



## DETERMINANTS OF FOOD SECURITY STATUS OF RICE FARMERS IN FLOOD PRONE AREAS IN YOBE STATE, NIGERIA

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### ABSTRACT

The study examined the determinants of food security status of rice farmers in flood prone areas in Yobe State, Nigeria. A multistage sampling technique was used in selecting 425 respondents. Data were collected using structured questionnaire and analyzed using descriptive and inferential statistics. The results revealed that majority (88.8%) of the respondents were male with mean age of 36 years. Majority of the respondents (86.4%) were married, and 39.3% had primary education. The mean household size, farm size, farming experience, monthly income and distance to market of the respondents were 7 persons, 1.3 ha, 9 years, ₦74,811 and 10.9km respectively. The result indicated that about 13% were food secured and 41% were severely food insecure, both moderate and mildly food insecure happened to be 23% each. The factors that influenced food security status were age ( $P<0.05$ ), household size ( $p<0.01$ ), educational status ( $p<0.05$ ), monthly income ( $p<0.05$ ) and cooperative membership ( $p<0.05$ ). The study concluded that educational status, monthly income, and cooperative membership play critical roles in enhancing food security among rice farmers in the study area. Conversely, larger household sizes and older ages reduce the likelihood of achieving food security. The study recommends that government and stakeholders enhance farmers' knowledge through adult literacy and vocational training, provide subsidized inputs, credit facilities, and market access to boost income, and promote cooperative membership and family planning awareness to improve food security.

**Keywords:** Food, Security, Rice, Farmers, Flood-prone, Factors

### INTRODUCTION

Rice is a strategic staple in Nigeria's food system and rural economy, yet its production and availability are increasingly constrained by climate-related shocks, especially flooding in the northern states. National and international assessments show that recent flood seasons have disrupted agricultural livelihoods, damaged cropland and infrastructure, and heightened food insecurity risks among smallholders (FAO, 2023; GRFC, 2023; NBS/NEMA/UNDP, 2023). In Yobe State where agriculture is a principal livelihood, rainfall anomalies and flood events coincide with critical stages of rice production, undermining yields and household access to food (NBS/NEMA/UNDP, 2023; Mwakyusa *et al.*, 2023). Evidence from northeast Nigeria and Yobe further indicates that climate stressors already depress rice output and income, amplifying vulnerability among farm households (Seahi Publications, 2023).

Beyond biophysical shocks, household food security among farming populations is shaped by socioeconomic characteristics and access to resources. Studies across Nigeria consistently identify factors such as household size, education, farm size, access to extension, off-farm income, and market access as salient determinants of food security status (Wudil *et al.*, 2023; Otekunrin *et al.*, 2023). Experience-based metrics like the Household Food Insecurity Access Scale (HFIAS) are widely used to characterize households' food access conditions and to classify food security status in rural settings, including among farmer groups (Ukonu *et al.*, 2023; Salman *et al.*, 2023). These tools and



determinants provide a robust analytical foundation for examining rice farmers' welfare in flood-prone contexts.

Despite this emerging evidence, there remains a critical knowledge gap specific to rice farmers in Yobe's flood-prone areas: how do their socioeconomic profiles interact with recurrent flooding to shape their food security outcomes? The 2022 flood disaster which inflicted extensive agricultural losses nationally, highlights the urgency of localized analysis to guide responsive programming and investments (NAERLS, 2023; NBS/NEMA/UNDP, 2023). In Yobe, where smallholders depend on seasonal rivers and lowland fields, exposure to flood hazards likely compounds pre-existing constraints (limited inputs, storage, credit, and extension contact), with unclear net effects on household food security status.

Recurrent flooding in Yobe State has continued to threaten rice production, disrupt livelihoods, and worsen household food insecurity (FAO, 2023; NBS/NEMA/UNDP, 2023). Despite the increasing frequency and severity of flood events, there is limited empirical evidence on how these disasters, alongside farmers' socioeconomic characteristics, affect their food security status (Wudil *et al.*, 2023; Otekunrin *et al.*, 2023). Without a clear understanding of these relationships, interventions by policymakers, extension agents, and development partners may remain ineffective and poorly targeted. Therefore, this study seeks to fill this gap by i. describe the socioeconomic characteristics of rice farmers in flood-prone areas, ii. examine their food security status, and iii. determine the factors influencing their food security status.

## METHODOLOGY

### The Study Area

The study was conducted in Yobe State located in the North- East, Nigeria. The state lies on latitude 10.00' to 13.00'N and longitude 10.50' to 13.50'E. It is located in the Sudano-Sahelian vegetation zone which is characterized by a hot and dry climate for most of the year (FAO and IITA, 2021). The Annual average rainfall and temperature ranges between 423.3 mm and 34°C respectively, hottest months in the state are March-May with temperatures of between 39°C - 44°C (Ambrose *et al.*, 2018; Acresal, 2023). Yobe state has a total land mass of 47 153 kilometers of which 70 percent of the land area (33 007.1 square kilometer). The population of the state according to head count in 2006 was about 2.6 million and projected to be 3.8 million in 2025. Millet, sorghum, cowpea and maize are the major food crops.

### Sampling Procedure and Sample Size

The multistage sampling procedure was employed in selecting respondents for this study. In the first stage, five (5) L.G.As, namely Bade, Jakusko, Nguru, Bursari and Karasuwa were purposively selected based on the predominance of rice production and their susceptibility to flooding in the area. In the second stage, five (5) villages were also purposively sampled from each of the selected L.G.As based on the concentration of smallholder rice farmers in the area making a total of 25 villages. In the third stage, 15% of the farming households in each selected village were proportionately sampled to ensure adequate representation of the population. According to the available records collected from **Yobe State Agricultural Development Programmes (YOSADPs)**, the sampling frame of farming households in the study area was 2,833. In all, a total of four hundred and twenty-five (425) respondents were used in the study.

### Method of Data Collection

The data were collected through the use of a structured questionnaire and administered with the help of trained enumerators. The questionnaire was designed based on the specific objectives of the study and was divided into two main sections, section A: socioeconomic characteristics of rice farmers, this section gathered information on the respondents' demographic and socioeconomic profiles. It covered variables such as age, sex, marital status, household size, educational level, farming experience, farm size, monthly income and membership in farmers' associations. While, section B: food security status of rice farmers, this section focused on assessing the food security situation of the respondents. It included questions on household food availability, accessibility,



utilization, and stability, using standardized indicators such as household dietary diversity and coping strategies during food shortages.

### Method of Data Analysis

Data collected were analyzed using descriptive and inferential statistics. Descriptive statistics used were frequency distribution, percentages and mean which was used to achieved objectives i and ii. The inferential statistics used to in this study was binary logistics regression, which were used to achieved objective iii. The model is implicitly specified as follows:

$$Y=b_0+b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+b_6x_6+b_7x_7+b_8x_8+b_9x_9+b_{10}x_{10}+\varepsilon \dots\dots\dots(1)$$

where;

$B_0$  =Intercept

$b_1 - b_{10}$  =Regression coefficients

Y = food security status (1= food secured, 0= food insecured)

$X_1$ = Age (years),

$X_2$ =Sex (1=male, 0=female),

$X_3$ =Household size (number of persons),

$X_4$ = Educational status (years),

$X_5$ =Cooperative membership ( yes/no),

$X_6$ = Farm size (hectares),

$X_7$ = Farming experience (years)

$X_8$ = Monthly income (naira).

$X_9$ =Extension contact (numbers of contact)

$X_{10}$ =Distance to market (kilometer)

## RESULT AND DISCUSSION

### Socio-Economic Characteristics of the Respondents

#### Quantitative socioeconomic characteristics

The Table 1 revealed the age of respondents 36.5%, are within the 25–34 age range, followed by 20.7% in the 45–54 category, with a mean age of 36 years. This implies that most farmers are within their economically active years, which is beneficial for labor-intensive rice farming in the study area, while, 7.1% of respondents aged 65 and above, aging poses a potential challenge for agricultural sustainability. These findings differ from Wabi *et al.* (2022), who reported that the majority (78.7%) of respondents in Benin were between 30 and 59 years old with a mean age of 46.

Regarding household size, 29.2% of respondents had 4–6 members, while 26.6% had 1–3 members, with a mean household size of seven members. Large households may provide more family labor but also increase food consumption needs. Similar results were reported by Danmaigoro and Gona (2022), who found that rice farming households in Kebbi State, averaged five members. Also, farming experience shows that the majority (72%) had between 0 to 10 years, with a mean of 9 years. This indicates an influx of relatively new farmers, possibly due to increased interest in rice cultivation or resettlement in flood-prone areas. A small proportion (8.2%) had over 21 years of farming experience, suggesting a limited number of highly experienced farmers with deep local knowledge. This is contrary to Agyo and Ornan (2021), who reported a mean farming experience of 16 years in Taraba State.

Farm size analysis reveals that 43.3% cultivated 1–2 hectares, while 41.4% operated on less than 1 hectare, with a mean farm size of 1.3 hectares. This highlights the predominance of smallholder farming in the flood-prone area, limiting mechanization and resilience against environmental shocks. The findings align with Jegede *et al.* (2021), who reported a similar trend in Abuja. Monthly income, 39.5% earned between ₦30,000 and ₦49,999, while 24.2% earned below ₦30,000, with a mean monthly income of ₦74,811.76. Low income constrains investment in improved seeds, fertilizers, and flood-resistant practices. This result differs from Idu *et al.* (2024), who reported an average annual income of ₦39,312.68 in Nasaraw State. Moreover, the average distance to market was 10.86 km, with 30% traveling 11–20 km and 26% traveling 1–5 km. Long distances pose transportation



challenges and may limit timely produce sales, potentially reducing farmers' incomes. This finding is not aligning with Abdulazez *et al.* (2018) who reported that the mean market distance is 2.5 km in their Kogi State.

**Table 1:** Distribution of Respondents Based on Quantitative Socioeconomic Characteristics

Variables	Frequency	Percentage	Mean
<b>Age</b>			<b>36</b>
15–24	32	7.5	
25–34	155	36.5	
35–44	78	18.4	
45–54	88	20.7	
55 and above	72	17.0	
<b>Household size</b>			
1–3	113	26.6	<b>7</b>
4–6	124	29.2	
7–9	92	21.6	
10–12	44	10.4	
<b>Farming experience</b>			
0–5	150	35.3	
6–10	156	36.7	<b>9</b>
11–15	57	13.4	
16–20	27	6.4	
21 and above	35	8.2	
<b>Farm size (ha)</b>			
<1	176	41.1	
1–2	184	43.3	1.3
2.1–3	48	11.3	
3.1 and above	17	4.0	
<b>Monthly income (₦)</b>			
<30,000	103	24.2	
30,000–49,999	168	39.5	<b>74,811.76</b>
50,000–99,999	64	15.1	
100,000–199,000	48	11.3	
200,000 and above	42	9.9	
<b>Distance to market (km)</b>			<b>10.86</b>
<1	78	18.0	
1–5	112	26.0	
6–10	32	8.0	
11–20	128	30.0	
Above 20	75	17	10.86

### Qualitative socioeconomic Characteristics

The Table 2 showed the sex distribution, majority (83.8%) of respondents are men, while only 16.2% are female. This aligns with cultural and economic norms limiting women's participation in agriculture. Jegede *et al.* (2021) reported that more than half of respondents in Abuja were male. In addition, for marital status, the majority (86.4%) were married, suggesting strong family responsibilities that can influence decision-making in farming. This aligns with Apuyor *et al.* (2021), who found similar results among rice farmers in Niger State. Similarly, educational status analysis shows that 39.3% attained primary education, 26.6% had no formal education, and only 10.8% had tertiary education. This low level of higher education limits access to agricultural innovations and extension services. This differs from Jirgi *et al.* (2022), who found higher rates of formal education in Niger State. However, cooperative membership was relatively high, with 68% belonging to at least one cooperative. This strengthens collective bargaining and access to resources. Jirgi *et al.* (2022) also



reported similar findings in Niger State. Extension contact was very low, with 93% having no contact with extension agents. This limits farmers' access to information and modern practices, contrary to Fasakin *et al.* (2024), who reported higher extension contact in Ebonyi State.

**Table 2:** Distribution of Respondents Based on Qualitative Socioeconomic Characteristics (n=425)

Variables	Frequency	Percentage
<b>Sex</b>		
Male	356	83.8
Female	69	16.2
<b>Marital status</b>		
Married	346	86.4
Single	54	13.6
<b>Educational status</b>		
No formal	114	26.6
Primary	167	39.3
Secondary	98	23.1
Tertiary	46	10.8
<b>Cooperative member</b>		
No	136	32.0
Yes	289	68.0
<b>Extension contact</b>		
Quarterly	11	3
Monthly	16	4

**Source:** Field Survey (2024)

### Food Security Status of Respondents

The food insecurity status of the farming households using the HFIAS Score is presented in Table 3. The result revealed that only 13% of the households were food secure, while 23%, 23%, and 41% of the households were mildly, moderately, and severely food insecure respectively. This shows that the proportion of severely food insecure households increased after the flooding, thereby pushing more households into greater levels of food insecurity. Evidence from Ilori *et al.* (2024) strongly supports the observation that about 35% are moderately food insecure in Ibadan, Nigeria.

**Table 3:** Distribution of Respondents based on Food Security Status

Food Security Status	Frequency	Percentage
Food secured	54	13
Mildly food insecure	99	23
Moderately food insecure	98	23
Severely food insecure	174	41
<b>Total</b>	<b>425</b>	<b>100</b>

**Source:** Field Survey (2024)

### Factors Influencing Food Security Status of the Respondents

The **log likelihood value** of **185.225** indicates how well the logistic regression model fits the data. In this context, a higher log likelihood suggests that the model explains the variation in the food security status of respondents reasonably well. Combined with the **Cox & Snell  $R^2=0.291$**  and **Nagelkerke  $R^2=0.406$** , the value implies that the model has a **good explanatory power**, meaning that the included variables **age, household size, educational status, monthly income, and cooperative membership** collectively contribute significantly to predicting the food security status of the respondents. Five (5) variables were significant factors that influence the food security status in the study area. These include **age, household size, educational status, monthly income, and cooperative membership**. The Table 4 shows the coefficient for age (-0.045) was statistically significant at the 5% level, indicating that as the age of the household head increases, the likelihood of





being food secure decreases by approximately 4.4% ( $\text{Exp(B)} = 0.956$ ). This supports the findings of Orjiakor *et al.* (2023), who reported that older farmers may have reduced physical capacity and slower adoption rates for innovative agricultural practices, thereby affecting productivity and income in Nigeria.

Household size (-0.217) was significant at the 1% level, implying that each additional household member reduces the likelihood of being food secure by about 19.5% ( $\text{Exp(B)} = 0.805$ ). This supports Otekunrin *et al.* (2023), who observed that large households increase dependency ratios, leading to reduce per capita food availability in Adamawa State, Nigeria. However, educational status (0.048) was significant at the 5% level, showing that higher education increases the odds of being food secure by about 47.8% ( $\text{Exp(B)} = 1.478$ ). This implies that household heads with higher levels of education are more likely to be food secure compared to those with little or no formal education. This corroborates Yusuf *et al.* (2021) who noted that education enhances adoption of improved practices and access to market information. Policy implications include promoting adult literacy and farmer training programs as core components of food security strategies.

Monthly income (0.002) was significant at the 5% level, indicating that higher income increases the odds of being food secure by 0.2% per unit of currency earned ( $\text{Exp(B)} = 1.002$ ). This is consistent with Aremu *et al.* (2022) and Otekunrin *et al.* (2023), who found income diversification to be a robust predictor of food security. The implication is that rural development programs should incorporate non-farm income opportunities to stabilize household food access. Moreover, cooperative membership (0.526) was significant at the 5% level, showing that members are 69.2% more likely to be food secure ( $\text{Exp(B)} = 1.692$ ). This supports Kehinde and Kehinde (2020) and Yakubu *et al.* (2021), who found that cooperatives improve access to inputs, credit, and market linkages. Strengthening cooperative societies could therefore be an effective rural food security intervention.

**Table 4:** Factors Influencing Food Security Status of the Respondents

Variables	B	S.E.	Wald	Sig.	Exp(B)
Age	-0.045	0.018	6.250	0.012**	0.956
Sex	0.302	0.265	1.298	0.255 <sup>Ns</sup>	1.352
Marital Status	0.183	0.292	0.393	0.530 <sup>Ns</sup>	1.201
Household Size	-0.217	0.071	9.333	0.002***	0.805
Farming Experience	0.014	0.022	0.411	0.521 <sup>Ns</sup>	1.014
Educational Status	0.391	0.198	3.900	0.048**	1.478
Farm Size	0.225	0.118	3.638	0.057 <sup>Ns</sup>	1.252
Monthly Income	0.002	0.001	4.000	0.045**	1.002
Cooperative Membership	0.526	0.250	4.426	0.035**	1.692
Extension Contact	0.154	0.220	0.491	0.484 <sup>Ns</sup>	1.167
Distance to Market	0.064	0.061	1.103	0.293 <sup>Ns</sup>	1.066
Constant	-1.837	0.742	6.126	0.013**	0.159
No. of Observations	425				
Log Likelihood	185.225				
Cox & Snell R <sup>2</sup>	0.291				
Nagelkerke R <sup>2</sup>	0.406				

Source: Field Survey (2024) \*\*\*=  $P < 0.001$ , \*\*=  $P < 0.05$



## CONCLUSION AND RECOMMENDATIONS

The study concluded that socioeconomic factors such as educational status, monthly income, and cooperative membership play critical roles in enhancing food security among rice farmers in the study area. Conversely, larger household sizes and older ages reduce the likelihood of achieving food security.

Based on the findings of this study, the following recommendations are made:

- i. Government and relevant stakeholders should organize adult literacy and vocational training programs to improve farmers' knowledge and capacity.
- ii. Farmers should be supported with subsidized inputs, access to credit, and market linkages to increase their income and improve food security.
- iii. Policymakers should sensitize farmers on the benefits of joining cooperatives to enhance access to information, inputs, and financial resources.
- iv. Awareness programs on family planning should be promoted to help farmers manage household size effectively and reduce pressure on available food resources.

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