

Determinants of Households' Demand Rice Consumption in Benue State, Nigeria

¹*Ogebe Ozoko Francis (OOF), Ameh Enemune David (AED)¹ and Mohammed H.L. (MHL)²

¹Department of Agricultural Economics, Federal University of Agriculture, PMB 2373 Makurdi, Benue State, Nigeria.

²Department of Statistics, Federal College of Wildlife Management, PMB 268 New Bussa, Niger State, Nigeria.

*Corresponding Authors' Contact Details: E-mail Address ✉: frankozoko@gmail.com; Phone Number ☎: Tel: + 2347035945500

Accepted November 08, 2023

The study examines the determinants of households' rice consumption in Benue State, Nigeria. Specifically, it determines the socio-economic characteristics of households in the study area, examined the household's consumption preferences between locally produced rice brands and imported rice brands, ascertains the factors influencing households' consumption preferences for foreign and local rice brands, ascertains the share of expenditure on rice in the total food budget of households and ascertains the determinants of households demand for rice consumption in the study area. A multistage sampling technique was employed in the selection of 534 households sampled from six (6) randomly selected LGAs in Benue State through the instrumentality of a well-structured questionnaire. The data collected were analyzed using descriptive statistics, budget share index, LA-AIDS model, and logit model. The result of the descriptive statistics showed that the majority (80%) of the households were male and (20%) were female. A larger proportion, (40%) of the households are in the age group of 42-52 years having one form of education or another and were civil servants. The average household size was 8 with an average monthly income of ₦ and an average of 9 income-earning members in the household, The result of the budget share index indicated that the aggregated households spent 15% income on rice consumption and this lends credence to the growing trend in households rice consumption preference over other food items attesting the central position of rice in the households food basket. The result of LA-AIDS estimates showed that the factors found to be significant in influencing the household's consumption preference for foreign and local rice brands were household size ($P < 0.10$), household income ($P < 0.05$), frequency of rice consumption ($P < 0.10$), price of rice ($P < 0.01$), quality of rice ($P < 0.10$) and ease of preparation of rice ($P < 0.10$). The study concluded that an improvement in the quality of local rice to attain the high quality desired by households would stimulate local rice consumption preference by households and save the nation from the colossal loss of foreign exchange incurred in the importation of foreign rice to meet local demand. It recommends that since the quality of rice is a major determinant of rice consumption in the study area, Nigeria's Agricultural Transformation Agenda should lay more emphasis on local rice processing to ensure improvement in local rice quality to make it competitive with foreign rice and this will encourage the consumers shift preference from imported rice to locally produced rice brands.

Keywords: Budget share index, consumption preference, food expenditure, households, Nigeria

INTRODUCTION

Rice accounts for over 20 percent of global caloric intake and has been an important food commodity for most people in sub-Saharan Africa particularly, Nigeria where it is the fourth most consumed crop in terms of calories (Cadoni and Angelucci, 2013). The demand for rice in Nigeria has been increasing at a faster rate than in any other African country since the mid-1970s (Daramola, 2005); the result is that local rice production has failed to meet up with the increasing pace of consumption over the years in Nigeria (Boansi, 2014). Nigeria's rice consumption is projected to reach 35 million tonnes by 2050 from 5 million tonnes in 2010, raising at the rate of 7 percent yearly (Ayanwale and Amusa, 2015). This trend is attributed to rising population growth, urbanization, and income growth as well as changes in family occupational structures. Nigeria currently doubles as the largest rice-producing nation in the West Africa sub-region and the second-largest importer of rice in the world United State Agency for International Development (USAID, 2009). This anomaly is attributed to the inability of its local production to meet up its demand which has been soaring at a very fast rate over the years. A combination of various factors seems to have triggered the structural increase in rice consumption over the years with consumption broadening across all socio-economic classes, including the poor.

In a bid to address the demand-supply gap of rice in Nigeria, the government has at various times come up with policies, programs, and institutions including Presidential Initiative on Rice (PIR) established in 1999, the National Program for Food Security (NPFS) which was launched in 2001 and the National Rice Development Committee (NRDC) in 2003 and a host of others. However, it was observed that some of the policy measures and programs have not been consistent in that Nigeria has continued to rely upon the importation of rice to meet its growing demand for imported rice brands to meet the shortfalls in domestic demand. This continual dependence on rice importation has constituted a great drain on foreign exchange earnings. For instance, Ayanwale and Amusan (2012) observed that the importation of rice to bridge the demand-supply gap is worth ₦365 billion and this implies a loss of considerable foreign exchange in the country. Equitable and sustainable economic development cannot ignore basic food commodities, particularly in developing countries such as Nigeria where rice continues to contribute to the socio-economic well-being of Nigeria both as a

major element in the nation's food security calculations and as a commodity for internal commercial transactions Food and Agriculture Organization (FAO, 2000).

Previous research on rice in Nigeria has focused on issues bordering on enhancing the supply side of the Nigerian rice industry such as the efficiency of rice production (Ayinde et al., 2009), rice processing (Basorun, 2008), the profitability of rice production (Onoja and Herbert, 2012), improved rice technologies (Dontsop-Nguezet et al., 2011), rice irrigation (Mohammed, 2011). There exists a dearth of literature on the demand side of the Nigerian rice industry concerning determinants of rice consumption. This is the identified gap that this research was designed to fill. Specifically, the study determines the socio-economic characteristics of households in the study area, examines the household's consumption preferences between locally produced rice brands and imported rice brands, ascertains the factors influencing households' consumption preferences for foreign and local rice brands, ascertains the share of expenditure on rice in the total food budget of households and ascertains the determinants of households demand rice consumption in the study area.

MATERIALS AND METHODS

The Study Area

The study area was Benue State, located in the middle belt of Nigeria. The State is second on the list of highest rice producing States in the country, producing a capacity of 1,500,000 MT per year (Nigerian Infopedia, 2022). Its geographic coordinates are longitudes 6° 35 and 10° 0E, and latitudes 6° 30 and 8° 10N with a population of 5,741,800 people with 413,159 farm families/households National Population Commission (NPC, 2007). The State shares boundaries with five other States namely; Nasarawa State to the North, Taraba State to the East, Cross Rivers to the South, Enugu to the South-West, and Kogi to the West. The State also shares a common boundary with the Republic of Cameroun to the South-East, and it occupies a total landmass of 32, 518km². Benue State has a tropical sub-humid climate, with two distinct seasons which are the wet season and the dry season. The wet season lasts for

seven months and is between April and October with annual rainfall ranging from 1500 – 1800 mm. The dry season comes between November and March. Temperatures are generally very high during the day with average daily temperatures ranging between 21°C – 35°C in the summer and 16°C – 37°C in the winter. Most of the people are farmers while the inhabitants of the riverine areas engage in fishing as their primary occupation. About 80% of the population is estimated to earn their living from agricultural production Benue Agricultural and Rural Development Authority (BNARDA, 2004). The State is the major producer of food crops such as yam, cassava, sorghum, and maize. The major cash crops include rice, soybeans, and beniseeds. Citrus, sugar cane, oil palm, and banana are other economic crops grown in the State. Livestock rearings such as cattle, sheep, goats, pigs, and poultry is also practiced in the State, hence the name, 'Food Basket of the Nation'.

Sampling Procedure

A multi-stage sampling technique was employed to select households for this study. The first was a purposive selection of two (2) local government areas (LGAs) from each of the agricultural zones in Benue State (Zones A, B, and C) making a total of six (6) LGAs. The next stage involved a random selection of two (2) districts each from each LGAs making a total of twelve (12) districts. Then the random proportionate sampling of 534 households (sample size) from a sample frame of 10,680 households in the selected districts. The population of households in the study area was obtained from National Population Commission (NPC, 2007).

Method of Data Collection

Primary data on household food consumption and expenditure patterns were collected using structured questionnaires from heads of households or their representatives where the heads were not available. The data collected on the demography characteristics of households were age, household size, educational level of household heads, sex, household income, and other socio-economic variables. Data were collected on household rice consumption concerning the type of rice consumed, frequency of consumption, quantity, price of rice, and expenditure on rice consumed by the household during the survey period.

Analytical Techniques

The study employed both descriptive and inferential statistics as analytical tools. Descriptive statistics such as mean, frequency counts, and percentages to analyze the socio-economic characteristics of the households. Inferential statistics including Linear Approximate Almost Ideal Demand System (LA-AIDS) model was used to examine the determinants of the demand for rice, logit model was employed to ascertain the factors influencing households' consumption preferences for foreign and local rice brands. While the budget share index was used to ascertain households' share of expenditure on rice in the total food expenditure of households.

Model Specification

The budget share index is expressed as:

$$w_r = \sum_{i=1}^n \left(\frac{X_r}{X_i} \right) \quad \text{equ... (1)}$$

Where:

W_r = Budget share on rice by i^{th} household

X_r = expenditure on rice by i^{th} household (₦/month)

X_i = expenditure on all food items consumed by i^{th} household (₦/month)

$i = 1, 2, \dots, n$ ($n=534$)

Linear Approximate Almost Ideal Demand System is expressed as:

$$w_i = a_i + \sum_{j=1}^n Y_{ij} \ln(P_i) + \beta_i \ln \frac{x}{p} + \sum_{j=1}^n \delta_{ij} Z_j + \varepsilon_i \quad \text{equ... (2)}$$

Where:

w_i = Budget share of commodity i

P_i = Price of commodity i

x = total expenditure on the commodity within the system

n = number of commodities

a_i = constant term in the i^{th} share equation

$\ln$ = natural logarithm

p = Stone's price index

Y_{ij} = slope coefficient associated with the j^{th} commodity in the i^{th} share equation

β_i = expenditure coefficient of i^{th} commodity in the i^{th} share equation

Z_i = the j^{th} demographic variables of which there are n in number

δ_{ij} = the vector of parameters
 ϵ_i = error term

The explicit system of demand equation for rice and other food items (beans, maize, garri and yam) captured in the survey was estimated simultaneously using Seemingly Unrelated Regression (SUR) with the homogeneity and symmetry restrictions imposed. The explicit system of demand equations are as follows:

$$W_R = a^*_1 + Y_{11}\ln P_R + Y_{12}\ln P_B + Y_{13}\ln P_M + Y_{14}\ln P_G + Y_{15}\ln P_Y + \beta_1 \ln\left(\frac{X}{P^*}\right) + \delta_{11}Z_1 + \delta_{12}Z_2 + \delta_{13}Z_3 + \delta_{14}Z_4 + \delta_{15}Z_5 + \epsilon_1 \quad \dots \text{equ (3)}$$

$$W_B = a^*_2 + Y_{21}\ln P_B + Y_{22}\ln P_R + Y_{23}\ln P_M + Y_{24}\ln P_G + Y_{25}\ln P_Y + \beta_2 \ln\left(\frac{X}{P^*}\right) + \delta_{21}Z_1 + \delta_{22}Z_2 + \delta_{23}Z_3 + \delta_{24}Z_4 + \delta_{25}Z_5 + \epsilon_2 \quad \dots \text{equ (4)}$$

$$W_M = a^*_3 + Y_{31}\ln P_M + Y_{32}\ln P_R + Y_{33}\ln P_B + Y_{34}\ln P_G + Y_{35}\ln P_Y + \beta_3 \ln\left(\frac{X}{P^*}\right) + \delta_{31}Z_1 + \delta_{32}Z_2 + \delta_{33}Z_3 + \delta_{34}Z_4 + \delta_{35}Z_5 + \epsilon_3 \quad \dots \text{equ (5)}$$

$$W_G = a^*_4 + Y_{41}\ln P_G + Y_{42}\ln P_R + Y_{43}\ln P_B + Y_{44}\ln P_M + Y_{45}\ln P_Y + \beta_4 \ln\left(\frac{X}{P^*}\right) + \delta_{41}Z_1 + \delta_{42}Z_2 + \delta_{43}Z_3 + \delta_{44}Z_4 + \delta_{45}Z_5 + \epsilon_4 \quad \dots \text{equ (6)}$$

$$W_Y = a^*_5 + Y_{51}\ln P_Y + Y_{52}\ln P_R + Y_{53}\ln P_B + Y_{54}\ln P_G + Y_{55}\ln P_M + \beta_5 \ln\left(\frac{X}{P^*}\right) + \delta_{51}Z_1 + \delta_{52}Z_2 + \delta_{53}Z_3 + \delta_{54}Z_4 + \delta_{55}Z_5 + \epsilon_5 \quad \dots \text{equ (7)}$$

Where:

W_R = household budget share on rice
 W_B = household budget share on beans
 W_M = household budget share on maize
 W_G = household budget share on garri
 W_Y = household budget share on yam
 P_R = price of rice (₦/kg)
 P_B = price of beans (₦/kg)
 P_M = price of maize (₦/kg)
 P_G = price of garri (₦/kg)
 P_Y = price of yam (₦/kg)
 Z_1 = age of household head (years)
 Z_2 = educational level of household head (number of years of schooling)

Z_3 = household size (number of household members)

Z_4 = household income (₦/ month)

Z_5 = number of household income earners

X = total household expenditure on all food items within the system (₦)

P^* = Stone's price index

Y_{11} - Y_{55} = price coefficients or the slope coefficients in the share equations of rice, beans, maize garri and yam, respectively.

β_1 - β_5 = expenditure coefficients of rice, beans, maize, garri and yam, respectively

a^*_1 - a^*_5 = constant terms in the share equations of rice, beans, maize, garri and yam, respectively

ϵ_1 - ϵ_5 = error terms in the share equations of rice, beans, maize, garri and yam, respectively

δ_{11} - δ_{55} = coefficients of demographic variables in the share equation of rice, beans, maize, garri and yam, respectively.

The logit model assumes that the probability of household's consumption preference for imported rice brand (P_i) is expressed as:

$$P_1 = \frac{1}{1+e} Z_i \quad \dots \text{equ (8)}$$

The probability of household's consumption preference for locally produced rice brand ($1-P_i$) is expressed as:

$$1-P_1 = \frac{1}{1+e} Z_i \quad \dots \text{equ (9)}$$

The explicit logit model is expressed as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_{11} X_{11} + \mu \quad \dots \text{equ (10)}$$

Where:

X_1 = age of household head (years)

X_2 = educational level of household head (number of years of schooling)

X_3 = household size (number of household members)

X_4 = household income (₦/ month)

X_5 = frequency of rice consumption (number of times rice is consumed/month)

X_6 = food expenditure (₦/month)

X_7 = non-food expenditure (₦/month)

X_8 = price (dummy: 1 if household regards price as a factor for consumption preference between locally produced rice brand and imported rice brand and 0 otherwise)

X_9 = taste (dummy: 1 if household regards taste as a factor for consumption preference between locally produced rice brand and imported rice brand and 0 otherwise)

X_{10} = taste (dummy: 1 if household regards quality as a factor for consumption preference between locally

produced rice brand and imported rice brand and 0 otherwise)

X_{11} = ease of preparation (dummy: 1 if household regards ease of preparation as a factor for consumption preference between locally produced rice brand and imported rice brand and 0 otherwise)

β_1 - β_{11} = coefficients of stimulus variables

μ = error term

RESULTS AND DISCUSSION

Socio-economic Characteristics of Households in the Study Area

The results in Table 1 showed households in the study area are largely male-headed households with 84% of the household heads being males while 16% were females. This finding corroborates the findings of Erhabor and Ojogho (2011), who found in a related study that rice-consuming households are largely male-headed with 89.3% of the household-headed being males. The implication of this finding is that gender of the household head could influence the food consumption pattern of households. This is in line with Agboola (2003) who noted that gender was one of the socio-economic characteristics that were significant in influencing grain demand, dairy product demand, and vegetable demand in a study on estimation of food demand patterns in South Africa. Table 1 also showed that a larger proportion (40.21%) of the households belong to the age group of 40-50 years with the youngest household head found to be 26 years and the oldest household head found to be 70 years with a mean age was 47 years. The coefficient of variation (CV) of age was low (22%), implying that there was low variation in the ages of the household heads. The age of household heads could influence food demand. Omonona et al. (2010) found that age was significant in influencing demand for chicken, grain flour, and green leaves in a related study on household food demand in semi-urban and rural households in South-west Nigeria. The results further showed that the majority (51.20%) of the household heads had tertiary education with only 5.33% of the households having no form of formal education. The mean years of schooling of households head was 10 years which is twice the national mean years of schooling of 5 years for Nigeria (UNDP, 2012). The implication is that the educational status of household heads could

influence rice demand as well as the preference for imported or local rice types as noted by Omonona et al. (2010) who reported that rice demand was significantly influenced by the educational level of household heads in a related study on household food demand. The majority (61.50%) of the heads of households in the sampled area were civil servants, probably because of their high educational attainment. This suggests that there is a tendency for households to rely on purchasing rice for household consumption rather than their production. There was a wide variation in the household size with a coefficient variation of 52% and an average household size of 8 persons which is large enough to increase the household's demand for food. The average monthly household income was estimated at ₦93, 988.56 with a high Coefficient of variation of 87%, implying a wider variation in purchasing power of households and subsequently, the household's demand for food. In addition, the majority (77.5%) of the households had one to two members of income earning members with a mean of 2 household income earners which tends increasing household income which will ultimately influence household food consumption. A larger proportion (60.41%) of the households consumed rice (local and/foreign) 16-30 times in a month while the least proportion (16.44%) consume rice 1-15 times in a month with a monthly mean consumption of 25 times. The CV was 42%, implying that there was a relatively low variation in the number of times rice is consumed by the households in a month.

Households Consumption Preference for Locally Produced Rice and Imported Rice Brands

The results in Table 2 showed that the majority of the households across the sampled local government areas in the State preferred consuming foreign rice to local rice types with Makurdi local government area (LGA) having the highest number of households (84%) who preferred consuming foreign rice compared to other local government areas in the State. From the pooled sample of households, a larger proportion (71.0%) preferred consuming foreign rice to local rice brands. Nevertheless, there was considerable local rice consumption preference by households (29.0%). This finding is in line with Adeyeye (2012) opined that though, the market for imported and locally produced rice in Nigeria appears segmented, consumption of locally produced rice is

Table 1. Socio-economic Characteristics of Households in the Study Area.

Variables	Frequency	Percentage
Sex		
Male	427	80
Female	107	20
Total	534	100.0
Age (years)		
20-30	59	11.00
31-41	97	18.10
42-52	215	40.21
53-63	113	21.14
64-74	48	9.00
>74	2	0.55
Total	534	100.0
Min	26	
Max	70	
Mean	47	
CV (%)	22	
Education level		
No formal education	28	5.33
Primary	70	13.04
Secondary	163	30.43
Tertiary	273	51.20
Total (mean)	534 (10)	100.0
The main occupation of households		
Agriculture	35	6.61
Artisanship	49	9.22
Civil service	328	61.50
Trading	92	17.13
Others	30	5.54
Total	534	100.0
Household size (number)		
2-4	172	32.24
5-7	246	46.00
8-10	84	15.66
>10	32	6.10
Total	534	100.0
Mean	8	
CV (%)	52	
Household income earners		
1-2	410	76.71
3-4	113	21.24
5-6	10	1.86
>6	1	0.19
Total	534	100.0
Min.	1	
Max.	6	
Mean	2	
(CV %)	40	

Table 1. Continue.

Household monthly income (N'000)		
<10	5	0.94
10-49	106	19.87
50-99	159	29.80
100-149	135	25.28
150-199	87	16.24
200-249	33	6.23
>249	9	1.64
Total	534	100.0
Min.	8	
Max.	90	
Mean	83.4	
CV (%)	87	
Rice consumption		
1-14	88	16.44
15-28	322	60.41
29-42	124	23.15
Total	534	100.0
Minimum	12	
Maximum	36	
Mean	25	
CV (%)	42	

Source: Author's Computation, 2022

as well on the increase as that of imported rice. A plausible explanation is that local rice is perceived to be more palatable and nutritious than foreign rice.

Factors Influencing Households Consumption Preference for Foreign and Local Rice Brands

Table 3 showed the maximum estimates of the parameters of the logistic regression of the factors influencing consumer preference for foreign and local rice brands in the study area. The log-likelihood was estimated at -30.6681 and was significant ($P < 0.01$) indicating the joint significance of the independent variables in the models. The overall percentage of the household's rice consumption preference for foreign and local rice correctly predicted seems good at 81%. Household size, household income, frequency of rice consumption, price of rice, quality, and ease of preparation were the factors that significantly influenced the households' consumption preference for foreign and local rice brands in the study area. Household size was negative and significant ($P < 0.1$)

with an odd ratio of 0.8362 which implies that a unit increase in the size of the household would decrease the probability of households' foreign rice consumption preference by a factor of 0.8362. This could be due to the inability of the households to increase the purchase of foreign rice to meet the consumption needs of its increasing household size. Household income was positively related to the probability of the household foreign and local rice consumption preference and was significant ($P < 0.05$). The odd ratio of 1.7600 indicated that a unit increase in the household income will increase the probability of households' rice consumption in favor of foreign rice preference by 1.7600. This is because as the income of households increases, their purchasing power also tends to increase. The household frequency of rice consumption was negative and significant ($P < 0.01$) with an odd ratio of 0.8402 which suggests that a unit increase in the frequency of rice consumption by households will decrease the probability of households' foreign rice consumption preference. This could be attributed to

Table 2. Result of Consumer Preference for Foreign and Local Rice Brands.

LGA/ Rice brands	Frequency	Percentage
Makurdi		
Foreign rice	78	83.9
Local rice	15	16.1
Total	93	100.0
Otukpo		
Foreign rice	64	71.1
Local rice	26	28.9
Total	90	100.0
Gboko		
Foreign rice	68	80.9
Local rice	16	19.1
Total	84	100.0
Vandeikya		
Foreign rice	55	61.8
Local rice	34	38.2
Total	89	100.0
Katsina-Ala		
Foreign rice	67	69.8
Local rice	29	30.2
Total	96	100.0
Ogbadibo		
Foreign rice	45	55.0
Local rice	37	45.0
Total	82	100.0
Pooled sample		
Foreign rice	379	71.0
Local rice	155	29.0
Total	534	100.0

Source: Author's Computation, 2022

Table 2. Continue

LGA/ Rice brands	Frequency	Percentage
Makurdi		
Foreign rice	78	83.9
Local rice	15	16.1
Total	93	100.0
Otukpo		
Foreign rice	64	71.1
Local rice	26	28.9
Total	90	100.0
Gboko		
Foreign rice	68	80.9
Local rice	16	19.1
Total	84	100.0
Vandeikya		
Foreign rice	55	61.8
Local rice	34	38.2
Total	89	100.0
Katsina-Ala		
Foreign rice	67	69.8
Local rice	29	30.2
Total	96	100.0
Ogbadibo		
Foreign rice	45	55.0
Local rice	37	45.0
Total	82	100.0
Pooled sample		
Foreign rice	379	71.0
Local rice	155	29.0
Total	534	100.0

Source: Author's Computation, 2022

the inability of the households to put up with the cost of purchasing additional quantity of foreign rice to meet their increasing rice demand. The price of rice

was negative and significant ($P < 0.01$) with an odd ratio of 0.0831. This implies that as the price of foreign rice increases, households tend to reduce

Table 3. Logit Regression Estimates of Factors Influencing Consumer Preference for Foreign and Local Rice Brands in the Study Area.

Variable	Coefficient	Standard Error	t-value	Exp.(β)
Intercept	6.0164	2.7266	2.2066	176.2590
Age	0.0022	0.0178	0.1235	1.0021
Education	-0.0465	0.0559	-0.8327	0.8362
Household size	-0.3066	0.1791	-1.7122	0.6376
Household income	0.1746**	0.0835	2.0914	1.7600
Rice consumption	-0.0764***	0.0443	-1.7261	0.8402
Food expenditure	0.1342	0.3860	0.3477	1.1208
Nonfood expenditure	-0.0117	0.1393	-0.0840	0.8871
Price	-2.2770*	0.8399	-2.7111	0.0831
Taste	-0.5183	0.6356	-0.8155	0.7100
Quality	1.2811***	0.7943	1.6128	3.4671
Ease of preparation	1.1381***	0.7003	1.6251	3.0642
Log-likelihood	-30.6681*			
Correct predictions	81%			
McFadden Pseudo R-squared	51.3%			

Note: *, **, and *** indicate statistical significance at ($P < 0.01$), ($P < 0.05$), and ($P < 0.1$), respectively.

their consumption of foreign rice by resorting to the consumption of low-priced local rice or other food items as substitutes for foreign rice. Rice quality (cleanliness of grain, shape of grain, etc.) was positively related to the household probability for foreign rice consumption preference and was significant ($P < 0.1$). The odd ratio of 3.4671 implies that a unit increase in the quality of rice will increase the probability of households' rice consumption in favor of foreign rice preference by a magnitude of 3.4671. This finding is consistent with Bamidele et al. (2010) who noted that households preferred imported rice to local rice, because the imported rice is of higher quality and grade, that is, has a better taste, it is polished, not broken, and is free of stones and other debris. The ease of rice preparation was positive and significant ($P < 0.1$) with an odd ratio of 3.0642, suggesting that a unit increase in the frequency of rice consumption by households will increase the probability of households' foreign rice

consumption preference.

Households' Share of Expenditure on Rice in the Total Food Expenditure

The result in Table 4 showed the household's monthly budget share on rice, foreign and/or local in Makurdi, Otukpo, Vandeikya, Gboko, Ogbadibo, and Katsina-Ala LGAs of Benue State. The result showed that 16%, 18%, 15%, 14%, 12%, and 10%, respectively of the households' monthly food expenditure were spent on rice consumption. The households' monthly budget share on rice for the aggregated households was 0.15, which indicated that the aggregated households spent 15% of their monthly food expenditure on rice consumption. However, this value is below that of the Northwest geographical zone and the nation's average which were reported to be 28.3% and 30.63% respectively (Adeyeye, 2012).

Table 4. Share of Households' expenditure on rice in the Total Food Budget and Comparison of Rice Budget Share with Selected Food Items.

Households	Rice expenditure (₦)	Total food expenditure (₦)	Rice budget share
Makurdi	294,389	1,839,897	0.16
Otukpo	141,022	783,456	0.18
Gboko	123,822	825,480	0.15
Vandeikya	88,792	634,226	0.14
Katsina-Ala	69,174	576,448	0.12
Ogbadibo	48,826	488,260	0.10
Pooled sample	666,020	4,421,544	0.15
Comparison of rice budget share with:			
Beans	397,939	4,421,544	0.09
Maize	265,293	4,421,544	0.06
Garri	176,862	4,421,544	0.04
Yam	132,646	4,421,544	0.03

Source: Author's Computation, 2022

A comparison of rice budget share with the selected food items' budget shares showed that the average monthly expenditure on rice was ₦666,020 while that of beans, maize, garri, and yam were ₦397,939, ₦265,293, ₦176,862, and ₦132,646, respectively. The households' average total food expenditure was estimated at ₦4,421,544. The budget share of rice was comparatively high (15%) than those of other selected food items indicating that rice constituted a larger proportion of the households' monthly food expenditure relative to beans, maize, garri, and yam. These findings imply that sudden changes in households' food expenditure could affect the households' rice consumption. This agrees with the findings of Erhabor and Ojogho (2011) who established that rice had the highest proportion of households' monthly food expenditure relative to other food items thus attesting to the central position of rice in households' food basket.

Determinants of the Demand for Rice

The generalized least squares (GLS) were employed to perform the seemingly unrelated regression of the linear approximate almost ideal demand system model for rice, beans, maize, garri, and yam with rice as the focal food item and the other food items taken into consideration for comparative purpose and better comprehension of the nature of rice demand. The result in Table 5 showed that the calculated Wald test (χ^2 104.88 was statistically significant ($P < 0.01$) indicating data consistency with the consumer utility-maximizing theory. The R^2 of the estimated rice demand equation was 0.77 indicating that 77% of the variability of the households' budget share on rice was explained by the explanatory variables included in the model. The F-statistics of the estimated rice demand equation was 18.22 and was statistically significant ($P < 0.01$) thus, indicating the joint significance of the explanatory variables in the models. The result showed that rice price, beans price, maize price, yam price, food expenditure, age of household head, household income and number of

household income earners were all significant in influencing the households' rice budget share.

In the beans demand equation, beans price, rice price, maize price, yam price and food expenditure were the significant variables that influenced the

proportion of households expenditure on beans. For maize demand equation, rice price, beans price, maize price, yam price, food expenditure and household income significantly influenced the

Table 5. Results of Seemingly Unrelated Regression Estimates of LA-AIDS Model for Determinants of the Demand for Rice in the Study Area.

Variables	Rice	Beans	Maize	Garri	Yam
Intercept	0.3948 (4.2669)	0.2177 (2.0754)	0.460 (2.3452)	0.0233 (2.1382)	0.1288 (1.5871)
Log of rice price	0.0076* (3.7891)	-0.0114*** (-1.8303)	-0.0128* (-3.6071)	0.0037*** (1.7081)	0.0063 (0.7156)
Log of beans price	-0.0112*** (-1.6311)	0.0418* (8.6200)	-0.0156* (-5.0361)	-0.0007 (-0.1002)	-0.0341* (-4.6852)
Log of maize price	-0.0129* (-3.6080)	-0.01764* (-5.1373)	0.0381* (13.1186)	-0.3611E-04 (-0.0164)	-0.0116** (-2.8526)
Log of garri price	0.0034 (1.5074)	-0.0003 (-0.1001)	-0.3421E-04 (0.0274)	0.0016*** (1.8321)	-0.0169* (-3.6461)
Log of yam price	0.0111*** (1.5613)	-0.0218* (-5.0871)	-0.0167* (-5.1340)	-0.0048* (-3.1081)	0.0564* (5.4528)
Log of expenditure	-0.0340* (-14.5370)	-0.0007** (-2.5561)	-0.0035* (-8.8070)	0.5266E-07 (0.6711)	0.1177E-04 (0.076)
Age	-0.0019** (-2.0173)	0.0004 (0.8831)	0.0001 (0.3310)	0.0001 (0.8163)	0.0005 (0.5711)
Education	0.0017 (1.1833)	-0.0005 (-0.5464)	0.0003 (0.6008)	0.0004 (0.2416)	0.0004 (0.2416)
Household size	0.0068** (2.5102)	0.0035 (1.5110)	-0.0012 (-1.0264)	-0.0001 (-1.0838)	-0.0103** (-2.2601)
Household income	0.0261** (2.4132)	-0.0078 (-0.7802)	-0.0145** (-2.0311)	-0.0031** (-2.2611)	0.0054** (2.3315)
Income earners	-0.0216** (-1.8185)	-0.0103 (-1.1324)	-0.0004 (-0.6232)	0.0022*** (1.8670)	0.0232*** (1.6427)
R-squared	0.77	0.58	0.68	0.56	0.69
F-statistics	18.22	8.89	15.91	8.72	13.4
Wald test (χ^2)	104.88				

Note: Values in parentheses are the calculated t values. * (P < 0.01), ** (P < 0.05) and *** (P < 0.1).

households maize budget share. The proportion of households' expenditure on garri was influenced significantly by the prices of garri, rice, yam, household income and number of household income earners. In the yam demand equation, the prices of yam, beans, maize, garri, household size and household income as well as the number of household income earners significantly influenced

income will increase the households proportion of expenditure on rice by a magnitude of 0.0261. This is because an increase in household income leads to an increase in the purchasing power of the households. The coefficient of household income earners was negative and statistically significant ($P < 0.05$). An increase in number of household income earners will decrease the household's rice budget share by 0.0216. The possible explanation could be

Ogebe et al. 665

the household yam budget share. The price of rice was found to be positive and statistically significantly ($P < 0.01$), implying a unit increase in the price of rice will increase the proportion of households expenditure by a unit of 0.0076. The coefficient of beans was found to be negative and statistically ($P < 0.1$). A unit increase in the price of beans will decrease households' proportion of expenditure on rice by a magnitude of 0.0112. The price of maize had a negative relationship with the households' rice budget share and was statistically significant ($P < 0.01$). An increase in the price of maize implies an increase in the expenditure on maize and hence, if the households must maintain its consumption level of maize, it means that the households' food expenditure on other food items such as rice would decrease for the households to be able to maintain their level of consumption of maize. The coefficient of yam was statistically significant ($P < 0.1$) and is positively related to the households budget share. It indicated that a unit increase in the price of yam will increase will increase the households rice budget share by a unit of 0.01. Expenditure on food was found to be negative and statistically significant ($P < 0.01$). A unit increase in food expenditure will decrease the household proportion of food expenditure on rice by a unit of 0.0340. Age has a negative relationship with the households' rice budget share and was statistically significant ($P < 0.05$).

A unit increase in age of household head will decrease the households' rice budget share by a unit of 0.0019. The coefficient of household size was positive and statistically significant ($P < 0.05$). A unit increase in the household size will increase the households' budget share by a unit of 0.0068 and this could be attributed to the increase in the number of persons to be fed in the household. Monthly income of households had a positive relationship with the households' proportion of expenditure on rice and was statistically significant ($P < 0.05$). It implies that a given unit increase in household's

attributed to the shift in consumption of other food items as a result of the increase in household income from the increased number of household income earning members especially for households whose income have hitherto been low. The price of rice was statistically significant ($P < 0.01$) and negatively related to the households expenditure share on beans and maize but positively related to the households expenditure share on garri. Also, not significant, the price of rice was found to be positively related to the household's expenditure share of yam.

CONCLUSION

The study provided empirical evidence of the central position of rice in the food basket of households in Benue State, Nigeria as evident by comparatively large monthly budget share of rice (0.15) compared to other budget shares of other food items includes in the research. The study found that households in Benue State consume both local and foreign rice brands as a necessity and not a luxury food item, however, a larger proportion of households prefer consuming foreign rice to locally produced rice due to perceived high quality of foreign rice, ease of preparation, taste among others. The study concluded that an improvement on the quality of local rice to attain the high quality desired by households would stimulate local rice consumption preference by households and save the nation from the colossal loss of foreign exchange incurred in importation of foreign rice to meet local demand.

RECOMMENDATIONS

The following recommendations are pertinent to the study:

1. Since quality of rice is a major determinant of rice consumption in the study area, the Nigeria's Agricultural Transformation Agenda should lay more emphasis on local rice processing to ensure improvement in local rice quality so as to make it competitive with foreign rice and this will encourage the consumers shift preference from imported rice to locally produced rice brands.

2. Policy measures aimed at ensuring stringent rice import duties and levies should be put in place and implemented to discourage foreign rice
666. Int. J. Agric. Res. Sustain. Food Sufficiency

importation and this will also stimulate increased local rice consumption and invariably production

3. There is need for adequate policy framework aimed at reducing the cost of production and increasing supply of local rice brands to reduce prices of local rice brands and invariably enhance demand for local rice by households.

4. Households need re-orientation on the consumption of available nutritious local rice brands through sensitization so as to save the nation from continuous loss of huge foreign exchange in the importation of foreign rice to meet local demand.

Authors' Contributions

This work was carried out in collaboration among all authors. Author **OOF** designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors **AED** and **MHL** managed the analyses of the study. Author **AED** managed the literature searches. All authors read and approved the final manuscript.

Conflict of Interest

The authors have not declared any conflict of Interest.

REFERENCES

- Adeyeye V.A. (2012). Strategies for Enhancing Consumption of Locally Produced Rice in Nigeria. The Nigerian Institute of Social and Economic Research (NISER), Ibadan, Nigeria.
- Agboola F.W. (2003). Estimation of Food Demand Patterns in South Africa Based on a Survey of Households. *Journal of Agricultural and Applied Economics*, 35(3): 663-670.

Ayanwale A.B. and Amusan C.A. (2012). Gender Analysis of Rice Production Efficiency in Osun State, Nigeria: Implication for the Agricultural Transformation Agenda. Paper presented at the 13th National Conference of the Nigerian Association of Agricultural Economists, Obafemi Awolowo University, Ile-Ife, Nigeria. September 25th -27th.

Ayinde O., Adewumi M. and Ojehomon V. (2009). Determinants of Technical Efficiency and Varietal-Gap of Rice Production in Nigeria: A Meta-Frontier

Model Approach. International Association of Agricultural Economics 2009 Conference Paper.

Bamidele F.S., Abayomi O.O. and Esther O. A. (2010). Economic Analysis of Rice Consumption Patterns in Nigeria. *Journal of Agricultural Science and Technology*, 12: 1-11.

Basorun J. O. (2008). A Bivariate Analysis of Factors Affecting Rice Processing in Igbemo-Ekiti, Nigeria. *Agricultural Journal*, 3(6): 442-446.

Benue Agricultural and Rural Development Authority, [BNARDA] (2004). The impact of AIDS on rural livelihoods in Benue State: implication for policy makers. Occasional paper, 3: 2 – 4

Boansi, D. (2014). Yield Response of Rice in Nigeria: A Co-Integration Analysis. *American Journal of Agriculture and Forestry*, 2(2): 15-24.

Cadoni P. and Angelucci F. (2013). Analysis of incentives and disincentives for rice in Nigeria. Technical notes, MAFAP. FAO, Rome.

Daramola B. (2005). Government Policies and Competitiveness of Nigerian Rice Economy. Paper presented at the 'Workshop on Rice Policy and Food Security in sub-Saharan Africa' organized by WARDA, Cotonou, Republic of Benin.

Dontsop-Nguezet P.M., Diagne A., Okoruwa V.O. and Ojehomob V. (2011). Impact of Improved Rice Technology on Income and Poverty among Rice Farming Households in Nigeria. A Local Average Treatment Effect (late) Approach. Contributed paper prepared for 25th Conference of the Centre for Studies of African Economics (CSAE). St. Catherine College, University of Oxford, UK. 20-22 March. Pp.1-13.

Erhabor P.O.I. and Ojogho O. (2011). Demand Analysis for Rice in Nigeria. *Journal of Food Technology*, 9(2): 66-74.

Food and Agricultural Organization [FAO] (2002). *Rice Information*, Vol. 2. Rome, Italy.

Mohammed S. (2011). Economics of Rain-fed and Irrigated Rice Production under Upper Benue River Basin Development Authority Scheme, Dadinkowa, Gombe State, Nigeria. *Continental Journal of Agricultural Economics*, 5(1): 14-22

National Population Commission, (NPC, 2007). National Population Census Report, Abuja.

Nigerian infopedia (2022). Full List of Rice Producing States in Nigeria.
<https://nigerianinfopedia.com.ng>rice>

Omonona B.T., Nkang N.M. and Ajao F.A. (2010). Households Demand Analysis: A Survey of Semi-

Urban and Rural Households in South-west Nigeria. *Global Journal of Pure and Applied Sciences*, 15(4): 315-324.

Onoja A.O. and Herbert B.C. (2012). Econometric evaluation of rice profitability determinants in Kogi State, Nigeria. *Journal of Agricultural Extension and Rural Development*, 4(5): 107-114.

Ogebe et al. 667

United Nations Development Program (UNDP) (2012). Towards a Food Secure Future. Africa Human Development Report. New York.
<http://hdr.undp.org/en/statistics>.

United State Agency for International Development [USAID] (2009). Nigeria Rice Value Chain Analysis. Draft Report.