Flood Preparedness and Adaptation Strategies among Farmers in Bayelsa State, Nigeria

Stanley Ebitare Boroh Department of Sociology and Anthropology, Federal University Otuoke. Email: borohse@fuotuoke.edu.ng ORCID ID: 0000-0002-5169-2583

Abstract

Objective: The study set out to assess the level of flood preparedness and adaptation strategies among farmers in the Anyama-Ijaw community of the Southern Ijaw Local Government Area in Bayelsa State.

Method: Thirty (30) participants were purposefully selected for the study, and an in-depth interview was conducted with them. The study utilised a qualitative research design through in-depth interviews. The thematic analysis method through verbatim quotations was employed as an analysis tool. The results were presented in prose.

Result: The study reveals that farmers primarily rely on traditional knowledge and community cooperation to prepare for floods while dealing with significant challenges, such as limited access to resources and climate change impacts. The findings also indicate that many farmers predict flooding based on environmental changes and work together to build protective structures despite some tension arising from unequal participation in these efforts. Adaptation strategies include diversifying crops, modifying farming techniques, and pursuing alternative livelihoods during floods. Farmers have also begun using flood-resistant crops and constructing drainage systems to minimise damage. The wisdom of older farmers plays a key role in sharing knowledge and fostering resilience among younger farmers.

Conclusion: Farmers acknowledge the risks associated with floods and are trying to reduce their vulnerability to floods.

Keywords: Flood; preparedness; adaptation strategies; impact; farmers

Introduction

Globally, flooding is a major natural disaster ravaging all parts of the world. It is regarded as one of the most destructive natural disasters because of its devastating effects on the environment, humans and their livelihoods (CRED, 2019). An estimated \$150 billion loss and 9,000 deaths are caused by 820 natural disasters annually (Yin et al., 2021). In the last 3 decades, climate change has also led to the intensity of flooding, and this can be seen in the form of increased rainfall, rising sea levels and changes in weather patterns. Several European countries have been faced with devastating floods that have resulted in loss of lives as well as destruction of properties (IPCC, 2021). The effects of flooding are felt more in developing countries, and this is because they are more resource-based economies and also have limited infrastructure and technological know-how to mitigate it. Flood is the most common natural disaster in Africa with a weighty negative impact (Cilliers, 2019). West Africa experienced the worst floods over the past 30 years, and it could be a

major hindrance to sustainable development in countries affected, as governments, individuals, households, and communities bear so many losses from it (Yin et al., 2021).

The Niger Delta region in Nigeria is one plagued with several hazards ranging from oil induced degradation, insecurity and recently flooding which has been happening for the past 2 decades now and this can be attributed to the fact that it is a low land. These issues have done great disservice to the region, and the people are disproportionately disadvantaged due to the activities of the oil multinationals. The impacts of floods in Bayelsa state cannot be overemphasized because of the lack of infrastructure and preparedness, often from both the government and individuals. While flooding generally affects all locations, it is believed that the impacts are disproportionately felt in rural areas where most livelihood activities depend on the natural environment. The recurrent flood in the state now seems like an annual ritual that must occur yearly or biannually, and this causes so many problems, including temporary displacement, loss of livelihoods, health impact, among others.

The concept of community preparedness is garnering attention globally because it is seen as a major problem. Most people are not prepared, which in turn seriously affects their economic, social, and health lives. Against this backdrop, this study aims to investigate the level of preparedness and adaptation strategies employed by farmers in the state during flood periods, as well as the coping strategies they adopt in response to these environmental crises.

Objectives of the Study

- 1. To examine the level of preparedness of farmers to handle flood disaster
- 2. Examine the adaptation strategies adopted by farmers in the face of flooding
- 3. Examine the impacts of flooding among farmers in Bayelsa State.

Literature Review

Natural hazards pose significant threats worldwide, and a substantial portion of the global population is projected to be exposed to catastrophic events by 2050. Among various natural hazards, flood disasters are a major cause of death and devastation, with significant economic and social consequences (Doocy et al, 2013). Over 30% of all natural disasters in the last century globally have been attributed to floods (Guha-Sapir et al, 2012).

Flooding is a major threat that poses significant challenges to farmers globally, regardless of their location. It affects their traditional livelihoods and displaces them from their environment. The causes of flooding include natural and man-made factors such as settlement in flood plains, extensive urbanization, poor waste management, and climate change, among others.

The impacts of floods in Nigeria range from mortality, physical injuries, widespread infection and vector-borne diseases, social disorders, homelessness, food insecurity, economic losses mainly through destruction of farmlands, social and urban infrastructure and economic disruption (Ologunorisa & Adejumo, 2005). In disaster management, the concept of community preparedness is critical because disasters are events that primarily affect local communities (Mabuku, 2019). Therefore, no one is more interested in reducing flood disaster risk than the affected locals, whose survival and well-being is at stake. In addition, as local people are those immediately affected when disasters occur, they become the first responders to the event; as such, communities must be prepared in order to mitigate the effects of flooding.

Ajumobi, Womboh and Eze (2023) argued that the 2022 flood, tagged by so many as the monster flood because of its devastating effect on the people, destroyed the environment and the people's traditional livelihood. These affected the community in several ways, ranging from psychological effects, loss of farm produce, food security, and their economic life. In their study on how livestock farmers adapt to flooding, Anitha, Jagadeeswary, and Shilpa Shree (2022) opined that most livestock farmers have adopted coping strategies to protect their animals during flooding. They relocate their animals to a higher place and put their feed in a proof container to protect it from flooding.

Faruk and Maharjan (2023) in their study on factors influencing farmers' perceived risk of flooding in Bangladesh, argued that farmers' previous experiences and knowledge about flooding have a way of strengthening their risk assessment skills as well as adaptation and coping strategies during subsequent floods. As such, what this means is that education and flood awareness are an enabling factor for community folks in flood preparedness and also a good way of adaptation.

In a comparative study by Mégnint et al. (2022), the authors investigated the adaptation strategies in agriculture by comparing farmers' responses in Bangladesh and Germany. The study emphasized the importance of crop diversification and employing sustainable practices in farming, while ignoring the fact that these strategies vary across place and time. This study placed emphasis on focusing on community adaptation strategies that is unique to their environmental challenges rather than providing a general solution.

Moses, Famurewa, and Gumus (2020), in their study on flood vulnerability and risk assessment in Yenagoa, found that lack of access to timely weather information and inadequate infrastructure increased farmers' vulnerability to flooding. The study opined that adequate infrastructures, such as good drainage systems, early warning signal systems, and provision of finance, can help mitigate the effects of flooding and provide good adaptation strategies for farmers.

Joshua, Ibrahim, Abubakar, Ejembi, Inmadu, Usman, and Adagba (2023), in their study on community flood disaster preparedness in Kaduna State, Nigeria, argued that collaboration between government, communities, and farmers plays a key role in flood preparedness. Their findings indicate that community engagement and training are important in enhancing farmers' readiness to respond to floods. The research suggests that building resilience among rural and urban farmers requires inclusive approaches that leverage local knowledge and foster community solidarity.

The concept of community preparedness is gaining attention in disaster management because disasters primarily affect local communities; they become the first responders to the event (Gaillard & Mercer, 2013). Therefore, communities must be proactive. Between 1985 and 2014, flooding in Nigeria affected more than 11 million lives, with 1100 deaths and property damage exceeding US\$17 billion (Nkwunonwo, 2016). Also, flood disasters accounted for about 38% of Nigeria's federally declared natural disasters between 1995 and 2005 (Obeta, 2009). National Emergency Management Agency (NEMA) reported that the 2012 flood affected 7,705,378 people; 2,157,419 were displaced, 5,800 were injured, and 431 died (NEMA, 2021). Thirty-two of the 36 states in the country were affected, and it was described as the most devastating flood in the last 40 years (NEMA, 2021).

Methods

In this study, a qualitative research design was selected to capture the rich, detailed experiences of the participants. This approach allowed for a deeper understanding of the local context and the specific challenges farmers face concerning flooding. The purposive sampling technique was adopted to choose participants who are faced with this issue of flooding and to also help narrate their lived experiences. For this study, 30 participants were purposively selected from the community to get first-hand data since they felt the impact of the flood directly, as well as share the strategies they have adopted over the years to mitigate the effects.

Data was collected through In-Depth Interviews (IDIs) with participants who shared their lived experiences, the impact of flooding, and their level of preparedness. The data was analyzed through thematic analysis, which helped identify themes from the participants.

Results and Discussion

Theme 1: Challenges Faced During Flooding and Their Level of Preparedness in Anyama-Ijaw

It is pertinent to note that flooding comes with so many challenges, and in this region, it is now like an annual festival that is expected to happen, and as such, people now have ways of mitigating the effects by preparing to face it. Farmers in Anyama-Ijaw prepare for flooding by relying on indigenous knowledge and practices passed down through generations. Many farmers know the seasons well and can predict when floods are likely to occur based on weather patterns and changes in their environment. For instance, one participant pointed out this traditional preparedness approach, noting that;

Over the years, we have become aware of the nature of changes in rainfall patterns, and this knowledge has helped us in preparing either our plantations or our harvesting mechanisms. We now know when to plant certain crops that are more resilient to waterlogged conditions or choose specific planting times to avoid peak flooding seasons. One major thing we do is early planting as well as early harvesting. Most times, this is not a good practice because we don't get the best of farm produce, but it mitigates the effect of losing out totally. (IDI Participant, Male, Anyama-Ijaw community, Farmer, aged 47 years)

This reliance on traditional knowledge is crucial, reflecting a deep understanding of the local ecosystem. However, while these practices are effective to some extent, they might not always keep up with the changing climate, especially since unpredictable weather patterns can lead to floods occurring at unexpected times, catching farmers off guard. However, this foundation proves that traditional knowledge enhances their preparedness, ensuring that these farmers have a more robust strategy for dealing with floods. In addition to traditional knowledge in enhancing their preparedness, community cooperation has proven to be an important tool when preparing ahead of floods. Suffice it to say that during flooding events, farmers often band together to share resources and support each other. As mentioned by one interviewee, this preparation efforts might involve pooling funds to build community dykes or sharing labor to salvage crops during a flood. According to this respondent;

To prepare ahead of flooding here, we organize ourselves in groups because we understand that understanding rainfall patterns alone is no longer sufficient, since rainfall is no longer the only source of flooding in our coastal area. We have instances where creekside waters and rivers overflow into our farmlands, so during these emergency cases, these groups help each other to salvage crops and rescue the ones that can be rescued at that moment. (IDI Participant, Female, Anyama-Ijaw community, Farmer, aged 52 years).

This solidarity provides practical resources and emotional support during tough times. However, it may result in challenges, especially when not all community members are equally affected or have the same capacity to involve themselves during the emergency. Some may feel left out or unable to participate, leading to tensions. Thus, this preparedness approach may be essential, particularly as this collective participation can foster an inclusive approach to communal resilience. However, the shortfall in terms of engaging all farmers, regardless of their group belonging, could lead to division and less effective flood preparedness. A notable challenge that comes with the community member's preparedness efforts is being able to access flooding awareness resources or information beforehand. According to this respondent;

We, the farmers here, often face serious difficulty in terms of flood preparedness due to our lack of access to resources and information pertaining to flooding. Many of us lack the financial means to invest in proper drainage systems or elevated farmland, which are important for reducing flood damage. So, we need this information more than you can imagine, but our lack of access to timely weather forecasts and climate information makes a huge difference in how effectively we can prepare ahead of floods. (IDI Participant, Female, Anyama-Ijaw community, Farmer, aged 48 years).

Suffice it to say that farmers are at a huge disadvantage without adequate resources. If they cannot afford to improve their land or invest in safer farming practices, they remain vulnerable to the impacts of flooding. Furthermore, when vital information is not readily available, farmers can miss crucial opportunities to safeguard their crops. In any case, we can say that it is not just about improving infrastructure but also about enhancing access to knowledge that can help them make informed decisions in the face of flooding. There is also a lack of awareness about climate change, which has become a global contributor to flooding. A participant noted this challenge by pointing out that;

Another pressing challenge farmers in Anyama-Ijaw face is the impact of climate change, which heightens flooding. Many of us have observed that floods are becoming more severe and unpredictable, leading to continuous crop losses and economic instability. This factor complicates our preparedness efforts, as we are dealing with immediate flooding issues from rainfall and long-term changes in our environment owing to oil exploration activities. (IDI Participant, Male, Anyama-Ijaw community, Farmer/Fisherman, aged 55 years).

These participants' deviation from the sequential narratives into climate change impacts shows how much of an effect climate change has, especially by creating a daunting scenario for farmers, as existing preparation methods may no longer suffice. This uncertainty can lead to anxiety and a sense of helplessness as they struggle to adapt. They may feel anxious about whether their crops will survive or if they will make enough money to support their families. Oftentimes, a lack of resources and social support systems might make people lose hope because of the devastating effects of flooding on their livelihoods and security.

Theme 2: Adaptation strategies that farmers adopt to cope with the effects of flooding on their livelihoods.

The farmers have developed a sense of resilience over the years by adapting to these floods, as they can do little or nothing to stop the floods from coming. This resilience is seen in various ways, showcasing the community's deep connection to their environment. Crop diversification and changing farming methods is one way the people have adapted to flooding to mitigate its effect on their crops. Following this probe regarding the adaptation strategies, one participant stated;

We have managed the challenges of flooding in Anyama-Ijaw by diversifying the types of crops we plant and changing our farming methods. Before now, we used to rely on purely organic plants, but now, instead of relying on just organic crops, which can delay production, thereby facing flooding disasters, we involve agro-seedlings and fertilization mechanisms to grow various plants. This helps us to meet the harvest before the flooding months begin. Although some people still strive to maintain traditional seedlings and crops to maintain the natural order, others mix traditional staple foods with more flood-resistant crops, like swamp rice or certain types of vegetables that can handle wet conditions. (IDI Participant, Female, Anyama-Ijaw community, Farmer, aged undisclosed).

This adaptation approach not only helps protect the people's food supply but also allows the farmers to spread their risk by having different crops to try and meet the needs of their families and community, even if some fields may not yield or survive as expected. Additionally, changing their farming techniques, like adopting raised beds or using organic materials to retain soil moisture, can further help manage water levels. Hence, this diversification strategy gives the people hope and a better chance of making a living despite unpredictable floods. Likewise, another interviewee noted instances of constructing some kind of drainage system where water is channelled out of the farmlands. In the words of this interviewee;

Here in the Anyama-Ijaw community, some of our farmers have worked together to build earthen barriers or dikes around our fields. These structures help redirect water away from our crops, protecting them during heavy rains. Apart from the fact that these drainages help redirect the waterways, enhancing them allows excess water to flow away more efficiently, which reduces waterlogging in the fields (IDI Participant, Male, Anyama-Ijaw community, Farmer, aged 39 years).

This collective action, as was with the preparedness efforts, helps foster a sense of unity and shared purpose in the face of flooding threats. Efficient drainage and protective structures ensure that the fields can recover quickly after heavy rains, allowing farmers to return to their regular planting schedules sooner. This proactive approach not only helps to safeguard crops but also promotes long-term productivity on their farms. Yet another strategy, which revolved around experiential prediction, was uncovered by a respondent. According to this respondent;

Many older farmers have lived through numerous flooding seasons and know how to read the signs of nature. They can predict when and where floods might occur and adapt their planting schedules accordingly. This experience helps the old farmers to know most times which crops do well in specific conditions and which ones do not, and they thereafter share this knowledge with younger generations to keep them abreast with the realities around them. (IDI Participant, Female, Anyama-Ijaw community, Farmer, aged undisclosed).

This revelation shows the deep understanding of farmers, especially aged farmers, regarding their environment and how to make the most of available resources. Learning from these aged farmers and adding the knowledge they have acquired through experiences to modern techniques helps farmers in Anyama-Ijaw to create sustainable practices that help them cope with flooding. Their experiences and knowledge also highlight the importance of not just looking forward but also honoring the past and learning from it to build a resilient coping mechanisms. Finally, another participant also revealed the use of alternative livelihoods alongside farming. To this interviewee;

When flooding becomes too much to manage, some of our farmers take up other jobs or businesses such as deep-sea fishing, crafting, or even trading goods. This provides an additional source of income and helps them remain financially stable when crops fail due to flooding. For example, those with fishing skills can utilize the rivers more effectively during flooding seasons, when fish may be more abundant. Additionally, engaging in small businesses, like selling handmade crafts or food in local markets, offers financial support and keeps the community vibrant even during tough agricultural seasons. (IDI Participant, Female, Anyama-Ijaw community, Farmer, aged 41 years).

It is important to note that this strategic shift reduces their dependency on farming alone and allows them to adapt more flexibly to changing circumstances, helping families navigate the challenges brought about by flooding. Equally, it showcases the strength and creativity of the community members. Instead of feeling overwhelmed by problems, these families find new ways to support themselves and each other. This adaptability is essential because it shows that they are not just waiting for things to get better but are actively working to improve their situation. So their coming together to support different activities help them build a strong network. This network helps them share resources, advice, and skills, making everyone more capable of handling tough times. Besides, as they try new things, families can learn from their experiences. For example, the elderly farmers who are familiar with the flooding patterns can share these experiences and knowledge with others. This sharing of knowledge helps the whole community grow stronger and more resilient. Also, by diversifying their income sources, families can protect themselves against unexpected events. If floods ruin one crop, they may still have income from fishing or a small

shop. This safety net gives them peace of mind and helps them face the future with a bit more confidence. Finally, this shift encourages a spirit of innovation. As the community members explore new ways to make a living, they may come up with ideas that benefit everyone. Working together, they can create a brighter future, even in the face of flooding challenges. Adapting and finding new opportunities helps families survive, strengthens their bonds, and makes their community a better habitat.

Theme 3: The impacts of flooding among farmers in Bayelsa State.

As we mentioned previously, flooding is something very common in Bayelsa State, mostly because of its coastal placement. There are consistent instances of flooding either from heavy downpours of rain, an overflow of the ocean and rivers, or the release of water from the dam in Cameroon. Whichever one, flooding has had devastating impacts on the people of Bayelsa State, especially the farmers who rely heavily on farm produce for their livelihoods. When the research probe into these impacts, an interviewee shared her experience, noting:

First of all, flooding destroys our crops. When the water rises too much, it can submerge our fields. For example, last year, I had a large portion of my cassava completely underwater for several days. This damages the crops that were already growing and can lead to the decay of the stems I planted. The few that survived were not able to produce as strong or healthy because they were affected by too much water. So we witnessed less food for my family and less to sell at the market. The implication here is an obvious one; when crops are lost, it directly impacts our income and food security. It makes it hard to provide for our families, and if enough farmers face this issue, it can lead to higher prices for food in the markets. (IDI Participant, Female, Anyama-Ijaw community, Farmer, aged 38 years).

This shows the struggle these people continue to face and why they adopt certain strategies to mitigate these impacts. It is no news that flooding ruins crops, making it difficult for farmers to produce sufficiently. This, as we know, not only impacts the individual farmer but the entirety of the society as the implications extend beyond the affected individuals. When farm fields are swept or submerged, the plants get damaged, and even the ones that survive are not as strong as they should be. This means there is less food for the farmer's families and less to sell at the market, which affects everyone just as this interviewee has presented. If many farmers have these problems, it can cause food prices to go up, making it harder for everyone to buy what they need. Another interviewee also mentioned how flooding impact their farming schedules, according to this respondent:

Flooding disrupts our farming schedules because we normally plan our planting and harvesting before the seasons. When flooding comes unexpectedly, it will wash away our carefully laid plans. For example, if the

rains come late and then flooding hits, we might have to delay our planting or even skip an entire planting season. This can affect the circle and also make it almost impossible to have enough produce to sell, and this affects our livelihoods seriously. These kinds of situations can result in uncertainty; we

cannot predict how much we will earn in a year, which prevents us from making long-term investments or improvements to our farms. (IDI Participant, Female, Anyama-Ijaw community, Farmer, aged 43years).

This can be likened to trying to build a house without a solid foundation. Just as a house needs stability to stand tall, farmers rely on consistent weather patterns to grow their crops effectively. When flooding occurs unexpectedly, it disrupts their plans and undermines their efforts, much like an unstable foundation would cause a house to crumble. This uncertainty makes it hard for farmers to know how much they will produce and earn, which in turn hampers their ability to invest in better tools or practices. The whole system becomes fragile, and livelihoods are at risk, similar to how a house without proper support can cause problems for those living in it. Another key impact raised is the economic loss owing to flooding events. For this participant:

As a fish farmer, I am sure that flooding affects livestock. Many of us here also raise animals, such as chickens, goats, and fishes. I am a fish farmer. When there is flooding, these fishes can get swept away or they might succumb to diseases that spread in standing water or contaminated waters. For example, after the 2022 flooding, I lost over 10,000 fingerlings from my ponds to the flooding and had to deal with a lot of sickness among my remaining fish when the flood eventually went down. This reduces our supply and creates emotional distress, as the financial burden is significant and can lead to more struggles in our daily life—(IDI Participant, Male, Anyama-Ijaw community, Fish farmer, aged 45 years).

The financial loss implications further compound the disaster flooding brings by adding a layer of stress that affects not just the fish but the farmers as well. When livestock is lost, it means less food and income, which makes it harder to support families and meet daily needs. Losing thousands of fish is more than just a loss of stock; it translates to a major hit to one's finances. The emotional toll from worrying about money and the future can be overwhelming, making it even tougher for farmers to bounce back. The struggles do not just stop with the loss; they create a cycle of hardship that affects every part of life. Other interviewees equally noted:

One thing that people keep forgetting to mention is that flooding leads to increased expenses. After a flood, we often have to spend money on repairs to our homes, farms, and even our mobility sources like our vehicles. For instance, after the last flood, I had to repair walls and clean out mud from my house, I also had to repaint, fix my palm processing engines, amongst other things. This created extra financial pressure because sometimes, we need to borrow money to fix what has been damaged. The implication of rising costs can push many farmers into debt, creating a cycle of financial hardship that is hard to come out from. (IDI Participant, Male, Anyama-Ijaw community, Palm oil farmer, aged undisclosed).

This dimension of impacts raised is is sacrosanct because the expenses do not stop with the flood itself; they continue long after. Farmers must repair homes and equipment, which can lead to unexpected costs that were not planned for. This often means borrowing money just to get back on

track, which adds even more stress. When farmers are in debt, it becomes much harder to save or invest in their future, making it a tough cycle of struggle that worsens their situation over time.

Conclusion and Recommendations

Based on our findings, one can conclude that farmers are resilient and have developed adaptation strategies to mitigate the effects of flooding on their traditional livelihoods and lives in general. They rely on indigenous knowledge, which has guided their understanding of the environment over the years. As such, they can anticipate when the floods will come and recede, which plays a key role in terms of the kind of crops they plant and when they will plant them. However, despite the preparations, the impacts of flooding are always disastrous because their prediction of the weather often does not work due to the effects of climate change on the environment. One major factor that helps community folks is a social support system in the form of cooperation amongst themselves. They come together to form cooperatives by pooling resources to provide relief for themselves. This initiative not only provides financial and emotional support for them, but also helps them to prepare well during floods

The study further noted that farmers face difficulties during the flooding season, which can manifest in not just the loss of livelihood and economic downturn but can also affect their mental well-being and the stability of the community. Crop diversification and changing their farming techniques are major ways they cope with flooding.

As a result, the study recommended the following to improve preparedness amongst farmers.

- 1) Climate change awareness through education about changing patterns in society and the best ways to manage flooding.
- 2) There should be a strong sense of community inclusion, which can be achieved by setting up local committees that include all farmers and ensuring everyone's voice is heard in planning and resource-sharing efforts.
- 3) Lastly, based on the financial impacts of flooding on farmers, the state government and NGOs domiciled in the state can create a financial support system by providing funding to help farmers recover after floods, so they do not have to borrow money to repair damages. These actors can help set up a system for collecting contributions to the recovery fund from local businesses and government resources. This would empower farmers to better withstand flooding and help them recover more quickly, ensuring food security and stability in the community over the long run.

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