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EFFECT OF FLOODING ON AVAILABILE AND ACCESSIBLE ESSENTIAL AGRICULTURAL INPUTS IN BENUE STATE, NIGERIA

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Abstract

Flooding is a recurrent natural disaster in Benue State, Nigeria, significantly impacting agricultural activities. This study investigates the effects of flooding on the availability and accessibility of essential agricultural inputs in the region. The primary aim is to understand the extent to which flooding disrupts the supply and accessibility of critical inputs such as seeds, fertilizers, and pesticides, which are vital for agricultural productivity and food security. A survey method was employed to gather data from a sample size of 400 farmers across various flood-prone areas in Benue State. Structured questionnaires were used to collect information on the types and frequencies of flooding, the availability and accessibility of agricultural inputs before and after flood events, and the coping strategies adopted by farmers. Findings reveal that flooding severely disrupts the supply chain of agricultural inputs. About 75% of respondents reported a significant reduction in the availability of essential inputs post-flooding, attributing this to damaged infrastructure and disrupted transportation networks. Additionally, 68% of farmers indicated that accessibility to these inputs was hindered due to increased prices and limited supply, exacerbating their vulnerability and reducing their agricultural output. The study recommends the implementation of proactive measures to mitigate the impact of flooding on agricultural inputs. These include the construction and maintenance of resilient infrastructure, the establishment of emergency supply depots, and the provision of financial assistance to affected farmers. Furthermore, the development of an efficient early warning system and the promotion of flood-resistant agricultural practices are essential to enhance the resilience of the agricultural sector in Benue State. Addressing the challenges posed by flooding on the availability and accessibility of agricultural inputs requires a multi-faceted approach involving infrastructure development, policy support, and community engagement to ensure sustainable agricultural productivity and food security in Benue State.

Keywords: Flooding, Availability, Accessibility, Essential Agricultural Inputs, Benue State, Nigeria

1. Introduction

Flooding is a natural hazard that significantly impacts various sectors globally, with agriculture being one of the most vulnerable. In Nigeria, particularly in Benue State, flooding has become a recurrent phenomenon with profound effects on agricultural activities. Benue State often referred to as the "Food Basket of the Nation," is renowned for its rich agricultural productivity. However, the increasing frequency and intensity of floods have raised concerns regarding the availability and accessibility of essential agricultural inputs, which are crucial for sustaining the agricultural economy of the region.

Benue State, located in the central region of Nigeria, is characterized by a tropical climate with distinct wet and dry seasons. The River Benue, one of the state's major rivers, often overflows its banks during the rainy season, leading to widespread flooding. These floods are exacerbated by factors such as climate change, deforestation, and poor urban planning. According to

the Nigerian Meteorological Agency (NiMet), there has been a significant increase in the intensity and frequency of rainfall in recent years, contributing to more severe flooding events (NiMet, 2023).

Agricultural inputs, including seeds, fertilizers, pesticides, machinery, and labor, are vital for the productivity and sustainability of farming activities. Flooding disrupts the supply chain and distribution networks of these inputs in several ways: Flooding often damages transportation infrastructure such as roads and bridges, hindering the movement of agricultural inputs to rural farming communities. A report by the National Emergency Management Agency (NEMA) highlighted that the 2022 floods destroyed over 200 kilometers of rural roads in Benue State, severely limiting access to essential inputs (NEMA, 2023). Floodwaters can lead to soil erosion, loss of soil fertility, and waterlogging, making it difficult for farmers to use fertilizers and pesticides effectively. Soil degradation also affects the choice of crops and the type of seeds required, often necessitating more resilient and costly varieties. Many farmers in Benue State store their seeds and fertilizers in makeshift warehouses or their homes. Flooding can inundate these storage facilities, leading to significant losses. The Food and Agriculture Organization (FAO) reported that the 2021 floods resulted in the loss of over 5,000 tons of stored grains and fertilizers in Benue State (FAO, 2022).

Access to agricultural inputs is crucial for timely planting and harvesting. Flooding poses significant challenges to accessibility: Floods often lead to economic hardship for farming communities, reducing their purchasing power. The destruction of crops and livestock results in lost income, making it difficult for farmers to afford essential inputs. A study by the International Food Policy Research Institute (IFPRI) found that households affected by flooding in Benue State experienced a 40% reduction in their agricultural income (IFPRI, 2022). Severe flooding can lead to the displacement of farming communities, disrupting agricultural activities and access to inputs. Displaced farmers may face challenges in accessing government or NGO assistance programs due to their temporary relocation. Floods can disrupt local markets, making it difficult for farmers to buy or sell agricultural inputs. Market disruptions also lead to price volatility, further exacerbating the accessibility issues. The Benue State Ministry of Agriculture reported that the prices of seeds and fertilizers increased by 30% following the 2021 floods due to market disruptions (Benue State Ministry of Agriculture, 2022).

Benue State often referred to as the "Food Basket of the Nation," relies heavily on agriculture for livelihood and economic sustenance. However, seasonal flooding, exacerbated by climate change and poor infrastructural planning, has become a perennial issue. Floods in Benue State result in the submergence of farmlands, destruction of crops, and erosion of soil fertility. The immediate aftermath of floods typically includes the loss of seeds, fertilizers, and other critical inputs stored by farmers. These inputs are either washed away or rendered unusable due to water damage (Owolabi et al., 2022).

The availability of agricultural inputs post-flooding is significantly hampered. Disrupted supply chains, due to impassable roads and damaged infrastructure, delay the delivery of seeds, fertilizers, pesticides, and farming equipment. Local markets, often the primary source for these inputs, are either flooded or inaccessible. This scenario forces farmers to rely on limited, often expensive, alternatives, thereby increasing production costs and reducing profitability (Ibrahim et al., 2021).

Accessibility to agricultural inputs is further constrained by the socio-economic impacts of flooding. Farmers in affected areas often face financial constraints due to the loss of crops and income. This financial strain reduces their purchasing power, limiting their ability to acquire necessary inputs for the next planting season. Moreover, financial institutions may be reluctant to provide loans to flood-affected farmers due to perceived high risks, further exacerbating the situation (Ajetomobi et al., 2023).

Efforts to mitigate the impacts of flooding on agricultural input availability and accessibility in Benue State have been varied. Government

interventions, such as the distribution of relief materials and the provision of subsidized inputs, have had limited success due to bureaucratic inefficiencies and corruption. Non-Governmental Organizations (NGOs) have also played a role in providing immediate relief and long-term support, though their reach and resources are often constrained (Ekpa et al., 2022). It's on against the backdrop this study is to examine Effect of Flooding on the Availability and Accessibility of Essential Agricultural Inputs in Benue State, Nigeria.

The major objective of this study is to examine Effect of Flooding on the Availability and Accessibility of Essential Agricultural Inputs in Benue State, Nigeria. In specific, this study seeks to:

i. Investigate the impact of flooding on the availability and accessibility of essential agricultural inputs, including seeds, fertilizers, and machinery.

ii. Identify and analyze the coping strategies adopted by farmers to mitigate the adverse effects of flooding on their agricultural activities.

2. Literature Review

2.1 Conceptual Issues

Concept of Flooding

Flooding, a natural phenomenon encompasses various circumstances where dry land succumbs to an overflow of water, caused by a multitude of factors such as excessive rainfall, river or dam overflow, dam bursts, blockades of waterways, seismic activity like earthquakes or tsunamis, high tides, and intentional releases of water from dams (Ologunorisa, 2004). This inundation results in temporary conditions of either partial or complete coverage of typically dry areas due to the overflow of inland or tidal waters, or rapid accumulation and runoff of water (Jeb and Aggarwal, 2008; Xiong et al., 2019).

The ramifications of flooding extend beyond the mere physical inundation of land; its impacts resonate at both micro and macro levels, affecting communities, neighborhoods, drainage basins, and vast expanses of land (Mwangi, 2016; Rimba et al., 2017). At a micro level, flooding can disrupt the lives of individuals and families, causing displacement, property damage, and in extreme cases, loss of life. Communities may face challenges in accessing basic necessities such as clean water, food, and medical supplies, leading to increased vulnerability and dependency on external aid.

On a macro level, the effects of flooding ripple through entire regions, impacting infrastructure, economies, and ecosystems. Floodwaters can damage roads, bridges, and buildings, disrupting transportation networks and essential services. Economic activities such as agriculture, tourism, and manufacturing may suffer significant setbacks due to damaged crops, property loss, and decreased productivity. Furthermore, flooding can alter the natural landscape, erode soil, and degrade habitats, posing threats to biodiversity and ecological balance.

The exacerbation of flooding events in recent years can be attributed to the intertwined influences of climate change and human activities (Rogelj et al., 2012; IPCC, 2013; Kriegler et al., 2013). Anthropogenic factors have significantly altered the elements of weather and climate, leading to changes in precipitation patterns and intensifying the frequency and severity of extreme weather events like heavy rainfall and storms.

One of the key contributors to flooding is the degradation of the environment through indiscriminate disposal of waste in drainages and waterways, bush burning, deforestation, and excessive cultivation and grazing activities. These activities disrupt natural drainage systems, reduce the capacity of watersheds to absorb water, and increase surface runoff, exacerbating the risk of flooding (IPCC, 2014).

Khan (2018) stated that excess moisture in crop reduces the ability of the plant to access subsoil water if summer weather becomes dry and hot. Sohel and Rayhanul (2015) posited that flood takes away rural farmers' crops which is the only source of income for survival, thus making them extremely susceptible to the subsequent poverty. Rural farmers are those predominantly affected by flood as their crop soak in water (Sohel et al., 2015). According to Khan (2018) excess moisture in crop reduces the ability of the plant

to access subsoil water if summer weather turns dry. Peasant farmers' crops are at a high risk for disease development for pathogens that thrive in flood conditions. Seeds, seedlings and cultivars, regardless of crop type, are living organisms hence need adequate moisture for survival. In this regard, Hitoshin (2005) asserts that early flood affects oxygen in the soil, thus have a long-term negative effects on crop performance.

Standing crops such as cassava, yams, maize and sugar cane are flushed away by flood. Umoh (2018) posits that cash crops like vegetables have been badly affected and damaged thus worsening the sufferings of the rural farming communities. Crop such as sugarcane, cassava, yam, maize and among others are affected as water are raised to its maximum on farm lands, thus, making the individual and communities poor through disruption of services and the degradation of agricultural land. Khan (2012) revealed that cucumber plants were damaged by flood due to unavailability of controlling measures.

Types of Flooding

There is equally no consensus on the various types of flooding even if the categorization is essential for early warning and mitigation (Sikorska et al., 2015). One of the most common categorization of the types of flooding is the trinity of fluvial, pluvial and groundwater flooding (ICLR, 2021). Fluvial flooding which is also known as riverine or river flooding refers to an inundation which occurs when levels in a river, creek or stream rise, allowing water to flow onto surrounding land that is normally dry. Pluvial flooding is flooding independent of the overflow of a body of water that is rain-driven ponding or overland flow that results from the exceedance of natural or engineered drainage capacity (Falconer et al., 2009; Carter et al., 2015; Rosenzweig, 2018). Groundwater flooding occurs when normal ranges of groundwater levels and flow are exceeded leading to seeping and an overflow of land or man-made structures (Macdonald et al., 2012; ICLR, 2021).

Another flooding trinity is the one put forward by Berz et al (2001) and French and Holt (1989) which includes coastal, river and flash floods. The inclusion of coastal and flash floods is at odds with the former suggesting there more than three types of flooding. Coastal flooding is an inundation of a coastal area caused by extreme sea levels through a combination of four key factors: waves, astronomical tides, storm surges and relative mean sea level (Haigh & Nicholls, 2017). Flash flooding on the other hand refers a rare and small in scale but sudden, fast and generally, violent flooding event with very limited predictability and severely impaired opportunity for response (Montz & Gruntfest, 2002, Hapuarachchi et al., 2011). It is nearly impossible to account for the several of types of flooding. Supposing it were, it is not the purpose here. Even studies that come up with a numbered category often recognize the validity of another category elsewhere as with ICLR (2021) of 'coastal flooding' or Jonkman (2005) of 'drainage problems' flooding. Drainage problems is indeed part of six types of flooding actually outlined by Jonkman (2005) including coastal floods, flash floods, river floods, tsunamis and tidal waves. Agreed that the typology of flooding cannot be pigeon-holed (ICLR, 2021) into a specific set of categories classification stretching may unnecessarily ignore better judgment provided by Occam's razor (Braithwaite, 2007). In Jonkman's (2005) typology, it is difficult to see how tidal and coastal flooding are different. Another problem with such pigeon holes is that in reality the supposed flooding types do not occur in isolation (Che et al., 2010; Sikorska et al., 2015; ICLR, 2021)

Causes of Flooding

In literature, flooding is a phenomenon with a multitude of causes. These causes, although diverse, share a common theme in that they stem from either natural occurrences or human activities, and sometimes a combination of both. Various research studies (Michener & Haeuber, 1998; Jha, 2010; Karymbalis et al., 2012; Stefanidis & Stathis, 2013; Komolafe et al., 2015; Abeka et al., 2020; Sholihah et al., 2020; Talke & Jay, 2020) have explored this recurrent theme, emphasizing the importance of

understanding the interplay between natural and anthropogenic factors in causing floods.

Concept of Agriculture

The understanding of agriculture has evolved, giving rise to various qualifying and competing terminologies such as traditional, appropriate, alternative sustainable, and modern or conventional agriculture (Loomis, 1984). This evolution reflects the dynamic nature of agriculture as it adapts to changes in time and space. Frick and Kahler (1991) as well as Bareja (2014) argue that, unfortunately, the conceptualization of agriculture has often been confined to the explication of its subfields rather than addressing it as a holistic activity. In an attempt to bring clarity to the definition of agriculture, Harris and Fuller (2014) embarked on a treatise, encouraging fellow scholars to contribute explicit definitions to the concept. However, their efforts culminated in a noteworthy observation – the absence of a definitive definition, as they resorted to citing a dictionary rendition. This underscores the difficulty in encapsulating the diverse facets of agriculture within a single, all-encompassing definition. Despite the challenges, some scholars have ventured into defining agriculture in their own terms.

Agricultural Inputs

Agricultural inputs encompass a wide range of materials, resources, and technologies essential for modern farming practices. These inputs play a crucial role in enhancing agricultural productivity, ensuring food security, and promoting sustainable farming methods. In this discussion, we'll delve into the significance of agricultural inputs, their types, and their impact on agricultural practices, drawing upon credible sources to support the discussion. To begin with, agricultural inputs are integral components of the farming process, encompassing various categories such as seeds, fertilizers, pesticides, machinery, and irrigation systems. Each input serves a specific purpose in optimizing crop yields, minimizing losses, and maximizing profitability for farmers.

Seeds are foundational agricultural inputs, serving as the starting point for crop production. High-quality seeds with desirable traits such as resistance to pests and diseases, tolerance to environmental stressors, and high yield potential are essential for achieving optimal harvests. According to a report by the Food and Agriculture Organization (FAO), improved seed varieties have contributed significantly to yield gains in major crops worldwide (FAO, 2019).

Fertilizers are another critical input in modern agriculture, providing essential nutrients to crops for healthy growth and development. They replenish soil nutrients depleted by previous crops and improve soil fertility, thus enhancing productivity. Research by the International Fertilizer Development Center (IFDC) highlights the role of balanced fertilization in increasing crop yields and improving nutrient-use efficiency (IFDC, 2020).

Pesticides, including insecticides, herbicides, and fungicides, are vital inputs for pest and disease management in agriculture. They help control weeds, insects, and pathogens that can cause significant yield losses if left unchecked. However, the indiscriminate use of pesticides can have adverse effects on human health and the environment. Therefore, integrated pest management (IPM) approaches, which combine chemical control with cultural, biological, and mechanical methods, are increasingly promoted for sustainable pest management (FAO, 2018).

Mechanization, including farm machinery and equipment, is another essential input that revolutionizes agricultural practices, increasing efficiency and reducing labor requirements. Tractors, harvesters, plows, and irrigation systems streamline farm operations, enabling timely planting, cultivation, and harvesting. The adoption of mechanized farming techniques has been shown to enhance productivity and profitability, particularly in large-scale commercial agriculture (World Bank, 2017).

2.2 Empirical Review

Shabu and Musa (2015) in a study which aimed to evaluate both short and long term impacts of the 2012 flood disaster on the socio-economic sectors of Benue State established agriculture as one of the most affected. Through field observation, the study revealed that within agricultural production, crop and fish

production were the most severely hit. Generally, the study found significant damage for both crops and livestock.

Mba and Ebere (2021) in a descriptive sample survey study set out to examine the effects of flooding on small scale farmers in Makurdi, Benue state, Nigeria found flooding to have significant effects on the target population for the study. Some of the effects identified by the study include hunger, starvation, and loss of farmlands and destruction of road networks. In a rather more general study, Ikyapa et al (2022) sought to assess the socio-economic, infrastructural, and environmental impacts of floods in Makurdi Local Government Area (LGA) based on a descriptive survey design. The study equally found flooding to have had significant effects on agricultural production. These include substantial destruction of farmlands and crops. In contrast to Shabu and Musa (2015), the study found livestock production to be the least affected. Possibly valid though, it might be argued that the study did not, customarily, link up with this earlier finding. The discrepancy in this outcome cannot be explained away solely on the reason that animals were moveable.

Shabu and Tyonum (2013) in one of such studies assessed coping measures adopted by dwellers living in flood prone areas of Makurdi town. Through a sample survey and direct observation, the study found that citizens in the flood prone areas through their own agency or collective effort undertook frequent sand removal of blocked drainages; creation of water channels and the use of sand banks as mitigation measures or strategies against floods. The study also found these measures were ineffective consistent with Schneider (1992) conclusion that private individual is ill-equipped to deal with disasters.

3. Methodology

The survey method was meticulously chosen to ensure comprehensive data collection, employing structured questionnaires to delve into the intricate dynamics of agricultural input availability and accessibility in flood-prone regions of Benue State. With a robust sample size of 400 farmers, representing diverse geographical areas within the region, the study aimed to capture a nuanced understanding of the challenges faced by farmers in the wake of flooding events. These structured questionnaires were designed to solicit detailed information on the types and frequencies of flooding experienced, the impact on agricultural input accessibility both pre and post-flood, and the coping mechanisms adopted by farmers to mitigate losses and sustain productivity.

4. Results and Discussion

Objective One: Effect of Flooding on Agricultural Inputs

Table 1: flooding affected the availability of agricultural inputs in your area

Variables	Frequency	Percentages (%)
Significantly reduced availability	200	50
Moderately reduced availability	109	27
Slight reduction in availability	75	19
No impact on availability	16	4
Total	**400**	**100**

Sources: field survey, 2024

Table 1 illustrates the impact of flooding on the availability of agricultural inputs in the area. Out of 400 respondents, 200 (50%) reported a significant reduction in availability, while 109 (27%) noted a moderate reduction. Slight reductions were experienced by 75 (19%), and only 16 (4%) saw no impact. This data, sourced from a 2024 field survey, highlights that a majority (96%) encountered some degree of disruption, emphasizing the substantial effect flooding has on agricultural supply chains.

Table 2: Have you observed any increase in the prices of agricultural inputs following flooding

Variables	Frequency	Percentages (%)
Yes, significant increase	179	45
Yes, moderate increase	90	23
Slight increase	89	22
No increase in prices	42	10
Total	**400**	**100**

Sources: field survey, 2024

The survey reveals that the majority of respondents observed an increase in the prices of agricultural inputs following flooding. Specifically, 45% reported a significant increase, 23% noticed a moderate increase, and 22% saw a slight increase. Only 10% observed no increase in prices. This data indicates a prevalent perception of price inflation for agricultural inputs post-flooding, with a substantial portion of the surveyed population experiencing notable cost escalations. The findings highlight the economic impact of flooding on agricultural supply chains, emphasizing the need for measures to mitigate such effects. The total sample size for the survey was 400 respondents.

Table 3: How has flooding impacted the accessibility of agricultural inputs in your community

Variables	Frequency	Percentages (%)
Limited accessibility due to damaged infrastructure	100	25
Some difficulties in accessing inputs	186	47
Minimal impact on accessibility	85	21
No impact on accessibility	29	7
Total	**400**	**100**

Sources: field survey, 2024

Table 3 shows the impact of flooding on the accessibility of agricultural inputs in a community. The majority, 47%, reported limited accessibility due to damaged infrastructure, indicating significant disruption. Some difficulties in accessing inputs were noted by 21%, suggesting moderate issues. Minimal impact was reported by 7%, while 25% experienced no impact, reflecting varied effects across the community. Overall, 75% of respondents faced challenges in obtaining agricultural inputs, highlighting the severe impact of flooding on agricultural practices. The data underscores the need for improved infrastructure resilience to support agricultural activities during and after floods.

Objective Two: Coping Strategies for Flood-affected Farmers

Table 4: Strategies employed to cope with flooding's adverse effects on agricultural activities

Variables	Frequency	Percentages (%)
Diversification of crops	63	16
Adoption of flood-resistant crop varieties	155	38
Improving drainage systems on farmland		
None of the above	98	25
Total		
	84	21
	400	100

Sources: field survey, 2024

The table highlights strategies used to mitigate flooding's impact on agriculture. The most common strategy is adopting flood-resistant crop varieties (38%), followed by improving drainage systems

(25%), and diversification of crops (21%). A notable 16% employ none of these strategies. The data, sourced from a 2024 field survey, suggests a significant reliance on adaptive agricultural practices to manage flood risks. However, the 16% not adopting any strategies points to potential gaps in knowledge, resources, or accessibility, emphasizing the need for increased support and education for farmers to enhance flood resilience.

Table 5: Have you received any support or assistance from government or non-governmental organizations to cope with flooding?

Variables	Frequency	Percentages (%)
Yes, significant support	77	19
Yes, moderate support	116	29
Minimal support	149	37
No support received	58	15
Total	**400**	**100**

Sources: field survey, 2024

Table 5 presents the survey results on receiving support for flooding. Out of 400 respondents, 19% reported significant support, 29% moderate support, 37% minimal support, and 15% no support at all. This indicates that while the majority (85%) received some form of assistance, the support levels varied, with only a small portion (19%) receiving significant help. The distribution highlights a potential gap in effective support, as a significant number of respondents received minimal or no assistance, pointing to areas for improvement in governmental and non-governmental flood response efforts.

Table 6: How effective do you consider your coping strategies in mitigating the impact of flooding on your agricultural activities

Variables	Frequency	Percentages (%)
Very effective	65	16
Moderately effective	190	47
Slightly effective	87	22
Ineffective	58	15
Total	**400**	**100**

Sources: field survey, 2024

Table 6 presents the effectiveness of coping strategies in mitigating flooding impacts on agricultural activities. Out of 400 respondents, 16% found their strategies very effective, 47% moderately effective, 22% slightly effective, and 15% ineffective. This indicates that while nearly half find their methods moderately successful, a significant portion sees only slight effectiveness or none at all, suggesting a need for improved strategies or additional support to better manage flood impacts on agriculture. The data underscores the varied effectiveness of current coping mechanisms among farmers, highlighting areas for potential intervention and enhancement.

4.1 Discussion of findings

The effects of flooding on the availability and accessibility of essential agricultural inputs in Benue State, Nigeria, present a complex challenge with multifaceted implications for the region's agricultural sector.

i. The inundation of farmlands, destruction of infrastructure, and disruption of supply chains due to flooding significantly impede the accessibility of essential agricultural inputs, exacerbating existing vulnerabilities in the agricultural system.

ii. One notable finding is the direct impact of flooding on the availability of agricultural inputs such as seeds,

fertilizers, and pesticides. Floodwaters often destroy stored inputs, rendering them unusable for the current planting season. This leads to a scarcity of these essential resources, which in turn affects farmers' ability to cultivate their lands effectively. Moreover, the destruction of transportation networks hampers the timely delivery of inputs to rural areas, further exacerbating the problem of accessibility.

iii. Furthermore, flooding can have long-term consequences on the availability of agricultural inputs by damaging agricultural infrastructure. For instance, inundation can degrade soil fertility, making it less conducive to farming even after the floodwaters recede. This necessitates additional investments in soil rehabilitation and restoration, further straining the availability of resources for farmers.

iv. The accessibility of agricultural inputs is also affected by the socioeconomic impact of flooding on farmers. Smallholder farmers, who constitute the majority of agricultural producers in Benue State, often lack the financial resilience to recover from flood-induced losses quickly. The inability to access credit or insurance exacerbates their vulnerability, as they struggle to afford essential inputs for the subsequent planting season.

5. Conclusions and Recommendations

Flooding in Benue State, Nigeria significantly disrupts the availability and accessibility of essential agricultural inputs. The inundation damages infrastructure, including roads and bridges, impeding transportation of inputs to rural areas. Fields are submerged, leading to crop loss and soil erosion, reducing the supply of inputs like seeds and fertilizers. Additionally, flooded areas become inaccessible, hindering distribution networks and exacerbating shortages. Smallholder farmers, already vulnerable, bear the brunt, facing increased costs and reduced yields. Mitigation strategies such as early warning systems, improved drainage infrastructure, and diversified input sourcing are crucial to safeguard agricultural productivity in flood-prone regions.

Based on the findings of the study, the following recommendations are made;

i. Implement comprehensive flood risk assessment and early warning systems tailored to Benue State's geography. This involves investing in flood mapping technologies, establishing community-based monitoring networks, and conducting regular drills to ensure swift responses to potential flooding events.

ii. Reduce reliance on centralized supply chains vulnerable to flooding by fostering a more diversified network of suppliers and distribution channels. Encourage local sourcing of agricultural inputs and support the development of decentralized storage facilities strategically located in flood-resistant areas.

iii. Upgrade agricultural infrastructure, including roads, bridges, and irrigation systems, to withstand the impact of flooding. Incorporate climate-resilient design principles into infrastructure projects to minimize damage during extreme weather events.

iv. Encourage farmers to adopt climate-smart agricultural practices that enhance resilience to flooding. This includes promoting the use of flood-tolerant crop varieties, implementing conservation agriculture techniques to improve soil structure and water retention, and adopting water-saving irrigation methods such as drip irrigation.

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