



International Journal of  
**Agricultural  
Research**

ISSN 1816-4897



Academic  
Journals Inc.

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## **Rice Demand Pattern and its Intervening Factors in Nigeria**

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### **ABSTRACT**

The study examined rice demand pattern and its intervening factors in Nigeria. To achieve this, the study examined the socio-economic characteristics of rice-consuming households, average income of households, quantity of rice, expenditure share of rice, rice meals consumption patterns, rice meals consumption habit and factor affecting rice meals consumption patterns. Both primary and secondary data were used to generate information for this study. A multi-stage sampling procedure, involving four stages, was used to select 812 households. Data collected were analysed using both descriptive and inferential statistics. The result of the descriptive statistics showed that rice consumption/demand was more in the urban centres than the rural centres of the study area, mostly among the married and the medium-size male-headed households with tertiary-education. Rice constituted the largest share of the household total food expenditure, ranging between about 28 and 21% among the high income and urban household, to 28 and 24% among the low income and rural households. The result of the multiple regressions showed that the pattern of rice consumption in Nigeria is a phenomenon linked with socio-economic characteristics of households, the type of rice, level of education, ease of preparation and urban lifestyles. Attention must be paid to these factors if Nigeria is to attain self-sufficiency in rice for sustainable consumption.

**Key words:** Rice, expenditure share, LA/AIDS, quantity of rice, rice patterns

### **INTRODUCTION**

All around the world, people eat rice. It is the world's most important staple food crop consumed by more than half of the world population as represented by over 4.8 billion people in 176 countries with over 2.89 billion people in Asia, over 150.3 million people in America and over 40 million people in Africa (FAO, 1996; Bruntrup, 2006; IRRI, 2004; Gulati and Narayanan, 2002). It also has been an important food commodity for most people in Sub-Saharan Africa particularly West Africa where it has increased from 15% in the 1970's to 26% in the 1990's (Jones, 1995; Rosegrant *et al.*, 2002; FAOSTAT, 2003). An interesting reason for it being so popular is that it is so easily digested. Even the sick, elderly, babies and people who are allergic to lots of other foods can digest it very well if cooked. It provides 21% of global human per capita energy and 15% of per capita protein. Although, it is low in fat but the 'african miracle rice', Nerica, has grains richer in protein than the old varieties. Recent studies by the modern nutritionists have compared the easily digestible Organic Rice Protein, a highly digestible and non-allergenic protein, to mother's breast milk in the aspect of its nutritious quality and also for the high quantity of amino acid that is common in both rice protein and breast milk. Rice also provides minerals, vitamins and fiber, although all constituents except carbohydrates are reduced by milling (Kwanchai, 2001).

Rice is a very important staple food in the diet of the estimated over 140 million Nigerians. According to Ojogho and Alufohai (2009), rice is a sustainable food for Nigeria, consumed in different forms such as white rice and stew, pudding and rice and onion stew. Numerous ways of consuming rice have evolved over time, from the normal way of cooking rice to boiling to steaming and to grilling in bamboo. Also evolved are the many different sizes and shapes of 'rice pots' which are dependent on the particular way that rice is cooked. Rice is generally eaten with varying kinds of 'dishes,' made of meat, vegetables and other condiments. This has also resulted in having many different designs of containers where rice and the meat/vegetable dishes are placed before serving. It is eaten both as glutinous and non-glutinous rice, prepared as meals, as snacks, as desserts and as drinks. It is consumed in various forms but the most popular is as grains. Rice has potential in a wide range of food categories. It is used in the preparation of several local dishes that are eaten in most homes, especially during festivals and ceremonies. It is usually eaten, by Nigerians, in different forms such as jolloff rice, fried rice, white rice, rice flour, noodles, rice cakes and more. It is commonly boiled and eaten with stew or vegetable soup. It is sometimes consumed in combination with other food staples such as plantain, beans, maize and vegetables (self communication). In the absence of rice, most Nigerian homes make do with yam, *garri*, *fufu* and other carbohydrate-source food items. Figure 1 shows the various uses of rice.

Although, general trends in food consumption patterns have been documented such analysis underscores serious gaps in our knowledge and understanding of rice consumption by consumer groups, in which form, where and why. A clear understanding of the principles and factors influencing the dynamics of rice consumption in Nigeria can constitute a major issue in her policy

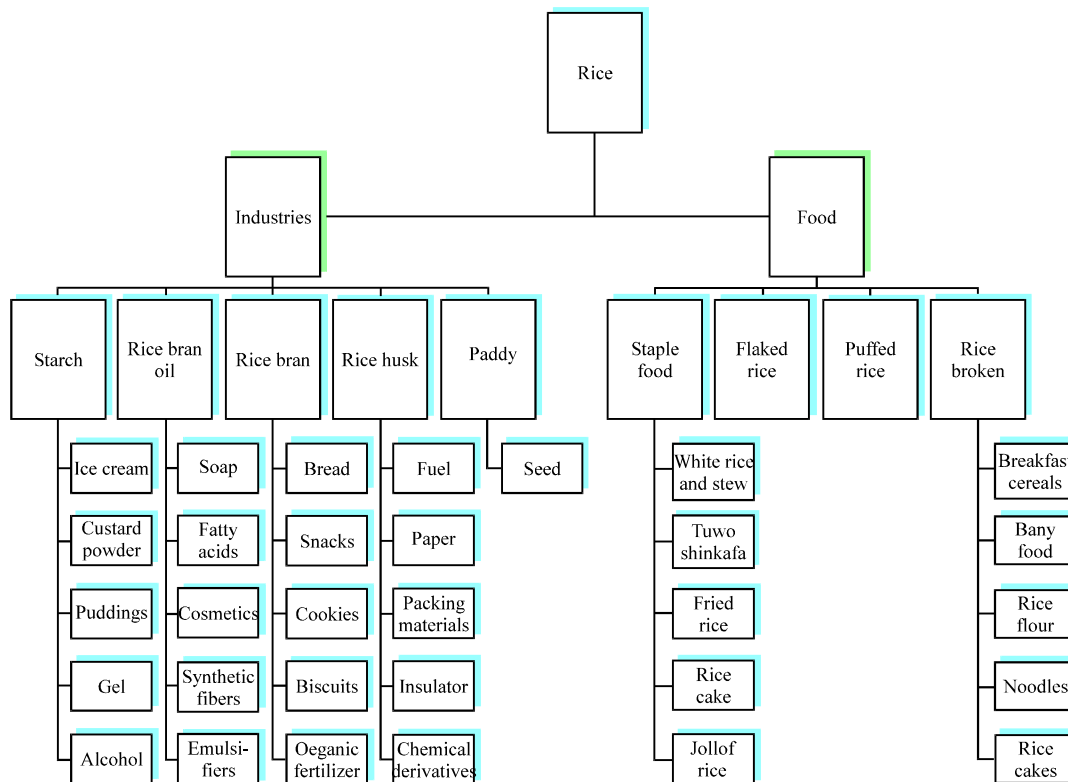


Fig. 1: Flow chart showing the uses of rice

formulation. Pertinent to such understanding is providing answers to such question as: What are the effects of socio-economic/demographic characteristics of households on the demand for rice?, what is the share of rice expenditure in total household expenditure? what is the level of rice consumption and what factors explain the demand pattern for rice in Nigeria? The study, therefore, undertook rice demand pattern and its intervening factors in Nigeria. To achieve this, the study examined the socio-economic characteristics of rice-consuming households, average income of households, quantity of rice, expenditure share of rice, rice meals consumption patterns, rice meals consumption habit and factor affecting rice meals consumption patterns.

## **MATERIALS AND METHODS**

The study was carried out in Edo, Delta and Lagos states of Nigeria. Administratively, the three States are divided into 68 Blocks (Local Government Areas) with 18 in Edo, 25 in Delta and 25 in Lagos State and each State has three Senatorial Districts. The location was specifically chosen for its high rice consumption in Nigeria, the three States being among the states in Nigeria with an average percentage rice share of 8-12% (accounting for about 34% of the total consumption) in food expenditure (IRRI, 2004) and having rain-fed upland, rain-fed lowland and having mangrove swamp rice production system. According to the 2006 census ([www.nigerianstat.gov.ng](http://www.nigerianstat.gov.ng)), the three states have a population of 16 330 257 representing 11.7% of the nation's population, who individually consume about 24.6 kg per capita of rice annually (IRRI, 2004). In addition, there are high economic activities in the region which are reflected in the living conditions of the people of the region in comparison with those in Northern Nigeria (Adamu, 2003). Besides Agriculture as the predominant occupation of the people in the region, it is a commercial centre with many industries and hotels for the comfort of visitors. In this study, the two Local Government Areas chosen were Egor and Oredo in Edo state, Ethiope-East and Sapele in Delta state and Lagos Island and Surulere in Lagos state. The target population for this study was the set of households that consume rice, whether the local or the imported rice types, in the study area.

Both primary and secondary data were used to generate information for this study. The secondary data were obtained from, among other sources, the National Bureau of Statistics (Federal Office of Statistics), Central Bank of Nigeria, World Bank Report, Journals, Agricultural Development Programme Office (ADP), Research Institute, Universities and Government Parastatals. The primary data were collected with the use of a structured questionnaire for information on quantity consumed of rice, income of households, total food expenditure and cost of rice quantity consumed/purchased. Data were also collected on the demographic variables such as age, education level, household size, sex, location (rural or urban), age of members and other socio-economic characteristics of households.

A multi-stage sampling procedure consisting of four stages was used in this study to select households within the study area in the three states. The first stage involved a Simple Random Sampling of one Senatorial district from each state using the lucky-dip approach. The second stage involved a Simple Random Sampling of two Blocks (LGAs) from the senatorial district using the lucky-dip approach. The Third stage involved a Simple Random Sampling of three Cells in each Block using the lucky-dip approach. As a last stage, a list of the all households in the study area based on the Enumeration Areas (EA) developed for the 2006 population census was obtained from the National Population Commission to serve as the sample frame for each Block. A Simple Random Sampling of 50 rice-consuming households was obtained in each Cell from the list using the random number table, making up a total of 300 households from each State. To achieve this last stage, a

pilot questionnaire was created to specifically target the study area population. Participants were asked to name the foods frequently served/consumed in their homes. Based on the participants' responses, a list of ten foods commonly served/consumed was generated. If six or more participants reported having been served/consumed a particular food, it was selected to be used in the final questionnaire. However, only households which had rice among the food served were finally sampled. Only eight hundred and twelve copies of questionnaire were retrieved from the respondents making a response rate of 90.2%. The study, therefore, used a sample size of eight hundred and twelve.

Owing to the difficulties involved in measuring and quantifying social variable especially when the study involves collecting data on population of poor record-keeping, all measurement of variables were taken in their local form and then standardized. Expenditure share was measured using the expenditure dimension, taken as the ratio of expenditure on a food item to the total food expenditure, sex (gender) was measured on male or female basis (male = 1 and female = 0), age was measured in years and categorized into children (under 13 years), teenagers (13-19 years), youth (20-45 years), adult (above 45 years) age brackets for household members according to the United Nation's classification and as used by Mariya-Dixton *et al.* (2004), marital status was measured on single, married, divorced, separated or widowed/widower basis, educational status was measured and categorized following the work of Ojogho *et al.* (2008) into primary, secondary and tertiary education. There was no household without education. In Nigeria, many researchers group the populace into three income groups, namely, low, middle and high-income households. The low income households spend 60% of their earning on food, the middle income households spend 45% of their earning on food, while a little over 33% of earning spent on food by the high income households (Ojo, 1991). In this study, the Income per consumption unit (equivalent income) in which the household income is "corrected" for differences in household size and household composition was used. To compare the level of income and living standards for households of varying size, income was adjusted with the help of equivalence scales or consumption units. The EU-equivalent scale was used for this purpose in which the first adult in the household counted as 1 unit, the next adult 0.5 unit each and each child under the age of 17 counted as 0.3 units. This study followed these approaches in classifying households into income groups: Earning less than = N = 25000.00 per month were classified as low-income households, earning between = N = 25000.00 and = N = 50000.00 were classified as middle-income group, while those in the earning above = N = 50000.00 were classified as high-income. A household was regarded as all persons living permanently in the home and having common housekeeping. Thus, household size was measured by the number of people feeding from the same cooking pot and categorized into small (1-5 members), medium (6-10 members) and large (above 10 members) according to Ojogho *et al.* (2008). The prices of food items were the average market price, at the retail level, of each food item in the community/local government area of study. This was done to ensure the perfect market scenario. Rural and urban areas were identified based on the NPC (2006) where any locality with less than 20,000 populations constitutes a rural area.

Data collected were analysed using both descriptive and inferential statistics. Descriptive statistics such as frequency count was used for the various forms in which rice is consumed. The effect of the socio-economic/consumer criteria for rice consumption and such factors on rice demand pattern was captured by modifying the intercept of the LA/AIDS model:

$$\alpha_3 = \alpha_1 + \sum_j \gamma_j \ln P_j + \beta_1 \ln \left( \frac{X}{P} \right) + \epsilon_i$$

through the translating method (Heien and Wessells, 1990). In this light, it was assumed that the parameter  $\alpha_i$  depended on some socio-economic characteristics/ demographic variables and other consumer criteria for rice consumption. The factors that were employed in the regression analysis are: Sex of the Household Head of Consumer (SHH), Average Education Level of Household (AEHH) given as:

$$\frac{\sum \text{HHMYE}}{\text{HHS}}$$

Level of Availability of the Rice (AVAIL), Household Size (HHS), Marital Status (MS), frequency of consumption (Freq), Dummy for rural or urban (D), Family Income (FI), Average Age of Household (AHH), Cleanliness of Rice Grain (CRG), Ease of Preparation of Rice (EPR) and type of rice (T):

$$\alpha_i = \alpha_i^* + \alpha_{1i} \text{HHS} + \alpha_{2i} \text{AVAIL} + \alpha_{3i} \text{ERP} + \alpha_{4i} \text{CRG} + \alpha_{5i} \text{AAHH} + \alpha_{6i} \text{MS} + \alpha_{7i} \text{SHH} + \alpha_{8i} \text{FI} + \alpha_{9i} \text{AEHH} + \alpha_{10i} \text{D} + \alpha_{11i} \text{T} + \alpha_{12i} \text{Freq}$$

Subject to the adding-up property:  $\sum_i \alpha_i^* = 1$  and  $\sum_i \alpha_{ik} = 0$ ,  $k = 1, 2, 3 \dots 13$ . This set of constraints from the equation is tantamount to the constraint:  $\sum_i \alpha_i = 1$  from the LA/AIDS equation.

## RESULTS AND DISCUSSION

**Socio-economic characteristics of households:** The distribution of households according to the socio-economic characteristics of households is shown in Table 1. The results showed that the area had more of the male-headed households (89.2%) than female-headed households (10.8%) with more male-headed households (93.5%) in the urban centres of the study area. Among the 56.5% of the male-headed households among the urban respondents, 21.8, 20.9 and 20.3% were, respectively in the urban centres of Delta, Edo and Lagos states. This suggests that there is a higher consumption of rice by the male-headed households in urban Delta, Lagos and Edo in particular and the entire sample in general than the rural centres. However, there was higher rice consumption in rural Delta among the female-headed households than in other areas of the study area.

The study area had a younger population who were mainly children and teenagers with a large proportion of them in the urban centres than rural centres. This is supported by the large proportion (79.2%) of children and teenagers with 49.4% (representing 64.1% of the total children and teenagers) of them in the urban centres. This suggests that rice consumption in the study area is mainly by children and teenagers. However, youths consumed rice more in urban Edo (16.9%) and Delta (20.1%) while rice consumption was more in urban Lagos (66.8%) and Delta (20.0%) by adults in the study area. In the study generally, rice was a function of the average age of household (family age structure) and decreased with increase in the age of a member.

Rice consumption/demand was mostly among the married (67.4%) and was higher in the urban centre than the rural of the study area. The proportion of widows/widowers was smaller in the rural areas than the urban centres accounting for only 5.2% in the sample. However, the proportion of widow/widower was highest in the urban Delta (31.0%). Rice consumption is likely to increase among widows/widowers in the state in particular and the study area at large if the proportion of this group increases.

Table 1: Summary statistics of socio-economic characteristics of households

	Entire sample							Lagos				Delta				Edo			
	Rural		Urban		Total		Mean	Rural		Urban		Rural		Urban		Rural		Urban	
	freq.	%	freq.	%	freq.	%		freq.	%	freq.	%	freq.	%	freq.	%	freq.	%	freq.	%
Urbanization sex	321	39.5	491	60.5	812	100.0		105	39.8	159	60.2	117	41.1	168	58.9	99	37.6	164	62.4
Male	265	32.6	459	56.5	724	89.2		95	36.0	147	55.7	88	30.9	158	55.4	85	32.3	151	57.4
Female	56	6.9	32	3.9	88	10.8		10	3.8	12	4.5	29	10.2	10	3.5	14	5.3	13	4.9
Age group (years)	1074	22.0	1914	39.3	2988	61.3	11.2	336	21.2	624	39.4	414	24.2	648	37.9	324	20.7	642	40.7
Teenagers	378	7.8	492	10.18	70	17.9	15.41	38	8.7	156	98	120	7.6	174	10.2	120	7.6	162	10.3
Youth	420	8.6	504	10.3	924	18.9	37.8	120	7.8	138	8.7	150	8.8	186	10.9	150	9.5	180	11.4
Adult	54	1.1	36	0.79	01.8	51.3		36	2.3	36	2.3	18	1.1	-	-	-	-	-	-
<b>Marital status</b>																			
<b>single</b>	82	10.1	111	13.7	195	24.0		21	8.0	39	14.8	32	11.2	26	9.1	32	12.2	43	16.3
Married	222	27.3	325	40.0	547	67.4		80	30.3	107	40.5	76	26.7	121	42.5	66	25.1	97	36.9
Widowed/widower	15	1.8	27	3.3	42	5.2		4	1.5	8	3.0	7	2.5	13	4.6	1	0.4	9	3.4
Separated	2	0.2	28	3.4	30	3.7		-	-	5	1.9	2	0.7	8	2.8	-	-	15	5.7
<b>Household</b>																			
size small (1-5)	88	10.8	186	22.9	274	33.7	2.54	32	11.2	67	23.5	24	8.4	75	26.3	32	12.2	44	16.7
Medium (6-10)	133	16.4	249	30.7	382	47.0	7.41	46	17.4	68	25.8	36	12.6	78	27.4	51	19.4	103	39.2
Large (above 10)	100	12.3	56	6.9	156	19.2	10.23	27	10.2	24	9.1	57	20.0	15	5.3	16	6.1	17	6.5
<b>Education</b>																			
Primary	170	20.9	156	19.2	326	40.1		61	23.1	43	16.3	70	24.6	44	15.4	39	14.8	69	26.2
Secondary	121	14.9	132	16.3	253	31.2		32	12.1	54	20.5	44	15.4	35	12.3	45	17.1	43	16.3
Tertiary	30	3.7	203	25.0	233	28.7		12	4.5	62	23.5	3	1.1	39	31.2	15	5.7	52	19.8
<b>Income Group (naira)</b>																			
Low (<25 000)	119	54.0	100	46.0	219	27.0		40	15.2	43	16.3	50	17.5	44	15.4	29	11.0	13	4.9
Middle																			
(25 000-50 000)	141	33.0	287	67.0	428	53.0		53	20.1	74	28.0	42	14.3	78	27.4	46	17.5	135	51.3
High																			
(above 50 000)	61	37.0	104	63.0	165	20.0		12	4.5	42	15.9	25	8.8	46	16.1	24	9.1	16	6.1

The mean household size was 3, 8 and 10 for the small-medium-and large-household sizes, respectively. However, the sample had a medium-size household range that lived in the urban centres of the study area. This distribution by household size was also shared by the three states in the study area. It not only implied that rice consumption is mainly among the urban population but that consumption is largely among the medium-size households. However, large-size households also consumed rice but the consumption was largely in rural areas. It means that as household size increased, rice consumption/demand shifted from urban to rural.

The Education level distribution of household heads was mainly tertiary education and they lived in the urban centres of the study area. Rice consumption was more prominent among the tertiary-education household heads and mainly in the urban centres. This increase was more in urban Delta than in the other states. This suggests that increase in urbanization and improvement in education level of a household head increase demand for rice. This may be due to increase in income as a result of improvement in education.

Table 1 showed that over half (53%) of the household heads were in the middle income class and were mainly concentrated (67%) in the urban centres of the study area while only 20% of them were high income earners with 63% of this high income earners in the urban centres. This suggests that the number of rice consumers first increased as income increased but decreased as income

Table 2: Average income of household, quantity of rice, and expenditure share of rice

Variable	Entire sample			Lagos		Delta		Edo		Income		
	Rural	Urban	Mean	Rural	Urban	Rural	Urban	Rural	Urban	Low	Middle	High
Expenditure rice	0.24	0.21	0.23	0.20	0.22	0.21	0.23	0.19	0.25	0.28	0.25	0.24
Household income (N)	13151.98	39290.17	49678.29	16308.46	47148.20	16945.42	48326.91	15124.78	46951.73	15952.38	35640.72	55129.07
Household food exp (N)	5129.27	8643.84	16393.84	5707.96	15087.42	5253.08	17397.69	6352.41	17841.65	12123.81	16751.14	10474.52
% income on food exp. (N)	39%	22%	33%	35%	32%	31%	36%	42%	38%	76%	47%	19%
Annual quantity of rice Consumed (Kg)	25.8	36.3	32.0	30.4	32.5	33.1	29.3	23.4	28.4	15.9	37.5	21.5

increased further. This decrease is probably due to the effects of economies of scale since households will buy rice in bulk as income increases. Also, as income increased, consumption shifted from high in rural to high in urban centres of the study area.

**Average income of households, quantity of rice and expenditure share of rice:** Table 2 presents a summary of the income of household, quantity of rice consumed and expenditure shares of households, including differences across income groups and rural and urban areas. The households had a mean monthly income of N49678 in the study area and N13151 and N39290 respectively in the rural and urban centres of the area.

The expenditure share of rice increased from 21% in the rural to 24% in the urban with a mean share of 23% in the study area. Rice constituted a larger share of the household total food expenditure, ranging between about 24 and 25% among the high-income and urban household, to 28 and 19% among the low-income and urban households. The share of rice in the household's budgets was higher at higher income levels. The low-income and rural households spent more of their income on food. However, proportion of income on food reduced as income was raised. Households located in the rural areas allocated larger shares of the food money to such foods as rice. The share of rice in the household's budgets was higher at lower income levels and decreased at high income levels. This means that as income increased, the expenditure share of rice decreased in the study area. Also, expenditure share of rice is higher in the urban centres than the rural centres. The decrease in rice expenditure is probably due to preference for less energy-source food items as income increased, beside the live in the urban centres.

The mean annual quantity of rice consumed was 32.0 kg per capita represented by 36.3 kg in the urban centres and 25.8 kg in the rural centres of the study area. The quantity consumed was highest in urban Lagos (32.5 kg), followed by urban Delta (29.3 kg) and closely followed by urban Edo (28.4 kg). Among the rural dwellers, rice consumer in rural Delta had the highest per capita (33.1 kg) and least in rural Edo (23.4 kg). Among the income category, the middle income earners had the highest annual per *capita* rice consumption (37.5 kg) while the low income earners had the least per capita rice consumption (15.9 kg).

**Rice meals consumption patterns:** Table 3 shows the summary statistics of the consumption pattern of the different rice meals in the study area. The Table shows that rice was more consumed as white rice and stew (21.1%), followed by white rice and onions stew (17%), joll of rice (11%) and fried rice (10%). Rice cake had the lowest percentage (3%) consumption among the respondents. A higher percentage of the white rice and onion stew (23.6%), white rice and stew (14.1%), braised rice (13.4%) and fried rice (13.8%) consumers were in the urban setting. There was no consumers



Table 3: Rice meals demand pattern of respondents

Rice meals	Entire sample												Income						
	Rural		Urban		Total		Lagos		Delta		Edo		Low		Middle		High		
	Freq.	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	freq	%	
White rice																			
and onion stew	22	6.9	116	23.6	138	17.0	52	19.7	46	16.1	40	15.2	39	17.8	86	20.1	13	7.9	
Rice cake	-	-	24	4.9	24	3.0	12	4.5	8	2.8	4	1.5	-	-	3	7.0	21	12.7	
Rice pudding	69	21.4	37	7.5	106	13.1	28	10.6	40	14.0	38	14.4	25	11.4	65	15.2	16	9.7	
Curry rice	-	-	41	8.3	41	5.0	13	4.9	11	3.9	17	6.5	10	4.6	13	3.0	18	10.9	
Fried rice	13	4.2	68	13.8	81	10.0	40	15.2	14	4.9	27	10.3	15	6.8	35	8.2	31	18.8	
Braised rice	7	2.2	66	13.4	73	9.0	15	5.7	25	8.8	33	12.5	10	4.6	33	7.7	30	1.8	
Joll of rice	48	15.4	41	8.4	89	11.0	31	11.7	26	9.1	32	12.2	20	9.1	58	13.6	11	6.7	
White rice and stew	102	32.7	69	14.1	171	21.1	44	16.7	67	23.5	60	22.8	74	33.8	81	18.9	16	9.7	
Coconut rice	23	7.4	9	1.8	32	3.9	11	4.2	12	4.2	9	3.4	5	2.3	21	4.9	6.0	3.6	
Banga rice	37	11.8	20	4.1	57	7.0	18	6.8	36	12.6	3	1.1	21	9.6	33	7.7	3.0	1.8	

of rice cake among the rural dwellers and low-income earners, while Lagos state households had about half (50%) of rice cake consumers in the study area. A high percentage (43.9%) of the high-income group was also found among curry rice consumers, rice cake (87.5%), fried rice (38.2%) and braised rice (41.1%) consumers, representing 10.9, 12.7, 18.8 and 1.8%, respectively of the high-income earners. Among the white rice and stew consumers, about half (43.3%) of the respondents are low-income earners while only 9.4% of them were in the high-income group. These represent 33.8 and 9.7%, respectively of the low- and high-income earners. A high percentage (62.3%) of the middle-income group was among the white rice and onion stew consumers, 9.4% among the high-income group, representing 20.1 and 7.9%, respectively of the middle- and high-income in the study area. This trend was also common with rice pudding, fried rice and joll of rice. However, the rice cake consumers were mainly high-income earners (87.5%) with very small proportion of the middle-income group.

Lagos state respondents consumed rice more in the form of white rice and stew (16.7%), white rice and onion stew (19.7%) and fried rice (15.2%). This trend is also shared with Delta state respondents with 23.5% white rice and stew, 16.1% white rice and onion stew but 14.0% rice pudding and only 2.8% of rice cake. Similarly, in Edo state, 22.8% are for white rice and stew, 15.2% white and onion stew, 14.4% rice pudding and only 1.5% rice cake consumers.

The high-income group respondents consumed rice in a more 'expensive' form such as fried rice (18.8%) and braised rice (18.2%) besides rice cake (12.7%) and curry rice (10.9%). With 27% of the respondents as low-income earners, rice was mainly consumed as white rice and stew and white rice and onion stew giving a composite percentage of 51.6%. None of the low-income earners consumed rice cake.

**Rice meals consumption habit:** In the study area (Table 4), the most frequently consumed rice meals consistently were white rice and stew, white rice and onion stew, rice pudding and jollof rice. Although white rice and onion stew ranked second at 17.0% in overall frequency of consumption percentage in the study area, more households (13.1%) consumed rice pudding once or twice a week. Only white rice and stew, white rice and onions stew and rice pudding were consumed over four times a week.

Table 4: Frequency of consumption of different rice meals by respondents

Rice meal	No.	0×week	1-2×week	3-4×week	Over 4×week	Overall (%)
Coconut rice	32	0.08	1.65	1.29	0.88	3.9
Curry rice	41	0.65	2.63	0.64	1.08	5.0
Rice cake	24	0.10	1.24	0.59	1.07	3.0
Braised rice	73	0.20	3.79	2.65	2.36	9.0
Rice pudding	106	0.02	2.40	3.61	6.98	13.1
Banga rice	57	0.61	2.20	2.80	1.39	7.0
Joll of rice	89	0.60	4.23	2.11	4.06	11.0
Fried rice	81	0.13	7.02	2.51	0.34	10.0
White rice and onion stew	138	1.26	7.23	2.40	6.11	17.0
White rice and stew	171	0.75	6.28	5.45	8.62	21.1

Table 5: Estimated parameters and associated asymptotic errors of the la/aids models for socio-economic effects on rice consumption pattern in the area

Parameter	White rice and stew i = 1	White rice and onion stew i = 2	Rice pudding i = 3	Jollof rice i = 4	Fried rice i = 5	Braised rice i = 6	Banga rice i = 7	Cake rice i = 8	Curry rice i = 9	Coconut rice i = 10
$\alpha_i^*$	0.2125 (16.473)	0.1009 (7.730)	0.0812 (9.333)	0.1022 (5.379)	0.1122 (9.508)	0.1347 (15.483)	0.1011 (22.467)	0.0304 (2.054)	0.0147 (0.993)	0.1101 (7.013)
$\alpha_{1i}$	0.1406 (6.995)	-0.0265 (22.083)	-0.0143 (6.810)	-0.0152 (1.900)	0.0222 (14.800)	0.0789 (6.415)	0.0156 (6.240)	-0.1147 (8.756)	-0.0167 (1.392)	-0.0491 (18.885)
$\alpha_{2i}$	0.0192 (16.000)	-0.0493 (17.000)	-0.0072 (2.250)	0.0205 (2.030)	0.0665 (1.296)	0.0107 (1.945)	0.0343 (2.185)	0.0826 (6.608)	-0.0756 (6.300)	-0.1017 (4.238)
$\alpha_{3i}$	0.0153 (5.276)	0.0172 (2.177)	-0.0216 (2.019)	0.0101 (7.214)	0.0358 (22.375)	-0.0306 (3.030)	-0.0412 (1.609)	0.0586 (1.546)	0.0239 (2.134)	-0.0675 (9.643)
$\alpha_{4i}$	0.0708 (2.255)	-0.0205 (2.010)	-0.0109 (7.786)	0.0409 (2.045)	-0.0591 (3.940)	-0.0743 (5.307)	0.0219 (2.168)	-0.0391 (2.734)	0.0512 (0.853)	0.0191 (1.592)
$\alpha_{5i}$	0.0322 (2.706)	-0.0809 (2.585)	-0.0158 (9.875)	-0.0317 (2.113)	-0.0410 (1.349)	0.0981 (1.608)	0.0743 (1.376)	-0.0316 (2.508)	-0.0210 (5.000)	0.0174 (0.892)
$\alpha_{6i}$	0.0289 (1.296)	0.0209 (1.282)	-0.0316 (1.596)	-0.0543 (3.879)	0.0324 (5.311)	0.0133 (1.291)	-0.0094 (0.790)	0.0108 (1.459)	0.0407 (0.993)	-0.0517 (4.169)
$\alpha_{7i}$	0.0187 (7.480)	0.0313 (1.218)	-0.0319 (1.204)	0.0215 (2.129)	0.0198 (3.667)	-0.0194 (1.630)	0.0131 (2.148)	-0.0129 (1.008)	-0.0231 (1.909)	-0.0171 (3.353)
$\alpha_{8i}$	-0.1344 (1.026)	-0.1274 (1.019)	-0.0786 (0.207)	0.0391 (0.273)	-0.0136 (1.079)	-0.2118 (0.689)	0.0529 (0.249)	0.0993 (7.638)	0.0411 (0.780)	0.0643 (0.303)
$\alpha_{9i}$	0.0067 (2.310)	0.0956 (2.320)	-0.0957 (7.975)	0.0414 (0.690)	-0.0711 (2.079)	-0.0154 (2.169)	-0.0931 (7.694)	0.0932 (7.339)	0.0273 (1.365)	0.0111 (2.220)
$\alpha_{10i}$	0.0215 (2.028)	-0.0033 (1.375)	-0.0529 (7.557)	0.0929 (7.742)	-0.0413 (2.118)	-0.0657 (5.298)	-0.1012 (6.702)	0.0650 (5.462)	0.0385 (2.436)	0.0465 (4.152)
$\alpha_{11i}$	-0.0148 (1.480)	-0.0101 (0.526)	-0.0010 (0.1667)	-0.0021 (0.100)	0.0217 (1.955)	-0.0016 (8.000)	0.0710 (2.432)	-0.0101 (5.316)	-0.0104 (0.208)	-0.0426 (3.521)
$\alpha_{12i}$	0.0619 (4.421)	-0.0012 (0.324)	-0.0020 (0.194)	-0.0295 (0.728)	-0.0242 (1.254)	-0.0210 (2.121)	0.0103 (1.020)	0.0182 (0.129)	0.0001 (0.526)	-0.0126 (3.405)

The t-values are in parentheses

**Factor affecting rice meals consumption patterns:** Table 5 shows the parameter and associated asymptotic error of the LA/AIDS model for the socio-economic effects on rice consumption pattern in the study area. It consists of one hundred and seventeen free a's, the parameters of the household demographic characteristics. The demographic variables, with some exceptions, conform

to a priori expectations. The bold figures are significant at 5% level of probability. The table shows that the household size (HHS), sex of household head (SHH), average age of household (AAHH), average education of household (AEHH), ease of rice preparation (ERP), cleanliness of rice grain (CRG), location (D), type of rice (T), the frequency of consumption (Freq) of rice significantly affected the share of rice in the total food expenditure.

One percent increase in the above characteristics, except family income, increased the consumption of white rice and stew by 14.06, 1.87, 1.92, 3.22, 0.67, 7.08, 2.15 and 6.19%, respectively. Family per capita income decreased consumption (share) by 13.44% for a percent increase in the family per capita income. A striking result from the table is the frequency of white-rice and stew consumption parameter (0.0619). The more the number of times white rice and stew was consumed, the higher the share of rice in white rice and stew in the food expenditure per meal. Contrary to white rice and stew, cake rice was negatively affected by household size, while family per capita income of household and average age of household head positively affected the share of rice in cake rice of the total food expenditure. These properties are also shared by coconut rice category of the basket of rice category and curry rice. Braised rice, however, shared in the same effect of household size, number of teenagers and family per capita income (-0.2118) on rice except for frequency (-0.0210).

## **CONCLUSION**

Rice is consumed mostly in the form of white rice and stew, white rice and onion stew, joll of rice and fried rice. This consumption pattern for rice is affected by such factors as household size, type of rice, age structure of the household, urbanization, quality, average education of household and the frequency of consumption. The pattern of rice consumption in Nigeria is not so much a matter of price but rather, it is a phenomenon linked with socio-economic characteristics of households, the type of rice, level of education, ease of preparation and urban lifestyles.

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