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Consumer demand and household food security on rice, maize, and cowpea in Niger State, Nigeria.

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ABSTRACT

This study examined consumer demand and household food security for rice, maize, and cowpea in four Local Government Areas (LGAs) of Niger State, Nigeria: Bosso, Lapai, Chanchaga, and Paikoro. The study aims to describe the socioeconomic characteristics of respondents, assess consumer behavior and purchasing decisions, determine the factors influencing demand, analyze household food security status, and identify challenges affecting consumer demand. A multistage sampling technique was employed to select a total of 332 respondents (150 from Bosso/Lapai and 182 from Chanchaga/Paikoro). Primary data were collected using structured questionnaires administered via Kobo Collect and personal interviews. Data were analyzed using descriptive statistics, Multiple Regression analysis, Foster Greer Thorbeeke (FGT) food security indices, Probit regression, and Kendall's coefficient of concordance. The socioeconomic results revealed a male-dominated household headship across all LGAs (86% in Bosso/Lapai; 78.6% in Chanchaga/Paikoro), with a mean age of approximately 40-42 years and large household sizes averaging 10-11 persons. Maize and rice were identified as the most widely consumed staples due to affordability and ease of preparation, while cowpea consumption was lower, serving mainly as a supplementary protein source. Multiple regression analysis revealed that gender, education, farm income, household size, and prices of substitutes significantly influenced the demand for the selected crops. The FGT index indicated high levels of food insecurity across the state; in Bosso/Lapai, 62.7% of households were food insecure, while in Chanchaga/Paikoro, 61.5% were food insecure. Probit analysis identified education, farm income, food availability, and affordability as positive determinants of food security, while distance to markets and large household sizes negatively affected it. Major challenges identified included price instability, poor road/transport infrastructure, high prices, and lack of credit access. The study recommends improving rural credit access, upgrading transport infrastructure, stabilizing prices through grain reserves, and promoting adult literacy and nutrition education.

KEY WORDS: *Consumer demand*; *Food security*; *Rice*; *Maize*; *Cowpea*; *Nigeria*

1. Introduction

Agriculture plays a vital role in Nigeria's economy, contributing significantly to national GDP, employment and household livelihoods. It engages over 70% of the rural labor force (NBS,

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2020), and smallholder farmers account for about 90% of total agricultural output. However, the sector faces systemic challenges including fragmented landholdings, overreliance on rain-fed agriculture, low yields, pest infestations, limited access to inputs, poor infrastructure, and climate variability. These issues hinder the sector's capacity to meet growing food demand and contribute to seasonal shortages and market instability.

Exploring future pathways in food and consumer economics, particularly the role of agri-food trade in Nigeria, holds considerable significance in addressing food security, economic development, and trade sustainability. Consumer demand defined as the quantity of a product or service that consumers are willing and able to buy at a given price over a specific period is vital for policymakers. It is influenced by key factors such as price (Kotler & Keller, 2020), income (Mankiw, 2020), consumer preferences (Euromonitor International, 2020), and seasonality.

Staple crops such as rice, maize, and cowpea are particularly critical for Nigeria's food security. Rice, once a luxury, has become one of the most consumed cereals in both rural and urban areas. Despite initiatives like the Anchor Borrowers' Programme, local production remains insufficient, leading to dependence on imports and price vulnerability. Maize is a dietary and industrial staple, widely used in making local dishes like ogi and tuwo, yet its production is often constrained by pests and erratic rainfall. Cowpea, a key protein source especially for low-income households, is plagued by post-harvest losses and pest infestation.

Agricultural marketing is crucial in bridging the gap between production and consumption. However, in Nigeria, poor storage, weak transportation infrastructure, and unreliable market information contribute to food price volatility (FAO, 2015). In areas like Bosso, Lapai, Chanchaga, and Paikoro LGAs, farmers often depend on middlemen, which distorts pricing. Urban and peri-urban populations are particularly affected, as these households rely more on food purchases than subsistence farming.

Food security is multidimensional, encompassing availability, accessibility, utilization, and stability (FAO, 2021). Even when food is available, households may remain food-insecure due to low purchasing power or poor utilization. Food insecurity and hunger are forerunners to nutritional, health, and economic development problems (Fashina *et al.*, 2020).

Food security remains a pressing developmental issue in Niger State's agrarian communities. Despite being leading producers of rice, maize, and cowpea crops that constitute a significant portion of the local dietary intake, LGAs such as Bosso, Lapai, Chanchaga, and Paikoro experience recurrent seasonal food insecurity.

First, production-consumption imbalances undermine local food systems. For instance, Bosso's floodplains yield significant rice, yet post-harvest losses exceeding 30% and inadequate market infrastructure limit household access. Similarly, Lapai's cowpea-producing zones experience massive price fluctuations. In Chanchaga and Paikoro, limited access to nutritious food is exacerbated by urbanization and informal food systems.

Second, demand-side constraints exacerbate food insecurity. Recent food inflation, standing at over 22% in 2024, has eroded purchasing power, leading households to substitute preferred staples with cheaper, less nutritious alternatives. Climate-induced shocks, such as flooding, have triggered localized supply shortages.

Third, policy-implementation gaps hinder progress. While Niger State's Agricultural Transformation Agenda emphasizes productivity, it pays insufficient attention to demand-side dynamics. The absence of localized data on staple crop demand patterns has led to blanket programs that overlook socio-demographic variations.

Previous studies found that only 16% of households in northern Nigeria were food secure. Thus, this study was conceived to ascertain the extent to which consumer demand and household food security in rice, maize, and cowpea have achieved their objectives in the study area.

The aim of this study is to assess consumer demand and household food security for rice, maize, and cowpea in Bosso, Lapai, Chanchaga, and Paikoro Local Government Areas of Niger State, Nigeria. The specific objectives are to:

i. examine the socioeconomic characteristics of the respondents.
ii. ascertain consumer behavior on the selected food grains (rice, maize, cowpea).
iii. determine the general purchase decision of consumers.
iv. determine the factors influencing the demand for the selected food grains.
v. determine the food security status of households in the study area.
vi. analyze the determinants of household food security.
vii. identify the challenges and problems of consumer demand for the selected food grains.

2. Methodology

2.1 Study Area

This study was conducted in four Local Government Areas (LGAs) Chanchaga, Paikoro, Bosso, and Lapai all in Niger State, north-central Nigeria. These LGAs were purposely selected for their high household density, diverse socioeconomic profiles, and documented engagement in staple food production and consumption.

Chanchaga LGA (population: 201,429; 2006 NPC census) covers approximately 72 km² and is inhabited mainly by the Nupe, Gbagyi, Hausa, Kamuku, and Kambari ethnic groups. It has a tropical savanna climate (60°F–94°F) with distinct wet (May-October) and dry (November–April) seasons, and its economy is driven primarily by farming, livestock rearing, and petty trading.

Paikoro LGA, headquartered in Paiko (Approximately 25 km south-east of Minna), covers about 2,066 km². Its 2006 census population of 158,086 is projected to have risen to approximately 271,300 by 2022. The area is predominantly agricultural; major crops include maize, sorghum, millet, and cowpea. The Gbari and Kadara Koro are the principal ethnic groups.

Bosso LGA (population: 208,212; 2019 census) shares borders with Chanchaga LGA and is predominantly Gbagyi, with smaller Fulani, Nupe, Hausa, and Yoruba communities. Fertile soils support cultivation of maize, cowpea, millet, yam,

and rice, making it a key hub for both subsistence and commercial farming.

Lapai LGA is another agriculturally significant area in Niger State, with the population engaged mainly in crop farming, animal husbandry, and small-scale trading across a mix of rural and semi-urban settlements.

2.2 Population of the study

The study population comprised households in the four selected LGAs. The target respondents were household heads and individuals primarily responsible for food purchasing decisions within their households.

2.3 Sampling technique and sample size

A multistage sampling procedure was adopted. In Stage 1, the four LGAs were purposely selected based on their prominence in staple food production and documented food security challenges. In Stage 2, three wards were randomly selected from each LGA (twelve wards in total). In Stage 3, the Taro Yamane formula was applied at a 95% confidence level and 5% margin of error to determine sample sizes from a combined NPC sampling frame of 751,740 households across all selected wards as used by Sallawu *et al*. (2016).

$$n = \frac{N}{1+N(e)^2} \text{ ----------(1)}$$

Where:
n = Sample size required;
N = Sampling frame;
1 = Constant; and
e^2 = level of precision (5%).

The population and sample size of the respondent in the LGA is summarized and presented in **Table 1**. In Stage 4, the total sample was proportionally allocated across wards. The overall sample yielded 332 households.

2.4 Method of data collection

Primary data were collected using structured questionnaires and interview schedules. Trained enumerators administered questionnaires to respondents who could not read. Data was

Table 1: Sampling frame and sample size across all selected LGAs

LGA	Selected Wards	LGA Population	Ward Population	N
Chanchaga	Limawa 'A'	380,900	31,164	51
	Sabon Gari		20,776	34
	Tudun Wada North		10,388	17
Paikoro	Chimbi	298,200	24,398	40
	Gwam		16,265	27
	Ishau		8,132	13
Bosso	Garatu	245,100	36,765	41
	Maikunkele		24,510	27
	Beji		12,255	14
Lapai	Gulu	200,700	30,105	34
	Muye		20,070	23
	Takuti		10,035	11
	Total	1,124,700*	244,863	332

Source: National Population Commission (NPC)

captured digitally via the Kobo Collect mobile application. The instrument elicited information on demographic characteristics, food consumption patterns, and factors influencing household demand for rice, maize, and cowpea

2.5 Methods of data analysis

Data were analysed using descriptive statistics (frequencies, percentages, and means) for Objectives I–III; multiple regression for Objective IV; the Foster, Greer, and Thorbecke (FGT) index for Objective V; binary probit regression for Objective VI; and Kendall's coefficient of concordance for Objective VII.

2.6 Model specification

Multiple regression model

To achieve Objective IV, a multiple regression model was specified to examine factors affecting household demand for rice, maize, and cowpea, following Obayelu *et al*. (2022). The implicit form of the demand function is:

$Y = F(X_1, X_2, X_3, \ldots\ldots X_{21})$ ---------- (2)

Y = Total household demand on the selected staple crop (Naira/month)
X_1 = Sex (Male =1, female =0)
X_2 = Age of household head (Years)
X_3 = Household size (number)
X_4 = Level of education (Years);
X_5 = Household income (Naira)
X_6 = Access to credit (₦);
X_7= Occupation (Ownership =1, 0 if otherwise)
X_8 = Cooperative membership (yes =1, if otherwise =0)
X_9 =Distance to market (km);
X_{10} = Transport cost to market (₦/trip);
X_{11} = Prices of maize (₦/kg);
X_{12} = Prices of cowpea (₦/kg);
X_{13} = Prices of Spaghetti (₦/kg);
X_{14} = Prices of millet (₦/kg);
X_{15} = Prices of soybean (₦/kg);
X_{16} =Prices of rice (₦/kg);
X_{17} = Frequency of consumption (number/week);
X_{18} = Taste preference (1 = Yes, 0 = No);
X_{19}= Price of complementary goods (Naira);
X_{20} = Seasonal variations (Quantity demand during festivals or harvesting period) (0 = Off-season, 1 = Peak season);
X_{21} = Advertising and market expenditure (Amount spent on promotion);
β_0 = Constant term
$\beta_1 - \beta_{21}$ = Regression parameters estimated
ln = natural logarithm
$X_n - X_n$= Independent variable;
U = error term

The functional forms to be fitted to the data in explicit forms include the following

1. Linear:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots \beta_{18} X_{18} + e$ ---------- (3)

2. Double logarithmic/Cobb-Douglass:

$\ln Y = \ln\beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \ldots \beta_{18} \ln X_{18} + e$ ----------(4)

3. Exponential

$\ln Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \ldots \beta_{18} X_{18} + e$ ----------(5)

4. Semi-logarithmic

$Y = \ln\beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \ldots \beta_{18} \ln X_{18} + e$ ----------(6)

where Y is total household expenditure on the selected staple crop (₦/month). The explanatory variables include household head characteristics (sex, age, education, occupation, cooperative membership), economic variables (household income, access to credit), market factors (distance to market, transport cost, commodity prices of rice, maize, cowpea, millet, soybean, and spaghetti/substitutes, complementary goods prices), and behavioural/contextual variables (frequency of consumption, taste preference, seasonal variation, and advertising expenditure). Four functional forms linear, double-log (Cobb-Douglas), exponential, and semi-log were estimated; the lead equation was selected based on the number of significant variables, R^2 value, conformity of coefficient signs with a priori expectations, and the overall F-ratio.

Foster, Greer, and Thorbecke (FGT) Index

The FGT index (Ojo *et al*., 2020) was used to measure food insecurity incidence (P_0), depth (P_1), and severity (P_2):

$$P_a = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{z-yi}{z}\right)^{\propto} \quad \text{----------(7)}$$

Pα = food security index (less than 1 is considered food in secured while 1 and above is food secured
N = total population = the number of households below the food security line
z = the food security line for the household.
yi = household income
Σ = summation
α= Food security aversion parameter which takes the value 0, 1, 2 representing incidence, depth and severity of the food security respectively.

FGT measure for the i^{th} sub-group (Pαi) is given as

$$P_{ai} = \frac{1}{n}\sum_{i-1}^{q}\left(\frac{z-y}{z}\right)^{a} \quad \text{----------(8)}$$

Where a = 0, P_o = food security incidence or head count
Where a = 1, P_1 = Food security depth
Where a = 2, P_2 = Food security severity

Where
n = number of households in a group
q = the number of food in secure households
z = Food security line
y the per capita income (PCI) of the household.
Total per-capita income TPCI = Summation of PCI
Mean TPCI = TPCI/ Total number of households
Food security security line PL = x MTPC

Binary Probit Regression Model

To achieve Objective VI, a binary probit model (Adesina & Zinnah, 1993) was estimated to identify determinants of household food security status (Y = 1 if food secure; 0 otherwise):

Explicitly it was expressed as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 - - - - - - \beta_{22} X_{22} + ei \quad \text{----------(9)}$$

Where: Y = food security status (1 income secure; 0 if otherwise).
X_1= Farm size (hectares)
X_2 = Household size (number of persons)
X_3 = Age of the household head (years)
X_4 = Education level of the household head (years of schooling)
X_6 = Access to credit (Amount received in Naira)
X_7 = Access to extension services (yes =1 or no = 00)
X_8 = Land tenure system (owned 1 otherwise =0)
X_9 = Availability of labour (number of labourers)

X_{10} = Farming experience (years)
X_{11} = Household income (Naira)
X_{12}= Access to improved seed (Kg),
X_{13} = Marital status (Married=1, otherwise =0),
X_{14} = contact with extension agent (1 for contact, 0 for non-contact),
X_{15} = Distance to market (km),
X_{16} = Distance to water source (km)
X_{17} = Off-farm income (N),
X_{18} = Farm income (N)
X_{19} = Sources of information (number);
X_{20} = Food utilization (number of meal /day);
X_{21} = Food available (1 = Yes, 0 = No);
X_{22}= food affordability (Naira);
E = error term

Covariates include farm size, household size, age and education of household head, access to credit and extension services, land tenure, labour availability, farming experience, household and off-farm income, access to improved seed, marital status, distance to market and water source, sources of information, and indicators of food availability, utilisation, and affordability.

Kendall's Coefficient of Concordance

Kendall's W (Olayemi, 2022) was used to rank perceived constraints to food security and staple food demand:

$$W = \frac{12S}{P^2(n^3-n)} - P^T \quad \text{----------(10)}$$

Where;
W = Kendall's coefficient of concordance;
P = number of respondents ranking the constraints,
n = number of quality perceptions.
T = correction factor for tied ranks,
S = sum of squares statistics over the row sum of ranks (Ri).

The sum of square statistics (S) is given as:

$$S = \sum_{i-1}^{n}(Ri - R)^2 \quad \text{----------(11)}$$

Where
Ri = row sums of rank;
R = mean of Ri

The correction factor for tied ranks (T) is given as:

$$T = \sum_{k-1}^{m}(t_k^3 - t_k) \quad \text{----------(12)}$$

The test of significance of Kendalls coefficient of concordance was done using the chi-square statistic which is computed using the formula

$$X^2 = P(n-1)W \quad \text{----------(13)}$$

Where;
n = number of constraints,
P = number of respondents, and
W = Kendalls coefficient of concordance.

3. Results and Discussion

3.1 Socioeconomic characteristics of respondents

The socioeconomic profile of the 182 surveyed households is presented in **Fig. 1**. The distribution by sex revealed that 78.6% were male, while 21.4% were female. This disproportionate male representation reflects gendered household decision-making structures in rural and peri-urban Niger State, where men typically control household finances and bulk food purchases. Results suggest that this dominance is a common cultural trait in the study area. This finding is in line with the study of Emmanuel *et al.,* (2023), who found that male household heads dominate staple food purchasing decisions in Nigeria, often reducing women's influence on dietary diversity and nutrition.

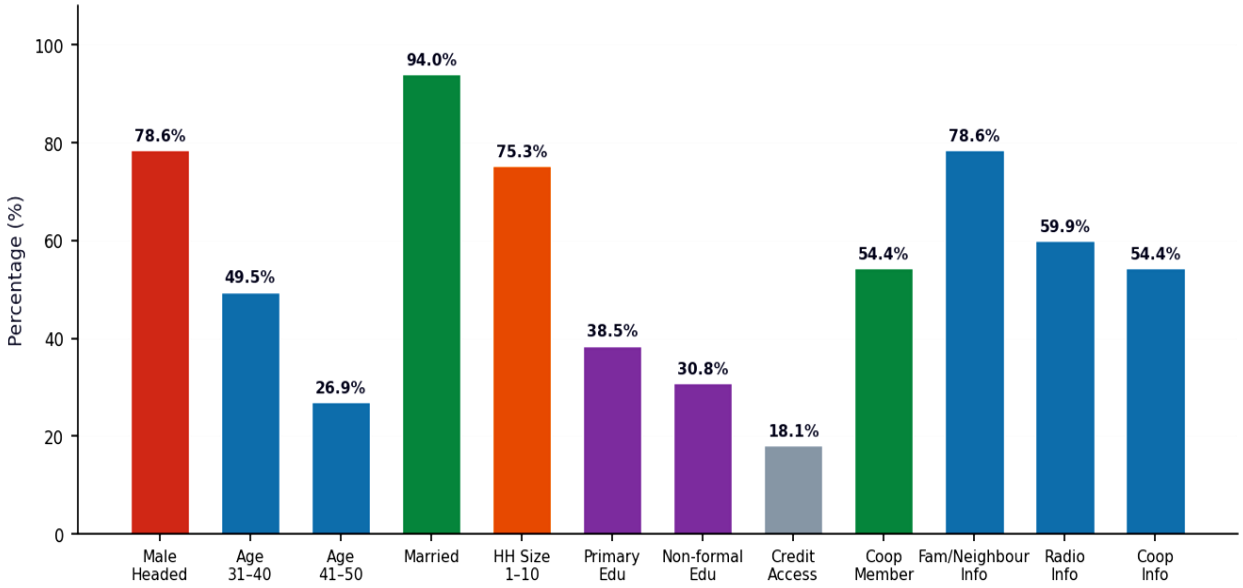

Fig. 1: Socioeconomic characteristics of respondents (%)

The age distribution shows that approximately half of respondents (49.5%) were between 31 and 40 years, followed by those aged 41–50 years (26.9%), with only 6.0% above 50 years. The mean age was 42 years, indicating that most respondents were in their economically active years. According to Neemthia *et al.*, (2020), food-secure households were predominantly headed by individuals in the 31–50 age bracket. It can be implied that the productive age of the respondents plays a critical role in determining household food security outcomes.

Regarding marital status, 94.0% of respondents were married and only 6.0% were single, consistent with rural demographic patterns in Northern Nigeria where early marriage is prevalent. Household size averaged 10 persons, which is considerably above the national average of 5–6 (NBS), reflecting the extended family systems in agrarian communities. These findings agree with Kwaghe and Tegbaru (2019), who found that large households in Northern Nigeria are more food insecure because consumption burdens often outpace income gains from family labour.

Educational attainment was predominantly low, with 38.5% having primary education, 30.8% non-formal education, 24.2% secondary, and only 6.6% attaining tertiary level. According to Rofiu and Kareem (2022), low education constrains nutritional knowledge and market information processing. Access to credit was limited to only 18.1% of respondents, suggesting heavy reliance on current income. Conversely, cooperative membership was relatively high (54.4%). Results suggest that social capital partially compensates for weak formal financial services, a position that is in line with Afolabi *et al.* (2020). Market price information flowed mainly through informal channels, including family and neighbours (78.6%), radio (59.9%), cooperative societies (54.4%), and extension agents (26.9%). It can be implied that strengthening extension services and formal communication channels could enhance the

efficiency of market information among the households.

3.2 Consumer behaviour on rice, maize and cowpea consumption patterns

The results from **Table 2** reveal that Maize was the most widely consumed staple crop (76.4% of households), followed by rice (73.1%), while cowpea lagged at 39.6%. Results suggest that maize's local availability, affordability, and culinary versatility being consumed as pap (ogi), tuwomasara, roasted corn, and boiled maize explain its dominance in the study area. Furthermore, it can be implied that rice closely follows due to its convenience and growing social prominence, particularly at household gatherings and among younger consumers. Cowpea's relatively low consumption reflects its higher market price and longer preparation time, relegating it to a supplementary protein role despite its nutritional value. This finding is in line with the study of Tena *et al.*, (2021), who observed that high costs and lengthy cooking times often limit the intake of legumes in many developing regions.

Frequency data reinforce these trends, showing that 64.0% consumed maize frequently (6–8 times per week), compared to 60.6% for rice and only 19.4% for cowpea. Nearly half (44.4%) of cowpea consumers reported rare consumption (0–2 times/week), consistent with its role as a supplementary rather than daily staple. Purchase forms differ markedly across the three crops: maize is predominantly purchased as whole grain (64.7%) for home processing; rice is split between whole grain (58.8%) and processed forms (41.2%); while cowpea is purchased exclusively in processed form (100%).

Results suggest that this purchase pattern reflects the common use of cowpea for specific processed meals such as akara, moi-moi, or cooked beans. According to Adebowale *et al.*, (2020), the form in which staples are purchased is often dictated by the level of processing required and the immediate culinary needs of the household. It can be implied that while grains like maize are processed at home to save costs, the total reliance on processed forms for cowpea indicates a demand for value-added products to reduce domestic labour time.

Table 2: Staple crop consumption patterns (%)

Category	Maize		Rice		Cowpea	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Staple crop consumed	139	76.4	133	73.1	72	39.6
Rate of Consumption						
Rarely (0–2 times/week)	18	12.9	22	12.9	32	44.4
Moderately (3–5 times/week)	32	23	45	26.5	26	36.1
Frequently (6–8 times/week)	89	64	103	60.6	14	19.4
Form Usually Purchased						
Processed	9	6.5	70	41.2	72	100
Whole grain	90	64.7	100	58.8	0	0
Flour	40	28.8	0	0	0	0

Source: Field Survey, 2025

Reasons for demand of staple crops

Findings as presented in **Table 3** reveal that consumer demand for maize is primarily driven by traditional value (88.5%) and affordability (87.1%). Results suggest that these factors confirm the crop's cultural embeddedness and economic accessibility within the study area. Regarding rice, demand was dominated by availability (94.1%), taste (90.6%), and ease of cooking (80.6%). It can be implied that these preferences reflect a growing trend among households seeking convenience and sensory satisfaction in their dietary choices.

Furthermore, cowpea demand was principally motivated by nutritional benefits (83.3%) and price sensitivity (68.1%). According to these results, households consume cowpea selectively based on health awareness, even in the face of affordability constraints. These findings are in line with the study of Awwal *et al.*, (2022), who similarly found that while affordability drives the demand for cereals, nutritional considerations are the major motivators for legume consumption in Nigeria.

Close substitutes of staple crops

The results regarding close substitutes for the staple crops under study are presented in **Table 4**. Findings reveal that when maize becomes unavailable or unaffordable, guinea corn (64.7%) and yam flour (57.6%) serve as the primary substitutes. Results suggest that this preference reflects their cultural equivalence in swallow-based traditional meals within the region.

Rice substitution is dominated by pasta products, specifically spaghetti (70.6%) and macaroni (58.8%). It can be implied that this signals a dietary transition toward wheat-based foods in peri-urban settings, often driven by affordability and quick preparation. This finding is in line with the study of Ajala *et al.*, (2020), who observed that convenience and price are major factors influencing the shift toward pasta among households in Nigeria.

Table 3: Reason for the demand of the staple crops

Reason	Maize		Rice		Cowpea	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Affordability	121	87.1	120	70.6	10	13.9
Traditional Value	123	88.5	130	76.5	12	16.7
Nutritional Benefits	45	32.4	125	73.5	60	83.3
Easy to Cook	79	56.8	137	80.6	15	20.8
Family Preference	82	59	129	75.9	16	22.2
Limited Alternatives	45	32.4	90	52.9	30	41.7
Taste	50	36	154	90.6	34	47.2
Cleanliness	25	18	105	61.8	27	37.5
Price	48	34.5	70	41.2	49	68.1
Availability	78	56.1	160	94.1	37	51.4

Source: Field Survey, 2025

Furthermore, cowpea substitutes are principally protein alternatives, including soya beans (71.4%) and meat (64.3%). According to Olayemi *et al.*, (2018), households often demonstrate a high level of awareness regarding protein adequacy and dietary adaptability during periods of price shocks. These findings agree with that assertion, as the choice of substitutes indicates that respondents prioritize nutritional maintenance even when their primary legume source is constrained.

Table 4: Substitution for staple crops

Close substitute	Frequency	Percentage
Substitutes of Maize		
Rice	14	10.1
Yam	18	12.9
Beans	15	10.8
Millet	34	24.5
Irish Potato	20	14.4
Yam Flour	80	57.6
Guinea Corn	90	64.7
Substitutes of Rice		
Maize	40	23.5
Macaroni	100	58.8
Millet	30	17.6
Potato	25	14.7
Spaghetti	120	70.6
Substitutes of Cowpea		
Garri	10	14.3
Yam	12	17.1
Beans	17	24.3
Soya Beans	50	71.4
Peanut	20	28.6
Meat	45	64.3
Macaroni	11	15.7
Cassava	15	21.4
Millet	28	40
Rice	18	25.7
Ugu	19	27.1
Cocoa Yam	13	18.6

Source: Field Survey, 2025

3.3 General purchase decision of consumers

Table 5 presents the findings on how consumers make decisions regarding where to purchase staple food crops and the factors influencing their choice of purchasing channel. The result shows that retailers (48.9%) form the most common purchasing channel for consumers in the study area, closely followed by farmers (42.9%), while wholesalers (7.7%) and supermarkets (0.5%) play relatively marginal roles. Results suggest that the dominance of retailers is consistent with the marketing structure of staple foods in Nigeria, where open markets and small-scale retail shops are the primary points of sale. It can be implied that retailers provide food in smaller, more affordable quantities, which aligns with the purchasing power of rural and semi-urban households that buy in daily or weekly portions rather than in bulk. Similarly, a significant proportion of consumers purchasing directly from farmers (42.9%) shows the agrarian nature of the study area, where many households reside in close proximity to farming communities. Findings agree with Adekoya and Oboh (2020), who reported that staple food crop consumers in Nigeria rely predominantly on informal market systems such as open markets and small retailers due to accessibility, affordability, and the ability to negotiate prices.

When asked why they preferred particular purchasing channels, lower price (49.5%) emerged as the most significant factor, followed closely by convenience (46.2%), while time-saving (4.4%) played only a minor role. Results suggest that the emphasis on price demonstrates the high sensitivity of consumer demand to cost, which is

expected in a context where household incomes are generally low and food expenditure constitutes a large proportion of total household spending. It can be implied that the removal of fuel subsidy, inflationary pressures, and rising food prices have further heightened consumers' sensitivity to price in the Nigerian market. Lower prices are typically found in traditional retail markets or direct purchases from farmers, where bargaining is common. Furthermore, convenience (46.2%) was nearly as important as price, highlighting the role of accessibility and proximity in food purchase decisions. According to Samson *et al.*, (2019), affordability and convenience are the most important drivers of staple food purchase decisions among rural consumers, while modern retail attributes such as ambience or variety are given minimal importance. These findings are in line with the observation that households prefer outlets within walking distance to reduce both transport costs and time spent shopping, underscoring the role of traditional retail shops embedded within communities.

Table 5: General purchase decision of consumers

Variable	Frequency	Percentage
Purchasing channel for this crop		
Farmers	78	42.9
Online vendors	0	0
Retailers	89	48.9
Supermarket	1	0.5
Wholesalers	14	7.7
Preferred reason for this purchasing channel		
Convenient	84	46.2
Lower price	90	49.5
Time	8	4.4

Source: Field Survey, 2025

3.4 Factors influencing demand for rice, maize and cowpea.

Table 6 presents the results of a multiple regression analysis conducted to determine the socio-economic and market-related factors influencing consumer demand for three staple food crops in the study area: maize, rice, and cowpea. Although four functional forms were tested (linear, semi-log, double-log, and exponential), the linear functional form was chosen as the lead equation for maize, rice, and cowpea. Results suggest that this choice is justified as the linear model returned the highest R-squared and adjusted R-squared values, confirming its superior explanatory ability relative to other forms. Furthermore, the coefficients in the linear functional form largely conformed to a priori expectations, displaying signs that are logically consistent with economic theory. The diagnostic statistics show that the models explain a substantial proportion of the variability in demand, with R-squared values of 0.8443 for maize, 0.9164 for rice, and 0.8115 for cowpea. It can be implied that approximately 84%, 92%, and 81% of the variations in demand for the respective crops are explained by the included explanatory variables. The adjusted R-squared values further confirm the fitness of the models, and the statistical significance of the overall regression models (Prob > chi²) indicates that the independent variables jointly influence demand.

The coefficient of sex was positive and statistically significant for both maize (0.8574; $p<0.05$) and rice (1.0426; $p<0.05$), but not significant for cowpea. Results suggest that being male-headed significantly increases the demand for maize by about 86% and rice by 104%, holding other variables constant. This finding is in line with the study of Adepoju and Oyewole

Table 6: Multiple Regression Analysis on factors influencing the demand for rice, maize and cowpea

Variable	Maize			Rice			Cowpea		
	Coeff.	Std. Err.	t-value	Coeff.	Std. Err.	t-value	Coeff.	Std. Err.	t-value
Sex	0.8574**	0.3558	2.41	1.0426**	0.4751	2.19	0.1544	0.3245	0.48
Age	0.2157	0.3581	0.60	0.1854	0.154	1.20	0.1441	0.3222	0.45
Household Members	0.6748	0.9766	0.69	0.4583***	0.1324	3.46	0.1448	0.1336	1.08
Education	0.7645***	0.2317	3.30	-0.3223	0.363	-0.89	0.2766*	0.1447	1.91
Income from Farm	0.8575***	0.2359	3.64	0.256	0.354	0.72	0.9335**	0.3924	2.38
Access to Credit	0.4367	0.6343	0.69	0.553	0.423	1.31	0.2455**	0.1224	2.01
Cooperative Member	0.1532	0.4376	0.35	0.3054	0.321	0.95	0.0476	0.1431	0.33
Shortest Distance	0.2664	0.8553	0.31	0.4543	0.4927	0.92	0.0215	0.0133	1.62
Cost of Transport	-0.6487***	0.2543	-2.55	0.3254	0.6231	0.52	0.023	0.021	1.10
Freq. of Consumption	0.2583	0.1765	1.46	0.5159**	0.2267	2.28	0.00013	0.00021	0.62
Price of Substitute	-0.2534**	0.1043	-2.43	-1.2533**	0.5634	-2.22	-0.5332**	0.2553	-2.09
Price of Crop	-0.2655	0.2588	-1.03	0.1774	0.7227	0.25	0.0077	0.0234	0.33
Price of Complement	-0.155	0.62	-0.25	-0.1652	0.2448	-0.67	-0.3542	0.6424	-0.55
Constant	0.5287***	0.1326	3.99	1.4022***	0.2432	5.77	0.6344**	0.3144	2.02
R-squared	0.8443			0.9164			0.8115		
Adj. R-squared	0.8386			0.8474			0.7383		

Note: *** p<0.01, ** p<0.05, * p<0.10

(2019), who observed that male-headed households in South-West Nigeria allocated more resources to rice and maize due to their social and dietary relevance. It can be implied that in rural

Nigeria, where men often hold greater purchasing power, these culturally valued staples are purchased in larger quantities to meet household needs. Household size was significant and positive in determining the demand for rice (0.4583; p<0.01). Results suggest that an increase in household members increases rice demand by 46%. These findings agree with Olayemi *et al.*, (2018), who reported a positive association between household size and rice demand in South-West Nigeria. It can be implied that larger families rely heavily on rice as a quick and convenient staple, reflecting its adaptability to diverse household needs in the face of changing dietary preferences.

Education was statistically significant for maize (0.7645; p<0.01) and cowpea (0.2766; p<0.1). Results suggest that a unit increase in education raised demand by 76% for maize and 28% for cowpea. According to Obayelu *et al.*, (2020), education significantly influences the demand for protein-rich staples like cowpea. It can be implied that better-educated households are more likely to demand these staples due to higher awareness of their nutritional benefits and dual utility as both food and industrial raw materials.

Farm income was another significant determinant for maize (0.8575; p<0.01) and cowpea (0.9335; p<0.05). Results suggest that higher income from farming activities increases demand for maize by 86% and cowpea by 93%. This finding corroborates the study by Ayanwale and Amusan (2018), which showed that rising farm incomes significantly increased demand for cowpea among

farming households. It can be implied that there is a direct relationship between income and purchasing capacity, where higher-earning households can afford more protein-rich diets and bulk cereal purchases. Access to credit was statistically significant for cowpea (0.2455; $p<0.05$). Results suggest that access to formal or informal loans raises cowpea demand by 25%. This finding aligns with Abdu and Bakari (2019), who found that access to credit positively influenced the demand for protein-dense foods in Northern Nigeria. It can be implied that credit facilities ease affordability constraints, allowing households to allocate more resources toward expensive protein sources to improve nutritional diversity. The coefficient for the cost of transport was significant and negative for maize (-0.6487; $p<0.01$). Results suggest that higher transport costs reduce maize demand by 65%. This finding supports the work of Oyinbo *et al.,* (2017), who established that transportation costs significantly depressed household demand for cereals in Northern Nigeria. It can be implied that because maize is bulky, its accessibility is highly sensitive to infrastructure and transportation pricing.

Finally, the frequency of consumption was significant for rice (0.5159; $p<0.05$), while the price of substitutes was significant and negative across all three crops: maize (-0.2534; $p<0.05$), rice (-1.2533; $p<0.05$), and cowpea (-0.5332; $p<0.05$). Results suggest that strong substitution effects exist within the study area. These findings agree with Afolabi *et al.,* (2020), who showed that substitute prices strongly influenced staple demand patterns in Nigeria. It can be implied that household demand is highly interdependent, where price shocks in one commodity significantly alter the consumption patterns of other staples.

3.5 Food security status of respondents

The results of the FGT analysis (**Table 7**) reveal that 61.5% of households were food insecure, while only 38.5% were food secure. The food security line was estimated at ₦20,809 per capita, representing the expenditure threshold below which households are classified as insecure. The headcount ratio (P_0 = 0.62) confirms that 62% of the respondents fall below this threshold. Results suggest that the food security gap (P_1 = 0.303) indicates that food-insecure households would require approximately 30.3% additional expenditure to attain the food security line. It can be implied that this signals a substantial resource deficiency rather than marginal shortfalls among the affected households. Furthermore, the severity index (P_2 = 0.164) indicates that deprivation is moderately deep among the insecure households. This finding is in line with the study of Idrisa *et al.,* (2020), who observed that high severity indices in Northern Nigeria reflect a significant distance between the poorest households and the food security threshold.

Table 7: Food security status of respondents

Indicator	Frequency / Value	Percentage / Index
Food Secure	70	38.5%
Food Insecure	112	61.5%
Total Households	182	100.0%
Food Security Line (₦)	20,809	—
Incidence (P_0)	0.62	—
Depth/Gap (P_1)	0.3034	—
Severity (P_2)	0.16421	—

Source: Field survey, 2025

The high prevalence of food insecurity is attributable to multiple structural factors, including volatile agricultural productivity driven by climatic variability, rising staple food prices

exacerbated by fuel subsidy removal, and the depreciation of the naira. Results suggest that these economic pressures, combined with high household dependency ratios, have severely strained household budgets. These findings agree with Ibrahim and Tyabo (2019), who attributed rural food insecurity in Nigeria primarily to poor income levels and high dependency ratios. It can be implied that the current economic environment has weakened the purchasing power of households, making it increasingly difficult for them to meet their basic nutritional requirements. According to these observations, the vulnerability of the households is deeply rooted in both macroeconomic shocks and localized productivity challenges.

3.6 Factors influencing food security status

Table 8 and **9** presents the results of a Probit regression analysis examining the factors influencing food security status among farming households in the study area. The dependent variable is food security status, which takes a binary outcome, with 1 denoting food secure and 0 denoting food insecure. A range of socio-economic, institutional, and food system-related variables were included as explanatory factors to capture the multidimensional nature of food security. Results suggest that the pseudo R^2 value of 0.6432 indicates that the explanatory variables jointly explain approximately 64% of the variation in the probability of being food secure. It can be implied that this value, being relatively high for cross-sectional household data, suggests that the model fits the data well. Furthermore, the model's significance is confirmed by the likelihood ratio chi-square (LR chi^2 (11) = 198.34, $p < 0.01$), which indicates that the included variables are collectively important predictors of food security status.

The coefficient for education (0.4536) was positive and statistically significant at 5% probability. Results suggest that, holding all other variables constant, an increase in educational attainment likely leads to an increase in food

Table 8: Probit Regression on factors influencing food security status

Variable	Coefficient	Std. Error	t-value	Marginal Effect	Significance
Age	0.8155	0.6453	1.26	0.2039	NS
Household Size	0.4532	0.6624	0.68	0.1133	NS
Education	0.4536	0.2243	2.02	0.1134	**
Farm Income	0.7637	0.3055	2.50	0.1909	***
Access to Credit	0.3665	0.5334	0.69	0.0916	NS
Cooperative Membership	0.4762	0.3546	1.34	0.1190	NS
Distance to Market	−0.4265	0.2544	−1.68	−0.1066	*
Sources of Information	0.1537	0.4043	0.38	0.0384	NS
Food Utilisation	0.3245	0.2433	1.33	0.0811	NS
Food Availability	0.6442	0.2623	2.46	0.1611	**
Food Affordability	0.7846	0.4013	1.96	0.1962	*
Constant	0.7469	0.4237	1.76	—	—
Pseudo R^2		0.6432	LR $chi^2(11)$ = 198.34	Prob > chi^2 = 0.0000	

Source: Field survey, 2025.
*** p<0.01; ** p<0.05; * p<0.10;
NS = not significant.

security status. It can be implied that education plays a critical role in equipping household heads with the skills and knowledge necessary to adopt improved farming technologies, diversify livelihood strategies, and effectively utilise available resources. According to these results, educated farmers are more likely to engage with extension services, interpret market signals, and adopt nutrition-sensitive practices. In the study area, where subsistence agriculture dominates, education empowers households to overcome traditional barriers to productivity and food utilisation. These findings agree with Ken *et al.*, (2019), who found that education significantly increased the probability of food security among rural farming households in South-West Nigeria. It can be implied that the significance of education reflects its role in enhancing decision-making capacity and facilitating access to income-generating opportunities outside agriculture, which ultimately bolsters food security.

Results suggest that farm income (0.7637) was positive and statistically significant at 5%. It can be implied that higher farm income enhances the purchasing power of households, enabling them to access diverse and nutritious food both in quantity and quality. In the study area, where farming remains the main livelihood activity, households with higher farm income are better placed to invest in productivity-enhancing inputs, store surplus for the lean season, and access market-purchased food. Furthermore, income stability mitigates vulnerability to price shocks and seasonal fluctuations, ensuring consistent food access throughout the year. This finding is in line with the study of Babatunde (2020), who reported that higher farm income significantly improved food security outcomes in rural Kwara State, Nigeria. According to these results, farm income remains a central driver of food security among rural farming households.

Results suggest that food availability (0.6442) was positive and statistically significant at 5%. It can be implied that a unit increase in food availability will increase the food security status of the respondents. This confirms that ensuring sufficient physical supply of food at the household level is a crucial pillar of food security. When food is readily available through own production, storage, or reliable markets, households are less vulnerable to hunger and malnutrition. These findings agree with Sunday and Abu (2020), who reported that food availability is a significant determinant of food security among rural households in Enugu

Table 9: Marginal effects of significant variables on food security status

Variable	dy/dx	Std. Error	z-value	Probability Interpretation
Education	0.1134**	0.0559	2.02	A unit increase in years of formal education may lead to a 5.6% increase in food security status
Farm Income	0.1909***	0.0764	2.50	A 1% increase in farm income may lead to a 19.1% increase in food security status
Food Availability	0.1611**	0.0655	2.46	A unit increase in food availability may increase the probability of food security by 16.1%
Food Affordability	0.1962*	0.1001	1.96	A unit increase in food affordability may increase the probability of food security by 19.2%

Source: Field Survey, 2025

State, Nigeria. In the study area, where variability in rainfall and production constraints often limit availability, households that achieve higher production levels or have reliable access to available food are significantly more secure.

Results suggest that food affordability is positively significant at 10%, indicating that households that can afford food are more likely to be food secure. It can be implied that affordability is closely linked to income levels, purchasing power, and prevailing food prices. In the context of recent economic challenges in Nigeria, including inflation and subsidy removal, affordability has become a critical dimension of food security. Households unable to afford diverse diets are forced to adopt negative coping strategies such as reducing meal frequency or relying on cheaper but less nutritious foods. This finding corroborates the study of Ojo *et al*. (2020), who emphasized that the affordability of food is a significant determinant of food security among rural households in Ekiti State, Nigeria. According to the statistical significance of this variable, the economic challenges farmers face beyond production underscore the importance of policies that stabilise food prices and enhance household incomes.

3.7 Challenges influencing consumer demand for rice, maize and cowpea

Using Kendall's weighted ranking, four challenges were rated as "serious" (weighted mean ≥ 3.0), namely price instability (4.13), poor road and transportation infrastructure (3.46), high absolute prices (3.25), and fear of adulterated products (3.16) (**Table 10**). Results suggest that price instability reflects the high level of volatility characterizing staple food markets in Nigeria, which is driven by seasonal supply shocks, weak storage infrastructure, exchange rate fluctuations,

Table 10: Challenges influencing consumer demand (Kendall's weighted ranking)

Challenge	Weighted Sum	Weighted Mean	Remark	Rank
Price Instability	752	4.13	Serious	1st
Poor Road / Transport	630	3.46	Serious	2nd
High Prices	592	3.25	Serious	3rd
Fear of Adulterated Products	575	3.16	Serious	4th
Low Income	501	2.75	Not Serious	5th
Changes in Household Size	442	2.43	Not Serious	6th
Seasonal Supply Fluctuations	437	2.40	Not Serious	7th
Long Distances to Market	430	2.36	Not Serious	8th
Imported Alternatives	428	2.35	Not Serious	9th
Poor Product Quality	426	2.34	Not Serious	10th
Lack of Market Information	424	2.33	Not Serious	11th
Poor Storage Conditions	386	2.12	Not Serious	12th
Lack of Availability	382	2.10	Not Serious	13th

Source: Field survey, 2025.
Serious = weighted mean ≥ 3.0.

and import policy inconsistencies. It can be implied that the remaining nine challenges, including low income, seasonal supply fluctuations, long market distances, and poor storage, although rated as "not serious," still exert a cumulative effect on demand that should not be dismissed.

Regarding infrastructure, findings are in line with the study of Afolabi (2020), who noted that poor road infrastructure raises effective consumer prices by inflating logistics costs and restricting market access, particularly during the rainy season. Results suggest that high absolute prices, sustained by fuel cost increases, naira depreciation, and insecurity in food-producing regions, have eroded household purchasing power. It can be implied that this economic pressure forces households to adopt negative coping strategies such as meal skipping or dietary substitution. Furthermore, the fear of adulterated products was ranked as a serious concern. According to the analysis, these concerns reduce market confidence and distort consumption decisions, particularly for rice grain mixing, maize contamination, and the chemical preservation of cowpea. It can be implied that addressing these serious challenges is fundamental to stabilizing consumer demand and ensuring food safety in the study area.

4. Conclusion

The study concludes that rice and maize are the dominant staples in Chanchaga and Paikoro LGAs due to affordability and cultural preference, while cowpea is primarily valued for its nutritional benefits. Results suggest that household demand is significantly shaped by socioeconomic factors, specifically education, farm income, and household size alongside market variables like transport costs and substitute prices.

It can be implied that the high prevalence of food insecurity (61.5%), with a gap index of 0.303 and severity of 0.164, reflects a population highly vulnerable to economic shocks. According to the Probit regression results, education, farm income, and food affordability are the most significant predictors of a household's food security status. Furthermore, these findings are in line with the identified challenges of price instability and poor transportation infrastructure, which act as major barriers to stable consumer demand. Ultimately, it can be implied that targeted interventions in rural infrastructure, credit access, and human capital are essential to mitigate the structural weaknesses within the local food system.

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