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Original Research Article

Agronomic and Social Effects of 2022 Flooding on Cassava Production in Delta State, Nigeria

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ABSTRACT
This study investigated the agronomic and social effects of flooding in 2022 on cassava production in Delta State, Nigeria. A descriptive survey research design was used and data collected from 250 cassava farmers in six flood-risk Local Government Areas through structured questionnaires. The research showed major agronomic impacts such as issues with planting stems as cuttings (mean = 2.6), transportation delays (mean = 2.6) and higher occurrences of cassava diseases (mean = 2.9). Research showed social well-being sustained major impacts as participants rated mobility troubles (mean=3.3) as well as psychological trauma (mean=3.0) and interrupted social activities (mean=3.0) as most detrimental. There was no significant difference (t = 1.879, p = 0.063) between agronomic and social effects indicated by a t-test, reflecting their symbiotic relationship. The study recommends joint flood mitigation strategies with agricultural support and psychosocial interventions to enhance farmers' resilience.

INTRODUCTION

Flooding has become the most disastrous climate conditions in Nigeria with tremendous effects on agriculture, food security, and rural livelihoods (Adamu & Dan'azumi, 2025). The 2022 flooding, particularly in Delta State, was one of the most disastrous in recent times, inundating agricultural fields, destroying crops, and displacing thousands of farming households. Cassava, a leading staple crop of Nigeria and primary source of revenue for small-scale farmers, suffered significantly, further exacerbating food insecurity and economic stress in agrarian communities (Adeoye, 2019; Akukwe *et al*., 2023a). Field evidence from flood-affected areas such as Kogi, Anambra, and Benue States captures the cyclical phenomenon of agricultural loss, diminished production, and compromised livelihoods caused by flooding (Adadu *et al*., 2024; Jonathan *et al*., 2020). Adeoye (2019) documented that Kogi State experienced a 41.2% reduction in agricultural crop production due to flooding while Akukwe *et al*. (2023a) detected southeastern Nigerian food insecurity increased from 67.7% to 92.8% because of flooding. The agricultural significance of Delta State combined with the flood-prone nature of this region makes it necessary to study the specific agronomic effects and social consequences of the 2022 floods on cassava farms. The geographical position of Delta State in Nigeria's Niger Delta places it at risk from periodic flooding due to heavy rainfall, river overflow, and poor drainage facilities (Balogun & Onokerhoraye, 2022).

The 2022 floods were also aggravated by spillage of water from Cameroon's Lagdo Dam, a factor that has been a recurring factor to increase the intensity of floods in

downstream states (Adeoye, 2019). According to Adeoye (2019) Kogi State agricultural crops suffered a 41.2% reduction due to flooding and Akukwe *et al*. (2023a) discovered southeastern Nigerian food insecurity increased from 67.7% to 92.8% after flooding. Research needs to prioritize studying both agronomic and social effects of 2022 flooding on cassava cultivation because this region maintains heavy reliance on cassava from its flooded fields. Female farmers, in particular, are more exposed to the risk of being negatively affected because of limited access to resources and heightened caregiving demands (Akukwe *et al*., 2023). Despite these challenges, there is little empirical evidence of the dual impacts of the 2022 floods on cassava agronomy and farmers' social welfare, particularly in Delta State. The current research fills this knowledge gap by carrying out an appraisal of the effect of the floods on cassava agrifood systems and their effects on farmers' livelihoods. Previous research on flood disasters in Nigeria, such as Adeoye (2019) in Kogi State and Akukwe *et al*. (2023a) in the southeast region, indicate that floods reduce crop yield, displacing farming communities and increasing food insecurity.

However, they fail specifically to refer to cassava a drought-resistant but flood-prone crop and focus on Delta State, which is where cassava is a major food security and economic crop. Besides, while the studies that are available identify generic flood impacts, there are not many that make a distinction between agronomic and social welfare consequences (e.g., income, health, gender disparity), therefore presenting a significant knowledge gap to policymakers and disaster management agencies. This study therefore seeks to investigate the social and agronomic effects of 2022 flooding on cassava production in Delta State, Nigeria. By synthesizing findings from comparable flood studies (e.g., Adekola *et al*., 2023; Jonathan *et al*., 2020), this research will contribute a greater understanding of the double burden of the 2022 disaster on Delta State's cassava sector, informing climate adaptation and social protection policy for rural farming communities vulnerable to flooding.

Research Objectives

1. Determine the agronomic effects of the 2022 floods on cassava production;
2. Assess the effects of the 2022 floods on the social well-being of cassava farmers; and
3. Examine the difference between agronomic and social well-being effects of the 2022 floods on farmers.

MATERIALS AND METHODS

Study Area

Delta State, Nigeria, is bounded by the States of Edo, Anambra, Imo, Rivers, and Bayelsa, and the Bight of Benin to the south. It falls between 5°00'–6°45' E and 5°00'–6°30' N and is made up of 25 Local Government Areas in three agro-ecological zones (Central, South, and North). The economy of the state is predominantly agrarian, with agriculture being the main way of life. Its tropical climate is marked by high rainfall (mean: 36.9 mm), with July maxima (423.2 mm) and January minima. Flooding poses a major threat, and climate variability contributes to it documented extreme rainfall in 2015 (3183.6 mm) resulted in worst-case farmland flooding. The lowland rainforest and swamp complexes of the state make it highly vulnerable to climate impacts, particularly floods, which destroy agriculture (Balogun & Onokerhoraye, 2022).

Research Design and Sampling Technique

It adopted a descriptive survey research design. Multistage and purposive sampling method were used in picking respondents from affected areas of the three agro-ecological zones in Delta State, i.e., Delta South, Delta Central, and Delta North. Six Local Government Areas (LGAs) were purposefully selected, two per zone, and the principal farming communities, which included Uzere and Igbide (Isoko South), Patani and Odorubu (Patani), Sapele and Amukpe (Sapele), Abraka and Orogun (Ethiope East), Asaba and Umuagu (Oshimili South), and Ogwashi-Uku and Isheagu (Aniocha South). The farmers were selected through the village heads, opinion leaders, and contact farmers. By the end of the sampling exercise, 250 respondents were selected for the study. Data were collected through a structured questionnaire containing 3 sections: demographic factors (Section A), agronomic effects of flooding (Section B), and social well-being effects (Section C).

Data Measurement and Analysis

Both categorical and numerical scales were employed in measuring the variables. Socioeconomic characteristics included age (chronological years), marital status (married=1, single=2, divorced=3, widow/widower=4), sex (male=1, female=2), educational level (years of formal schooling), farming experience (years), and cooperative membership (member=1, non-member=2). Agronomic and Social effects were assessed using a 4-point Likert scale. For analysis, descriptive statistics (frequencies, percentages, mean, standard deviation) summarized demographic and flood impact data, while inferential statistics specifically T-test tested the mean differences in social and agronomic effect of flooding on cassava production.

RESULTS AND DISCUSSION

Socioeconomic Characteristics

The result shown in Table 1 reflects the socioeconomic status of the respondents encompassing the study area. The research findings revealed that out of the respondents, 58.8% were males and 41.2% females, consistent with

Nigeria's male-dominated agricultural environment where women have insufficient access to land and increased flood exposure with economic and caregiver constraints (Adekola *et al*., 2023; Akukwe *et al*., 2023, Owigho *et al*., 2023). Farmers' mean age was 45 years, with 36.4% aged 41–50, reflecting experience-based resilience, though aging (10.8% over 60) and low youth participation (11.2% under 30) raise long-term adaptive capacity issues (Okeleye *et al*., 2016; Adadu *et al*., 2024). They were mostly married (67.6%), with family labor utilized but high dependency ratios during floods, while widowed/divorced farmers (17.2%) had no support (Akukwe, 2019). Educationally, 63.6% of them were secondary/tertiary educated, increasing flood adaptation literacy, while 36.4% with primary/no education were still disadvantaged in access to mitigation measures (Jonathan *et al*., 2020). Averagely, the farm sizes were 2.87 hectares, of which 51.2% farmed 1–3 hectares, increasing vulnerability to complete loss of crops (Adeoye, 2019); 69.6% cooperatively affiliated acquired resilience through shared facilities, compared to the 30.4% non-members (Bukhari *et al*., 2024). Despite the fact that agriculture was the predominant source of income (74.4%), constrained incomes (₦337,173.75/year) stifled recovery, highlighting the urgency for diversified livelihoods and institutional support to improve climate resilience (Adadu *et al*., 2024; Akukwe *et al*., 2023a).

Table 1: Socioeconomic characteristics of respondents

Variable	Frequency	Percent (%)	Mean/Mode
Gender			**Male**
Male	147	58.8	
Female	103	41.2	
Age			**45 years**
Below 30	28	11.2	
31–40	57	22.8	
41–50	91	36.4	
51–60	47	18.8	
61 and above	27	10.8	
Marital Status			**Married**
Single	38	15.2	
Married	169	67.6	
Divorced	22	8.8	
Widowed	21	8.4	
Educational Level			**Secondary**
No formal education	32	12.8	
Primary	59	23.6	
Secondary	106	42.4	
Tertiary	53	21.2	
Farm Size (ha)			**2.87 hectares**
Below 1	43	17.2	
1–3	128	51.2	
4–6	56	22.4	
Above 6	23	9.2	
Farming Experience (years)			**11 years**
Below 5	31	12.4	
6–10	68	27.2	
11–15	102	40.8	
Above 15	49	19.6	
Annual Income (₦)			**₦337,173.75**
Below ₦100,000	53	21.2	
₦100,001–₦500,000	144	57.6	
₦500,001 and above	53	21.2	
Membership of Cooperative			**Yes**
Yes	174	69.6	
No	76	30.4	

Main Source of Income			Farming
Farming	186	74.4	
Trading	46	18.4	
Other	18	7.2	

Source: Author, 2025.

Agronomic Effects of the 2022 Flooding on Cassava Production

In Table 2, the 2022 flood experienced serious agronomic impacts on cassava production in the study area as shown by the high mean ratings across the items. The most severe issues included planting stem cuttings with challenges (mean = 2.6), transport disruption (mean = 2.6), and challenges in fertilizer/manure application (mean = 2.7). Adeoye (2019) confirmed that Kogi State flood events created open fields and planting delays and disrupted the timely use of farm inputs which resulted in decreased agricultural output. According to Akukwe *et al*. (2023) flood water sweeps away fertilizers which causes fast soil nutrient depletion and hinders cassava plant development. The very severe challenges in tuber harvesting (mean = 2.5) and increased susceptibility to cassava diseases (mean = 2.9) also corroborate evidence by Adadu *et al*. (2024), that waterlogged soils increase fungal and bacterial infections, reducing both yield quantity and quality. All these agronomic disruptions are threats to food security, as cassava is a staple food in Nigeria becomes less available and more expensive during post-flooding (Jonathan *et al*., 2020).

Interestingly, weeding effect (mean = 2.4) and low cassava tuber yield (mean = 2.4) were both "not severe," suggesting that flooding may temporarily inhibit weed growth due to the submerged condition, as observed by Okeleye *et al*. (2016). This benefit is, however, temporary, considering the reality that post-flooding weed growth is typically intensive to manage (Adekola *et al*., 2023). The moderate yield effect can also suggest farmers' adoption of early-maturing or flood-resistant varieties, methods documented by Jonathan *et al*. (2020) among Southern Guinea Savanna households. Nevertheless, the grand mean of 2.6 suggests that flooding poses severe threats to cassava production systems. Policy interventions should target improved drainage systems, early warning systems, and the release of disease-resistant varieties of cassava in a bid to mitigate such agronomic problems (Bukhari *et al*., 2024).

Table 2: Agronomic effects of the 2022 flooding on cassava production

Agronomic Effects	Mean	Std. Dev.	Ranks
Difficulty in planting stem cuttings	2.6	1.033	Severe
Effects of transportation	2.6	1.066	Severe
Effects of weeding	2.4	0.912	Not Severe
Effects of fertilizer/manure application	2.7	0.909	Severe
Low yield of cassava tuber	2.4	0.947	Not Severe
Challenges of harvesting tubers	2.5	0.983	Severe
Challenges of cassava diseases	2.9	0.905	Severe
Grand mean	2.6		

Source: Author, 2025. Mean value ≥2.5 is Severe, <2.5 is Not Severe

Effects of the 2022 Flooding on Social Well-Being of Cassava Farmers

Table 3 presents that the social welfare of cassava farmers in the study location was extremely affected by the flood in 2022, based on high mean ratings (3.0 to 3.3) from all measured items. The most powerful effect was mobility hindrance (mean = 3.3), as witnessed by Adeoye (2019) and Adadu *et al*. (2024), who observed that floods interrupt transportation networks, disconnecting communities and inhibiting access to markets, health facilities, and social functions. Similarly, the critical psychological distress (mean = 3.0) corroborates the work of Akukwe *et al*. (2023), who concluded that flood survivors often show depression, anxiety, and post-traumatic stress after damage to property, food insecurity, and uncertain recovery opportunities. The mean score of 3.2 for uncomfortable living conditions points to damaged residential structures as well as faulty sanitary facilities which continues to be a persistent issue based on reports from NEMA and Adeoye (2019) and Jonathan *et al*. (2020). This showed flood victims were crammed into crowded settlements prone to diseases.

The survey results indicated that meeting and party attendance disruption (mean = 3.0) demonstrates how floods break down community relationships according to Ralph-Imoniruwe and Idama (2023) who documented disrupted cultural events and collective leadership practices. Poor communication (mean = 3.0) exacerbates these challenges, as damaged roads and electricity networks impede information flow, delaying emergency responses and recovery efforts (Bukhari *et al*., 2024). The grand mean of 3.1 confirms that flooding's social impacts

are systemic and multidimensional, editing with Akukwe (2019)'s integrated vulnerability assessment, which linked flood severity to declines in social cohesion and mental health. These findings collectively emphasize the need for holistic interventions such as psychosocial support, improved infrastructure, and community-based early warning systems to mitigate the non-economic dimensions of flood disasters.

Table 3: Effects of the 2022 flooding on social well-being of cassava farmers

Flooding Effects on Social Well-Being	Mean	Std. Dev.	Remark
Problem of attending meetings/parties	3.0	0.849	Severe
Challenges of moving from place to place	3.3	0.904	Severe
Psychological effect/trauma	3.0	0.973	Severe
Uncomfortable living conditions	3.2	0.897	Severe
Poor communication	3.0	0.902	Severe
Grand mean	3.1		

Source: Author, 2025. Mean value ≥2.5 is Severe, <2.5 is Not Severe

Difference between agronomic and social well-being effects of the 2022 floods on farmers

Table 4 outcome of the t-test (t = 1.879, df = 248, p = 0.063) yields a statistically non-significant but marginally difference between social welfare and agronomic effects of the 2022 floods to farmers in Delta State, considering that the obtained p-value value (0.063) exceeds the conventional 0.05 critical value. This concurs with empirical literature highlighting the intertwined nature of flood effects to welfare and agriculture. For instance, Adeoye (2019) and Akukwe *et al*. (2023a) demonstrated that flood damage to crops (agronomic effect) has a direct impact on food insecurity, loss of revenue, and health problems (social well-being), and they constitute a cyclic vulnerability. Similarly, Adadu *et al*. (2024) confirmed that Benue State agricultural losses heightened household dependency ratios and psychological stress, blurring agronomic and social effects. However, the almost significance of the mean difference (0.250) suggests slight differences, possibly pointing to findings by Jonathan *et al*. (2020) and Adekola *et al*. (2023), where farmers prioritized short-term agronomic recovery (e.g., replanting) to social well-being in the long term (e.g., mental health support). Thus, while the null hypothesis (H01) of no meaningful difference between agronomic and social well-being effects cannot be rejected, the p-value at the borderline highlights the urgency of concerted policies addressing both agricultural rehabilitation and psychosocial support, as indicated by Akukwe (2019) and Ralph-Imoniruwe and Idama (2023).

Table 4: Difference between agronomic and social well-being effects of the 2022 floods on farmers

t-test for Equality of Means	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
	1.879	248	0.063	0.250	0.133

Source: Author, 2025.

CONCLUSION

The 2022 flooding throughout Delta State produced extensive effects that linked together impacts on both plant cultivation of cassava and the overall social health of local farmers. The agricultural practices of planting and harvesting together with disease prevention took major hits due to flooding which posed harm to food security. The flooding events created serious limitations for social mobility along with psychological distress that caused communities to separate from one another. While the statistical difference between these effects was marginal, their synergy underscores the need for holistic interventions. The findings align with existing literature in Nigeria, where recurrent exposure of smallholder farmers to climatic shocks has been the case. Resolution of the issues is by coordinated efforts towards sustaining agricultural as well as social protection systems. Based on the findings the following recommendations as listed were made: Delta State Ministry of Agriculture, in collaboration with the National Root Crops Research Institute and NGOs, plans to enhance flood-tolerant cassava varieties through farmer training and subsidized planting materials; Nigerian Meteorological Agency and State Emergency Management Agencies should plan to enhance early warning systems by deploying IoT-based flood monitoring devices and developing mobile alert systems; Psychosocial support schemes have to be enforced by the Ministry of Health in collaboration with organizations like the Red Cross through centres of counselling at the community level and trauma healing workshops for women and aged-headed households that were flooded; Agricultural Development Programs and cooperative societies should avail the farmer cooperatives with greater access to low-interest loans from the Central Bank of Nigeria, low-cost crop insurance programs, and community storage houses so as to help farmers to recover as a group from flood damages; Local authorities are to enhance drainage facilities in farming areas by

building and maintaining adequate waterways and embankments, especially in flood-risk areas as defined in this research, in order to mitigate subsequent flood losses to cassava farms

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