households that were affected by flood disaster in Indonesia identified by Nugroho and Koji (2012) are as follows:

2.1.1 Gender Ratio of Households

This is the socio-economic factor that was related with the behaviour of households when confronted with flood disaster, where males compared to females have strong body to withstand the adverse effects of flood disaster will be used to evacuate the affected family members to safe places.

2.1.2 Households Size

Households with few family members can easily evacuate the affected family members compared to households with large family members that face a lot of difficulties.

2.1.3 Occupation of Households

This is the socio-economic factor that was concerned with the ability to recover from the adverse effects of flood disaster. It was found that most of the households of Purworejo communities

in Indonesia are farmers by occupation. Therefore, the economy of this community was very dependent on agriculture that can be vulnerable to the adverse effects of flood disaster.

2.1.4 Households Level of Education

This is the socio-economic factor that was concerned with ability of households to come up with their own ways to save the affected family members from the adverse effects of flood disaster. However, low level of education was observed to have an effect on the households' coping strategies in flood disaster management.

2.1.5 Age Proportion of Households

This is the socio-economic factor that was concerned with the behaviour of households when confronted with flood disaster, where elderly members and children in the family are more vulnerable to the adverse effects of flood disaster compared to young and adult members of the family. It was observed that the young generation in most occasions lived in the urban areas for education and other alternative sources of income when flood disasters occurred.

2.1.6 Housing Condition of Households

This is the socio-economic factor that was concerned with the behaviour of households when confronted with flood disaster, where the residential buildings made up of low quality material will lack the adequate strength to withstand the adverse effects of flood disaster.

2.2 Causes of Flood Disaster

There are three different schools of thought about the causes of flood disaster especially in the tropics. According to the first school of thought, climate change and global warming directly or indirectly lead to the excessive rainfall and melting down of snow, which increase the amount of runoff that eventually cause flood disaster. According to the second school of thought, abuse of physical environment by human beings that include poor land use planning, poor management of waste

disposal and drainage facilities are the factors that cause flood disaster. According to the third school of thought, the combination of climate change, global warming and abuse of physical environment by human beings are the factors that cause flood disaster (Michael and Oyewale, 2013).

Bariweni *et al.* (2012) described climate change as the factor that causes flood disaster because when the climate is warmed, excessive rainfall occurs and this will raise the sea level that will cause flood disaster. This implies that Bariweni *et al.* (2012) has the same viewpoints with the first school of thought who believes that the flood disaster occurs due to influence of climate change and global warming. Aderogba (2012) however, believes in the second school of thought by observing that poor management of waste disposals and blockage of drainage facilities divert the normal flow of water which in turn causes flood disaster. Similarly, Isah (2015) who aligns with the second school of thought added that the modification of natural environment for residential buildings and agricultural activities cause flood disasters. The Nigerian Meteorological Society (2016) that also believes in the third school of thought reported that flood disaster can be caused by natural and human factors. Nevertheless, the classification of factors that can cause flood disasters, expressed by different scholars was based on contributions of the three schools of thought reviewed in this chapter.

2.2.1 Excessive Rainfall and Melting of Snow

According to Onwuka *et al.* (2015), flood disaster occurs due to excessive rainfall and accelerated melting of snow. For instance, the excessive rainfall and melting of snow causes flood disaster in Bangladesh and Nepal every year due to changes in rainfall pattern of Indian monsoon (Ghatak *et al.*, 2012). Also, the excessive rainfall experienced in 2010 caused flood disaster in twenty three States of Nigeria (NEMA, 2010). However, in northern Ghana, fifty five communities were affected by flood disaster due to excessive rainfall (United Nations Development Programme, 2009). In Indonesia, excessive rainfall experienced in 2011 caused flood disaster (Nugroho and Koji, 2012). According to Fox World News (2016), excessive rainfall causes flood disaster in Moscow. State of

emergency was also declared in London cities of Windsor and Tecumseh in 2016 due to excessive rainfall that destroyed homes, roads and parking lots (London Ontario, 2016). According to United Nations Humanitarian Bulletin (2016), excessive rainfall also causes flood disaster in Sudan. The India's Ministry of Home Affairs Disaster Management Division (2016) reported that excessive rainfall also was the major cause of 2016 flood disaster in India. The Civil Defense of Brazilian State of Parana (2016) reported that the flood disaster in Brazil 2016 was caused due to excessive rainfall. Flood disaster in 2016 also occurred in China due to excessive rainfall (Wikipedia, 2016). However, it was observed from the review that countries in Africa, America, Asia and Europe were all affected by flood disaster due to excessive rainfall and melting of snow that could be attributed to the impact of climate change and global warming (Bariweni *et al.*, 2012; Michael and Oyewale, 2013).

2.2.2 Excessive Release of Water from Dams

According to Onwuka *et al.* (2015), the release of excess water from dams was another factor that causes flood disaster. Nwilo (2013) similarly, expressed that the overflow of river Niger in Nigeria caused flood disaster due to excess release of water from dams that were not properly managed some times by regulating authorities. As a result of this assertion, Onwuka *et al.* (2015) highlighted that excess water from Shiroro and Kainji dams that were discharged cause flood disaster in Kogi State and other States around the downstream areas. Also, in 2011 excess water from Oyan dam in Ogun State caused flood disaster. Similarly, Lagdo dam in Cameroon Republic was made by excessive rainfall received to cause flood disaster in Adamawa, Taraba, Benue, Nasarawa, Plateau and Kogi States of the Federal Republic of Nigeria (Ikusemoran *et al.*, 2013). Likewise, Bakolori and Goronyo dams in Sokoto and Rima rivers were also made by excessive rainfall to cause flood disaster in 2010 around the areas covered by Sokoto Rima Basin (Adamu and Umar, 2015).

2.2.3 Collapse of Dams Structures

Generally, the collapse of dams' structures cause dams failures due to excessive rainfall, sub-standard construction materials, geological instability, poor maintenance, extreme inflow and internal erosion (Wikipedia, 2016). Thus, dams that have recently failed due to excessive rainfall, snowmelt and poor maintenance are presented in (Table 2.2.3).

Table 2.2.3.: Collapsed Dams and Cause of Failure

Dam	Year of Collapse	Locations	Cause of Failure
Sobenove Dam	2002	Czech, Czech Republic	Excessive Rainfall
Hope mills Dam	2003	North Carolina, USA	Excessive Rainfall
Camera Dam	2004	Paraiba, Brazil	Poor Maintenance
Shakidor Dam	2005	Pasni, Pakistan	Excessive Rainfall
Gusau Dam	2006	Gusau, Nigeria	Excessive Rainfall
Koshi Dam	2008	Koshi, Nepal	Excessive Rainfall
Algodoes Dam	2009	Piauni, Brazil	Excessive Rainfall
Situ Gintang Dam	2009	Tangerang, Indonesia	Poor Maintenance
Kyzyl-Agush Dam	2010	Qyzylaghash, Kazakhstan	Excessive Snowmelt
Testalinda Dam	2010	Oliver, Canada	Poor Maintenance
Delhi Dam	2010	Iowa, USA	Excessive Rainfall
Niedow Dam	2010	Voivodeship, Poland	Excessive Rainfall
Ivanovo Dam	2012	Biser, Bulgaria	Excessive Snowmelt
Kopru Dam	2012	Adana, Turkey	Excessive Rainfall

Source: Adopted from Wikipedia, 2016

2.2.4 Influence of Topography

Topography was considered to be a natural factor that influences flood disaster. For instance, Onwuka *et al.* (2015) expressed that the characteristics of run off, the configurations of physical terrains, the orientations of rivers, the conditions and properties of soils and rocks are the topographical factors that can cause flood disaster. Mohsen and Stephan (2011) revealed that the effects of topography in flood-affected areas are divided into four categories that include lowlands, medium lands, steep lands and very steep lands. However, the first category was considered to be the topography with very sensitive parameter that can cause flood disaster because it has less than 3.5% surface slope. The second category was considered to be the topography with sensitive parameter that can cause flood disaster because it has greater than 3.5% surface slope. The third category was considered to be the topography with low parameter that can cause flood disaster because it has less

than 10% surface slope. The fourth was considered to be the topography with parameter greater than 28.6% surface slope that cannot cause flood disaster due to absence of sensitivity. Thus, the classification of different categories of topography based on catchments is presented in (Table 2.2.4).

Table 2.2.4: Classification of Different Categories of Topography Based on Catchments

Topography	Categories	Description	Surface Slope (%)
1	Low Lands	Very Sensitive	Less than 3.5
2	Medium Lands	Sensitive	Greater than 3.5
3	Steep Lands	Low Sensitive	Less than 10
4	Very Steep Land	Not Sensitive	Greater than 10

Source: Adopted from Mohsen and Stephan, 2011

2.2.5 Poor Land Use Planning and Physical Development

Poor land use planning around the world was believed to be another factor that causes flood disaster (Ismail and Mustaquim, 2013). In terms of physical development, countries like Nigeria had experienced a lot of physical development that include building constructions, roads and canals along the river ways (Aderogba, 2012). This development, according to William and Mary (2006), can increase the frequency of the occurrence of flood disasters. Other developments that can influence flood disaster include development of housing estate and agricultural land along the river ways (William and Mary, 2006).

2.2.6 Absence of Flood Mitigation Plans

Agbonkhese *et al.* (2014) highlighted that the provision of early warning instruments are considered to be part of flood mitigation plans essentially used to serve as proactive mechanism to forecast flood disaster and issue warning in order to avert the adverse effects of a flood disaster. However, in line with this assertion, Monzu (2007) stressed that the early warning signs and forecasting instruments are important in order to know when flood disasters will occur. In Nigeria, farming communities suffered a lot of adverse effects of flood disasters due to absence of flood mitigation plans. For instance, NEMA (2015) accused state governments of Nigeria for the absence of flood warning signs and forecasting instruments in the flood-affected areas. This action

precipitated the need for the concerned stakeholders to shift from being reactive to proactive to all issues related to flood disaster. Therefore, for this to be achieved the structural and non-structural measures need to be institutionalised in curbing the adverse effects of flood disaster. These measures include construction of irrigation structures that can absorb the excess run off, avoid building residential houses in flood-prone areas, collaboration with local communities and voluntary or donor groups, integration of environmental education and involvement of experts and concerned stakeholders in all matters concerning flood disasters (Agbonkhese *et al.*, 2014).

2.3 Reasons for Living in the Flood-Affected Areas

Farming communities affected by adverse effects of flood disaster are living mostly in riverine areas, which were naturally prone to flood disasters (Kinsley and Christopher, 2013). For instance in Nigeria, according to Olorunfemi and Gbadegesin (2009), flood disaster has a wide range of environmental effects to households that are living in the lowland and upland areas like Sokoto, Bauchi, Niger and Kwara states. However, in Nigeria the households who are living in riverine areas are affected by flood disasters in three different ways that include coastal, river and urban. Coastal flood disaster occurs in the lowland of mangrove and fresh water swamp areas. River flood disaster occurs also in the flood-prone areas, while urban flood disaster in the other hand occurs in terrain with a little or no provision has been made for surface drainage or where the drainage structures has been blocked with municipal waste or refuse dump (Ologunorisa, 2004). It has been observed that the socio-cultural activities of different households that are living in riverine areas have promoted the occurrence of flood disaster in Nigeria (Orebiyi, 2008). This was evident due to the fact that the socio-economic effects of flood disaster on households for the last decades had tend to hit vulnerable communities in developing countries like Nigeria, thereby increasing the countries level of vulnerability to flood disaster (United Nations Disaster Risk Reduction, 2005). Furthermore, despite the manifestation of adverse effects of flood disaster, the households living in the riverine areas had

attached reasons for living in the flood-affected areas to be based on social, economic, environmental and physical reasons (Van Beek and Loucks, 2005; Galloping, 2006; Haase, 2003 and Balica, 2007).

2.3.1 Factors Affecting Living in the Flood-Affected Areas

According to NEMA (2011), process and condition are the two factors that are unfavorable for living in flood-affected areas. As process, it was recognised as the degree to which households may be adversely affected by flood disaster, while as condition it was considered as the lack of capacity to cope with the adverse effects of flood disaster by households. However, Tanvir (2015) reported that population growth and changes in land use pattern were among the factors that encouraged vulnerability to flood disaster and the adverse effects of flood disaster manifested often resulted to mortality, morbidity, displacement of the households, damage of crops, infrastructures and properties (Doocy *et al.*, 2013 and Intergovernmental Panel on Climate Change, 2007). Aliyu (2014) also revealed that the ability to measure vulnerability to flood is an essential prerequisite for reducing its risk. In some instances, the measurement of vulnerability to flood was aimed at identifying the capacities of households in response to disaster situations. However, flood vulnerability components developed by United Nations Educational, Scientific and Cultural Organisations (UNESCO) remained an important framework that will be used to determine how households that can be affected by flood disaster in terms of exposure, susceptibility and resilience.

2.3.2 Flood Vulnerability

According to Dixit (2003), vulnerability is considered as the condition of households to cope with, resist and recover from the adverse effects of flood disaster. Khandlhela and May (2006) however, observed that flood disaster may affect everyone but the poor households are more vulnerable to the adverse effects of flood disaster. Ultimately, the condition of households for living in the flood-affected areas was largely based on vulnerability components. Therefore, the inter play of vulnerability components in relation to flood disaster was clearly demonstrated in (Figure 1).

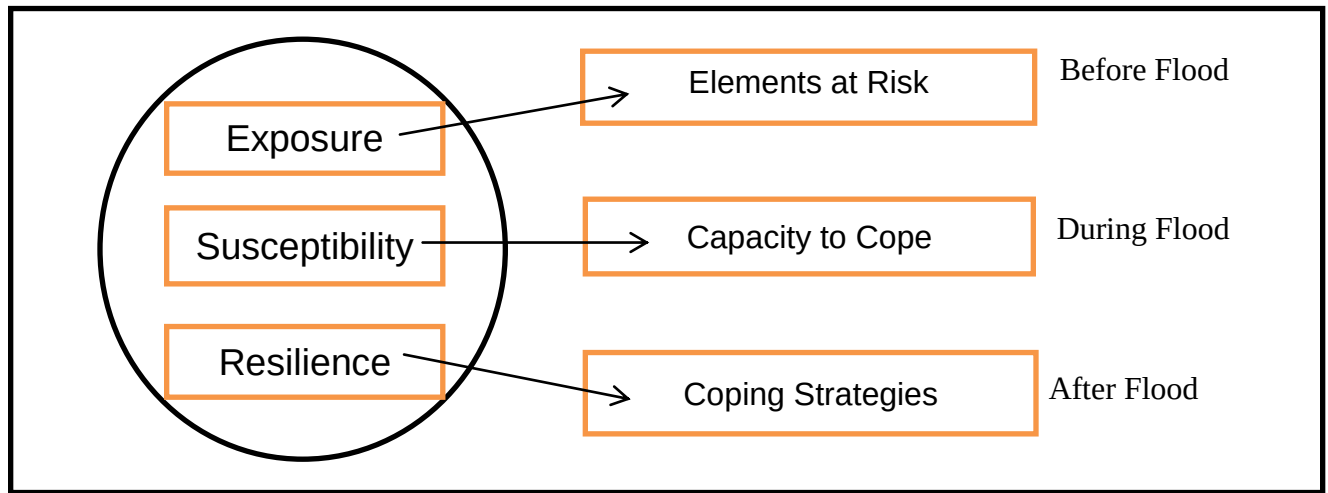


Figure 2.1: United Nations Educational, Scientific and Cultural Organisations Flood Vulnerability Model

It can be observed in the model that the elements at risk are described as exposure, which means the situation of being pre-disposed to the adverse effects of flood disaster. The capacity to cope with adverse effects of flood disaster as expressed in the model are considered to be the function of susceptibility that stands to be the sensitivity of being adversely affected by flood disaster. The coping strategies as revealed in the model are considered to be the capacity to endure from the adverse effects of flood disaster. It is based on this premise that the vulnerability is expressed in the simple equation presented as, $\text{vulnerability} = \text{exposure} + \text{susceptibility} - \text{resilience}$.

2.4 Extent of Losses in Monetary Value of Livelihood Assets due to Flood Disaster

Flood disaster has varied adverse effects on livelihood assets. Ashley and Hussein (2000) described livelihood assets as the physical, financial and social properties owned by households. Therefore, the comprehensive assessments that quantify the livelihood assets losses due to flood disaster in terms of monetary term remains central for the achievement of integrated flood management approach (Kreibich and Dimitrova, 2010). In this framework, the most vulnerable households are exposed to high risk factor in terms of number of assets losses due to flood disaster.

Studies on flood vulnerability established that the households' exposure to flood disaster was responsible for the loss of their assets. However, the degree of protection depends on the quality of assets and its ability to withstand the adverse effects of flood disaster. For instance, fishermen whose occupation required them to live closer to water bodies are at high risk than other households that are away from water bodies. In essence, the fishermen due to the nature of their occupations are exposed to the adverse effects of flood disaster. However, the adverse effects can be effectively minimised by the use of appropriate mitigation mechanism (Ministry of Water and Irrigation, 2009). Nevertheless, migration to urban areas for the improvement of the livelihood assets was seen as one of the options for mitigating the adverse effects of flood disaster. Adugna (2011) highlighted that migration to urban areas also occurred due to response in the livelihood degradation and inability to grow enough food for the sustenance family. Also, the World Bank (2012) added that education and employment opportunities are reasons that cause migration to urban areas. Hunne (2012) further expressed that migration from rural to urban areas is a common strategy adopted by the farming households in dealing with the adverse effects of flood disaster.

2.5 Indigenous Knowledge in Coping with Flood Disaster

According to local people, knowledge is important if it is useful for their survival and for coping with environmental stress (Institute for Global and Environmental Strategies, 2004). According to Obasi (2012), the international labour organisation defines indigenous population as the households who belong to the geographical area with legal, social, economic, cultural and political identities. Similarly, the indigenous knowledge refers to as traditional knowledge, traditional environmental knowledge, indigenous traditional knowledge, indigenous agricultural knowledge or households' knowledge (Institute for Global and Environmental Strategies, 2004). Furthermore, Umunakwe *et al.* (2012) define indigenous knowledge as content of knowledge that emanated from intellectual activity in a traditional context that include the technical know-how, skills, innovations,

practices and learning activities that form part of traditional knowledge system of the communities. However, the indigenous system that embodies on the traditional way of life of indigenous communities can be preserved from one generation to another. Therefore, the concept of indigenous knowledge is a useful means to achieve the coping strategies against the adverse effects of flood disaster (Obasi, 2012). According to Monzu (2007), coping strategies are locally utilised by indigenous knowledge system to combat the adverse effects of flood disaster. Kivaria (2007) also, explained that the coping strategies are viewed as the framework adopted by households to manage losses to a tolerance level. It is also important to note that the two terms coping and coping strategies should not be mixed up together in the sense that, the former term means the manner in which resources are utilised to achieve various ends while the later term means the way in which the resources were mobilised to cushion the adverse effects of flood disaster.

2.6 Participatory Rural Appraisal

According to World Bank (2004), Participatory Rural Appraisal (PRA) is a method that emphasizes on the indigenous knowledge, which enables the households to make their own analysis. However, Training of Trainers Workshop (2002) highlighted that PRA enables the households to express, share or analyse the complex and diverse realities of their conditions in order to gain confidence and plan for the future action, which can be achieved through learning from different perspectives of indigenous knowledge and involvement of all the important stakeholders in the community action plans. Consequently, the principles of PRA are applied in the studies of livelihood, poverty and natural resource management in order to achieve the monitoring and evaluation objectives of the community action plans (Kumar, 2002). It is on the basis of this postulation that field workers and researchers directly involved households in the problem identification for execution of the community action plans. For instance, Abubakar (2006) highlighted the following PRA tools that are essentially useful in the prioritisation and identification of the community needs.

2.6.1 Focus Group Discussion

The Focus Group Discussion (FGD) is a semi-structural interview guideline presented to households that possessed certain characteristics in common, use in socially oriented research to generate qualitative data that conventional questionnaire cannot properly capture, which will assist to provide speedy results based on the real life situations (World Bank, 2004).

2.6.2 Wealth Ranking

According to Kumar (2002), wealth ranking is among the PRA tool that can be used to classify the households on the basis of income, wealth and other perceivable well-being. The wealth ranking is based on the assumption that the community members are of the picture of who among them is more or less better-off.

2.6.3 Venn Diagram

According to Davis (2001), Venn diagram is among the PRA tool that can be used to show the relationship between the key institutions, organisations, associations as well as influential households that are involved in a community decision making and action plans. It is based on this assumption that scholars in the rural development study views Venn diagram as the most familiar diagram in all the sketches used in PRA to identify the main actors in the community action plans.

2.6.4 Social Mapping

According to Kumar (2002), social mapping is among the PRA tool that that can be used to express the habitation pattern and the nature of housing and social infrastructure such as roads, culverts and drainage systems. Thus, social mapping can be used to identify the environmental features of the community and to know the relationship between the households in community and environmental features.

2.7 Conceptual Model

The model for this study was conceptualised on the ground that the socio-economic characteristics of the farming households, coupled with the causes of flood disaster and the reasons for living in flood-affected areas have influenced the occurrence of 2010 flood disaster, in which the livelihood assets of the farming households are destroyed due to the adverse effects of the 2010 flood disaster. Therefore, in order to cope with the adverse effects of the 2010 flood disaster on livelihood assets, coping strategies are adopted by the farming households. Thus, the dependent variables conceptualised for this study are livelihood assets of farming households, the intervening variables are the institutional factors while the independent variables are the socio-economic characteristics, causes of the flood disaster and reasons for living in the flood-affected areas. Hence, the arrows in the model indicated the relationship between independent, intervening and dependent variables.

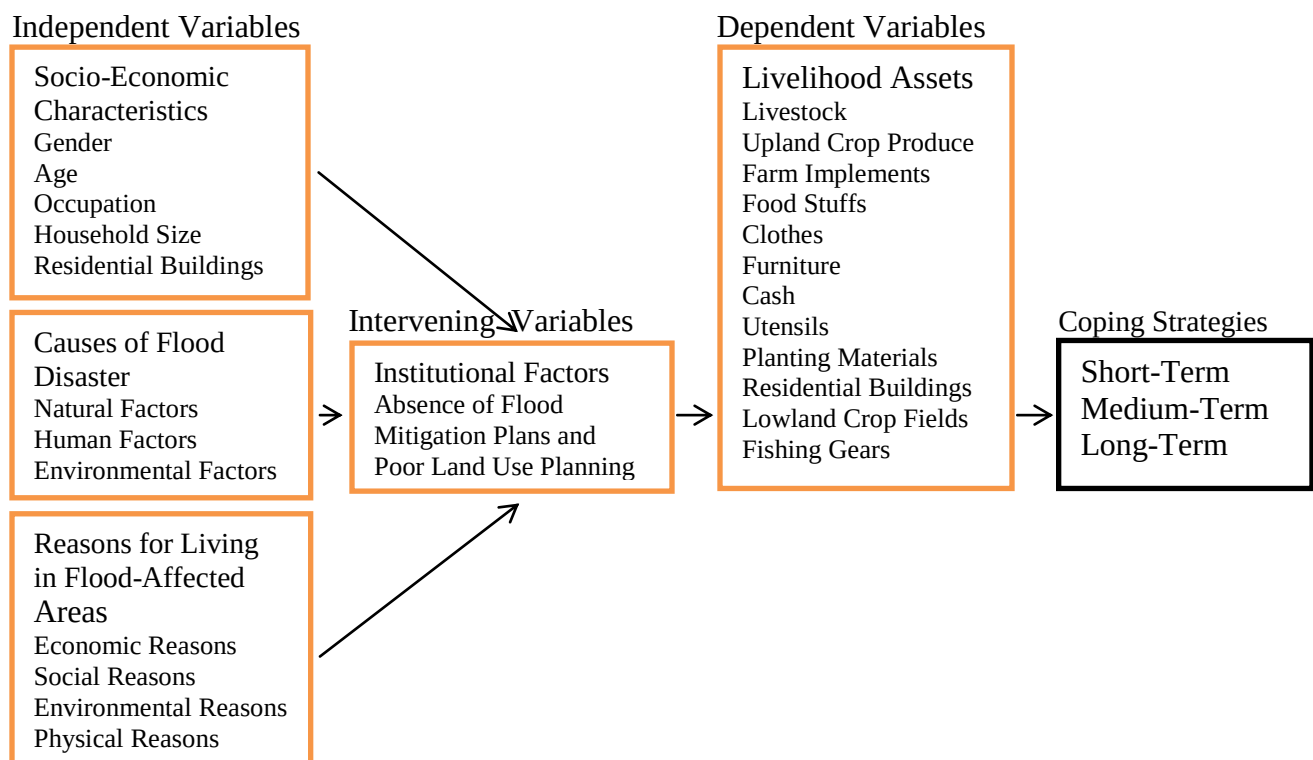


Figure 2.2: Schematic Presentation of Conceptual Model of the Study

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

The methodology adopted for the study is aptly described in this chapter. Specifically, the chapter dealt with description of the study area, population of the study, reconnaissance survey, determination of the sample size, sampling procedure and sample size, research instrument, determination of reliability coefficient, test of validity and reliability of the research instrument, method of data collection, tools for data analysis and measurement of variables.

3.1 Description of the Study Area

Sokoto State is located in the north-western region of Nigeria found between latitude 11⁰ 00 and 14⁰ 00 N and longitude 3⁰ 5⁰ to 8⁰ 00 E (Haliru, 2016). Therefore, the State is bordered to the north by Niger Republic, Zamfara State to the east and Kebbi State to the south and west respectively (Sokoto State Government Diary, 2016). Also, the State covers an area of 32,000 square kilometer with a projected population of 4,998,090 people (National Population Commission, 2016). In terms of occupation, more than 75% of the populations are farmers in all the 23 Local Government Areas (LGAs) of the State (Sokoto State Government Diary, 2016). However, 9 LGAs in the State are affected by the 2010 flood disaster (Sokoto State Emergency Management Agency, 2010).

Meanwhile, the rainy season starts from May and ends in September with mean rainfalls of 600mm, while the dry season commences from October to April (Iliya and Tukur, 2013). The harmattan that is cold and dust-laden wind arrives from November to February (Yabo, 2005).

As regards to the climatic condition, the State is under the influence of dry air mass that originates from the Sahara and warm air mass that originates from the Atlantic Ocean, the land for agricultural activities in the State is divided into lowland and upland (Abdullahi *et al.*, 2014).

In terms of water body, Rima and Sokoto rivers are extensively used by the farmers in the State for dry season farming activities (Iliya and Tukur, 2013).

3.2 Population of the Study

The population of the study was comprised of all the farming households affected by the 2010 flood disaster in Sokoto State, Nigeria.

3.3 Reconnaissance Survey

This is a preliminary visit to assess the study area, through interaction with relevant stakeholders that assist the researcher to be familiar with the study area and population of the study.

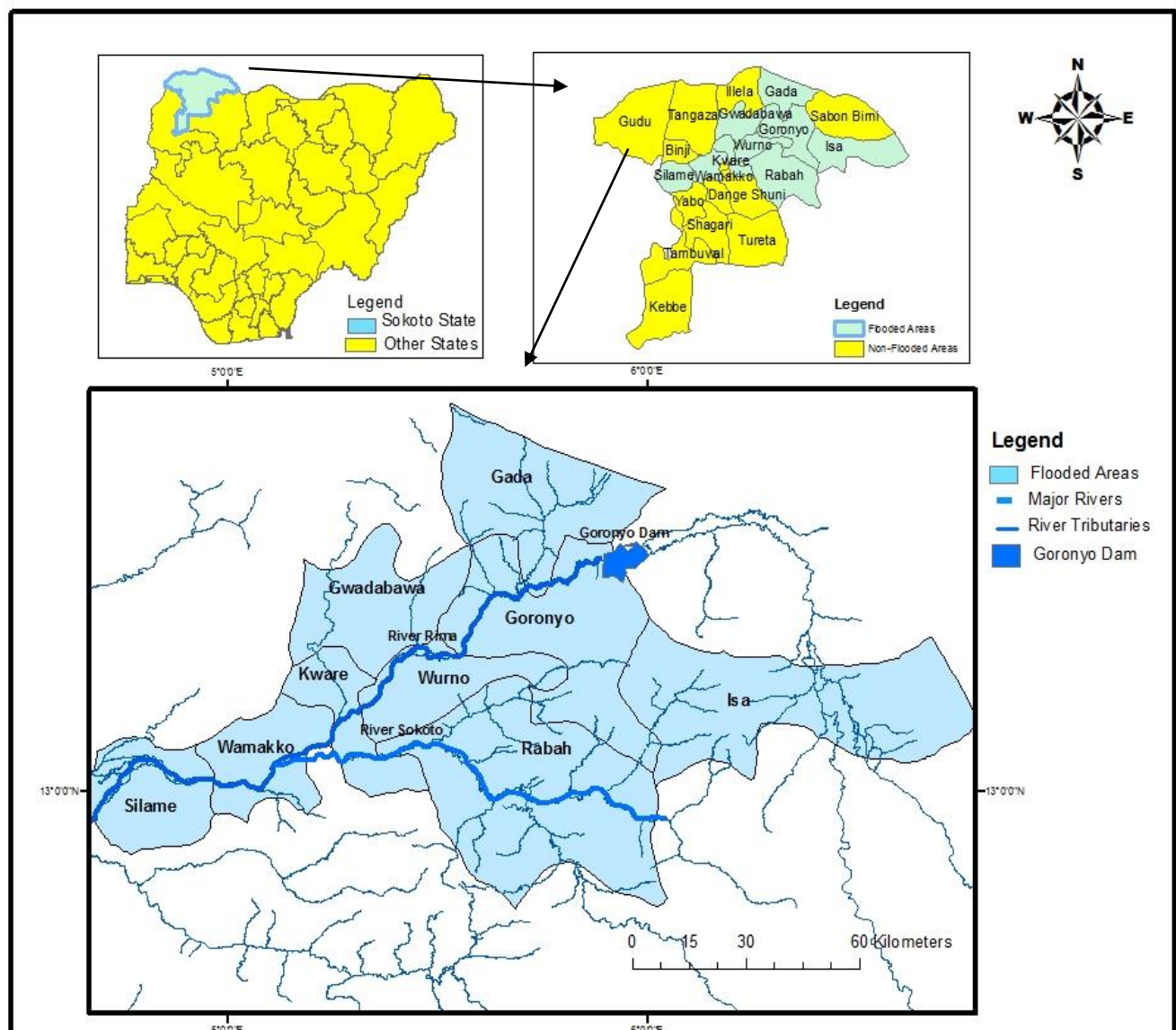


Figure 3.1: Map of Sokoto State Showing the Areas Affected by 2010 Flood Disaster
Source: Geographical Information System Laboratory, Department of Geography, UDUS, 2016

3.4 Determination of the Sample Size

The sample size for the study was determined by the formula developed by Yamane published by Harper and Row in New York in 1967 (Eric, 2009). The formula is presented as:

$n = \frac{N}{1+N(e^2)}$ Where: n = sample size, N = population size, e = level of precision.

$$n = \frac{N}{1+N(e^2)} \quad n = \frac{1425}{1+1425(0.07)^2} \quad n = \frac{1425}{1+1425(0.0049)} \quad n = \frac{1425}{1+1425(0.0049)} \quad n = \frac{1425}{1+6.98} \quad n = \frac{1425}{8.0} \quad n = 178$$

Therefore, the farming households are selected from the following population of the flood-affected farming communities:

1. Kagara Rima
 $\frac{202 \times 178}{1425} = 25.2 \approx 25$

2. Taloka
 $\frac{160 \times 178}{1425} = 19.9 \approx 20$

3. Giyawa
 $\frac{122 \times 178}{1425} = 15.2 \approx 15$

4. Lugu
 $\frac{221 \times 178}{1425} = 27.6 \approx 28$

5. Tunga
 $\frac{151 \times 178}{1425} = 18.8 \approx 19$

6. Barayar Zaki
 $\frac{111 \times 178}{1425} = 13.8 \approx 14$

7. Bakin Gulbi
 $\frac{160 \times 178}{1425} = 19.9 \approx 20$

8. Kwal-Kwalawa

$$\frac{155 \times 178}{1425} = 19.3 \approx 19$$

9. Rimawa

$$\frac{143 \times 178}{1425} = 17.8 \approx 18$$

3.5 Sampling Procedure and Sample Size

Purposive sampling technique was used in four different stages to select the farming households affected by the 2010 flood disaster based on number of losses encountered on upland crop produce, lowland crop fields, planting materials, farm implements, fishing gears, residential buildings, livestock, food stuff and other assessable livelihood assets. In the first stage, three out of nine flood-affected LGAs were purposively selected. In the second stage, three flood-affected farming communities were selected in each of the selected LGAs. In the third stage, the population of the farming households affected by the 2010 flood disaster was identified. In the fourth stage, the sample size of one hundred and seventy eight farming households was obtained for the study.

Table 3.5: Sampling Procedure and Sample Size

Flood-Affected LGAs	Selected Study LGAs	Flood-Affected Communities	Households Population	Selected Households
Gada	Goronyo	Kagara Rima	202	25
Goronyo		Taloka	160	20
Gwadabawa		Giyawa	122	15
Isah	Wurno	Lugu	221	28
Rabah		Tunga	151	19
Wurno		Barayar Zaki	111	14
Kware	Wamakko	Bakin Gulbi	160	20
Silame		Kwal-Kwalawa	155	19
Wamakko		Rimawa	143	18
9	3	9	1425	178

Source: Field Survey, 2016

3.6 Research Instrument

Interview schedule and checklist for FGD was used as the research instruments for the study.

3.7 Determination of Reliability Coefficient

Reliability coefficient of the research instrument was achieved by using the Cronbach's alpha

test of internal consistency presents as $\alpha = \frac{N \times C}{\bar{v} + (N-1) \times C}$ Where α = Reliability coefficient,

N = Number of items tested, C = Covariance of inter items tested and $\bar{v}$ = Variance of items tested.

3.7.1 Socio-Economic Characteristics of the Farming Households

$$\alpha = \frac{N \times C}{\bar{v} + (N-1) \times C} \alpha = \frac{7 \times 19}{83 + (7-1) \times 19} \alpha = \frac{133}{83 + (6) \times 19} \alpha = \frac{133}{83 + 114} \alpha = \frac{133}{197} \alpha = 0.70$$

3.7.2 Causes of the 2010 Flood Disaster in the Study

$$\alpha = \frac{N \times C}{\bar{v} + (N-1) \times C} \alpha = \frac{5 \times 1.6}{0.8 + (5-1) \times 1.6} \alpha = \frac{8}{0.8 + (4) \times 1.6} \alpha = \frac{8}{0.8 + 6.4} \alpha = \frac{8}{7.2} \alpha = 1.00$$

3.7.3 Reasons for Living in the Flood-Affected Areas

$$\alpha = \frac{N \times C}{\bar{v} + (N-1) \times C} \alpha = \frac{4 \times 1.5}{0.8 + (4-1) \times 1.5} \alpha = \frac{6}{0.8 + (3) \times 1.5} \alpha = \frac{6}{0.8 + 4.5} \alpha = \frac{6}{5.3} \alpha = 1.00$$

3.7.4 Extent of Losses in Monetary Term of Livelihood Assets of the Farming Households

$$\alpha = \frac{N \times C}{\bar{v} + (N-1) \times C} \alpha = \frac{12 \times 13}{21 + (12-1) \times 13} \alpha = \frac{156}{21 + (11) \times 13} \alpha = \frac{156}{21 + 143} \alpha = \frac{156}{164} \alpha = 0.95$$

3.7.5 Indigenous Coping Strategies Adopted by the Farming Households

$$\alpha = \frac{N \times C}{\bar{v} + (N-1) \times C} \alpha = \frac{5 \times 8.4}{17.2 + (5-1) \times 8.4} \alpha = \frac{42}{17.2 + (4) \times 8.4} \alpha = \frac{42}{21 + 34} \alpha = \frac{42}{51} \alpha = 0.82$$

Table 3.7: Reliability Coefficient of the Research Instrument

Variable	Reliability Coefficient	No. of Items Tested	Mean	Total Variance
Socio-economic characteristics of the farming households	0.70	7	4.85	83.00
Causes of the 2010 flood disaster	1.00	5	2.80	0.80
Reasons for living in the flood-affected areas	1.00	4	4.75	0.80

Extent of losses in monetary term of livelihood assets	0.95	12	3.40	21.00
Indigenous coping strategies	0.82	5	5.40	17.20

Source: Field Survey, 2016

3.8 Test of Validity and Reliability of the Research Instrument

The research instrument was subjected to face and construct validity assessment by experts in the field of agricultural extension, geography, urban and regional development. Therefore, the validity assessment assisted the researcher to modify the items in research instrument with vague meaning. However, the reliability coefficient of the research instrument was achieved by using Cronbach's alpha test of internal consistency. The reliability coefficients of 0.70 to 1.00 are considered as sufficient values for research instrument to be reliable (Okoro and Hassan, 2011). Thus, the reliability coefficient of the research instrument for the study was found to be 0.70 for the socio-economic characteristics, 1.00 for both the causes of the 2010 flood disaster and reasons for living in flood-affected areas, 0.95 for the extent of losses in monetary term of livelihood assets and 0.82 for indigenous coping strategies adopted by the farming households as indicated in (Table 3.2). Meanwhile, the pretest was carried out on 5th to 20th March, 2016 to twenty five farming households affected by the 2010 flood disaster that were not part of sample size of the study. After the questionnaire was tested and modified, the actual field work was conducted from 20th April to 20th May, 2016 through face to face interviews with the selected farming households' heads.

3.9 Method of Data Collection

Data for the study was obtained from the primary and the secondary sources. However, the primary data was collected through the aid of interview schedule that was administered to the farming households affected by the 2010 flood disaster, while the FGD conducted with separate groups of the farming households affected by the 2010 flood disaster was used to collect qualitative

data for the study. In the other hand, the secondary information used for the study was obtained from different articles that can be found in journals, proceedings, technical reports, projects, dissertations, theses, newspapers, textbooks and any other relevant materials that can be utilised for the study.

3.10 Tools for Data Analysis

The descriptive and inferential statistics were used for the data analysis to which bar charts, frequency distributions and percentages are used to achieve objectives i, ii, iii and v of the study, while Analysis of Variance known as ANOVA test was used to achieve objective iv of the study. Similarly, the qualitative data collected for the study from the farmers groups, livestock owners and fishermen groups affected by the 2010 flood disaster in addition to the mapping of Goronyo, Wurno and Wamakko LGAs of the study were all achieved with the aid of PRA tools that include FGD, wealth ranking, Venn diagram and social mapping.

Table 3.10: Tools for Data Analysis

Data Analysis	Qualitative Data	Quantitative Data	Tools
Descriptive statistics	Objectives of the Study	Farming Households	PRA
Bar charts	Socio-economic characteristics	Farmers groups	FGD
Tables	of the farming household	affected by the	Wealth ranking
Frequencies		2010 flood disaster	Venn diagram
Percentages	Causes of the 2010 flood disaster		
		Livestock owners	FGD
	Reasons for living in the flood-affected areas	affected by the	Wealth ranking
		2010 flood disaster	Venn diagram
	Indigenous coping strategies adopted by the farming households	Fishermen groups	FGD
		affected by the	Wealth ranking
		2010 flood disaster	Venn diagram
Inferential statistics	Extent of losses in monetary	Mapping of LGAs	Social mapping
ANOVA	term of livelihood assets of the farming households	of the study	

Source: Field Survey, 2016

3.11 Model Specification

3.11.1 Analysis of Variance

The text book method and computer method are two ways of conducting ANOVA test that produce the same results. In the text book method, calculated F value is compared with tabulated F value before taking decision at 1% or 5% level of significance, while in the computer method; probability value is compared with observed value before taking decision also at 1% or 5% level of significance. Therefore, for the null hypothesis to be rejected in the text book method, which was used in this study, calculated F value must be greater than or equal to tabulated F value. For the null hypothesis to be rejected in the computer method, probability value must be greater than or equal to observed value. The F-ratio is obtained by dividing the mean sum of squares between groups and within groups (Wikipedia, 2016). Thus, One Way ANOVA was used to test the null hypothesis on the extent of losses in monetary term encountered by the farming households affected by the 2010 flood disaster among Goronyo, Wurno and Wamakko LGAs of the study (Table 3.5). However, the choice of the One Way ANOVA for this study is based on its statistical ability to measure and compare the mean value among the three LGAs of the study that involves the separate computations of the following parameters:

- i. Sum of squares among the 3 LGAs of the study.
- ii. Sum of squares within the 3 LGAs of the study.
- iii. Degree of freedom among the 3 LGAs of the study.
- iv. Degree of freedom within the 3 LGAs of the study.
- v. Degree of freedom for total variance of the 3 LGAs of the study.

- vi. Mean sum of squares or variance estimate of the 3 LGAs of the study.
- vii. F-ratio is obtained by dividing the mean sum of squares among 3 LGAs of the study and within the 3 LGAs of the study.

3.11.2 Focus Group Discussion

The following step wise procedures are used in conducting the focus group discussion:

- Step 1: Selecting the place where the FGD will not be disturbed by any interference.
- Step 2: Involving the village heads and community key figures into the exercise.
- Step 3: Explaining the objective of the FGD before starting.
- Step 4: Maintaining six farming households for each group.
- Step 5: Avoiding the questions with yes and no answers.
- Step 6: Encouraging in active households to speak out their opinions.
- Step 7: Ensuring triangulation by presenting the same issue from different perspectives.
- Step 8: Giving households chance to express their views without unnecessary interference.
- Step 9: Recording all the comments generated during the FGD exercise.

3.11.3 Wealth Ranking

The following step wise procedures are used in conducting the wealth ranking:

- Step 1: Selecting the place where the wealth ranking will not be disturbed by any interference.
- Step 2: Identifying the key informants who are willing to participate in the wealth ranking.
- Step 3: Explaining the objective of the wealth ranking before starting.
- Step 4: Classifying the wealth into three hierarchies of rich, average and poor.
- Step 5: Ranking the wealth into quantity of food stuff, livestock and fish.
- Step 6: Analysing the results together to detect errors.
- Step 7: Recording the details of the analysis in a field note book for the future references.

3.11.4 Venn Diagram

The following step wise procedures are used in the Venn diagram:

Step 1: Selecting the place where the Venn diagram will not be disturbed by any interference.

Step 2: Identifying the key informants who are willing to participate in the Venn diagram.

Step 3: Explaining the objective of the Venn diagram before starting.

Step 4: Identifying the key actors that influence the life of the farming households.

Step 5: Drawing circles to represent issues under discussion, the size of the circle indicates scope while the distance of the circle indicates the degree of importance.

Step 6: Touching circles express the relationship; small overlap indicates little cooperation, large overlap defines the level of cooperation and separate circles reveal no relationship.

Step 7: Encouraging discussion to enhance cross checking and probing.

Step 8: Analysing the results together to detect errors.

Step 9: Recording the details of the exercise in a field note book for the future references.

3.11.5 Social Mapping

The following step wise procedures are used in the social mapping:

Step 1: Selecting the place where the mapping will not be disturbed by any interference.

Step 2: Identifying the key informants who are willing to participate in the social mapping.

Step 3: Explaining the objective of the social mapping before starting.

Step 4: Assigning physical, financial, material and social properties.

Step 5: Assigning unique symbols to physical, environmental, social and economic resources.

Step 6: Putting different colours to each symbol for easy referencing and identification.

Step 7: Taking the sketches to Geographical Information System laboratory for analysis.

Step 8: Recording the details of the exercise in a field note book for the future references.

3.12 Measurement of Variables

- i. Gender was measured as binary variables for male and female.
- ii. Marital status was measured as single, married, divorced, widowed or separated.
- iii. Age was measured according to the number of years of the farming households.
- iv. Educational attainment was measured according to the number of years spent in western and in Quranic education.
- v. Household size was measured based on number of the farming households that live together as the single household and eating from the same cooking pot.
- vi. Occupation was measured according to major and minor occupations of farming households.
- vii. Residential buildings were measured based on thatch, mud and concrete housing types.
- viii. Causes of the flood disaster were measured according to natural, human, environmental and institutional factors.
- ix. Reasons for living in the study area were measured according to economic, social, environmental and physical reasons.
- x. Extent of losses of livelihood assets were measured according to the quantity estimated in monetary value of livestock, lowland crop fields, farm implements, foodstuff, clothes, furniture, cash, utensils, planting materials, residential buildings, upland crop produce and fishing gears.
- xi. Indigenous coping strategies were measured according to short-term coping strategies, medium-term coping strategies and long-term coping strategies.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presented the results of the study that include socio-economic characteristics of the farming households affected by the flood, causes of the flood disaster, reasons for living in the flood-affected areas, extent of losses in monetary term of livelihood assets, indigenous coping strategies adopted by the farming households affected by the 2010 flood disaster and ANOVA test of significant difference in the extent of losses in monetary term. Results of the focus group discussion, wealth ranking, Venn diagram and social mapping were also presented in this chapter.

4.1 Socio-Economic Characteristics of Farming Households Affected by the 2010 Flood Disaster

4.1.1 Gender

Table 4.1 indicated that majority (96.1%) of the farming households were male compared to their female counterparts. However, it was implied from the result that the responsibility of providing the households basic needs for survival from the adverse effects of 2010 flood disaster was taken by male headed households. According to Galadima (2016), the basic needs for survival were provided by male headed households in Sokoto State, Nigeria.

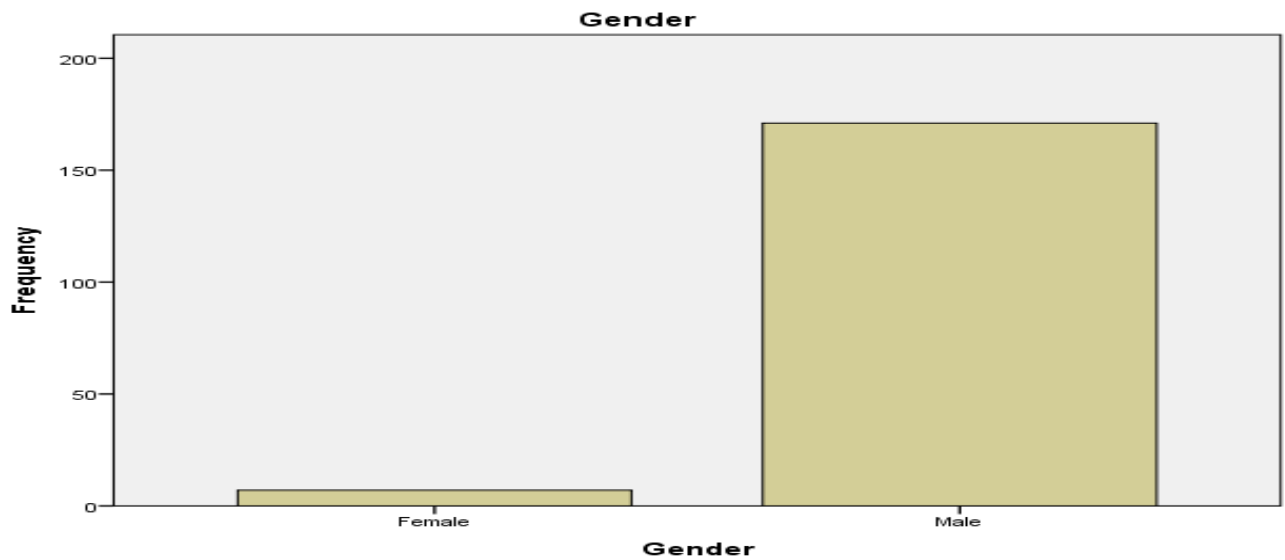


Figure 4.1: Bar Chart of the Farming Households based on Distribution of Gender

4.1.2 Marital Status

The result in Table 4.1 expressed that nearly all (94.9%) the farming households affected by flood were married. This result implied that marriage served as an important social institution in the study area. According to Makinta (2016), norms were preserved through the institutions of marriage.

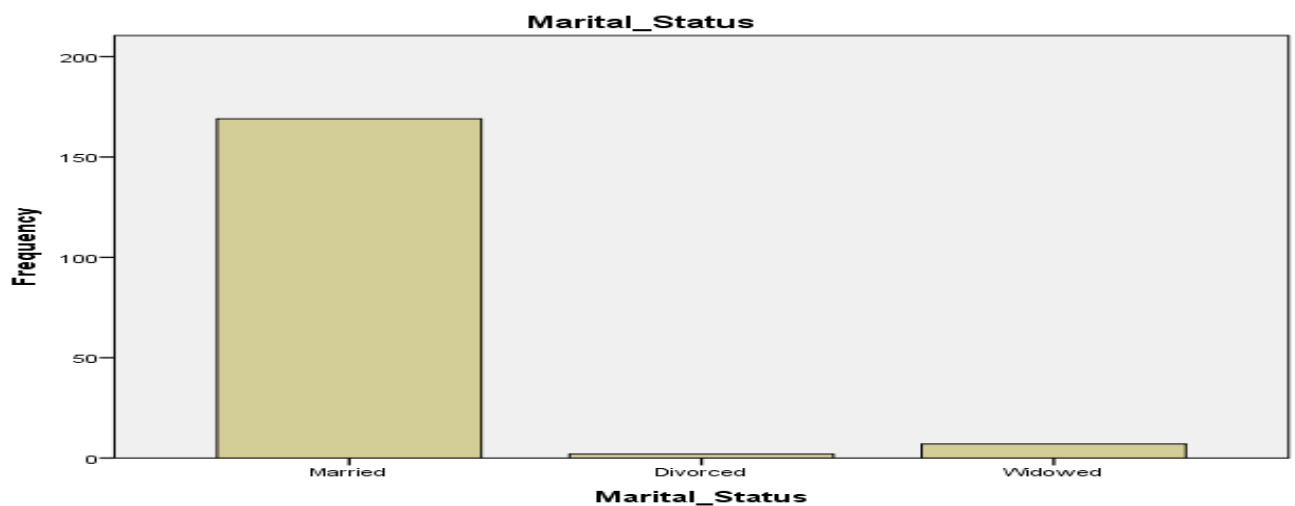


Figure 4.2: Bar Chart of the Farming Households based on Distribution of Marital Status

4.1.3 Age

The Result in Table 4.1 revealed that most (42.7%) of the farming households were within the age of 41-50 years that made them strong in dealing with post-disaster activities. According to Yeldu

(2014), household heads that were in the prime ages possessed the energy needed to embark on post disaster reconstruction activities.



Figure 4.3: Bar Chart of the Farming Households based on Distribution of Age

4.1.4 Educational Attainment

As revealed in Table 4.1 that most (48.3%) of the farming households had Quranic education as their educational attainment. This result implied that a sizable proportion of the farming households were not vast in the western education. Nugroho and Koji (2012) were of the same view that the low level of western education will affect the households' mechanism for the flood disaster management as in the case of adaptation and mitigation measures.

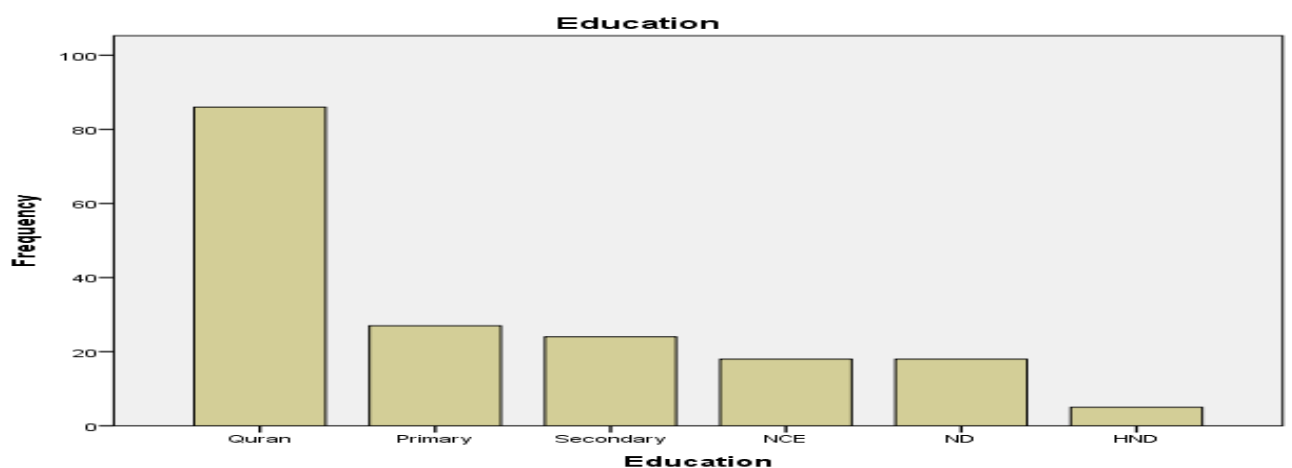


Figure 4.4: Bar Chart of the Farming Households based on Distribution of Educational Attainment

4.1.5 Household Size

The result in table 4.1 expressed that 45.5 per cent of the farming households affected by flood had 11-20 members. This result implied that the family with large members will find it stressful to move their family to safer places especially in the case of children and elderly members of the family. Yeldu (2014) similarly observed that the family with large members had faced a lot of challenges to move their family to safer places in the event of flood disaster.

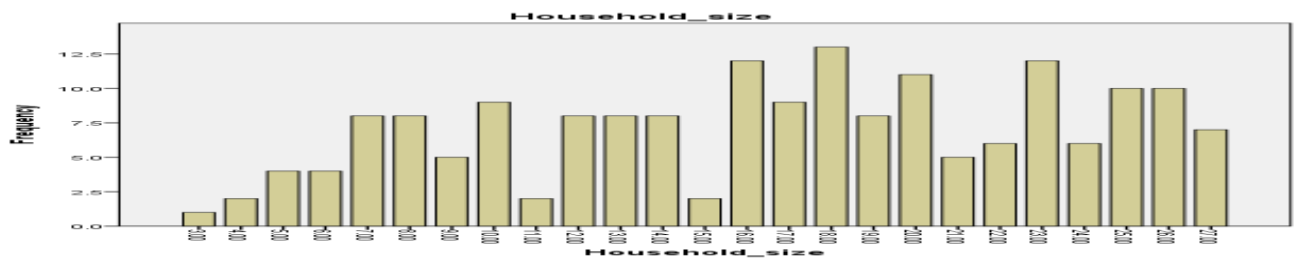


Figure 4.5: Bar Chart of the Farming Households based on Distribution of Household Size

4.1.6 Occupation

Table 4.1 revealed that majority (65.2%) of the farming households in the study area had farming as primary occupation. However, it was implied from the result that the agriculture remained the major occupation of the farming households affected by 2010 flood disaster. This result corroborated with Sokoto State Government Diary (2016) that in terms of occupation more than seventy five per cent of the populations in Sokoto State are farmers.

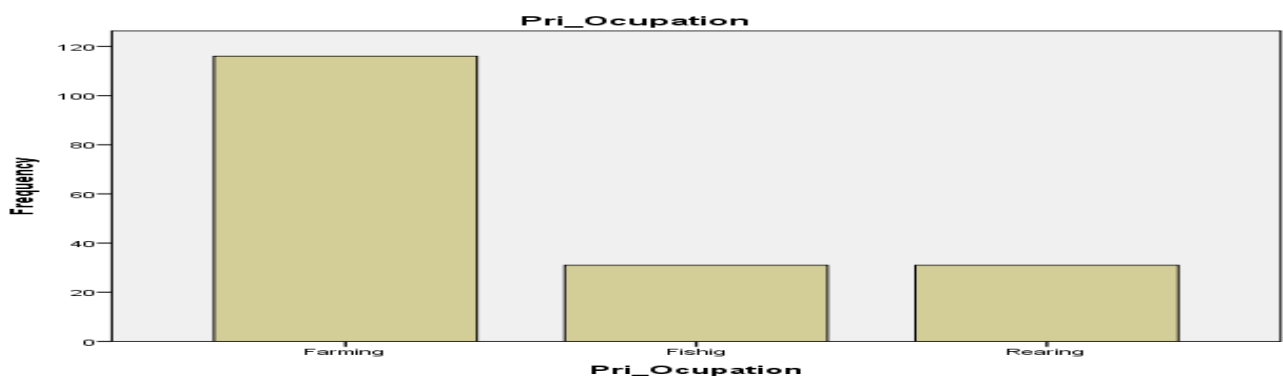


Figure 4.6: Bar Chart of the Farming Households based on Distribution of Major Occupation

4.1.7 Residential Buildings

The result in table 4.1 revealed that the majority (63.5%) of farming households had their residential buildings made of mud that lack the strength to withstand the adverse effects of flood disaster. This result was in lined with Ismail and Mustaquim (2013) that the residential buildings in Chanchal sub-division that was made of mud were vulnerable to the adverse effects of flood disaster.

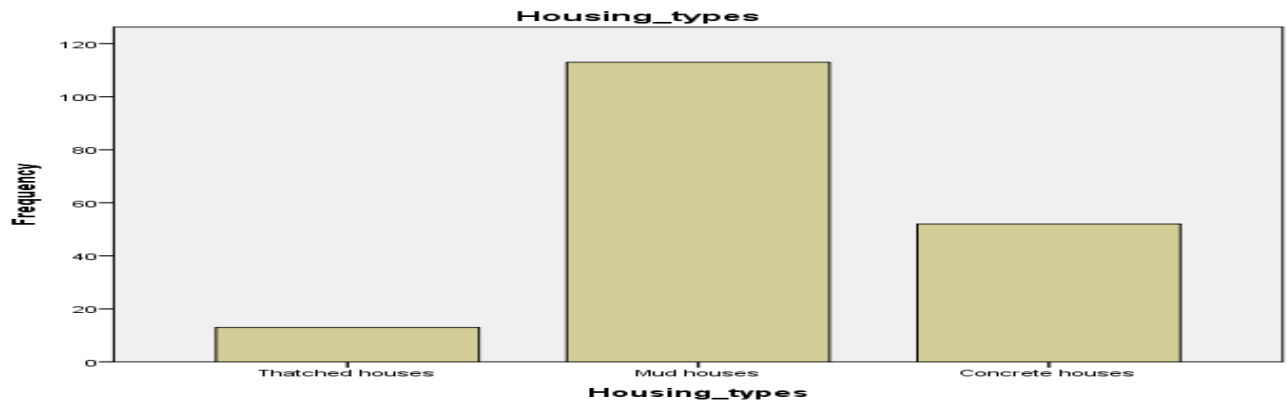


Figure 4.7: Bar Chart of the Farming Households based on Distribution of Residential Buildings

Table 4.1: Distribution of Farming Households based on the Socio-Economic Characteristics (n=178)

Variable	Frequency	Percentage
Gender		
Male	171	96.1
Female	7	3.9
Marital Status		
Married	169	94.9
Widowed	7	3.9
Divorced	2	1.1
Age (years)		
30-40	36	20.2
41-50	76	42.7
51-60	62	34.8
61and above	4	2.2
Educational Attainment		
Quran	86	48.3
Primary	27	15.2
Secondary	24	13.5
NCE	18	10.1
ND	18	10.1
HND	5	2.8
Household Size		
3-10	41	23.1
11-20	81	45.5
21-30	56	31.4
Major Occupation		

Farming	116	65.2
Fishing	31	17.4
Rearing	31	17.4
Residential Buildings		
Thatch	13	7.3
Mud	113	63.5
Concrete	52	29.2

Source: Field Survey, 2016

4.2 Causes of the 2010 Flood Disaster

4.2.1 Natural Factors

The result in table 4.2 revealed that nearly all (91.6%) the farming households believed that excessive rainfall was the natural factor that caused the 2010 flood disaster. This result corroborated Kinsley and Christopher (2013) that flood occurred when excessive rainfall was accumulated across the impermeable soil that cannot rapidly disappear from the ground surface.

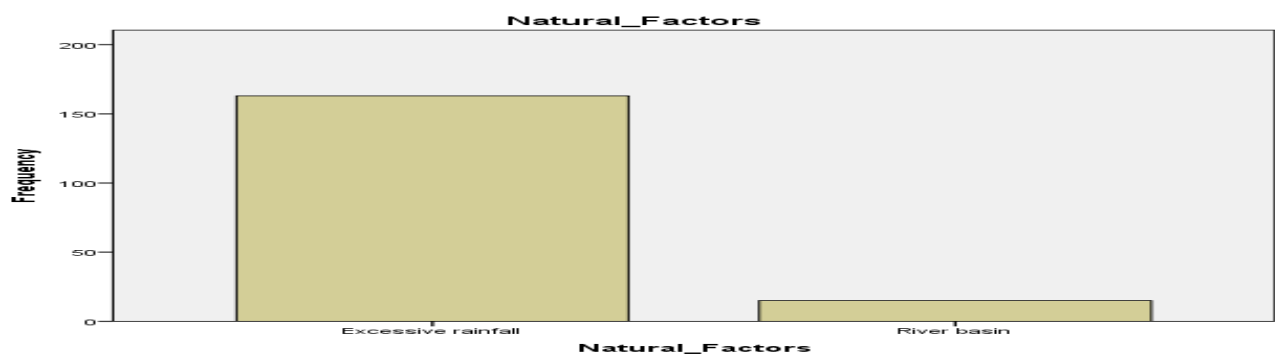


Figure 4.8: Bar Chart of the Farming Households based on Distribution of Natural Factors

4.2.2 Human Factors

The result in table 4.2 expressed that virtually all (92.1%) the farming households revealed that excessive release of water from Goronyo dam and Lugu dam in Wurno LGA was the human factors that caused the 2010 flood disaster. This result was in lined with Sokoto Rima River Basin Development Authority (2010) report that the spill gates of Goronyo dam was opened to discharge the excess water of about 602m³/sec in order to save the two dam from collapse.

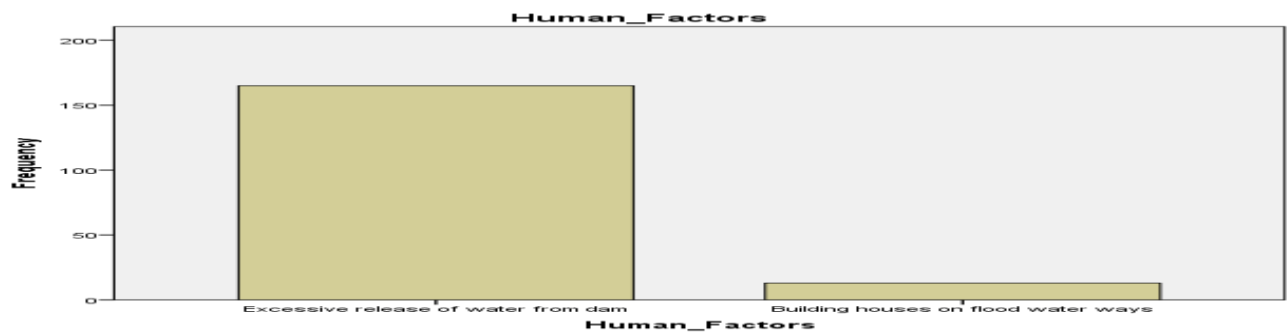


Figure 4.9: Bar Chart of the Farming Households based on Distribution of Human Factors

4.2.3 Environmental Factors

The result in Table 4.2 illustrated that the majority (68.0%) of the farming households revealed that influence of topography is the environmental factor that encouraged occurrence of the 2010 flood disaster. This result agreed with Ghatak *et al.* (2012) that the geographical settings around river Ganges, and Brahmaputra encouraged the occurrence of flood disaster in Bangladesh.

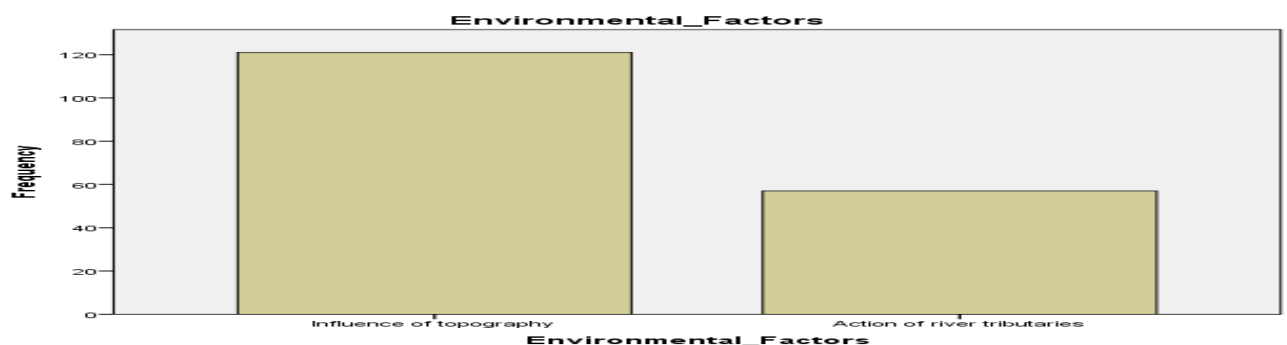


Figure 4.10: Bar Chart of the Farming Households based on Distribution of Environmental Factors

4.2.4 Governmental Factors

The result in Table 4.2 further indicated that the majority (80.9%) of the farming households had maintained their view points that the absence of flood mitigation plans was the governmental or

institutional factor that helped the 2010 flood disaster to occur. This result implied that the flood early warning signs and forecasting instruments were not put in place in the study area, which will eventually help to know when flood will occur. Monzu (2007) has stressed that the early warning signs and forecasting instruments were put in use to know when flood will occur.



Figure 4.11: Bar Chart of the Farming Households based on Distribution of Governmental Factors

Seasonal Factors

The result in Table 4.2 revealed that virtually all (98.3%) the farming households expressed that the 2010 flood disaster occurred in the rainy season. This result was in lined with Tosin (2010) that the torrential rainfall in 2010 had destroyed more than 50 farming communities in Sokoto state.

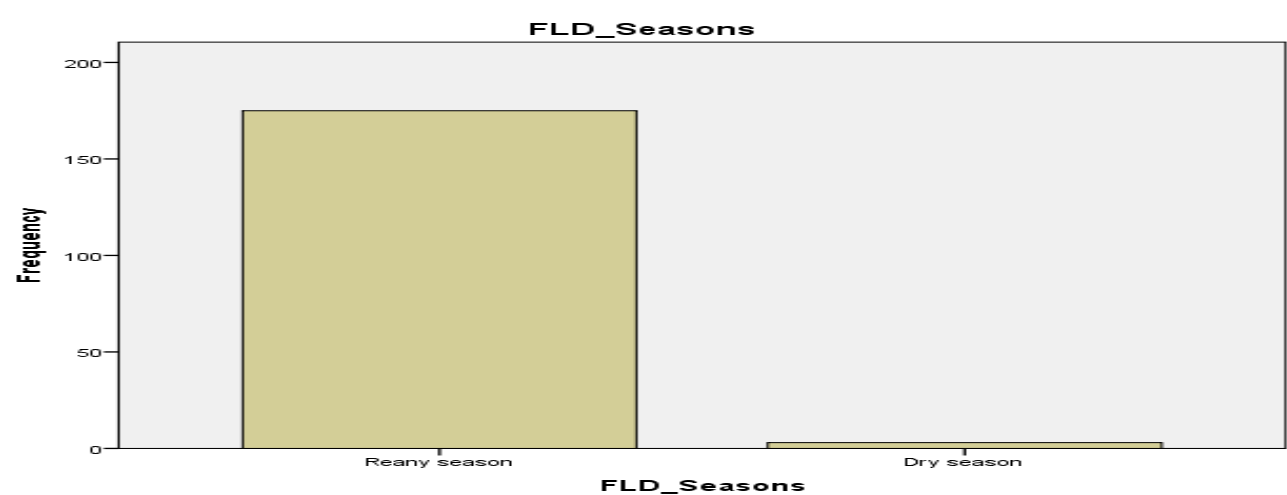


Figure 4.12: Bar Chart of the Farming Households based on Distribution of Seasonal Factors

Table 4.2: Distribution of the Farming Households based on the Causes of Flood Disaster (n=178)

Variable	Frequency	Percentage
----------	-----------	------------

Natural Factors		
Excessive rainfall	163	91.6
River basin	15	8.4
Human Factors		
Excessive release of water from dams	165	92.7
Building houses on flood water ways	13	7.3
Environmental Factors		
Influence of topography	121	68.0
Action of river tributaries	57	32.0
Institutional Factors		
Absence of flood mitigation plans	144	80.9
Poor land use planning	34	19.1
Seasonal Factors		
Rainy season	175	98.3
Dry season	3	1.7

Source: Field Survey, 2016

4.3 Farming Households' Reasons for Living in the Flood-Affected Areas

4.3.1 Economic Reasons

Majority (61.2%) of the farming households expressed that the opportunity for lowland farming were their reasons for living in the study area, despite the fact that their lives was exposed to the adverse effects of the 2010 flood disaster. This result was in lined with Galloping (2006) that the economic issues that are inherent to income, wages and labour sources that were generated from agriculture and fishing activities are pre-disposed to the adverse effects of flood disaster.

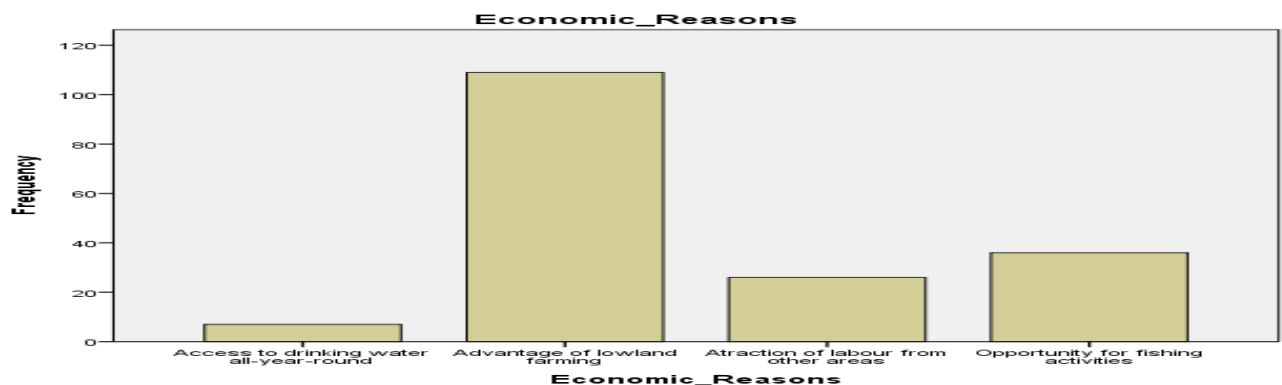


Figure 4.13: Bar Chart of the Farming Households based on Distribution of Economic Reasons

4.3.2 Social Reasons

Majority (75.8%) of the farming households indicated that born in the study area were considered as the social reason that exposed them to the adverse effects of flood the 2010 disaster. This result was in lined with Van Beek and Loucks (2005) that the social components such as gender and age can be adversely affected by flood disaster.

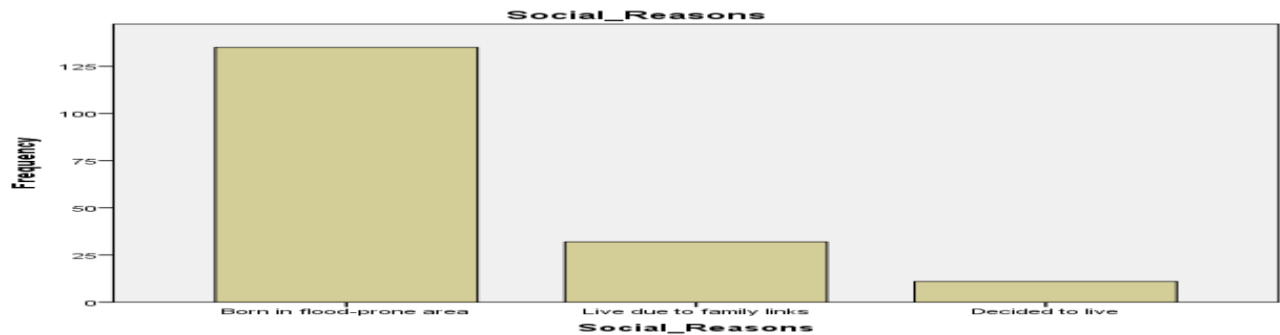


Figure 4.14: Bar Chart of the Farming Households based on Distribution of Social Reasons

4.3.3 Environmental Reasons

Most (46.1%) of the farming households revealed that the fertile soil were the environmental reasons for their stay in the study area that exposed them to the adverse effects of the 2010 flood disaster. This result was in lined with Iliya and Tukur (2013) who observed that the valleys formed by Sokoto and Rima rivers are wide and constituted one of the most fertile dry season farmlands in Nigeria specifically and West Africa at large.

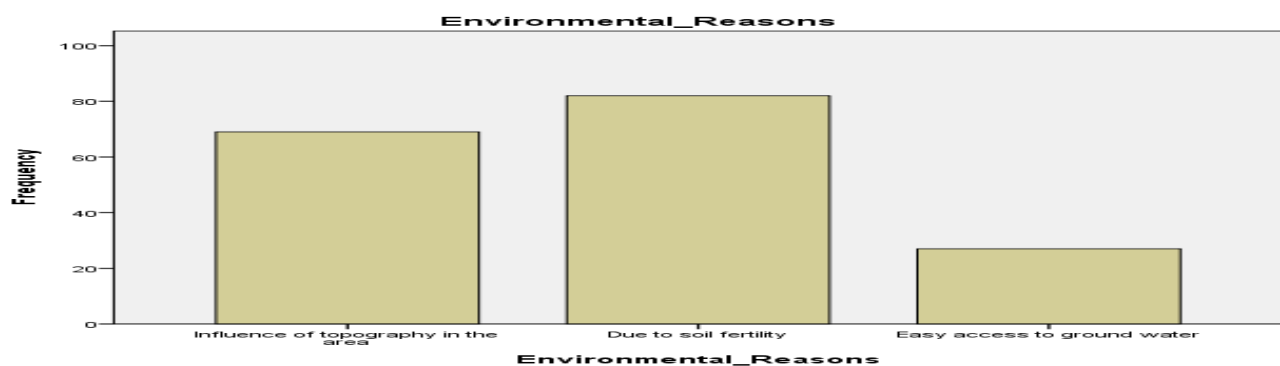


Figure 4.15: Bar Chart of the Farming Households based on Distribution of Environmental Reasons

4.3.4 Physical Reasons

More than half (51.1%) of the farming households opined that the closeness to river basin of the Rima and Sokoto rivers were identified to be the physical reason for living in the study area that

exposed them to the adverse effects of the 2010 flood disaster. However, this result was in lined with Balica (2007) that the physical properties like houses, roads, bridges, reservoirs, canals, and embankments can be exposed to the adverse effects of flood disaster.

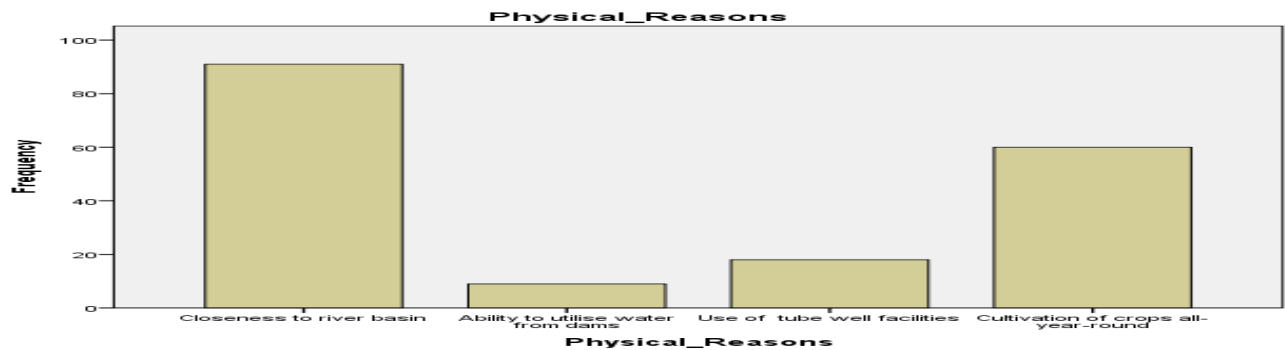


Figure 4.16: Bar Chart of the Farming Households based on Distribution of Physical Reasons
Table 4.3: Distribution of Farming Households on Reasons for Living in the Flood-Affected Areas (n=178)

Variable	Frequency	Percentage
Economic Reasons		
Access to drinking water all-year-round	7	3.9
Opportunity for lowland farming	109	61.2
Attraction of labour from other areas	26	14.6
Opportunities for fishing	36	20.2
Social Reasons		
Born in the study area	135	75.8
Live due to family links	32	18.0
Decided to live	11	6.2
Environmental Reasons		
Influence of topography in the area	69	38.8
Due to fertile soil	82	46.1
Easy access to ground water	27	15.2
Physical Reasons		
Closeness to river basin	91	51.1
Ability to utilised water from dams	9	5.1
Use of tube well facilities	18	10.1
Cultivation of crops all-year-round	60	33.7

Source: Field Survey, 2016

4.4 Extent of Losses in Monetary Term of Livelihood Assets Caused by the 2010 Flood Disaster

The extent of losses of livelihood assets of the farming households affected by the 2010 flood disaster was assessed based in monetary term. However, Ninety three million, six hundred and five thousand naira (N93,605,000) which was equivalent to four hundred and seventy thousand, three hundred and seventy one United States dollars (\$470,371) was estimated to be the monetary term of livelihood assets of the farming households that were loss due to 2010 flood disaster in the study area. This result conformed with National Disaster Management Organisation (2010) that one hundred and sixteen thousand, three hundred and forty (\$116,340) United States dollars were estimated as the monetary term of livelihood assets lost due to 2010 flood disaster in central Gonja district, Ghana.

Consequently, the extent of loss in monetary term and the estimated quantity of every livelihood assets of the farming households affected by the 2010 flood disaster in the study area was presented separately and discussed as follows:

4.4.1 Livestock

A total of four hundred and eighty three (483) livestock of the farming households were lost due to the adverse effects of the 2010 flood disaster, with an estimated value of ten million and

seventy four thousand naira (N10,074,000). The livestock that were lost include large and small ruminants such as cattle, camels, rams, sheep and goats. This implied that there was a drastic reduction in income and intake of livestock protein in the study area. This result was in lined with Yeldu (2014) who expressed that livestock have an important place in the livelihood of the farmer in Kebbi State, because it was used as food in terms of meat and milk or reared as a source of income.

4.4.2 Upland Crop Produce

A total of sixty nine (69) metric tons of upland crop produce of the farming households were lost due to the adverse effects of the 2010 flood disaster, with an estimated value of thirteen million, seven hundred and forty thousand naira (N13,740,000). However, the crops that were lost are cereals and vegetables such as rice, maize, onion, ginger, tomato and pepper etc. This result was in lined with United Nations Development Programme (2009) report that 955,050 tons of cereals were destroyed by flood disaster in northern Ghana.

4.4.3 Farm Implements

A total of one thousand one hundred and fifty one (1,151) different farm implements of the farming households were lost due to the adverse effects of the 2010 flood disaster, with an estimated value of three million, six hundred and seventy five thousand naira (N3,675,000). The farm implements that were lost include local and mechanized tools such as hoes, sickles, cutlasses, planters, sprayers and pumping machines were among the valuable assets of the farming households. This result was in lined with Jummai *et al.* (2013) that described the destruction of vital infrastructures, loss of agricultural produce and personal valuables as the vital assets destroyed by the 2010 flood disaster in Sokoto State, Nigeria.

4.4.4 Food Stuff

The farming households had also lost a total of fifty nine (59) metric tons of foodstuff due to the adverse effects of the 2010 flood disaster, with an estimated value of eleven million, eight hundred and forty nine thousand naira (N11,849,000). The foodstuff lost was mostly grains that include rice, maize, millet and guinea corn that could be used to sustained the livelihood of the farming households in the study area. This result conformed with Ma'arufuddeen (2013) that the economic hope of the flood-affected households were jeopardised due to the adverse effects of the 2010 flood disaster in Sokoto State, Nigeria.

4.4.5 Clothes

A total of two thousand, nine hundred and nine (2909) different set of clothes of the farming households were lost due to adverse effects of the 2010 flood disaster, with an estimated value of six million, four hundred and six thousand naira (N6,406,000). The clothes that were lost are mostly the native attire for both male and female household members of different age categories. This result conformed with Makinta (2016) who observed that, almost all forms of disaster had direct or indirect effects on the livelihoods of the farming households in Borno State, Nigeria.

4.4.6 Furniture

A total of three hundred and eighty three (383) different set of furniture of the farming households were lost due to the adverse effects of the 2010 flood disaster, with an estimated value of four million, one hundred and twenty thousand naira (N4,120,000). The furniture that was lost includes beds, mattresses, cupboards and chairs of different sizes that belong to male and female households. This result implied that the home management of the farming households was destabilised and loss it values due to the adverse effects of the 2010 flood disaster. Ode (2013) has observed that the home management had a greater value in the households' well-being.

4.4.7 Cash

Physical cash worth one million, eight hundred and twenty three naira (N1,823,000) of the farming households were lost due to the adverse effects of the 2010 flood disaster. This result implied that the cash lost was the money realised by the farming households from the selling and buying of farm produce, livestock and fish. Kinsley and Christopher (2013) reported that the households' savings of Omambala riverine communities earned from processing of cassava into *gari* flour were also lost to the adverse effects of flood disaster in Anambra State, Nigeria.

4.4.8 Utensils

A total of one thousand and ten (1010) different set of domestic utensils of the farming households were lost due to the adverse effects of the 2010 flood disaster, with an estimated value of two million, eight thousand naira (N2,008,000). The types of utensils that were lost are pots, plates, cups, pans, mortars and pestles used for the purpose of cooking, eating, drinking, prying and grinding of food stuff. This result implied that even the kitchen activities were also disturbed from the adverse effects of the 2010 flood disaster to which the relief materials were provided. This result also agreed with NEMA (2010) report that the distribution of relief materials to the flood-affected households was made after the assessment of the property damaged by the 2010 flood disaster.

4.4.9 Planting Materials

A total of twenty five (25) metric tons of different varieties of planting materials of the farming households were also lost due to the adverse effects of the 2010 flood disaster, with an estimated value of five million, ten thousand naira (N5,010,000). The planting materials that were lost include germplasms of cereals and vegetables like rice, maize, onion, garlic, tomato, pepper and okra that were widely cultivated in the study area. This result implied that the planting materials that were part of the farming households' assets due to its importance in the cultivation practices were

also destroyed by the 2010 flood disaster. This result agreed with Yeldu (2014) that the planting materials were provided to the farming households who lost their planting stocks due to the adverse effects of the 2010 flood disaster in Kebbi State, Nigeri.

4.4.10 Residential Buildings

A total of one hundred and seventy eight (178) residential buildings of the farming households were affected due to the adverse effects of the 2010 flood disaster, with an estimated value of sixteen million, six hundred and sixty four thousand naira (N16,664,000). The affected buildings in most cases were the residential houses ordinarily built with poor quality materials. This result was in lined with Tanvir (2015) who reported that flood disaster due to poor building materials had caused significant lost to properties and infrastructures every year in Bangladesh and Nepal.



Figure 4.17a: Photograph of the Typical Mud Residential Building in Rimawa Flood-Affected Area



Figure 4.17b: Researcher at the Scene of Residential Buildings lost to the 2010 Flood Disaster in Bakin Gulbi

4.4.11 Lowland Crop Fields

A total of twenty nine (29) acreage of lowland crop fields of the farming households were lost due to the adverse effects of the 2010 flood disaster with an estimated value of fifty five million, one hundred and seventy thousand naira (N55,170,000). This result was in lined with Ecological Fund Office (2010) who reported that hundreds of farmlands worth millions of naira were submerged due to the 2010 flood disaster in Sokoto State, Nigeria.

4.4.12 Fishing Gears

A total of one hundred and sixty seven (167) different fishing gears of the farming households were lost due to the adverse effects of the 2010 flood disaster, with an estimated value of four million, six hundred and eighty thousand naira (N4,680,000). These gears were used by fishermen for the purpose of catching and trapping of fish. However, the gears that were lost include nets, traps and boats of different sizes. This result was in lined with Orebiyi (2008) who observed that flood disaster caused the destruction of several fishing sites in Lagos State, Nigeria.

Table 4.4a: Total Value of Livelihood Assets Lost to the 2010 Flood Disaster by the Farming Households

Asset	Quantity	Unit	Estimated Value(N)
Livestock	483	Number	10,074,000
Upland Crop Produce	69	Ton	13,740,000
Farm Implements	1151	Number	3,675,000
Food Stuff	59	Ton	11,849,000
Clothes	2909	Set	6,406,000
Furniture	383	Set	4,120,000
Cash	-	Naira	1,823,000
Utensils	1010	Set	2,008,000
Planting Materials	25	Ton	5,010,000
Residential Buildings	178	Number	13,995,000
Lowland Crop Fields	29	Acre	16,225,000
Fishing Gears	167	Number	4,680,000
Total Monetary Value	=		N93,605,000

Source: Field Survey, 2016

The distribution of study LGAs based on the value of livelihood assets lost to the 2010 flood disaster presented in Table 4.4b revealed that the farming households in Wamakko LGA encountered the highest value of losses per households with the mean value of N606,088. This implied that each

of the affected farming households in Wamakko LGA on the average, lost livelihood assets worth N606,088. The high level of losses experienced in Wamakko LGA could be attributed to the fact the LGA was found to be a confluence, where the excess water from Goronyo dam and Lugu dam in Wurno LGA that passed through Rima River converged with the excess water that came from the Bakolori dam through River Sokoto. However, because of the influence of this confluence, the upland crop produce, farm implements, planting materials, fishing gears, food stuff and residential buildings of the farming households in Wamakko LGA were adversely affected by the 2010 flood disaster compared to Goronyo and Wurno study LGAs.

Table 4.4b: Value of Livelihood Assets of Local Government Areas Lost to the 2010 Flood Disaster

Livelihood Asset	Study Local Government Area								
	Goronyo (n=60)			Wurno (n=61)			Wamakko (n=57)		
	Qty	Unit	Estimated Value (N)	Qty	Unit	Estimated Value (N)	Qty	Unit	Estimated Value (N)
Livestock	220	No.	4,894,000	78	No.	1,880,000	185	No.	3,300,000
Upland Crop Produce	19	Ton	3,770,000	21	Ton	4,150,000	29	Ton	5,820,000
Farm Implements	305	No.	980,000	416	No.	635,000	430	No.	2,060,000
Food Stuff	18	Ton	3,685,000	19	Ton	3,674,000	22	Ton	4,490,000
Clothes	1205	Set	2,771,000	897	Set	1,860,000	807	Set	1,775,000
Furniture	169	Set	1,375,000	118	Set	1,485,000	96	Set	1,260,000
Cash	-	N	425,000	-	N	718,000	-	N	680,000
Utensils	337	Set	690,000	278	Set	637,000	395	Set	681,000
Planting Materials	7	Ton	1,370,000	6	Ton	1,280,000	12	Ton	2,360,000
Residential Buildings	60	No.	5,174,000	61	No.	5,210,000	57	No.	5,841,000
Lowland Crop Fields	10.7	Acre	4,800,000	8.5	Acre	4,975,000	9.4	Acre	4,220,000
Fishing Gears	38	No.	910,000	69	No.	1,710,000	60	No.	2,060,000
Total Estimated Value	N30,844,000			N28,214,000			N34,547,000		
Mean Value per Household	N514,067			N462,525			N606,088		

Source: Field Survey, 2016

4.5 Indigenous Coping Strategies Adopted by Farming Households Affected by 2010 Flood Disaster

4.5.1 Short-Term Coping Strategies

The result presented in Table 4.5 expressed that most (45.5%) of the farming households that were adversely affected due to the 2010 flood disaster had relied on assistance from their relatives as a short-term strategy for coping with the stress caused by flood disaster. This result conformed with Tanvir (2015) who reported that puff and flat rice made from *muri* and *chira* were immediately provided to flood-affected households by their relatives in Bangladesh and Nepal. The result further revealed that 55.1 per cent of the farming households had relied on borrowing from neighbours as their short-term coping strategy. This result also agreed with Ninno *et al.* (2001) who similarly observed that households adjusted to adverse effects of flood disaster through the borrowing strategy.

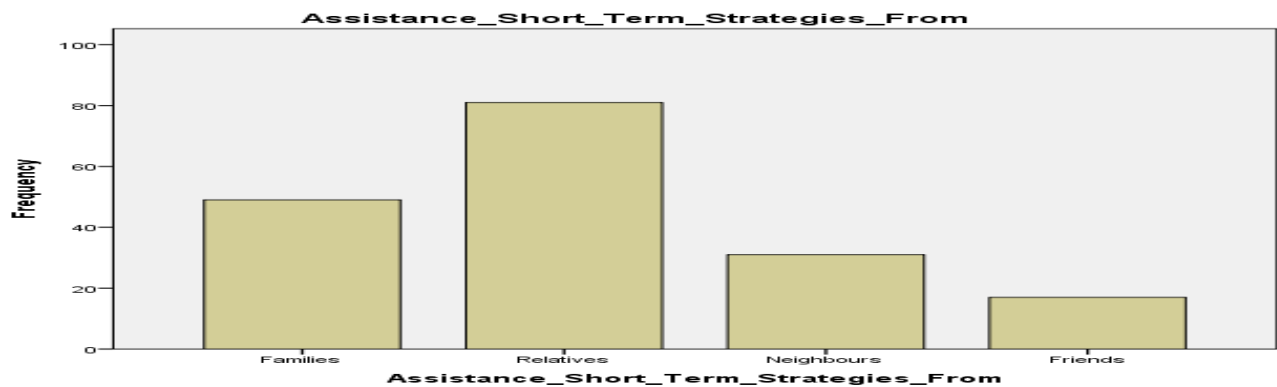


Figure 4.18: Bar Chart of the Farming Households based on Distribution of Assistance

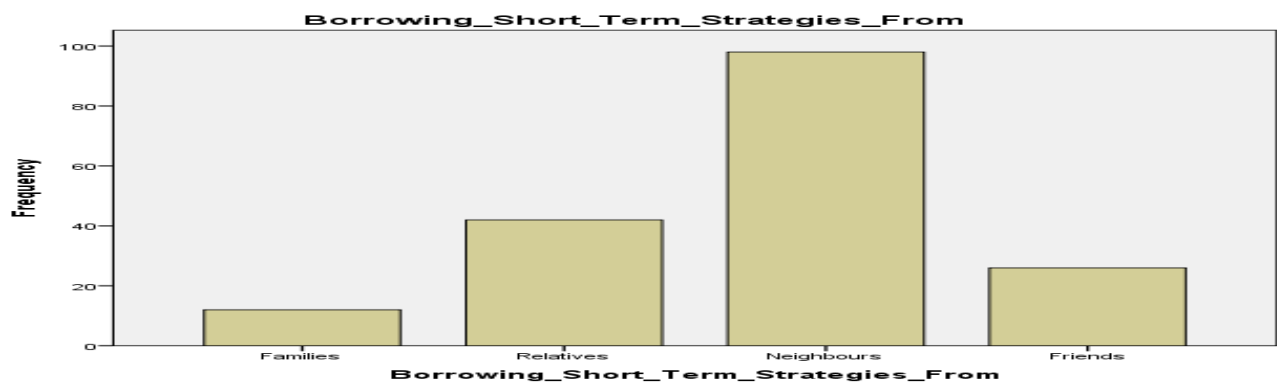


Figure 4.19: Bar Chart of the Farming Households based on Distribution of Borrowing

4.5.2 Medium-Term Coping Strategies

The result presented in Table 4.5 revealed that 48.9 per cent of the farming households that were adversely affected due to the 2010 flood disaster had received relief materials from NEMA as a

medium-term strategy for coping with the stress caused by the 2010 flood disaster. Evidently, other donor groups as indicated in (Table 4.5) also played a pivotal role in the provision and distribution of relief materials to the farming households that were adversely affected due to 2010 flood disaster. This result implied that the distribution of relief materials had attracted the attention of multiple stakeholders in flood disaster management. Therefore, this result conformed with Kinsley and Christopher (2013) who reported that relief materials were provided by donor groups such as United Nations Children’s Fund, United Nations and European Union to the flood-affected households of Omambala riverine communities in Anambra State, Nigeria.

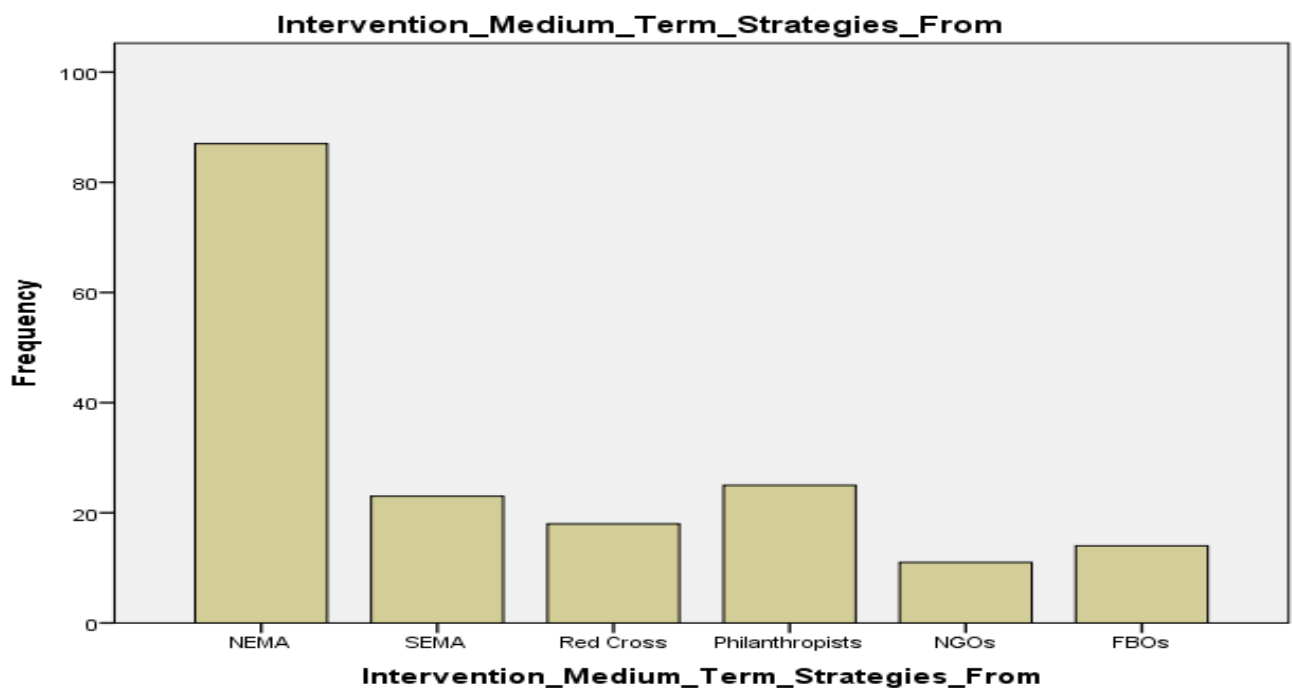


Figure 4.20: Bar Chart of the Farming Households based on Distribution of Intervention

4.5.3 Long-Term Coping Strategies

The result presented in Table 4.5 revealed that 65.2 percent of the farming households that were adversely affected due to the 2010 flood disaster had migrated to urban areas for search of non-

farm income activities as long-term strategy for coping with the stress caused by flood disaster. This result agreed with Action Aid International (2006) that migration of the flood-affected households to urban areas were considered to be among the adverse effects of flood disaster in African Sahel. Furthermore, the result presented in Table 4.5 revealed that the farming households migrated to non-flood affected areas for non-farm income activities as means for coping with the stress caused by 2010 flood disaster. This result also conformed with Abimbola and Oluwakemi (2013) who reported that in most cases the households were diversified into non-farm activities in coping with the stress caused by flood disaster in Ondo State, Nigeria.

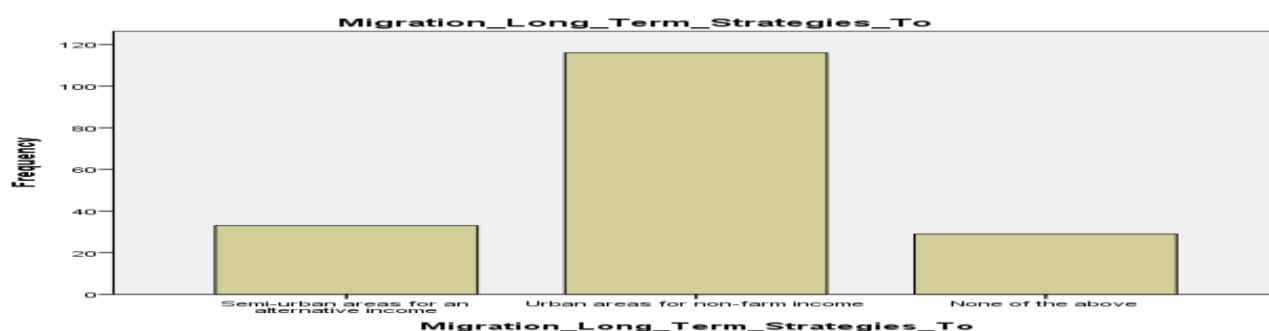


Figure 4.21: Bar Chart of the Farming Households based on Distribution of Migration

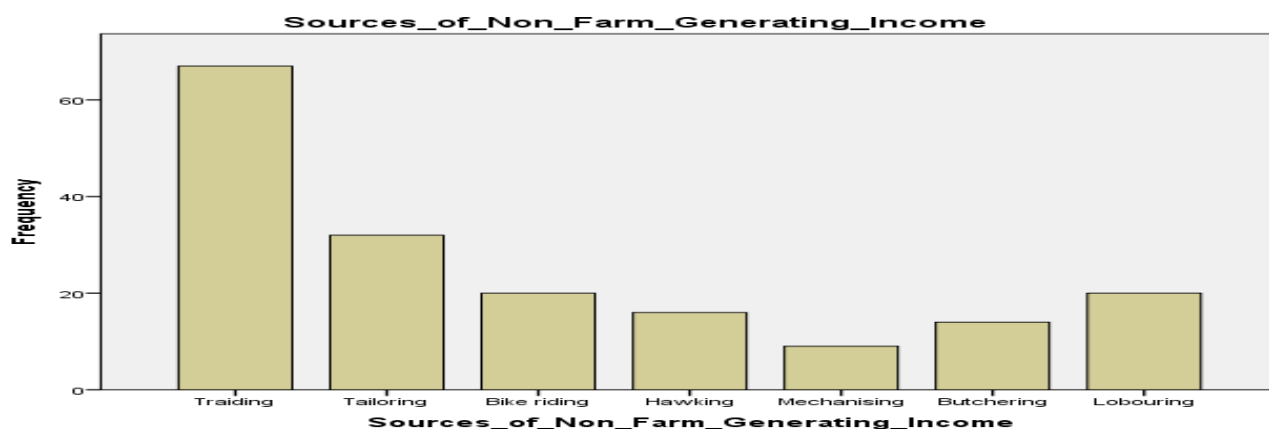


Figure 4.22: Bar Chart of the Farming Households based on Distribution of Sources Non-Farm Income

Table 4.5: Distribution of Farming Households based on the Indigenous Coping Strategies (n=178)

Variable	Frequency	Percentage
Short-Term Coping Strategies		
Assistance from Families	49	27.5

Relatives	81	45.5
Neighbors	31	17.4
Friends	17	9.6
Borrowing from		
Families	12	6.7
Relatives	42	23.6
Neighbors	98	55.1
Friends	26	14.6
Medium-Term Coping Strategies		
Intervention from		
NEMA	87	48.9
SEMA	23	12.9
Red Cross	18	10.1
Philanthropists	25	14.0
NGOs	11	6.2
FBOs	14	7.9
Long-Term Coping Strategies		
Migration to		
Semi-urban areas for an alternative income	33	18.5
Urban areas for non-farm income	116	65.2
None of the above	29	16.3
Non-Farm Income		
Trading	67	37.6
Tailoring	32	18.0
Bike ridding	20	11.2
Hawking	16	9.0
Mechanising	9	5.1
Butchering	14	7.9
Labouring	20	11.2

Source: Field Survey, 2016

4.6 Test of Significant Difference in the Extent of Losses in Monetary Term of the Study LGAs

One Way ANOVA was used for this study to test the significance difference in the extent of losses in monetary term, based on its statistical ability to measure and compare the mean value

among the three LGAs of the study that involves the separate computations of the following parameters:

- i. Sum of squares among the 3 LGAs of the study.
- ii. Sum of squares within the 3 LGAs of the study.
- iii. Degree of freedom among the 3 LGAs of the study.
- iv. Degree of freedom within the 3 LGAs of the study.
- v. Degree of freedom for total variance of the 3 LGAs of the study.
- vi. Mean sum of squares or variance estimate of the 3 LGAs of the study.
- vii. F-ratio is obtained by dividing the mean sum of squares among 3 LGAs of the study and within the 3 LGAs of the study.

In order to compute the items presented above, the following information about the farming households affected by the 2010 flood disaster will be required:

n = number of the farming households in each of the study LGAs.

N = total number of the farming households in all the study LGAs.

$\sum X$ = sum of all the extent of losses in monetary term in each of the study LGAs.

$\sum \sum X$ = sum of all the extent of losses in monetary term in all the study LGAs.

$\sum X^2$ = sum of all the squares of the extent of losses in monetary term in each of the study LGAs.

$\sum \sum X^2$ = sum of all the squares of the extent of losses in monetary term in all the study LGAs.

n = 60 for Goronyo LGA

61 for Wurno LGA

57 for Wamakko LGA

N = 60+61+57=178

$$\sum X = 30,844,000 \text{ for Goronyo LGA}$$

$$28,214,000 \text{ for Wurno LGA}$$

$$34,547,000 \text{ for Wamakko LGA}$$

$$\sum X = 30,844,000 + 28,214,000 + 34,547,000$$

$$= 93,605,000$$

$$\sum X^2 = 1.9446 \times 10^{13} \text{ for Goronyo LGA}$$

$$1.52674 \times 10^{13} \text{ for Wurno LGA}$$

$$2.2376 \times 10^{13} \text{ Wamakko LGA}$$

$$\sum X^2 = 1.9446 \times 10^{13} + 1.52674 \times 10^{13} + 2.2376 \times 10^{13}$$

$$= 5.71 \times 10^{13}$$

Sum of Squares among the 3 LGAs of the Study

$$\frac{\sum (\sum x)^2}{n} - \frac{(\sum X)^2}{N}$$

$$= \frac{(30,844,000)^2}{60} + \frac{(28,214,000)^2}{61} + \frac{(34,547,000)^2}{57} - \frac{(93,605,000)^2}{178}$$

$$= \frac{9.51 \times 10^{14}}{60} + \frac{7.96 \times 10^{14}}{61} + \frac{1.193 \times 10^{15}}{57} - \frac{8.76 \times 10^{15}}{178}$$

$$= 1.586 \times 10^{13} + 1.305 \times 10^{13} + 2.09 \times 10^{13} - 4.922 \times 10^{13}$$

$$= 4.981 \times 10^{13} - 4.922 \times 10^{13} = 5.9 \times 10^{11} = 5.9 \times 10^{11}$$

Sum of Squares within the 3 LGAs of the Study

$$\sum X^2 - \frac{(\sum X)^2}{N}$$

$$= 1.9446 \times 10^{13} + 1.52674 \times 10^{13} + 2.2376 \times 10^{13} - \frac{(30,844,000)^2}{60} + \frac{(28,214,000)^2}{61} + \frac{(34,547,000)^2}{57}$$

$$= 5.71 \times 10^{13} - 1.586 \times 10^{13} + 1.305 \times 10^{13} + 2.09 \times 10^{13}$$

$$= 5.71 \times 10^{13} - 4.981 \times 10^{13}$$

$$= 7.29 \times 10^{12}$$

Degree of Freedom among the 3 LGAs of the Study

K- 1 where K = number of the study LGAS

$$3 - 1 = 2$$

Degree of Freedom within the 3 LGAs of the Study

N – K where N = total number of the farming households

$$178 - 1 = 177$$

Degree of Freedom for Total Variance of the 3 LGAs of the Study

$$N - 1$$

$$178 - 1 = 177$$

Among the 3 LGAs of the Study Mean Sum of Squares

$$\frac{5.9 \times 10^{11}}{2} = 2.95 \times 10^{11}$$

Within the 3 LGAs of the Study Mean Sum of Squares

$$\frac{7.29 \times 10^{12}}{176} = 4.14 \times 10^{10}$$

F-Ratio

$$\frac{2.95 \times 10^{11}}{4.14 \times 10^{10}} = 7.12$$

Table 4.6: Analysis of Variance in the Extent of Losses in Monetary Term among the Study LGAs

SV	SS	DF	MS	F-Cal.	F-Tab.	Decision
Analysis among the 3 LGAs of the study.	5.9×10^{11}	2	3.0×10^{11}	7.12	1.32	S
Source of error within the 3 LGAs of the study.	7.3×10^{12}	176	4.1×10^{10}			
Total	7.9×10^{12}	178				

SV=Source of Variation, SS=Sum of Squares, DF=Degree of Freedom, MS=Mean Sum of Squares, F-Cal. =F-Calculated Values, F-Tab.=F-Tabulated Values, $P<0.05$ =Significant at 5%

Results presented in table 4.6 revealed a significant difference in the extent of losses in monetary term of the farming households affected by the 2010 flood disaster among the study LGAs at 5% level of significance. This implied that the null hypothesis was rejected and the alternative hypothesis was accepted, because the calculated F-value was greater than the tabulated F-value. Consequently, the significant difference established after the analysis of variance among the study LGAs were as a result of differences of the livelihood assets of the farming households that were adversely affected by the 2010 flood disaster as discussed and presented in (Table 4.4b).

4.7 Focus Group Discussion of the Farming Households Affected by the 2010 Flood Disaster

4.7.1 Farmers Groups Affected by the 2010 Flood Disaster

According to the farmers groups, excessive rainfall and release of water from Bakolori and Goronyo dams, coupled with the absence of flood mitigation plans were the factors that caused the 2010 flood disaster. However, loss of residential buildings, farmlands, farm produce and farm

implements worth millions of naira were revealed by the farmers groups as the adverse effects of the 2010 flood disaster on their livelihood assets. They also expressed their reasons for living in the flood-affected areas to be based on the opportunities for lowland farming activities in all-year-round. Accordingly, assistance from social contacts, provision of relief materials from donor groups, government agencies and migration to urban areas under extreme conditions was the coping strategies adopted by the farmers groups for coping with the stress caused by the 2010 flood disaster.



Figure 4.23: Photograph Showing PRA Plenary with Farmers Groups Affected by the 2010 Flood Disaster

4.7.2 Livestock Owners Affected by the 2010 Flood Disaster

According to the livestock owners, excessive release of water from Bakolori and Goronyo dams in addition to the residential buildings of the farmers in flood water ways were the factors that caused the 2010 flood disaster. However, loss of residential buildings and livestock worth millions of naira were revealed by the livestock owners as the adverse effects of the 2010 flood disaster on their livelihood assets. They also expressed their reasons for living in the flood-affected areas to be based

on the availability of pasture for their livestock grazing and closeness to water body that also served as the livestock source of drinking water. Accordingly, assistance from the social contacts and migration to semi-urban and urban areas for sales of fresh milk, fermented milk, condensed and skimmed milk was the coping strategies adopted by the livestock owners for coping with the stress caused by the 2010 flood disaster in the study area.



Figure 4.24: Photograph Showing PRA Plenary with Livestock Owners Affected by the 2010 Flood Disaster

4.7.3 Fishermen Groups Affected by the 2010 Flood Disaster

According to the fishermen groups, the excessive rainfall and release of water from Bakolori and Goronyo dams coupled with poor land use planning were the factors that caused the 2010 flood disaster. However, loss of human lives, loss of fishing gears as well as cloths, food-stuffs and cash were revealed by the fishermen groups as the adverse effects of the 2010 flood disaster on their livelihood assets. They expressed their reasons for living in the flood-affected area to be based on the closeness to Rima River for fishing activities. Accordingly, assistance from social contacts, donor

agencies and sales of dry or smoked fish to semi-urban areas or urban areas was the coping strategies adopted by the fishermen groups for coping with the stress caused by the 2010 flood disaster.



Figure 4.25: Photograph after PRA Plenary with Fishermen Group Affected by the 2010 Flood Disaster

4.8 Wealth Ranking of the Farming Households Affected by the 2010 Flood Disaster

4.8.1 Wealth Ranking by Farmers Groups Affected by the 2010 Flood Disaster

The wealth ranking presented in Table 4.8.a was based on comparison of estimation on the quantity of food stuff possessed by the farmers groups before and after the 2010 flood disaster. However, the wealth ranking revealed that the quantity of food stuff was reduced due to the adverse effects of the 2010 flood disaster. This reduction was observed among the categories of farmers groups that were rich, average and poor in terms of the quantity of food stuff that was lost to the adverse effects of the 2010 flood disaster.

Table 4.8.a: Distribution of Wealth Ranking by Farmers Groups Affected by the 2010 Flood Disaster

Community	Category	Wealth	Qt. before 2010 FLD	Qt. after 2010 FLD
Kagara	Rich	sorghum, rice	70 bags	50 bags
	Average	millet, maize	40 bags	30 bags
	Poor	cowpea	20 bags	15 bags
Taloka	Rich	rice, onion	60 bags	40 bags
	Average	millet, sorghum	30 bags	20 bags
	Poor	millet, cowpea	8 bags	4 bags
Giyawa	Rich	rice, garlic	70 bags	50 bags
	Average	sorghum, onion	40 bags	20 bags
	Poor	millet	20 bags	10 bags
Lugu	Rich	rice, garlic	60 bags	40 bags
	Average	sorghum, onion	30 bags	20 bags
	Poor	millet, cowpea	10 bags	5 bags
Tunga	Rich	rice, wheat	80 bags	65 bags
	Average	rice, onion	60 bags	50 bags
	Poor	sweet potato	30 bags	15 bags
Barayar Zaki	Rich	rice, onion	70 bags	55 bags
	Average	sorghum	50 bags	40 bags
	Poor	cowpea	20 bags	10 bags
Bakin Gulbi	Rich	onion, rice	80 bags	60 bags
	Average	maize, cowpea	60 bags	45 bags
	Poor	maize	20 bags	10 bags
KwalKwalawa	Rich	sorghum, onion	100 bags	85 bags
	Average	maize, onion	70 bags	60 bags
	Poor	sweet potato	30 bags	20 bags
Rimawa	Rich	rice, okra, onion	80 bags	65 bags
	Average	maize, tomato	50 bags	35 bags
	Poor	maize	20 bags	10 bags

Source: Field Survey, 2016

4.8.2 Wealth Ranking by Livestock Owners Affected by the 2010 Flood Disaster

The wealth ranking also presented in Table 4.8.b was based on the comparison of the number of farm animals possessed by the livestock owners before and after the 2010 flood disaster. However, the wealth ranking revealed that the number of livestock was reduced due to the adverse effects of the 2010 flood disaster. This reduction was observed among the categories of livestock owners that were rich, average and poor in terms of the number of livestock that was lost to the adverse effects of the 2010 flood disaster.

Table 4.8.b: Distribution of Wealth Ranking by Livestock Owners Affected by the 2010 Flood Disaster

Communities	Category	Wealth	No. before 2010 FLD	No. after 2010 FLD
-------------	----------	--------	---------------------	--------------------

Kagara	Rich	cattle, sheep, goats	50-60	45-50
	Average	sheep, goats	70-80	60-70
	Poor	sheep	6-10	4-6
Taloka	Rich	cattle, sheep, goats	30-50	5-8
	Average	sheep, goats	50-70	30-60
	Poor	sheep	6-10	4-6
Giyawa	Rich	cattle, sheep, goats	50-60	45-50
	Average	sheep, goats	50-70	50-60
	Poor	sheep	5-8	2-7
Lugu	Rich	cattle, sheep, goats	50-60	45-58
	Average	sheep, goats	30-40	21-30
	Poor	sheep	5-8	3-5
Tunga	Rich	sheep, goats	70-80	55-70
	Average	sheep, goats	30-40	25-33
	Poor	sheep	15-20	7-13
Barayar Zaki	Rich	cattle, sheep	40-50	44-55
	Average	sheep, goats	60-70	56-58
	Poor	sheep	10-12	6-9
Bakin Gulbi	Rich	sheep, goats	100-110	99-105
	Average	sheep, goats	80-90	77-88
	Poor	sheep	20-30	15-22
KwalKwalawa	Rich	cattle, sheep	40-50	44-55
	Average	sheep, goats	60-70	50-66
	Poor	sheep	10-15	5-10
Rimawa	Rich	cattle, sheep, goat	80-90	55-80
	Average	sheep, goats	50-60	40-58
	Poor	sheep	15-20	8-15

Source: Field Survey, 2016

4.8.3 Wealth Ranking by Fishermen Groups Affected by the 2010 Flood Disaster

The wealth ranking further presented in Table 4.8.c was based on comparison of estimation on the quantity of fish harvested by fishermen groups before and after the 2010 flood disaster. However, the wealth ranking revealed that the quantity of fish was reduced due to the adverse effects of the 2010 flood disaster. This reduction was observed among the categories of fishermen groups that were rich, average and poor in terms of the quantity of fish harvested that was lost to the adverse effects of the 2010 flood disaster.

Table 4.8.c: Distribution of Wealth Ranking by Fishermen Groups Affected by the 2010 Flood Disaster

Communities	Category	Qty. of Fish before the 2010 Flood Disaster (Kg)	Qty. of Fish after the 2010 Flood Disaster(Kg)
-------------	----------	---	---

Kagara	Rich	30-40	15-20
	Average	20-30	10-15
	Poor	10-20	5-6
Taloka	Rich	50-60	20-30
	Average	40-50	10-20
	Poor	30-40	5-8
Giyawa	Rich	60-70	30-40
	Average	50-60	20-35
	Poor	20-30	10-15
Lugu	Rich	70-80	45-55
	Average	60-70	35-40
	Poor	50-60	25-35
Tunga	Rich	40-50	20-25
	Average	30-40	15-20
	Poor	20-30	10-15
Barayar Zaki	Rich	60-70	20-25
	Average	50-60	15-20
	Poor	40-50	10-15
Bakin Gulbi	Rich	70-80	35-45
	Average	60-70	30-40
	Poor	40-60	10-20
Kwal-Kwalawa	Rich	30-40	20-25
	Average	20-30	15-20
	Poor	20-30	10-15
Rimawa	Rich	50-60	30-35
	Average	40-50	20-25
	Poor	30-40	10-15

Source: Field Survey, 2016

4.9 Venn Diagram of the Farming Households Affected by the 2010 Flood Disaster

4.9.1 Venn Diagram by the Farmers' Groups Affected by the 2010 Flood Disaster

The Venn diagram presented in Figure 4.26 was based on the extent of relationship between the institutional framework and key actors of the farmers groups affected by the 2010 flood disaster. However, twenty one different institutions, associations, groups and influential households were identified as key figures of the farmers groups affected by the 2010 flood disaster. For instance, universities, research institutes, ministry of agriculture, ministry of environment and Sokoto agricultural development projects were the institutions that have relationship with farmers groups through the extension contact as indicated in the overlaps. Even though, the provision of organic fertilizer, improved seeds, pumping machines and credit facilities were provided to the farmers

groups as indicated in the overlaps. Furthermore, the cereal crops association, vegetable crops association, roots and tuber crops association, women processing association and blacksmith association were the associations that have relationship with farmers groups as indicated in the overlaps. Although, the relationship was established within the associations, for instance the overlap between the cereal crops association and women processing association revealed that the activities of women processing association were based on the efforts of cereal crops association. Likewise, the overlap between the vegetable crops association with root and tuber crops association revealed the degree of importance the farmers groups attached to lowland farming activities. Meanwhile, the activities of cereal crops and vegetable crops associations were connected together by trade union for the purpose of local and inter-state domestic consumptions, which served as the sources of market for agricultural produce. Consequently, the relationship between farmers groups and blacksmith association was based on the purchase and sharpening of farming tools by blacksmith and in turn the purchase of food stuff produced by the farmers groups. Moreover, the lowland dry season farming in addition with upland rainy season farming was practiced by the farmers groups as indicated in the overlaps of the cultivation pattern. The overlaps between the rainfall, dam, tube well and river were identified as the sources of water for cultivation practices by the farmers groups. The water from dam, river and tube well was used for the purpose of irrigation farming. Similarly, the overlaps between the village and district heads together with community development workers and non-governmental organisations had indicated a robust channel of communication on activities that influence the livelihood of the farmers groups. Additionally, the overlaps between community development workers with vigilante group and aid group revealed the level of commitment among *Yanga aiki*, *Yan dako* and *Yangayya* that were involved in self-help and for post-disaster activities.

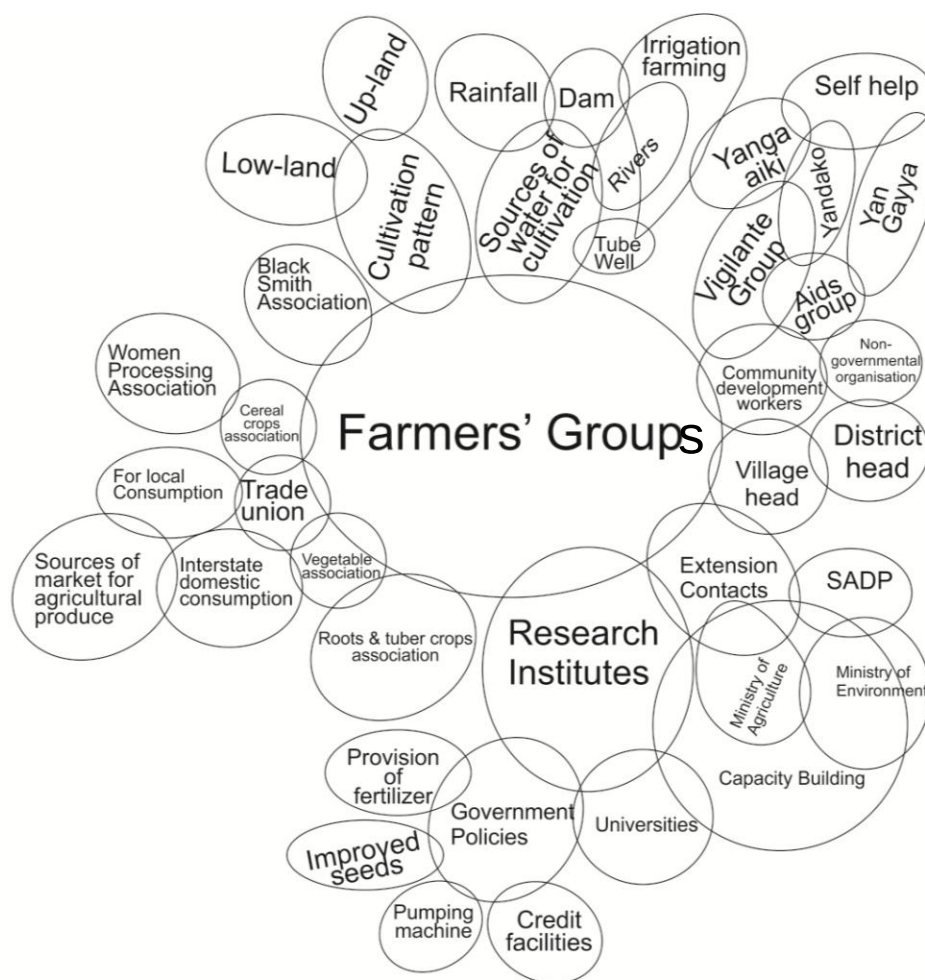


Figure 4.26: Venn Diagram by the Farmers' Groups Affected by the 2010 Flood Disaster

4.9.2 Venn Diagram by the Livestock Owners Affected by the 2010 Flood Disaster

The Venn diagram presented in Figure 4.27 was based on the extent of relationship among the institutional framework and key actors of the livestock owners affected by the 2010 flood disaster. However, twelve different institutions, associations, groups and influential households were identified as key figures of livestock owners. For instance, ministry of animal health and fisheries resources, ministry of agriculture, ministry of environment, Sokoto agricultural development projects were the institutions that have relationship with livestock owners through the extension contact as indicated in the overlaps. Even though, the provision of veterinary services was provided to the livestock owners as indicated in the overlaps by individual and group at the community base or by

veterinarian through the ministry of animal health. Meanwhile, the poultry association and cattle association was the two important livestock associations that have relationship with livestock owners as indicated in the overlaps. Although, the relationship was established within the associations, for instance the overlaps between the butchers association and livestock association indicated that the activities of butchers association were based on the effort of livestock association and livestock owners respectively. Likewise, the overlaps between the livestock raised revealed the degree of importance the livestock owners attached to livestock husbandry. Meanwhile, local consumption, inter-state consumption and cross border for livestock meat, milk and by-products were the principal sources of markets for the livestock owners. Consequently, single and collective grazing pattern was adopted by the livestock owners as indicated in the overlaps. However, residual plants and formulated feeds stuff were identified in the overlaps as the sources of feeding the livestock. Also, the overlaps between the dam, river and water from tube well were revealed as the sources of drinking water for the livestock. Similarly, the overlaps between the village and district heads had indicated a robust channel of communication on the livestock husbandry that influences the livelihood of the livestock owners.

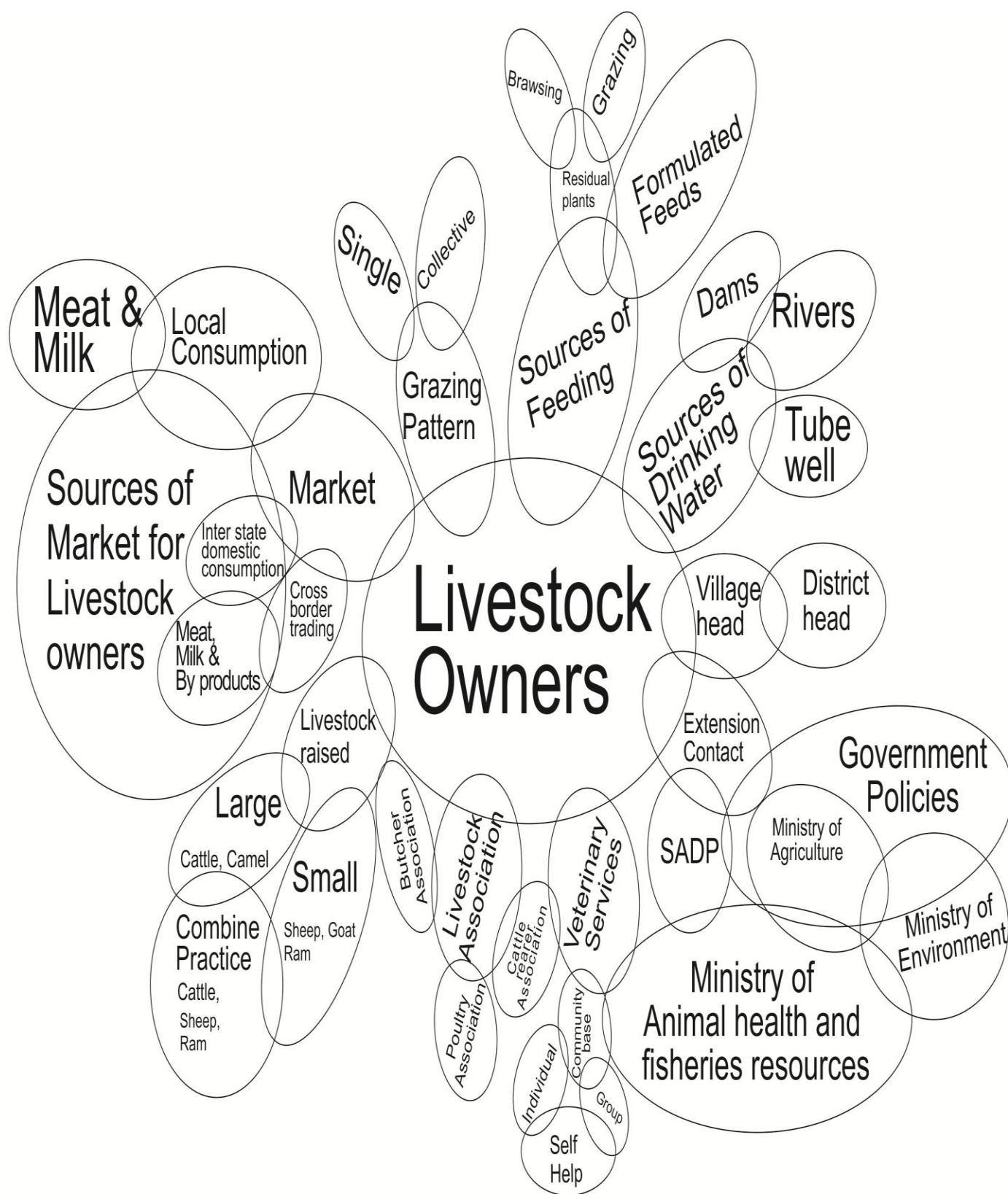


Figure 4.27: Venn Diagram by the Livestock Owners Affected by the 2010 Flood Disaster

4.9.3 Venn Diagram by the Fishermen Groups Affected by the 2010 Flood Disaster

The Venn diagram presented in Figure 4.28 was based on the extent of relationship among the institutional framework and key actors of the fishermen groups affected by the 2010 flood disaster. However, seven different institutions, associations and influential households were identified as key figures of fishermen groups. For instance, ministry of agriculture, ministry of environment, Sokoto agricultural development projects were the institutions that have relationship with fishermen groups through the extension contact as indicated in the overlaps. Even though, the species of fish harvested by fishermen groups as indicated in the overlaps are tilapia, claria and catfish. Meanwhile, the popular fishing equipment adopted by the fishermen groups as indicated in the overlaps are nets, traps and fishing boards. Likewise, the overlaps between the markets and trade associations revealed the degree of importance the fishermen groups attached to the fishing activities. Furthermore, markets for the harvested fish were assisted by the associations of middle men at artisanal level as indicated in the overlaps. Similarly, the pattern of sales was identified to be the fish sold as fresh, dry or fry. Consequently, natural and artificial growing pattern was adopted by fishermen groups as revealed in the overlaps. However, the planktons and formulated feeds stuff were identified in the overlaps as the principal sources of fish feeding harvested by the fishermen groups. Also, the overlaps between the dam and river controlled by Rima basin authorities and water heads of local fishermen were expressed as the sources of water for fishing activities. Similarly, the overlaps between the village and district heads had indicated a robust channel of communication on the fishing activities that influence the livelihood of fishermen groups.

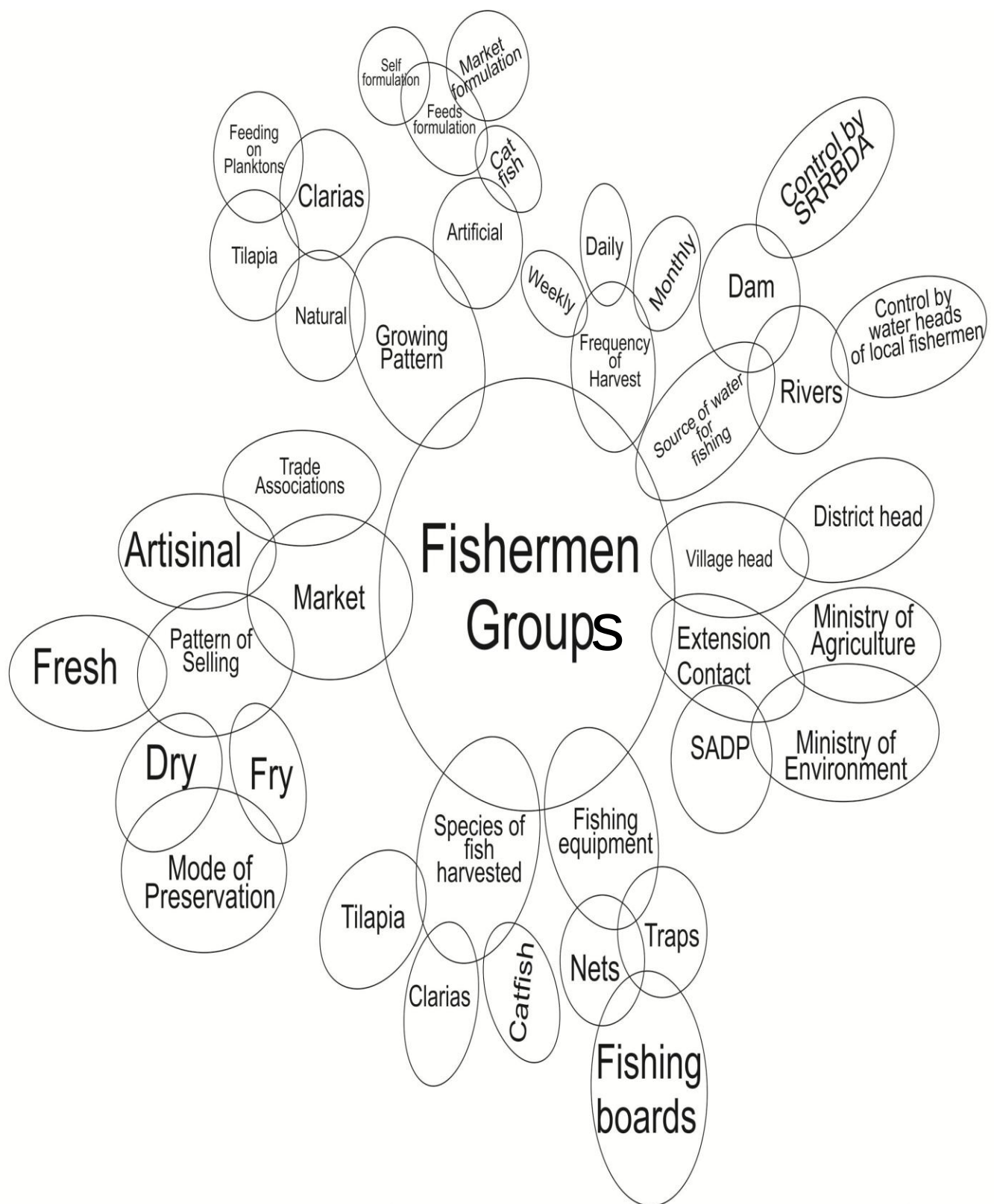


Figure 4.28: Venn Diagram by the Fishermen Groups Affected by the 2010 Flood Disaster

4.10 Social Mapping of the Farming Communities Affected by the 2010 Flood Disaster

4.10.1 Social Mapping of Goronyo Local Government Area Affected by the 2010 Flood Disaster

Different colours were used in Figure 4.29 to explain the physical, environmental, social and economic assets of the farming communities in Goronyo LGA affected by the 2010 flood disaster. For instance, red colour portion in the map indicated the location of flood-affected farming communities that include *Taloka, Kagara Rima and Giyawa* at the major route of River Rima. This implied that closeness to River Rima and its tributaries exposed the farming communities in Goronyo LGA to the adverse effects of the 2010 flood disaster. The light blue colour portion in the map indicated the position of Goronyo Dam and River Rima. This implied that Goronyo dam located in the area exposed the farming communities to hardship due to the adverse effects of the 2010 flood disaster. The deep blue colour portion in the map indicated different locations of flooded fishing sites due to the 2010 flood disaster. This implied that fishing sites affected due to the adverse effects of the 2010 flood disaster were located at River Rima. The light green colour portion in the map shown the lowland areas flooded due to the 2010 flood disaster. This implied that the influence of topography in flood-affected areas exposed the farming communities to the adverse effects of the 2010 flood disaster due to action of river tributaries and flood water ways. The dark green colour portion in the map expressed the entire landmass of Goronyo LGA. This implied that the adverse effects of the 2010 flood disaster in upland areas were not severe compared to lowland areas due to the nature of physical terrain, closeness to River Rima and Goronyo dam. The fade white colour portion in the map indicated the portion of upland areas. This implied that upland areas affected by the 2010 flood disaster were close to lowland areas due to action of river tributaries, topography and frequency of which the excess water was discharged from Goronyo dam. The black colour portion in the map indicated the position of settlements of the farming communities. This implied that settlements of the farming communities affected by the 2010 flood disaster were located at lowland areas.

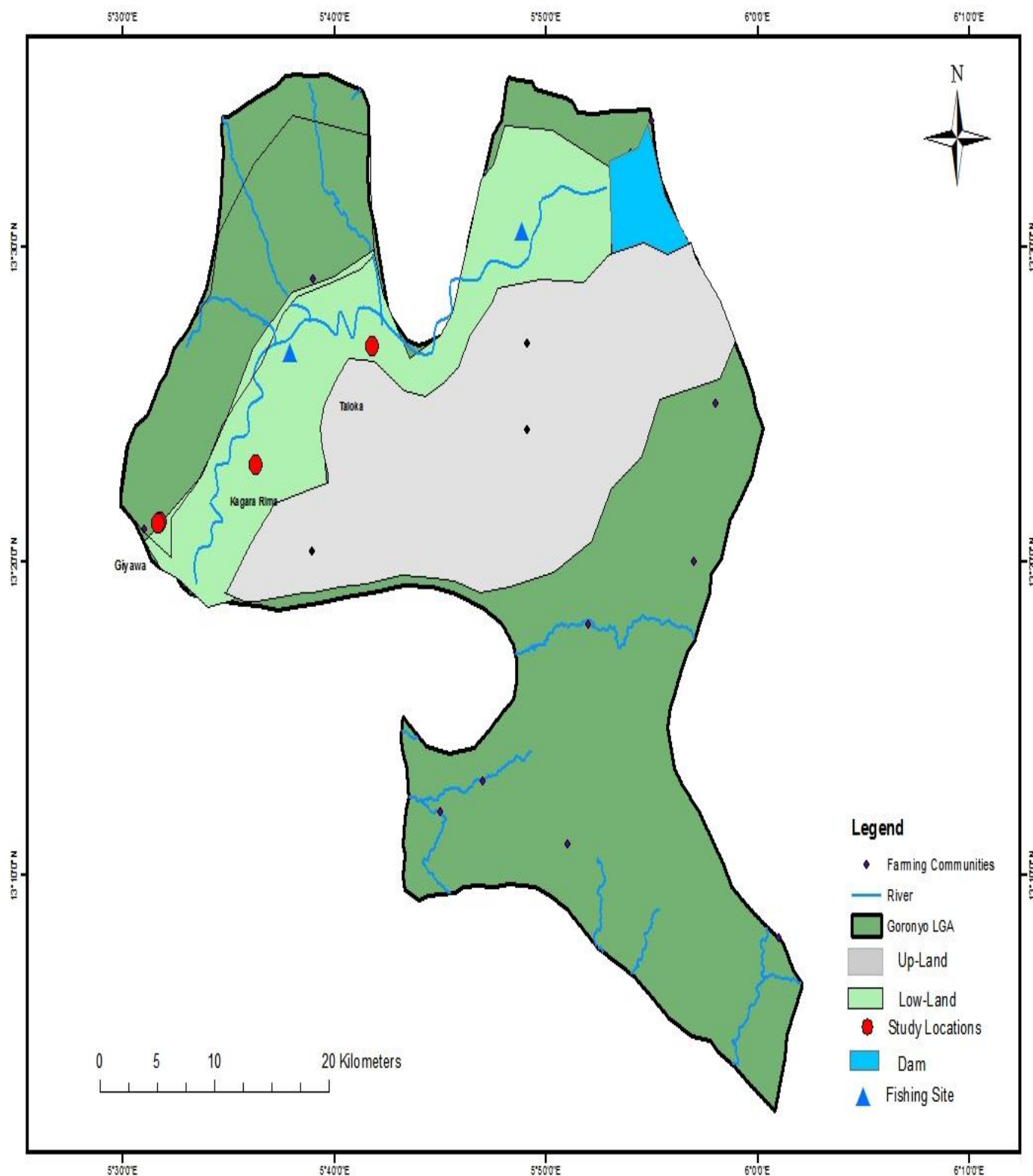


Figure 4.29: Map of Goronyo LGA Showing the Features Adversely Affected by the 2010 Flood Disaster
Source: Geographical Information System Laboratory, Department of Geography, UDUS, 2016

4.10.2 Social Mapping of Wurno Local Government Area Affected by the 2010 Flood Disaster

Different colours were used in Figure 4.30 to explain the physical, environmental, social and economic assets of the farming communities in Wurno LGA affected by the 2010 flood disaster. For instance, red colour portion in the map indicated the location of flood-affected farming communities that include *Barayar Zaki, Lugu and Tunga* at the major route of River Rima. This implied that closeness to River Rima and its tributaries exposed the farming communities in Wurno LGA to the adverse effects of the 2010 flood disaster. The light blue colour portion in the map indicated the position of Lugu dam and River Rima. This implied that the Lugu dam located in the area exposed the farming communities to hardship due to the adverse effects of the 2010 flood disaster. The deep blue colour portion in the map indicated different locations of the flooded fishing sites due to the 2010 flood disaster. This implied that the fishing sites affected by the 2010 flood disaster were located at River Rima. The light green colour portion in the map shown the lowland areas flooded due to the 2010 flood disaster. This implied that the influence of topography in the flood-affected area exposed the farming communities in Wurno LGA to the adverse effects of the 2010 flood disaster due to the action of river tributaries, valleys and flood water ways. The dark green colour portion in the map expressed the entire landmass of Wurno LGA. This implied that the adverse effects of the 2010 flood disaster in upland areas were not severe compared to lowland areas due to the nature of physical terrain, closeness to River Rima and Lugu dam in Wurno LGA. The fade white colour portion in the map indicated the portion of upland areas of Wurno LGA. This implied that the upland areas affected by the 2010 flood disaster were close to lowland areas due to action of river tributaries, topography and frequency of which the excess water was discharged from Lugu dam. The black colour portion in the map indicated the position of settlements of the farming communities. This implied that settlements of the farming communities affected by the 2010 flood disaster were located at lowland areas.

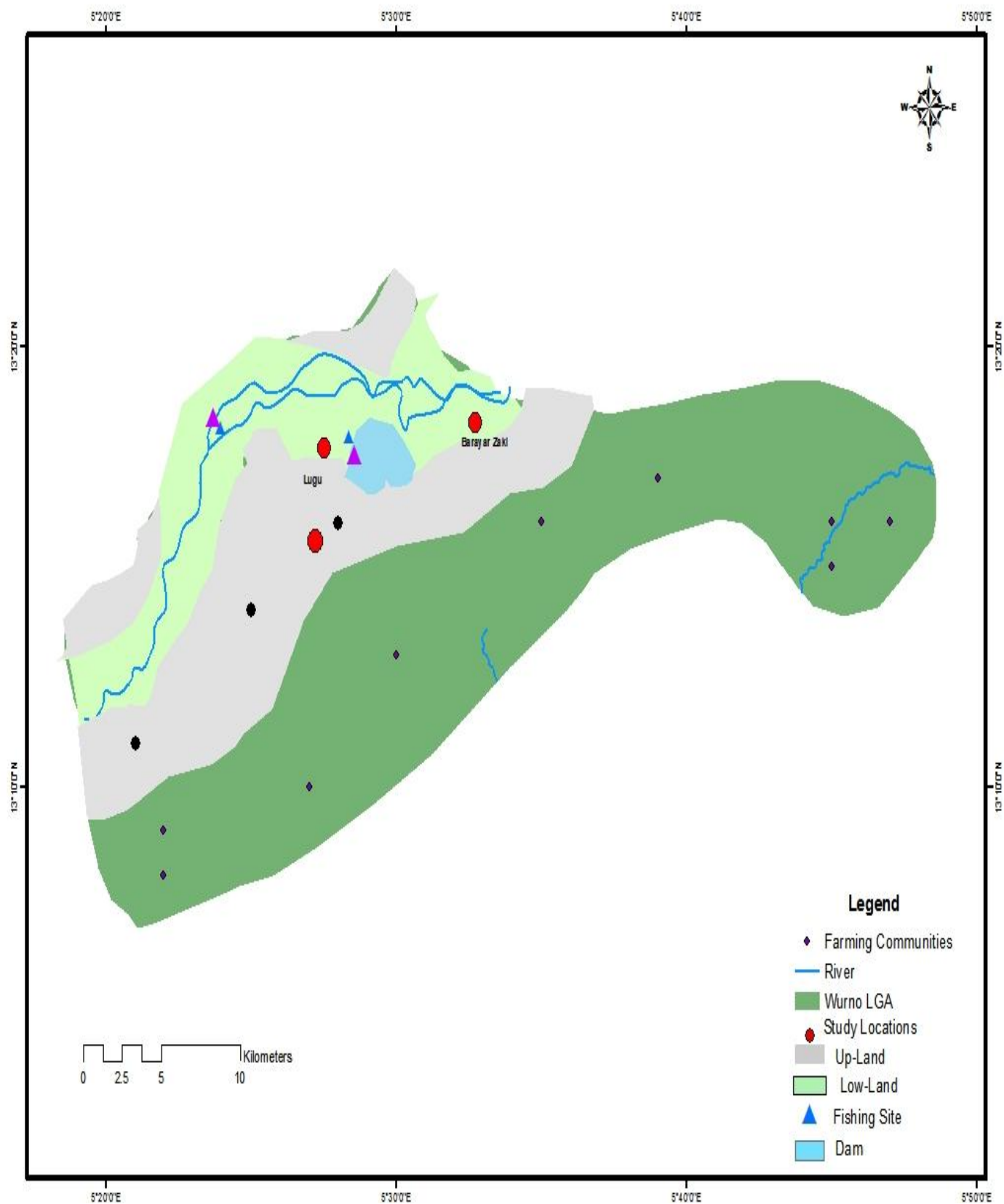


Figure 4.30: Map of Wurno LGA Showing Features Adversely Affected by the 2010 Flood Disaster
Source: Geographical Information System Laboratory, Department of Geography, UDUS, 2016

4.10.3 Social Mapping of Wamakko Local Government Area Affected by the 2010 Flood Disaster

Different colours were used in Figure 4.31 to explain the physical, environmental, social and economic assets of the farming communities in Wamakko LGA affected by the 2010 flood disaster. For instance, red colour portion in the map indicated the location of flood-affected farming communities that include *Rimawa, Bakin Gulbi and Kwal-Kwalawa* at the major route of River Rima. This implied that closeness to River Rima and its tributaries exposed the farming communities in Wamakko LGA to the adverse effects of the 2010 flood disaster. The light blue colour portion in the map indicated the presence of River Rima for fishing activities and other domestic functions. This implied that the presence of River Rima in the area exposed the farming communities to hardship due to the adverse effects of the 2010 flood disaster. The light green colour portion in the map shown the lowland areas flooded due to the 2010 flood disaster. This implied that the influence of topography in the area exposed the farming communities in Wamakko LGA to the adverse effects of the 2010 flood disaster due to action of river tributaries, valleys and flood water ways. The dark green colour portion in the map indicated the entire landmass of Wamakko LGA. This implied that the adverse effects of the 2010 flood disaster in upland areas were not severe compared to lowland areas due to the nature of physical terrain and closeness to River Rima. The fade white colour portion in the map indicated the portion of upland areas of Wamakko LGA. This implied that the upland areas affected by the 2010 flood disaster were close to lowland areas due to action of river tributaries, topography and frequency of which the excess water was discharged from Goronyo and Lugu dams. The black colour portion in the map indicated settlements of the farming communities. This implied that settlements of the farming communities affected by the 2010 flood disaster were located at lowland areas.

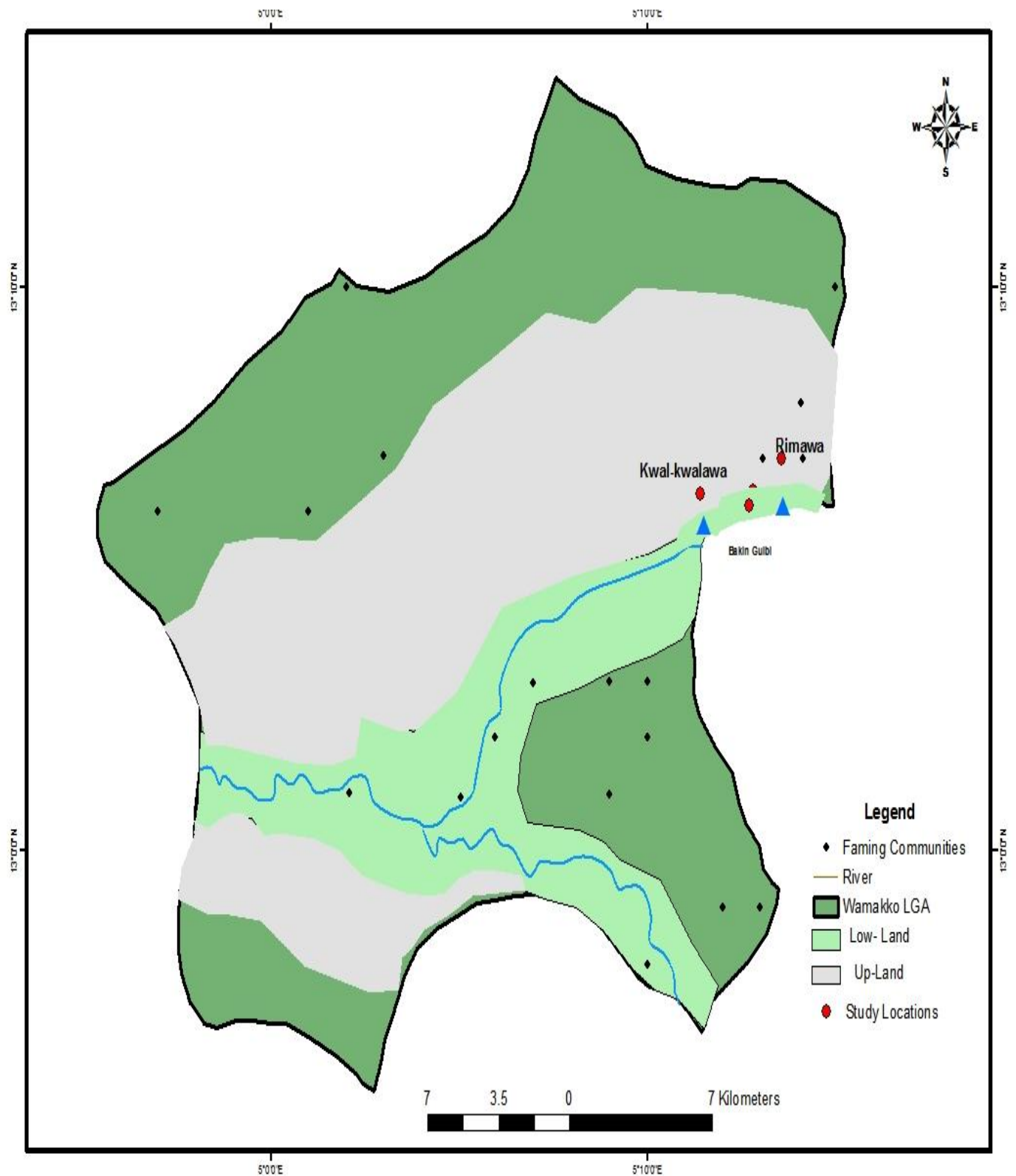


Figure 4.31: Map of Wamakko LGA Showing the Features Adversely Affected by the 2010 Flood Disaster
Source: Geographical Information System Laboratory, Department of Geography, UDUS, 2016

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS OF THE STUDY

This chapter presented the summary, conclusion and recommendations of the study based on the results that were emanated from the objectives of the study. Similarly, contributions of the study to knowledge and suggestions for further study were also presented in this chapter.

5.1 Summary

The study assessed the livelihood assets of the farming households affected by the 2010 flood disaster in Sokoto State, Nigeria. Purposive sampling technique was used in four stages to select the most flood-affected farming communities in which 178 farming households were obtained as the sample size for the study. Descriptive and inferential statistics were used for the analysis of qualitative data, while PRA tools were used for the analysis of quantitative data.

Results of the study revealed that majority of the farming households were male (96.1%) and married (94.9%). As regards to the household size, the study also revealed that (45.5%) of the farming households had 11-20 family members. In terms of occupation, majority (65.2%) of the farming households were engaged into farming as major the occupation, while majority (63.5%) of the farming households had residential buildings that were made of mud. Results of the study also indicated that majority (91.6%) of the farming households revealed that the excessive rainfall was the natural factor that caused the 2010 flood disaster. For the human factor, majority (92.1%) of the farming households revealed that the 2010 flood disaster was caused due to excessive release of water from Goronyo and Lugu dams. For the environmental factor, majority (68.0%) of the farming households revealed that the 2010 flood disaster was caused due to the influence of topography. Meanwhile, for the institutional factor, majority (80.9%) of the farming households revealed that the 2010 flood disaster was caused due to the absence of flood mitigation plans. As regards to the reasons for living in the flood-affected areas, majority (61.2%) of the farming households expressed that the opportunity for lowland farming was the economic reason that exposed them to the adverse

effects of the 2010 flood disaster. According to (46.1%), of the farming households the fertile soil was the environmental reason that encouraged their living in the flood-affected areas. Furthermore, majority (51.1%) of the farming households opined that closeness to Rima and Sokoto Rivers were their physical reason for living in the flood-affected areas. Results of the study further revealed that the monetary term of the farming households' assets lost to the 2010 flood disaster in all the study LGAs were estimated to be N93,605,000 million, while Wamakko LGA had the highest lost with mean value of N606,088 per households. As regards to the coping strategies, most of the farming households had relied on assistance from relatives (45.5%) and borrowing from neighbours (55.1%) as short-term coping strategies, for coping with the stress caused by the 2010 flood disaster. Similarly, (48.9%) of the farming households had received relief materials from NEMA as a medium-term coping strategies, for coping with the stress caused by the 2010 flood disaster, while majority (65.2%) of the farming households had migrated to urban areas for non-farm activities as a long-term coping strategies, for coping with the stress caused by the 2010 flood disaster. ANOVA revealed significant difference in the extent of losses in monetary term among the three study LGAs.

Results of the FGD further revealed that losses of human lives, residential buildings and other livelihood assets of farming households that include farmlands, farm produce, farm implements, fishing gears and livestock worth millions of naira were occurred due to the adverse effects of the 2010 flood disaster. The wealth ranking technique revealed that the quantity of food, livestock and fish was reduced due to the adverse effects of the 2010 flood disaster. However, the extent of relationship between the institutional framework and key actors among the farmers groups, livestock owners and fishermen groups were expressed in the Venn diagram, while the social mapping was used to identify the physical, environmental, social and economic assets of the farming households that were adversely affected due to the 2010 flood disaster.

5.2 Conclusion

Based on the results of the study, it can be concluded that the farming households with residential buildings that was made from mud; the buildings were not strong enough to endure the adverse effects of the 2010 flood disaster. Furthermore, the interactions of natural, human, environmental and institutional factors were responsible for occurrence of the 2010 flood disaster while economic, social, environmental and physical reasons of the farming households for living in flood-affected areas were identified. Also, the study assessed the extent of loss in monetary term of livelihood assets of the farming households worth millions of naira. Moreover, short-term, medium-term and long-term coping strategies were adopted by the farming households in coping with the 2010 flood disaster. Thus, ANOVA was used to test the significant differences among the selected LGAs, while PRA tools were used to validate the qualitative responses of the farming households.

5.3 Recommendations

- i. Farming households should build strong residential buildings that can withstand the pressure of collapsing due to the adverse effects of flood disaster.
- ii. Flood warning and forecasting instruments should be put in place by government, to serve as control measures in dealing with the causes of flood disaster in the flood-affected areas.
- iii. Dry season farming due to fertile soil should be utilised optimally by the farming households, to produce adequate food that can replace the food lost due flood in the wet season farming.
- iv. Assessment of the extent of losses in monetary term of livelihood assets, due to the adverse effects of the 2010 flood disaster should be used to guide the concerned stakeholders to expedite actions to control the adverse effects of flood disaster.
- v. Migration of the farming households should be minimised by provision of skills acquisition programmes, which will serve as an alternative means of livelihood diversification without resolving to migration in semi-urban or urban area for search of livelihood alternatives.

5.4 Contributions of the Study to Knowledge

The Contributions of the study to knowledge were extracted based on the novelty found in the following results:

- i. The in-depth assessment of the livelihood assets of the farming households affected by the 2010 flood disaster was considered to be an important breakthrough for the study.
- ii. The logical assessment of the factors that caused the 2010 flood disaster in the study area was entirely new in relation to the area that was covered by the study.
- iii. The detail assessment of the farming households' reasons for living in the flood-affected areas will be added to existing stock of knowledge.
- iv. The comprehensive assessment of short-term, medium-term and long-term coping strategies adopted by the farming households in coping with the stress caused by the 2010 flood disaster will significantly add to knowledge.
- v. The application of PRA tools to validate the qualitative responses of the farming households affected by the 2010 flood disaster was entirely new to the study of this nature.

5.5 Suggestions for Further Studies

Based on the outcome of enormous interactions with relevant stakeholders and review of the previous work in relation to the area that was covered by the study, the following suggestions for further studies were made by the researcher:

- i. Assessment of the farming households benefits due to the 2010 flood disaster.
- ii. Assessment of the role of flood disaster management agencies for effective flood control.
- iii. Assessment of the role of donor groups for efficient flood mitigation measures.
- iv. Assessment of the role of dams' regulatory agency on sustainable livelihood of farm families.
- v. Assessment of the strength of households indigenous knowledge for combating flood disaster.

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APPENDIX I

ASSESSMENT OF LIVELIHOOD ASSETS OF FARMING HOUSEHOLDS AFFECTED BY 2010 FLOOD DISASTER IN SOKOTO STATE, NIGERIA

AN INTERVIEW SCHEDULE FOR HOUSEHOLD HEADS AFFECTED BY THE 2010 FLOOD DISASTER

SECTION A

INFORMATION ON THE SOCIO-ECONOMIC CHARACTERISTICS

S/N	QUESTION	RESPONSE
1	Gender	1=Male [] 0=Female []
2	Marital Status	1=Single [] 2=Married [] 3=Divorced [] 4=Widowed [] 5=Separated []
3	Age (years)	
4	Educational Attainment	1=Primary [] 2=Secondary [] 3=NCE [] 4=ND [] 5=HND [] 6=Degree [] 7=Other, please specify-----
5	Household Size	1=Number of male [] 2=Number of female [] 3=Number of dependent [] 4=Number of wives [] Total Family Size []
6	<u>Major Occupation</u> 1=Farming [] 2=Fishing [] 3=Rearing [] 4=Civil service [] 5=Artisan [] 6=Other,-----	<u>Minor Occupation</u> 7=Farming [] 8=Fishing [] 9=Rearing [] 10=Civil service [] 11=Trading [] 12=Other,-----
7	Residential Buildings	1=Thatch house [] 2=Mud house [] 3=Concrete house []

SECTION B

INFORMATION ON THE CAUSES OF THE 2010 FLOOD DISASTER

S/N	QUESTION	RESPONSE
8	Please, which among these factors have caused 2010 flood disaster in this community?	<u>Natural Factors</u> 1=Excessive rainfall [] 2=River basin []

		3=Other, please specify----- <u>Human Factors</u> 1=Excessive release of water from dams [] 2=Building houses on flood water ways [] 3=Other, please specify----- <u>Environmental Factors</u> 1=Influence of topography [] 2=Action of river tributaries [] 3=Other, please specify----- <u>Institutional Factors</u> 1=Absence of flood mitigation plans [] 2= Poor land use planning [] 3=Other, please specify----- <u>Seasonal Factors</u> 1=Rainy season 2=Dry season
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SECTION C

INFORMATION ON THE REASONS FOR LIVING IN THE FLOOD-AFFECTED AREAS

S/N	QUESTION	RESPONSE
9	As a household head kindly indicate among the reasons for living in the flood-prone areas. <u>Economic Reasons</u> 1=Access to drinking water all-year-round [] 2=Advantage of lowland farming [] 3=Attraction of labour from other areas [] 4=Fishing opportunities [] 5=Other, please specify----- <u>Social Reasons</u> 1=Born in the study area [] 2=Live due to family links [] 3=Decided to live [] 4=Forced to live [] 5=Other, specify-----	<u>Environmental Reasons</u> 1=Influence of topography in the area [] 2=Due to fertile Soil [] 3=Easy access to ground water [] 4=Other, please specify----- <u>Physical Reasons</u> 1=Closeness to river basin [] 2=Ability to utilise water from dams [] 3=Use of tube well facilities [] 4=Cultivation of crops all-year-round [] 5=Other, please specify-----

SECTION D

INFORMATION ON THE EXTENT OF LOSSES IN MONETARY TERM OF LIVELIHOOD ASSETS

10	Please indicate from the table the extent of loss on monetary value of your livelihood assets affected due to 2010 flood disaster.	Asset	Type	Quantity	Estimated Val. /N
		1=Livestock	Large/Small		
		2=Upland Crop Produce	Cereals Vegetables Tubers Others-----		

		3=Farm Implement	Local Mechanised	
		4=Food Stuff	Grains Tubers Vegetables Others-----	
		5=Clothes	Male Female Others-----	
		6=Furniture	Bed Mattress Cupboard Chairs Others-----	
		7=Cash	Physical (N)	
		8=Utensils	Pots Plates Pan Mortar & pestle Others-----	
		9=Planting Materials	Cereals Vegetables Tubers Others-----	
		10=R/Buildings	Thatch Mud Concrete	
		11=Lowland Crop Fields	Dry Fadama Other-----	
		12=Fishing Gears	Nets Traps Boats Others-----	

SECTION E

INFORMATION ON THE INDIGENOUS COPING STRATEGIES

S/N	QUESTION	RESPONSE
11	Please which of the following strategies were you relied in coping with the stress caused by 2010 flood disaster?	<u>Short-Term Coping Strategies</u> Assistance from: 1=Families [] 2=Relatives [] 3=Neighbors []

		4=Other, please specify----- Borrowing from: 1=Families [] 2=Relatives [] 3=Neighbors [] 4=Friends [] 5=Other, please specify----- <u>Medium-Term Coping Strategies</u> Intervention from: 1=NEMA [] 2=SEMA [] 3=Red Cross [] 4=Philanthropists [] 5=NGOs [] 6=FBOs [] 7=Other, please specify----- <u>Long-Term Coping Strategies</u> Migration to: 1=Urban areas [] 2=Semi-urban areas [] 3=None of the above []
12	Kindly indicate your sources of non-farm generating income.	<u>Sources of Non-Farm Generating Income</u> 1=Trading [] 2=Tailoring [] 3=Bike riding [] 4=Hawking [] 5=Mechanising [] 6=Butchering [] 7=Lobouring [] 8=Other, please specify-----

APPENDIX II

CHECKLIST FOR FOCUS GROUP DISCUSSION WITH FARMERS GROUPS, LIVESTOCK OWNERS AND FISHERMEN GROUPS AFFECTED BY THE 2010 FLOOD DISASTER

1. What are your socio-economic characteristics that were adversely affected by the 2010 flood disaster?

- -----

2. What are your stands on the causes of the 2010 flood disaster in this farming community?

- -----

3. What are your reasons for living in the area affected by the 2010 flood disaster?

- -----

4. What are the extents of losses in monetary term of your livelihood assets affected by the 2010 flood disaster?

- -----

5. What are your coping strategies that guaranteed your survival during and after the 2010 flood disaster?

APPENDIX III

**CONVERSION OF LIVELIHOOD ASSETS LOST TO THE 2010 FLOOD DISASTER BY
THE FARMING HOUSEHOLDS**

Some assets lost to the 2010 flood disaster were converted to fit into standard units of measurement. For example the losses of upland crop fields, food stuff and planting materials were estimated at individual level in kilo gram (kg) per bag and then later converted into tons per unit area.

Meanwhile, the lowland crop fields were measured at individual level in square meter (sq. m) and then later converted into acreage per unit area. Thus, the conversion was carried out as follows:

Upland Crop Field

$$\begin{array}{l}
 1376 \text{ bags of upland crop} \\
 1 \text{ bag} \text{ -----} 50\text{kg} \\
 1000\text{kg} \text{-----} 1\text{metric tons} \\
 \frac{1376 \times 50}{1000} = \frac{68800}{1000} = 68.8 \approx 69 \text{ tons}
 \end{array}$$

Food Stuff

$$\begin{array}{l}
 1188 \text{ bags of lost foodstuff} \\
 1 \text{ bag} \text{ -----} 50\text{kg} \\
 1000\text{kg} \text{-----} 1\text{metric tons} \\
 \frac{1188 \times 50}{1000} = \frac{59400}{1000} = 59.4 \approx 59 \text{ tons}
 \end{array}$$

Planting Materials

$$\begin{array}{l}
 501 \text{bags of lost planting materials} \\
 1 \text{ bag} \text{ -----} 50\text{kg} \\
 1000\text{kg} \text{-----} 1\text{metric tons} \\
 \frac{501 \times 50}{1000} = \frac{25050}{1000} = 25.05 \approx 25 \text{ tons}
 \end{array}$$

Lowland Crop Field

$$\begin{array}{l}
 114,400 \text{ sq. m of lowland crop field} \\
 10,000 \text{ sq. m} \text{-----} 2.5 \text{ acre or 1 hectare of farm-land} \\
 \frac{114400 \times 2.5}{10000} = \frac{286000}{10000} = 28.6 \approx 29 \text{ acres}
 \end{array}$$

CONVERSION OF LIVELIHOOD ASSETS LOST TO THE 2010 FLOOD DISASTER BY GORONYO, WURNO AND WAMAKKO LGAs

APPENDIX IV

DATA ANALYSIS

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	7	3.9	3.9	3.9
	Male	171	96.1	96.1	100.0
	Total	178	100.0	100.0	

Marital Status		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Married	169	94.9	94.9	94.9
	Divorced	2	1.1	1.1	96.1
	Widowed	7	3.9	3.9	100.0
	Total	178	100.0	100.0	

Age Class		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-40years	36	20.2	20.2	20.2
	41-50years	76	42.7	42.7	62.9
	51-60years	62	34.8	34.8	97.8
	61years and above	4	2.2	2.2	100.0
	Total	178	100.0	100.0	

Education		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Quran	86	48.3	48.3	48.3
	Primary	27	15.2	15.2	63.5
	Secondary	24	13.5	13.5	77.0
	NCE	18	10.1	10.1	87.1
	ND	18	10.1	10.1	97.2
	HND	5	2.8	2.8	100.0
	Total	178	100.0	100.0	

Primary occupation		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Farming	116	65.2	65.2	65.2
	Fishing	31	17.4	17.4	82.6
	Rearing	31	17.4	17.4	100.0
	Total	178	100.0	100.0	

Secondary Occupation	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Farming	29	16.3	16.3	16.3
Fishing	46	25.8	25.8	42.1
Rearing	64	36.0	36.0	78.1
Civil Service	8	4.5	4.5	82.6
Trading	31	17.4	17.4	100.0
Total	178	100.0	100.0	

Housing types	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Thatched houses	13	7.3	7.3	7.3
Mud houses	113	63.5	63.5	70.8
Concrete houses	52	29.2	29.2	100.0
Total	178	100.0	100.0	

Natural Factors	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Excessive rainfall	163	91.6	91.6	91.6
River basin	15	8.4	8.4	100.0
Total	178	100.0	100.0	

Human Factors	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Excessive release of water from dams	165	92.7	92.7	92.7
Building houses on flood water ways	13	7.3	7.3	100.0
Total	178	100.0	100.0	

Environmental Factors	Frequency	Percent	Valid Percent	Cumulative Percent
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Valid	Influence of topography	121	68.0	68.0	68.0
	Action of river tributaries	57	32.0	32.0	100.0
	Total	178	100.0	100.0	

Institutional/Governmental Factors		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Absence of flood mitigation plans	144	80.9	80.9	80.9
	Poor land use planning	34	19.1	19.1	100.0
	Total	178	100.0	100.0	

Seasonal Factors		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rainy season	175	98.3	98.3	98.3
	Dry season	3	1.7	1.7	100.0
	Total	178	100.0	100.0	

Economic Reasons		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Access to drinking water all-year-round	7	3.9	3.9	3.9
	Advantage of low-land farming	109	61.2	61.2	65.2
	Attraction of labour from other areas	26	14.6	14.6	79.8
	Opportunity for fishing activities	36	20.2	20.2	100.0
	Total	178	100.0	100.0	

Social Reasons	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Born in flood-prone area	135	75.8	75.8	75.8
Live due to family links	32	18.0	18.0	93.8
Decided to live	11	6.2	6.2	100.0
Total	178	100.0	100.0	

Environmental Reasons	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Influence of topography in the area	69	38.8	38.8	38.8
Due to soil fertility	82	46.1	46.1	84.8
Easy access to ground water	27	15.2	15.2	100.0
Total	178	100.0	100.0	

Physical Reasons	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Closeness to river basin	91	51.1	51.1	51.1
Ability to utilise water from dams	9	5.1	5.1	56.2
Use of tube well facilities	18	10.1	10.1	66.3
Cultivation of crops all-year-round	60	33.7	33.7	100.0
Total	178	100.0	100.0	

Assistance Short-Term Strategies From	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Families	49	27.5	27.5	27.5
Relatives	81	45.5	45.5	73.0
Neighbours	31	17.4	17.4	90.4
Friends	17	9.6	9.6	100.0
Total	178	100.0	100.0	

Borrowing Short-Term Strategies From	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Families	12	6.7	6.7	6.7
Relatives	42	23.6	23.6	30.3
Neighbours	98	55.1	55.1	85.4
Friends	26	14.6	14.6	100.0
Total	178	100.0	100.0	

Intervention Medium-Term Strategies From	Frequency	Percent	Valid Percent	Cumulative Percent
Valid NEMA	87	48.9	48.9	48.9
SEMA	23	12.9	12.9	61.8
Red Cross	18	10.1	10.1	71.9
Philanthropists	25	14.0	14.0	86.0
NGOs	11	6.2	6.2	92.1
FBOs	14	7.9	7.9	100.0
Total	178	100.0	100.0	

Migration Long-Term Strategies To	Frequency	Percent	Valid Percent	Cumulative Percent
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Valid	Semi-urban areas for an alternative income	33	18.5	18.5	18.5
	Urban areas for non-farm income	116	65.2	65.2	83.7
	None of the above	29	16.3	16.3	100.0
	Total	178	100.0	100.0	

Sources of Non-Farm Generating Income		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Trading	67	37.6	37.6	37.6
	Tailoring	32	18.0	18.0	55.6
	Bike riding	20	11.2	11.2	66.9
	Hawking	16	9.0	9.0	75.8
	Mechanising	9	5.1	5.1	80.9
	Butchering	14	7.9	7.9	88.8
	Lobouring	20	11.2	11.2	100.0
	Total	178	100.0	100.0	

SN	Livestock	Estimated Value	Upland Crop	Estimated Value	F/Implement	Estimated Value	Food Stuff	Estimated Value	Clothes	Estimated Value	Furniture	Estimated Value	Cash	Estimated Value	Utensils	Estimated Value	Planting Mat	Estimated Value	R/Buildings	Estimated Value	Low Land Crop Fields	Estimated Value	Fishing Gears	Estimated Value	Total Est Val
1	0	15000	2000	2000	8000	4000	2000	2000	2000	2000	2000	2000	2000	2000	15000	5000	5000	15000	0	0	0	0	0	0	60000
2	0	12000	2000	2000	8000	4000	1500	0	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	45500
3	0	14000	0	0	8000	2000	0	0	0	0	0	0	0	0	0	6000	6000	14000	30000	0	0	0	0	0	84000
4	0	8000	0	0	10000	4000	2000	0	1000	1000	5000	5000	5000	5000	14000	5000	5000	20000	15000	0	0	0	0	0	69000
5	0	14000	0	0	12000	6000	2000	0	3000	3000	4000	4000	4000	4000	14000	5000	5000	15000	0	0	0	0	0	0	57000
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27000
7	0	12000	0	0	8000	4000	2000	0	3000	3000	5000	5000	5000	5000	14000	5000	5000	15000	0	0	0	0	0	0	68000
8	0	0	0	0	15000	4000	2000	0	2000	2000	3000	3000	3000	3000	15000	5000	5000	15000	0	0	0	0	0	0	72000
9	0	12000	0	0	8000	2000	2000	0	0	0	0	0	0	0	0	6000	6000	12000	0	0	0	0	0	0	34000
10	0	15000	5000	5000	8000	3000	2000	1000	1000	1000	1000	1000	1000	1000	15000	5000	5000	15000	0	0	0	0	0	0	59000
11	15000	3000	2000	2000	6000	4000	2000	3000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	67000
12	0	0	0	0	9000	4000	3000	0	2000	2000	3000	3000	3000	3000	15000	5000	5000	15000	0	0	0	0	0	0	65500
13	0	15000	5000	5000	8000	4000	3000	0	2000	2000	3000	3000	3000	3000	15000	5000	5000	15000	0	0	0	0	0	0	50000
14	0	15000	0	0	4000	6000	2000	0	0	0	0	0	0	0	0	6000	6000	14000	0	0	0	0	0	0	48000
15	0	15000	0	0	4000	6000	2000	0	0	0	0	0	0	0	0	6000	6000	14000	0	0	0	0	0	0	47000
16	0	12000	5000	5000	4000	2000	4000	0	1000	1000	1000	1000	1000	1000	14000	5000	5000	15000	0	0	0	0	0	0	57400
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	10000	3000	3000	5000	4500	3000	2000	1000	1000	1000	1000	1000	1000	14000	5000	5000	15000	0	0	0	0	0	0	68500
19	0	9000	6000	6000	12000	8000	8000	2000	2000	2000	2000	2000	2000	2000	15000	5000	5000	15000	0	0	0	0	0	0	85500
20	0	15000	3500	3500	5000	1500	3000	0	1000	1000	1000	1000	1000	1000	15000	5000	5000	15000	0	0	0	0	0	0	55000
21	10000	15000	5000	5000	4000	1000	0	1000	1000	1000	1000	1000	1000	1000	14000	5000	5000	15000	0	0	0	0	0	0	54000
22	0	12000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12500
23	0	15000	1000	1000	0	1300	4500	13000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	25500
24	0	14000	8000	8000	0	1300	4500	13000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	45000
25	0	10000	7000	7000	5000	800	4000	13000	0	0	0	0	0	0	14000	5000	5000	15000	0	0	0	0	0	0	62500
26	15000	0	0	0	5000	1000	4000	2000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	44800
27	0	0	0	0	8000	1000	4500	15000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	40000
28	0	0	0	0	15000	2000	4000	1000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	31000
29	0	12000	0	0	0	0	4000	3000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	31500
30	0	0	0	0	9000	6000	2000	0	1000	1000	1000	1000	1000	1000	15000	5000	5000	15000	0	0	0	0	0	0	39000
31	0	8000	2000	2000	9000	3000	3000	2000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	42000
32	0	12000	0	0	0	2000	2000	0	1500	1500	3000	3000	3000	3000	15000	5000	5000	15000	0	0	0	0	0	0	395500
33	12000	0	0	0	0	6000	1000	0	0	0	0	0	0	0	16000	20000	20000	0	0	0	0	0	0	0	8000
34	0	0	0	0	12000	6000	4000	1000	0	0	0	0	0	0	16000	20000	20000	0	0	0	0	0	0	0	55000
35	0	0	0	0	12000	6000	4000	1000	0	0	0	0	0	0	16000	20000	20000	0	0	0	0	0	0	0	55000
36	16000	0	0	0	13000	7000	2000	0	0	0	0	0	0	0	17000	2000	2000	0	0	0	0	0	0	0	40000
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13000	2000	2000	0	0	0	0	0	0	0	50000
38	8000	0	0	0	6000	0	0	5000	0	0	0	0	0	0	4000	0	0	0	0	0	0	0	0	0	24000
39	0	12000	0	0	8000	0	0	0	0	0	0	0	0	0	14000	0	0	0	0	0	0	0	0	0	34000
40	12000	0	0	0	6000	4000	0	0	0	0	0	0	0	0	15000	0	0	0	0	0	0	0	0	0	15000
41	0	8000	0	0	0	0	5000	10000	0	0	0	0	0	0	15000	5000	5000	15000	0	0	0	0	0	0	47000
42	0	0	0	0	0	2000	0	2000	0	0	0	0	0	0	14000	0	0	0	0	0	0	0	0	0	14000
43	0	10000	0	0	0	4000	4000	3000	0	0	0	0	0	0	13000	0	0	0	0	0	0	0	0	0	35000
44	0	0	0	0	12000	8000	4000	1000	0	0	0	0	0	0	16000	20000	20000	0	0	0	0	0	0	0	50000
45	12000	0	0	0	8000	4000	0	1500	0	0	0	0	0	0	13000	0	0	0	0	0	0	0	0	0	395500
46	0	0	0	0	15000	4000	0	0	0	0	0	0	0	0	11000	30000	30000	0	0	0	0	0	0	0	65000
47	0	10000	0	0	8000	2000	0	0	0	0	0	0	0	0	14000	0	0	0	0	0	0	0	0	0	34000
48	12000	0	0	0	8000	6000	0	0	0	0	0	0	0	0	13000	0	0	0	0	0	0	0	0	0	32000
49	12000	0	0	0	8000	6000	0	0	0	0	0	0	0	0	14000	0	0	0	0	0	0	0	0	0	50000
50	0	10000	3000	3000	0	0	0	0	0	0	0	0	0	0	15000	0	0	0	0	0	0	0	0	0	15000
51	0	12000	0	0	0	6000	0	2000	0	0	0	0	0	0	17000	0	0	0	0	0	0	0	0	0	27000
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8000	8000	8000	0	0	0	0	0	0	0	8000
53	0	15000	2000	2000	8000	0	7000	0	0	0	0	0	0	0	12000	30000	30000	0	0	0	0	0	0	0	65000
54	16000	4000	0	0	8000	6000	0	3000	0	0	0	0	0	0	12000	20000	20000	0	0	0	0	0	0	0	72000
55	0	0	0	0	8000	4000	0	0	0	0	0	0	0	0	2000	0	0	0	0	0	0	0	0	0	20000
56	0	12000	0	0	0	9000	0	0	0	0	0	0	0	0	23000	0	0	0	0	0	0	0	0	0	23000
57	0	0	0	0	0	8000	4000	0	0	0	0	0	0	0	2000	0	0	0	0	0	0	0	0	0	23000
58	20000	0	0	0	8000	4000	2000	0	0	0	0	0	0	0	2000	0	0	0	0	0	0	0	0	0	36000
59	8000	0	0	0	6000	4000	3000	0	0	0	0	0	0	0	14000	0	0	0	0	0	0	0	0	0	35000
60	8000	6000	2000	2000	8000	4000	2000	0	0	0	0	0	0	0	4000	50000	50000	0	0	0	0	0	0	0	35000
61	0	180000	415000	63500	367400	185000	148000	71800	637000	128000	497500	171000	2821400	0	0	0	0	0	0	0	0	0	0	0	53000

SN	Livestock	Estimated Value	Upland Crop	F/Implement	Food Stuff	Clothes	Furniture	Cash	Utensils	Planting Mat	R/Buildings	Low Land Crops Fields	Fishing Gears	Total Est Value
1	0	160000	80000	20000	80000	40000	40000	0	20000	60000	120000	200000	0	820000
2	0	120000	120000	40000	60000	20000	20000	10000	10000	60000	120000	0	150000	680000
3	0	120000	120000	80000	50000	80000	60000	20000	20000	50000	150000	0	140000	780000
4	0	120000	120000	70000	120000	40000	40000	20000	20000	80000	120000	0	60000	780000
5	0	120000	120000	80000	100000	30000	20000	20000	20000	80000	120000	0	950000	0
6	0	120000	100000	80000	100000	40000	20000	10000	10000	50000	120000	0	510000	0
7	0	150000	50000	50000	100000	20000	20000	50000	10000	50000	150000	100000	0	680000
8	70000	150000	150000	70000	80000	40000	40000	20000	20000	60000	60000	0	0	590000
9	30000	110000	60000	60000	50000	20000	10000	10000	10000	70000	150000	0	0	570000
10	0	130000	130000	70000	80000	60000	20000	10000	10000	50000	140000	0	0	700000
11	0	120000	120000	80000	100000	20000	20000	0	5000	30000	50000	0	60000	840000
12	150000	80000	70000	80000	80000	40000	30000	0	10000	40000	140000	200000	0	840000
13	0	160000	160000	40000	120000	30000	20000	20000	20000	50000	50000	0	0	560000
14	0	150000	150000	90000	80000	80000	20000	10000	6000	20000	140000	0	0	596000
15	120000	120000	120000	20000	80000	40000	40000	0	20000	20000	160000	0	0	620000
16	0	150000	150000	50000	40000	40000	0	20000	10000	80000	120000	350000	0	840000
17	120000	120000	120000	20000	50000	20000	20000	0	20000	50000	130000	0	0	590000
18	80000	120000	120000	20000	100000	20000	0	20000	20000	20000	80000	0	0	480000
19	200000	80000	80000	60000	80000	40000	20000	50000	150000	0	150000	0	0	720000
20	180000	80000	80000	60000	50000	40000	40000	10000	20000	40000	110000	300000	0	960000
21	0	100000	100000	20000	50000	50000	0	0	20000	60000	30000	0	160000	520000
22	0	120000	120000	20000	50000	40000	60000	0	0	60000	80000	0	50000	520000
23	0	120000	120000	20000	80000	40000	20000	0	10000	50000	130000	0	0	480000
24	0	120000	120000	20000	40000	40000	20000	0	15000	40000	120000	0	40000	455000
25	100000	80000	80000	40000	120000	0	40000	15000	10000	50000	160000	0	0	615000
26	30000	120000	120000	0	50000	40000	20000	30000	0	70000	130000	300000	0	870000
27	180000	80000	80000	20000	80000	40000	60000	20000	0	40000	150000	0	670000	0
28	100000	80000	80000	20000	80000	40000	20000	10000	10000	20000	70000	170000	130000	750000
29	100000	90000	90000	10000	40000	40000	20000	0	20000	40000	40000	0	0	480000
30	180000	0	0	0	0	0	0	0	0	0	140000	0	0	320000
31	0	80000	80000	20000	100000	20000	0	10000	20000	80000	160000	300000	0	750000
32	0	180000	180000	40000	40000	20000	0	10000	10000	50000	0	0	80000	410000
33	0	90000	90000	60000	90000	50000	20000	10000	10000	40000	140000	0	150000	670000
34	0	30000	60000	60000	50000	40000	20000	0	20000	20000	140000	300000	100000	871000
35	0	120000	120000	60000	80000	40000	10000	40000	20000	50000	170000	0	200000	750000
36	70000	120000	120000	40000	120000	0	40000	0	15000	40000	140000	0	0	585000
37	0	120000	120000	60000	80000	40000	20000	0	20000	30000	150000	0	50000	520000
38	0	100000	100000	40000	50000	40000	20000	0	10000	20000	140000	300000	0	750000
39	0	110000	110000	60000	80000	40000	10000	10000	10000	60000	0	0	300000	0
40	0	120000	120000	50000	60000	20000	0	20000	10000	30000	60000	0	0	370000
41	0	120000	120000	0	60000	20000	0	0	10000	30000	140000	0	200000	680000
42	0	80000	80000	0	50000	0	20000	0	10000	40000	110000	200000	0	570000
43	30000	120000	120000	0	50000	0	0	50000	0	40000	130000	0	0	450000
44	0	120000	120000	0	0	0	0	0	0	0	40000	0	0	160000
45	0	120000	120000	0	80000	0	0	20000	0	0	50000	100000	200000	520000
46	100000	0	0	0	50000	40000	60000	20000	10000	0	50000	0	0	360000
47	30000	140000	0	0	80000	60000	90000	0	20000	50000	30000	200000	0	750000
48	100000	80000	80000	20000	80000	20000	20000	0	20000	60000	130000	0	0	520000
49	80000	100000	100000	20000	80000	40000	0	20000	10000	0	120000	0	130000	660000
50	70000	120000	120000	30000	100000	20000	0	20000	10000	50000	150000	0	0	570000
51	150000	150000	150000	20000	100000	20000	20000	15000	20000	50000	130000	200000	100000	850000
52	100000	50000	100000	0	80000	0	40000	0	0	80000	0	300000	0	785000
53	120000	80000	80000	50000	110000	0	0	0	0	0	150000	150000	0	510000
54	120000	50000	50000	50000	50000	0	0	0	0	0	150000	0	0	420000
55	30000	50000	40000	40000	50000	20000	60000	40000	10000	0	100000	100000	80000	530000
56	0	80000	0	40000	100000	0	0	10000	0	50000	150000	150000	0	580000
57	250000	0	0	0	0	15000	30000	20000	10000	0	0	0	0	325000
	3300000	5820000	2060000	4450000	1775000	1160000	680000	681000	681000	2360000	5840000	4220000	2060000	34547000

SN	Livestock Quantity	Upload Quantity	Food Stuff Quantity	Clothes Quantity	Furniture Quantity	Cash Quantity	Household Quantity	Planting Mat Quantity	R/Buildings Quantity	Low Land Crop Beds Size/Quan	Fishing Gear Quantity
1	9	30	7	30	0		0	2	1	40×30 1200	0
2	4	12	6	20	3		10	1	1	30×20 600	2
3	11	15	6	20	5		5	3	1	30×30 900	0
4	3	8	4	27	6		10	5	1	40×20 800	0
5	4	7	5	20	6		10	4	1	50×30 1500	0
6	7	9	7	25	2		15	3	1	20×10 200	0
7	0	8	6	20	3		0	3	1	0 0	0
8	0	8	5	18	4		10	5	1	0 0	3
9	10	5	6	30	2		10	7	1	0 0	0
10	15	0	0	20	3		5	0	1	0 0	6
11	0	0	5	30	2		5	0	1	30×30 900	4
12	10	0	4	10	3		4	0	1	30×20 600	2
13	8	8	4	15	10		0	6	1	40×20 800	0
14	0	0	5	12	1		5	0	1	60×30 1800	0
15	2	0	5	15	4		5	0	1	20×20 400	0
16	8	7	6	20	2		5	2	1	30×20 600	0
17	6	0	6	20	2		0	0	1	40×30 1200	0
18	8	8	6	30	4		0	4	1	40×40 1600	0
19	15	9	8	40	3		8	5	1	0 0	0
20	12	0	5	10	4		10	0	1	20×20 400	0
21	0	0	6	20	5		5	0	1	40×30 1200	0
22	5	15	6	20	6		4	6	1	20×10 200	0
23	10	0	6	10	2		8	0	1	30×30 900	0
24	0	6	5	10	6		5	4	1	30×20 600	0
25	8	0	6	15	5		10	0	1	20×20 400	0
26	0	0	6	20	3		10	0	1	0 0	3
27	2	0	6	20	1		5	0	1	0 0	0
28	0	0	2	10	3		12	0	1	50×30 1500	5
29	3	8	6	20	2		0	2	1	60×40 2400	0
30	4	0	8	15	1		5	0	1	60×30 1800	0
31	0	0	6	13	2		10	0	1	40×30 1200	0
32	0	4	6	20	0		0	4	1	30×20 600	0
33	3	8	6	40	2		5	5	1	40×40 1600	0
34	4	0	4	10	1		5	0	1	20×20 400	0
35	5	0	6	10	2		0	0	1	0 0	0
36	1	7	5	15	0		5	2	1	0 0	0
37	2	2	5	20	4		6	1	1	0 0	0
38	8	6	8	20	2		8	2	1	0 0	0
39	0	16	8	30	4		20	3	1	20×10 200	2
40	0	0	6	30	1		10	0	1	60×40 2400	4
41	0	8	7	30	2		8	3	1	50×30 1500	0
42	10	0	4	20	3		5	0	1	40×20 800	0
43	0	15	6	20	4		0	2	1	0 0	0
44	0	4	8	20	1		0	2	1	10×10 100	0
45	1	12	8	10	1		5	5	1	30×30 900	0
46	0	6	5	15	3		10	0	1	60×50 3000	0
47	2	8	8	10	2		0	2	1	50×40 2000	0
48	3	8	6	10	6		5	5	1	30×10 300	0
49	1	8	6	10	5		5	6	1	0 0	0
50	4	7	8	20	1		0	5	1	20×20 400	0
51	0	12	8	30	0		10	2	1	30×20 600	4
52	0	15	8	10	5		10	2	1	50×20 1000	0
53	0	12	6	20	1		6	2	1	40×30 1200	0
54	2	0	8	20	1		5	0	1	30×30 900	0
55	0	9	12	20	2		0	1	1	20×20 400	0
56	0	8	6	30	4		0	1	1	25×15 375	0
57	8	9	8	30	2		0	6	1	20×10 200	0
58	2	10	8	40	2		0	5	1	15×15 225	0
59	0	12	9	20	3		8	6	1	0 0	0
60	0	10	6	20	0		10	3	1	0 0	3
	220	379	368	1205	169		337	137	60	42800	38

sN	Livestock Quantity	Upland Quantity	Food Stuff Quantity	Clothes Quantity	Furniture Quantity	Cash Quantity	Discs Quantity	Planting Mst Quantity	R/Buildings Quantity	Low Land Crop Paddy Size Sqm	Fishing Gears Quantity
1	0	15	8	20	2	5	5	1	0	0	3
2	0	12	3	10	1	7	3	1	40×20	800	0
3	0	14	8	10	0	0	6	1	30×30	900	4
4	0	8	10	20	1	5	6	1	20×20	400	4
5	0	14	8	20	2	6	5	1	30×10	300	2
6	0	0	12	20	1	10	0	1	0	0	0
7	0	12	8	20	1	15	5	1	20×10	200	0
8	0	0	15	20	1	10	0	1	30×20	600	3
9	0	12	8	10	2	0	6	1	30×30	900	0
10	0	13	8	15	2	5	3	1	40×20	800	4
11	1	8	6	20	2	0	7	1	30×20	600	2
12	0	0	9	20	1	5	0	1	30×30	900	5
13	0	0	8	20	3	10	0	1	20×20	400	0
14	0	15	8	10	2	0	6	1	50×30	1500	0
15	0	15	4	15	1	5	5	1	40×40	1200	0
16	0	12	4	10	4	16	8	1	30×30	900	0
17	0	0	0	20	1	4	10	1	20×20	400	3
18	0	10	5	15	2	10	5	1	15×10	150	2
19	0	9	12	40	5	5	2	1	20×10	200	4
20	0	15	5	15	4	5	10	1	40×20	800	2
21	4	15	4	10	0	8	3	1	0	0	0
22	0	12	0	0	0	0	0	1	40×30	1200	4
23	0	13	0	0	11	0	0	1	0	0	3
24	0	14	0	15	5	5	0	1	50×40	2000	0
25	0	10	5	8	3	3	0	1	50×30	1500	3
26	5	0	0	9	5	10	0	1	0	0	2
27	0	0	8	10	5	5	0	1	0	0	0
28	0	0	15	15	0	5	0	1	10×10	100	0
29	0	12	0	0	2	0	0	1	20×10	200	0
30	0	0	9	20	1	8	0	1	20×20	400	0
31	0	8	9	30	1	10	3	1	0	0	0
32	0	12	0	10	2	0	0	1	30×20	600	4
33	1	0	0	40	1	0	0	1	20×20	400	0
34	0	0	12	20	2	5	0	1	30×10	300	3
35	0	0	13	20	4	2	0	1	30×20	600	0
36	2	0	0	20	0	6	0	1	20×10	200	0
37	0	12	6	0	6	0	10	1	10×10	100	0
38	1	0	6	0	0	8	0	1	0	0	0
39	0	12	8	0	0	0	0	1	40×30	1200	0
40	4	0	6	20	0	0	0	1	50×20	1000	3
41	0	8	0	0	5	0	0	1	20×10	200	0
42	0	0	0	10	0	0	0	1	15×10	150	0
43	0	10	0	20	2	0	0	1	0	0	0
44	0	0	12	40	2	10	0	1	0	0	4
45	12	12	8	20	0	0	2	1	0	0	0
46	0	0	15	20	0	20	0	1	30×40	1200	0
47	0	10	8	10	0	0	0	1	40×20	800	0
48	10	0	8	30	0	0	3	1	30×30	900	0
49	6	8	6	0	8	0	0	1	0	0	0
50	0	10	0	0	0	0	2	1	50×20	1000	0
51	8	0	0	20	0	20	0	1	30×20	600	0
52	0	0	0	0	0	0	0	1	30×30	900	5
53	0	15	8	0	10	0	3	1	40×30	1200	0
54	8	4	8	30	0	0	3	1	20×10	200	0
56	0	0	8	20	0	10	0	1	0	0	0
57	0	12	9	0	0	0	2	1	0	0	0
58	4	0	8	20	1	10	0	1	60×30	1800	0
59	2	0	6	20	1	0	0	1	50×20	1000	0
60	10	6	8	20	1	0	5	1	40×40	1600	0
61	0	0	9	20	1	10	0	1	30×20	600	0
	78	415	371	897	118	278	128	61		33900	69

S _N	Livestock	Quantity	Upload	Quantity	Food Stuff	Quantity	Clothes	Quantity	Furniture	Quantity	Cash	Utensils	Quantity	Planting Mat	Quantity	R/Buildings	Quantity	Low Land Crop Fields	Size Square	Fishing Gears	Quantity
1		16		8		8		20		1			10		6		1	20×20	400		0
2		0		12		10		20		1			10		6		1	30×30	900		3
3		0		12		8		30		2			10		5		1	40×30	1200		4
4		0		13		12		20		1			10		8		1	50×40	2000		5
5		0		12		10		20		3			10		8		1	30×10	300		0
6		0		10		8		20		2			10		5		1	0	0		0
7		0		15		10		10		1			5		5		1	10×10	100		0
8		2		13		8		20		1			10		6		1	20×10	200		0
9		2		11		8		10		1			10		7		1	30×20	600		0
10		0		13		8		20		2			4		5		1	20×10	200		0
11		0		12		10		10		2			3		3		1	0	0		4
12		7		8		8		20		2			8		4		1	20×20	400		0
13		0		16		12		20		2			10		5		1	60×30	1800		0
14		0		15		8		30		1			6		2		1	30×30	900		0
15		8		12		8		20		4			10		2		1	40×30	1200		0
16		0		13		4		20		0			8		8		1	30×30	900		0
17		12		10		9		20		1			10		5		1	0	0		0
18		8		12		10		10		0			10		2		1	40×30	1200		0
19		5		8		8		20		1			5		5		1	50×30	1500		0
20		4		8		8		20		4			10		4		1	40×20	800		0
21		0		10		8		30		0			20		6		1	60×40	2400		5
22		0		12		9		20		4			0		6		1	0	0		3
23		0		12		8		10		4			10		5		1	30×20	600		0
24		0		12		4		20		2			15		4		1	20×20	400		4
25		4		8		12		0		2			10		5		1	30×30	900		0
26		2		12		8		20		2			0		7		1	20×10	200		0
27		3		8		8		20		4			0		4		1	40×40	1600		0
28		10		8		8		20		2			5		2		1	40×30	1200		3
29		4		9		4		20		4			10		4		1	30×20	600		0
30		6		0		0		0		0			0		0		1	0	0		0
31		0		8		10		12		0			10		8		1	30×20	600		0
32		0		18		4		20		0			10		5		1	40×30	1200		2
33		0		9		9		20		1			5		4		1	50×20	1000		3
34		0		8		9		20		1			10		2		1	40×20	800		4
35		0		12		8		10		1			10		5		1	50×30	1500		4
36		7		12		12		0		2			5		4		1	30×30	900		0
37		0		12		8		20		1			10		3		1	30×20	600		3
38		0		10		8		20		2			5		2		1	50×30	1500		0
39		0		11		8		20		2			8		6		1	20×20	400		0
40		0		12		6		10		0			5		3		1	30×20	600		0
41		0		12		8		0		1			10		3		1	20×20	400		2
42		0		8		8		0		0			0		4		1	20×10	200		0
43		10		12		8		0		0			0		4		1	30×30	900		0
44		0		12		0		0		0			0		0		1	0	0		0
45		0		12		8		0		0			0		0		1	10×10	100		2
46		5		0		8		20		4			5		0		1	40×40	1200		0
47		2		14		8		20		5			10		5		1	30×20	600		0
48		6		8		8		10		2			10		5		1	30×30	900		0
49		8		10		8		20		0			8		6		1	0	0		3
50		2		12		10		10		0			10		5		1	0	0		0
51		7		15		10		15		3			5		5		1	20×10	200		0
52		10		5		8		0		6			0		8		1	30×30	900		2
53		10		8		11		0		0			0		0		1	20×20	400		0
54		12		5		5		0		0			0		0		1	0	0		0
55		8		5		5		10		6			10		0		1	10×10	100		4
56		0		8		10		0		0			0		5		1	20×10	200		0
57		5		0		0		10		3			10		0		1	0	0		0
		185		582		449		807		96			395		236		57		37700		60

S/N	Livestock	Quantity	Upload	Quantity	Food Stuff	Quantity	Clothes	Quantity	Furniture	Quantity	Cash	Jewels	Quantity	Planting Mat	Quantity	R/Buildings	Quantity	Low Land Crop Fields	Size Sqm	Fishing Gears	Quantity
1		16		8		8		20		1			10		6		1	20x20	400		0
2		0		12		10		20		1			10		6		1	30x30	900		3
3		0		12		8		30		2			10		5		1	40x30	1200		4
4		0		13		12		20		1			10		8		1	50x40	2000		5
5		0		12		10		20		3			10		8		1	30x10	300		0
6		0		10		8		20		2			10		5		1	0	0		0
7		0		15		10		10		1			5		5		1	10x10	100		0
8		2		13		8		20		1			10		6		1	20x10	200		0
9		2		11		8		10		1			10		7		1	30x20	600		0
10		0		13		8		20		2			4		5		1	20x10	200		0
11		0		12		10		10		2			3		3		1	0	0		4
12		7		8		8		20		2			8		4		1	20x20	400		0
13		0		16		12		20		2			10		5		1	60x30	1800		0
14		0		15		8		30		1			6		2		1	30x30	900		0
15		8		12		8		20		4			10		2		1	40x30	1200		0
16		0		13		4		20		0			8		8		1	30x30	900		0
17		12		10		9		20		1			10		5		1	0	0		0
18		8		12		10		10		0			10		2		1	40x30	1200		0
19		5		8		8		20		1			5		5		1	50x30	1500		0
20		4		8		8		20		4			10		4		1	40x20	800		0
21		0		10		8		30		0			20		6		1	60x40	2400		5
22		0		12		9		20		4			0		6		1	0	0		3
23		0		12		8		10		4			10		5		1	30x20	600		0
24		0		12		4		20		2			15		4		1	20x20	400		4
25		4		8		12		0		2			10		5		1	30x30	900		0
26		2		12		8		20		2			0		7		1	20x10	200		0
27		3		8		8		20		4			0		4		1	40x40	1600		0
28		10		8		8		20		2			5		2		1	40x30	1200		3
29		4		9		4		20		4			10		4		1	30x20	600		0
30		6		0		0		0		0			0		0		1	0	0		0
31		0		8		10		12		0			10		8		1	30x20	600		0
32		0		18		4		20		0			10		5		1	40x30	1200		2
33		0		9		9		20		1			5		4		1	50x20	1000		3
34		0		8		9		20		1			10		2		1	40x20	800		4
35		0		12		8		10		1			10		5		1	50x30	1500		4
36		7		12		12		0		2			5		4		1	30x30	900		0
37		0		12		8		20		1			10		3		1	30x20	600		3
38		0		10		8		20		2			5		2		1	50x30	1500		0
39		0		11		8		20		2			8		6		1	20x20	400		0
40		0		12		6		10		0			5		3		1	30x20	600		0
41		0		12		8		0		1			10		3		1	20x20	400		2
42		0		8		8		0		0			0		4		1	20x10	200		0
43		10		12		8		0		0			0		4		1	30x30	900		0
44		0		12		0		0		0			0		0		1	0	0		0
45		0		12		8		0		0			0		0		1	10x10	100		2
46		5		0		8		20		4			5		0		1	40x40	1200		0
47		2		14		8		20		5			10		5		1	30x20	600		0
48		6		8		8		10		2			10		5		1	30x30	900		0
49		8		10		8		20		0			8		6		1	0	0		3
50		2		12		10		10		0			10		5		1	0	0		0
51		7		15		10		15		3			5		5		1	20x10	200		0
52		10		5		8		0		6			0		8		1	30x30	900		2
53		10		8		11		0		0			0		0		1	20x20	400		0
54		12		5		5		0		0			0		0		1	0	0		0
55		8		5		5		10		6			10		0		1	10x10	100		4
56		0		8		10		0		0			0		5		1	20x10	200		0
57		5		0		0		10		3			10		0		1	0	0		0
		185		582		449		807		96			395		236		57		37700		60

GORONYO LGA (n=60)

S/N	X (Value/N)	X ²	S/N	X(Value/N)	X ²
1	700,000	4.9 x 10 ¹¹	31	160,000	2.6 x 10 ¹⁰
2	625,000	3.9 x 10 ¹¹	32	670,000	4.5 x 10 ¹¹
3	705,000	4.9 x 10 ¹¹	33	610,000	3.7 x 10 ¹¹
4	560,000	3.1 x 10 ¹¹	34	500,000	2.5 x 10 ¹¹
5	390,000	1.5 x 10 ¹¹	35	300,000	9.0 x 10 ¹⁰
6	590,000	3.4 x 10 ¹¹	36	280,000	7.8 x 10 ¹⁰
7	335,000	1.1 x 10 ¹¹	37	300,000	9.0 x 10 ¹⁰
8	420,000	1.7 x 10 ¹¹	38	550,000	3.0 x 10 ¹¹
9	455,000	2.0 x 10 ¹¹	39	820,000	6.7 x 10 ¹¹
10	450,000	2.0 x 10 ¹¹	40	280,000	7.8 x 10 ¹⁰
11	505,000	2.5 x 10 ¹¹	41	500,000	2.5 x 10 ¹¹
12	680,000	4.6 x 10 ¹¹	42	440,000	1.9 x 10 ¹¹
13	490,000	2.4 x 10 ¹¹	43	460,000	2.1 x 10 ¹¹
14	230,000	5.3 x 10 ¹⁰	44	330,000	1.1 x 10 ¹¹
15	470,000	2.2 x 10 ¹¹	45	730,000	5.3 x 10 ¹¹
16	800,000	6.4 x 10 ¹¹	46	300,000	9.0 x 10 ¹⁰
17	444,000	2.0 x 10 ¹¹	47	490,000	2.4 x 10 ¹¹
18	640,000	4.1 x 10 ¹¹	48	750,000	5.6 x 10 ¹¹
19	630,000	4.0 x 10 ¹¹	49	620,000	3.8 x 10 ¹¹
20	470,000	2.2 x 10 ¹¹	50	710,000	5.0 x 10 ¹¹
21	190,000	3.6 x 10 ¹⁰	51	900,000	8.1 x 10 ¹¹
22	820,000	6.7 x 10 ¹¹	52	380,000	1.4 x 10 ¹¹
23	710,000	5.0 x 10 ¹¹	53	280,000	7.8 x 10 ¹⁰
24	580,000	3.4 x 10 ¹¹	54	400,000	1.6 x 10 ¹¹
25	605,000	3.7 x 10 ¹¹	55	710,000	5.0 x 10 ¹¹
26	340,000	1.2 x 10 ¹¹	56	550,000	3.0 x 10 ¹¹
27	280,000	7.8 x 10 ¹⁰	57	490,000	6.2 x 10 ¹¹
28	315,000	9.9 x 10 ¹⁰	58	820,000	6.6 x 10 ¹¹
29	560,000	3.1 x 10 ¹¹	59	420,000	1.8 x 10 ¹¹
30	345,000	1.2 x 10 ¹¹	60	470,000	2.2 x 10 ¹¹
Total				N30,844,000	1.9446 x 10¹³

Wurno LGA (n=61)					
S/N	X (Value/N)	X ²	S/N	X(Value/N)	X ²

1	610,000	3.7×10^{11}	31	395,000	1.6×10^{11}
2	455,000	2.1×10^{11}	32	240,000	5.8×10^{10}
3	840,000	7.1×10^{11}	33	550,000	3.0×10^{11}
4	690,000	4.8×10^{11}	34	750,000	5.6×10^{11}
5	870,000	7.6×10^{11}	35	400,000	1.6×10^{11}
6	270,000	7.3×10^{10}	36	560,000	3.1×10^{11}
7	680,000	4.6×10^{11}	37	640,000	4.1×10^{11}
8	720,000	5.2×10^{11}	38	240,000	5.8×10^{10}
9	340,000	1.2×10^{11}	39	340,000	1.2×10^{11}
10	530,000	2.8×10^{11}	40	350,000	1.2×10^{11}
11	670,000	4.5×10^{11}	41	470,000	2.2×10^{11}
12	685,000	4.7×10^{11}	42	140,000	2.0×10^{10}
13	200,000	4.0×10^{10}	43	350,000	1.2×10^{11}
14	500,000	2.5×10^{11}	44	560,000	3.1×10^{11}
15	480,000	2.3×10^{11}	45	395,000	1.6×10^{11}
16	470,000	2.2×10^{11}	46	650,000	4.2×10^{11}
17	574,000	3.3×10^{11}	47	340,000	1.2×10^{11}
18	685,000	4.7×10^{11}	48	320,000	1.0×10^{11}
19	895,000	8.0×10^{11}	49	500,000	2.5×10^{11}
20	550,000	3.0×10^{11}	50	150,000	2.3×10^{10}
21	540,000	2.9×10^{11}	51	270,000	7.3×10^{10}
22	255,000	6.5×10^{10}	52	80,000	6.4×10^9
23	450,000	2.0×10^{11}	53	650,000	4.2×10^{11}
24	692,000	4.8×10^{11}	54	720,000	5.2×10^{11}
25	448,000	2.0×10^{11}	55	180,000	3.2×10^{10}
26	400,000	1.6×10^{11}	56	200,000	4.0×10^{10}
27	310,000	9.6×10^{10}	57	230,000	5.3×10^{10}
28	335,000	1.1×10^{11}	58	360,000	1.3×10^{11}
29	390,000	1.5×10^{11}	59	350,000	1.2×10^{11}
30	420,000	1.8×10^{11}	60	350,000	1.2×10^{11}
			61	530,000	2.8×10^{11}
Total				N28,214,000	1.52674×10^{13}

Wamakko LGA (n=57)					
S/N	X (Value/N)	X^2	S/N	X(Value/N)	X^2
1	820,000	6.7×10^{11}	31	790,000	6.2×10^{10}

2	680,000	4.6×10^{11}	32	410,000	1.7×10^{11}
3	780,000	6.1×10^{11}	33	670,000	4.5×10^{11}
4	700,000	4.9×10^{11}	34	871,000	7.6×10^{11}
5	950,000	9.0×10^{11}	35	790,000	6.2×10^{10}
6	510,000	2.6×10^{11}	36	585,000	3.4×10^{10}
7	680,000	4.6×10^{11}	37	530,000	2.8×10^{10}
8	690,000	3.5×10^{11}	38	750,000	5.6×10^{11}
9	610,000	3.7×10^{11}	39	390,000	1.5×10^{11}
10	570,000	3.2×10^{11}	40	370,000	1.4×10^{10}
11	485,000	2.4×10^{11}	41	600,000	3.6×10^{11}
12	840,000	7.1×10^{11}	42	570000	3.2×10^{11}
13	560,000	3.1×10^{11}	43	450,000	2.0×10^{11}
14	596,000	3.6×10^{10}	44	160,000	2.6×10^{10}
15	620,000	3.8×10^{11}	45	520,000	2.7×10^{11}
16	840,000	7.1×10^{11}	46	360,000	1.3×10^{11}
17	590,000	3.5×10^{11}	47	750,000	5.6×10^{11}
18	480,000	2.3×10^{11}	48	520,000	2.7×10^{11}
19	720,000	5.2×10^{11}	49	660,000	4.4×10^{11}
20	960,000	9.2×10^{11}	50	570,000	3.2×10^{11}
21	530,000	2.8×10^{10}	51	890,000	7.9×10^{11}
22	520,000	2.7×10^{11}	52	785,000	6.1×10^{11}
23	480,000	2.3×10^{11}	53	510,000	2.6×10^{10}
24	455,000	2.1×10^{11}	54	420,000	1.8×10^{11}
25	615,000	3.8×10^{11}	55	530,000	2.8×10^{11}
26	870,000	7.6×10^{11}	56	580,000	3.4×10^{11}
27	670,000	4.5×10^{11}	57	325,000	1.1×10^{11}
28	750,000	5.6×10^{11}			
29	400,000	1.6×10^{11}			
30	320,000	1.0×10^{11}			
Total				N34,547,000	2.2376×10^{13}

APPENDIX V

PLATES



Plate 1: PRA Team Familiarisation Visit to the Palace of District Head of Dundaye in Wamakko LGA



Plate 2: Researcher with District Head of Dundaye during the PRA Familiarisation Visit at his Palace



Plate 3: Photograph with the Farming Households after PRA Plenary in Rimawa Flood-Affected Area



Plate 4: PRA Team with the Farming Households after PRA Plenary in Bakin Gulbi Flood-Affected Area



Plate 5: Researcher with Taru/Chief of the Water Body in Bakin Gulbi Flood-Affected Area



Plate 6: Illustration of the Fishing Site in Bakin Gulbi Flood-Affected Area



Plate 7: Researcher with the Families of the Farming Households in Bakin Gulbi Flood-Affected Area



Plate 8: Researcher discussing with important Key informants in Kwal-Kwalawa



Plate 9: Researcher Observing the Environmental Features of KwalKwalawa Flood-Affected Area

