

## **Economic Analysis of Rice Consumption Patterns in Nigeria**

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### **ABSTRACT**

**This study examined the nature and patterns of rice consumption in Nigeria, using Kwara State as a case study. The study methodology comprised a two stage sampling technique which was used to survey 110 rice consumer households across two villages and six towns in Kwara State. Analytical tools used in the study include descriptive statistics and the multinomial logit model. The major factors that significantly influence household preferences for either a combination of local and imported rice or the imported rice only to the local rice were the income of the head of household, household size and the educational status of the heads of household, the price per unit kilogramme of rice, however, was not a significant factor. This study therefore recommends that an effort should be made to increase rice production coupled with the provision of standard processing facilities. This will help to make the local rice sufficiently more competitive thereby increasing its demand.**

Keywords: Consumer choices, Food availability, Multinomial logit model, Nigeria, Rice.

### **INTRODUCTION**

Rice is an important annual crop in Nigeria. It is one of the major staples, which can provide a nation's population with the nationally required food security minimum of 2,400 calories per person per day (FAO, 2000). The crop is commonly consumed even as a food crop for household food security. The average Nigerian consumes 24.8 kg of rice per year, representing 9 per cent of annual calorie intake (IRRI, 2001). Due to its increasing contribution to the per capita calorie consumption of Nigerians, the demand for rice has been increasing at a much faster rate than domestic production and more than in any other African countries since mid 1970s (FAO, 2001). For instance, during the 1960s, Nigeria had the lowest per capita annual consumption of rice in the West African sub-region with an annual average of 3 kg (See Table 1). Since then,

Nigeria's per capital consumption levels have grown significantly at 7.3 per cent per annum. Consequently, per capital consumption during the 1980s increased to an annual average of 18 kg and reached 22 kg between 1995-2000.

As a response to the prevailing rice supply deficit situation in Nigeria, successive Nigerian governments intervened in the rice sector by increasing tariffs so that local production could be encouraged. This was expected to widen the home market for the nation's local rice. The Government also established the Federal Rice Research Station (FRRS) at Badeggi in 1970 and the National Cereal Research Institute (NCRI) in 1974. Also established were the National Seed Service (NSS) with the assistance of the Food and Agriculture Organization (FAO) in 1975, and Operation Feed the Nation (OFN) in 1976. Other government programmes were the River Basin

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**Table 1.** Comparison between Nigeria and the Rest of West Africa

Indicator	Mean (1961-75)	Mean (1976-82)	Mean (1983-85)	Mean (95-2000)
	Nigeria			
Production in metric tonnes	332800	806222	2306794	3189833
Import in metric tonnes	2036	420756	334974	525307
Self-reliance ratio	99%	54%	77%	79%
Total consumption in metric tonnes	178199	833640	1599609	2248113
Per capita consumption	3.0	12.0	18	22
	West Africa without Nigeria			
Production in metric tonnes	1779376	2344073	2822635	4041384
Import in metric tonnes	416183	894073	1760884	2107146
Self-reliance ratio	65%	56%	42%	50%
Total Consumption in metric tonnes	1178753	1950821	2973885	3985721
Per capital consumption	21.0	27.0	30.0	34

Source: Okorowa and Ogundele, (2005)

Development Authority (RDBA), Agricultural Development Projects (ADP), the National Grain Production Programmes (NGPP), the Structural Adjustment Programmes (SAP), and the Presidential Initiative on Increased Rice Production, Processing and Export. The last mentioned Programme, which was the latest, was aimed at addressing the ever widening demand-supply gap for rice and stimulating surplus rice harvest for export by the year 2007. The implementation of this initiative started in 2004 under which rice boxes containing 10 kg of rice seeds and enough agrochemicals for 0.25 hectares were sold to farmers in each state at ₦3,500.00 per box. The idea was to encourage farmers in each beneficiary state to cultivate rice on at least 250 hectares of land. This initiative has thus encouraged farmers to go into the production of rice. The emergence of the VEETEE rice company was another way to boost local rice production in Nigeria. The company is initiating a rice out-growers scheme with farmers to boost domestic output. The company has the facility for polishing rice, which means high quality of local rice (FAO, 2004).

Despite the numerous Nigerian government policies on rice, the demand-supply gap for rice still persists. Recent rice production figures from 2004 put national rice production at 2.96 million tonnes of

paddy cultivated on an area of 1,595,840 hectares. This estimate established a yield of 1.82 metric tonnes per hectare and total milled rice of 1,480,168 tonnes giving a milling recovery rate of 51 percent while total national demand of milled rice is estimated at 3.0 million tonnes per annum. There is therefore a deficit of 1,519,832 tonnes of milled rice. Estimates indicate that rice imports represent more than 25 per cent of agricultural imports and over 40 per cent of domestic consumption (FMARD, 2004). Nigeria has thus become a major rice importer in the world market and second only to Indonesia in the last five years of this decade (2000-2005). From 1999, the value of rice imports rose steadily from US \$259 million to US \$655 million and US \$756 million in 2001 and 2002, respectively (CBN, 2006). These estimates do not take into account the unrecorded smuggled rice imports into Nigeria (Rahji, 2005).

The demerit of Nigeria's dependence on imported rice is more so as the share of the imported rice in the Nigerian food market is far above that of the domestically produced rice. Rice imports have affected the domestic production and marketing of Nigeria's local rice. This is due to the decreased demand for local rice by Nigerians as opposed to the imported ones. The local Nigerian variety has a lower demand due to the high cost of producing

the crop and cost of production is usually not subsidized by the government. The non-competitiveness could also be as a result of poor processing resulting in a final product with a high percentage of broken grains and debris (FAO, 2004).

The foregoing therefore raises pertinent questions regarding the place of local Nigerian rice in the nutrition of the nation's households. It also raises questions as to the nature and pattern of local rice consumption in the country. The current study therefore examined the nature and pattern of rice consumption in Nigeria using Kwara State, Nigeria as a case study. The study's specific objectives were to examine those socio-economic characteristics of rice consumers and the determinants of rice type: -whether domestic or imported rice- preferred by rice consumers.

The study is of paramount importance as it examined a contemporary issue in the Nigerian economy: the nature of rice consumption in Nigeria. It identifies those factors explaining the nature of rice consumption by Nigerian households especially those factors that explain the demand differentials between local and imported rice. Such study outcomes could therefore serve as a pointer to policy options that could be adopted by stake-holders in the domestic rice industry, to raise the demand for local rice thereby raising the nation's rice production at the local farm level. This in turn will reduce Nigeria's import dependency on rice.

## MATERIALS AND METHODS

### Area of Study and Sample

This study was carried out in Kwara State, Nigeria. The state serves as a 'bridge' state between northern and southwestern Nigeria, sharing boundaries with Ondo, Oyo, Osun, Niger and Kogi States in Nigeria, and an international border with the Republic of Benin. The State has a population of about 2.37 million people

(NPC, 2006), who individually consume about 24.6 Kg of rice annually (IRRI, 2001). The state is divided into four Agricultural Zones by the Kwara State Agricultural Development Project (KWADP) authority based on agro-ecological considerations. Although rice is produced in all the KWADP Zones, the KWADP Zone B produces about 90 percent of the state's annual rice production. Kwara State's annual rice production estimate ranges between 17.5-118.3 metric tonnes: 49.6 metric tonnes on average (KWADP, 2004).

The target population for this study are those households that consume rice, whether the local or the imported rice types, in the study area. Given the four ADP zones of Kwara State, a two stage sampling procedure was adopted to select a representative sample for the study. The first stage comprised the random selection of towns and villages in KWADP Zones B and C. Towns and villages in these zones were selected because they are representative zones for rice consumption in Kwara State. Zone C was selected because it has more towns than all the other ADP Zones in Kwara State. Imported rice consumers are therefore expected in this Zone than in the other Zone(s). The second stage involved the random selection of 110 households across the selected towns and villages as shown in Table 2. The households (respondents) were interviewed via the use of interview schedules that were administered to them.

**Table 2.** Study Sample Design Outlay

ADP Zone	Town/Village	No of Respondents
B	Lafiagi	15
	Pategi	15
	Edogi	10
	Sabo-Gondangi	10
C	Ilorin Metropolis	15
	Oke-Oyi	15
	Afon	15
Total	Jebba	15
	8	110

Source: Field Survey (2007)



Additionally, some information for the study was sourced from secondary sources namely academic journals, Food and Agricultural Organization (FAO) bulletins, National Cereal Research Institute (NCRI) bulletins, International Institute for Tropical Agriculture (IITA) reports and the Central Bank of Nigeria (CBN) bulletins.

## Analytical Techniques

### Data Analysis

The tools employed for analysing the study data were the descriptive and the multinomial logit analysis. The descriptive statistical tool comprised frequency counts, percentages means and mode which were used to analyse the socio-economic characteristics of rice consumers. The multinomial logit tool was used to examine those factors that influence household preference for either the imported rice only, or a combination of both the imported and local rice, to the local rice only option.

### The Multinomial Logit Model

The multinomial logit model was used to assess why households in the study area prefer other rice types to the local Nigerian rice type. The model was chosen based on survey results that revealed that household rice consumption (dependent variable) was found to be a categorical variable which can take three (3) categories or levels. These categories were assigned numbers 0, 1 and 2. 0 was used to indicate the combined (local and imported rice) consumer group; 1 for the only imported rice consumer group and 2 was used to indicate the local rice consumer group. The local rice consumer group was taken as the reference group. The multinomial logit model was therefore used to identify the variables that make households belong to categories 0 (local and imported rice consumer group) and 1 (imported rice consumer group) instead of 2 (the local rice consumer group) as follows.

The probability that the  $i$ th household belongs to the  $j$ th rice consumer group  $P_{ij}$  reduces to:

$$P_{ij} = \frac{e^{\beta_j X_i}}{\sum_{k=j} e^{\beta_k X_i}} \quad (1)$$

According to Maddala (1983), the model makes the choice of probabilities on individual characteristics of agents. Following Maddala (1990) and Babcock et al. (1995), the basic model is written as:

$$P_{ij} = \frac{e^{\beta_j X_i}}{\sum_{k=0} e^{\beta_k X_i}} \quad (2)$$

Where  $i = 1, 2, \dots, n$  variables;  $k = 0, 1, \dots, j$  groups and  $\beta_j$  is vector of parameters that relates  $X_i$ 's to the probability of being in group  $j$  where there are  $j+1$  groups.

For this study, the  $X_i$  variables range from  $X_1$ – $X_4$ , where  $X_1$  = Income of household of household head,  $X_2$  = Household size,  $X_3$  = Educational status of household head and  $X_4$  = Price per kilogramme of rice in Naira ₦ (where ₦140 equals \$1).

### Normalization of the Model

As a rule, the summation of the probability for the three categorical groups in our model must equal to unity. This calls for normalization of the equation model. The common rule is to set one of the parameters' vectors equal to zero (Kimhi, 1994). Hence, for  $k$  number of choices only  $v-1$  distinct parameters are identified and estimated. Based on Equation (2), the probability of being in the reference group: the local rice consumer group with parameter vectors equal zero is

$$P_{i0} = \frac{1}{1 + \sum_{k=j} e^{\beta_k X_i}} \quad (3)$$

Similarly, the probability of being in each of the other  $j$  groups is

$$P_{ij} = \frac{e^{\beta_j X_i}}{1 + \sum_{k=j} e^{\beta_k X_i}} \quad (4)$$

Dividing equation (3) by (4) gives

$$\frac{P_{ij}}{P_{i0}} = e^{\beta_j X_i} \quad (5)$$

This denotes the relative probability of each group to the probability of the reference group. Hence, the estimated coefficients for each group reflect the effect of  $X_i$ 's on the likelihood of the consumer's household belonging to that alternative group relative to the reference group. The logarithm of the odd ratio in the equation to base e gives the estimating equation.

$$\ln \frac{P_{ij}}{P_{i0}} = \beta_j X_i \quad (6)$$

Following Hill (1983), the coefficients of the group can be given using the formula

$$\beta_v = - [\beta_1 + \beta_2 + \dots + v-1] \quad (7)$$

### Issues: Coefficients, Their Signs and Interpretations

i. A positive coefficient indicates that the variable is associated with a higher probability of being in the group choice under consideration relative to the reference group. This implies that the probability of the individual selecting the particular group is greater than the probability of choosing the reference group.

ii. A negative coefficient means that the probability of the household choosing the particular group is smaller than the probability of being in the reference group.

iii. Estimates not significantly different from zero indicate that, the particular regressor ( $X_i$ ) does not affect the consumption nor the probability of the state to which it applies relative to the reference group (Basant, 1997).

**Table 3.** Socio-Economic Characteristics of Rice Consumers

Characteristic	Educational Status	Frequency	Percentage %
Quranic Education		9	8.3
Primary Education		4	3.6
Secondary Education		27	24.5
Tertiary Education		66	60.0
Adult Education		1	0.9
No Formal Education		3	2.7
Total		110	100.0
Primary Occupation			
Trading		8	7.4
Farming		71	64.5
Civil Service		5	4.5
Others		26	23.6
Total		110	100.0
Secondary Occupation			
Trading		55	50.0
Civil Service		23	20.9
None		32	29.1
Total		110	100.0
Household Size			
<5		37	33.4
5-9		46	41.8
10-14		16	14.5
15-19		6	5.5
>20		5	4.8
Total		110	100.0

Source: Data Analysis (2007)



## RESULTS AND DISCUSSION

### Socio-economic Characteristics of Rice Consumers

Table 3 presents the socio-economic and demographic characteristics of rice consumer respondents in the study area. The educational status of the head of household to a large extent influences his/her choice of rice type to be fed to the family. Those with some level of formal education are expected to prefer the imported rice type. This is most probably because of the higher quality of imported rice. However some of the educated heads of household may patronise local rice because of its higher raw nutrients composition. Table 3 indicates that a sizable number of the head of household respondents have had at least primary education. Occupation is a primary determinant of the consumers' income level; income, in turn, determines the household level of consumption. Consumption is usually hypothesized to be a function of disposable income. The majority of respondent heads of household in the study area (64.5%) practised farming as their primary occupation. The remaining respondents (35.5%) were in trading and civil service jobs as their primary occupation. However, they supplemented their primary occupation with farming. The size of the household to a large extent determines the type of rice that would be consumed by the household. It is expected that larger households will tend to consume more of the cheaper local rice as opposed to those with small households. This is because the large households have less per capita income than the small households. About three-quarters of the household respondents (75.2%) have families that comprised less than 9 persons while the remaining respondent households (24.8%) have family sizes that comprised more than nine people. The average family size per household is six while the modal or model? household class in the study area ranged between 5-9 persons per household.

Within the study area, three categories of rice consumer households were identified during the study: those households that consume the local Nigerian rice type, those that consume the imported rice type and those that consume a combination of the local and imported rice types. Table 4 shows that the commonest rice type consumed by farming households in the study area was a combination of the local and imported rice types. This is consumed by over half of the respondents (55.4%) in the study area. About a quarter of the farming households (26.4%) consumed the imported rice type only. Only a few (18.2%) consumed the local rice type only. The study respondents also gave reasons as to why they preferred one particular rice type to the others (Table 5). Almost all the household respondents reported that they preferred imported rice to the local rice, because the imported rice is of a higher quality and grade: it has a better taste, it is polished, not broken and is free of stones and other debris. As regards the local rice, respondents agreed that the local Nigerian rice is of low quality and less tasty like the imported rice. It is broken and usually accompanied by little stones and other debris like rice husks. These findings

**Table 4.** Type of rice consumed by households.

Type of Rice	Frequency	Percentage %
Local	20	18.2
Imported	29	26.4
Combined	61	55.4
Total	110	100.0

Source: Data Analysis (2007).

**Table 5.** Reasons why households prefer imported rice to local rice.

Reason	Frequency	Percentage %
Quality and taste	100	90.9
Personality status	10	9.1
Total	110	100.0

Source: Data Analysis (2007).

concur with Oni and Olayemi (1973) and Spenser (1979), who both reported that the Nigerian rice is of a lower quality when compared with rice imported into the country. Clark (1982) also reported that during the processing of the local rice, no polishers and cleaners are used while the hullers are usually in a bad state. Other processing problems reported by Clark were poor parboiling and drying techniques. The resulting rice is thus generally dirty, having mineral and vegetable contamination (2 percent and 0.2 percent, respectively) and often having a strong off-odour due to slight fermentation during the parboiling process (Akpokodje *et al.*, 2001). Other reasons why study respondents preferred the imported rice to the local rice was found to be the personality of the consumer household head. Only a few of the respondents (9.1%) reasoned along this line. They explained that they purchased the imported rice because they believe it was the elites' rice. They therefore consumed the imported rice because they wanted to be like the elites.

#### Multinomial Logistic Regression Estimates for Determinants of Rice Consumption.

The variables that determine the various rice consumer categories were analysed

using the multinomial logit model. The result of the model estimation is presented in Table 4 or Table 6.

From the study, the likelihood ratio test for the model lambda ( $\lambda$ ) is 395.750 which is significant at 5 percent. This implies that the rice consumer groups are heterogeneous. The multinomial logistic estimate for the combined rice consumer group (consumers of local and imported rice groups) indicates that income, the educational status of the head of household and household size were significant. These variables therefore determine why households prefer to consume a combination of local and imported rice to the local rice. The price per kilogramme of rice is not significant and therefore it did not significantly influence a household's preference for a combination of local and imported rice to the local rice only. Also, the multinomial logistic estimate for the imported rice only group indicates that income, educational status of the head of household and household size were all significant. These variables therefore determine why households prefer to consume imported rice alone to the local rice. The price per kilogramme of local rice was not significant. The variable therefore did not significantly influence a household's preference for imported rice only. The household size variable coefficient was negative, implying that the probability of the

**Table 6.** Multinomial logistic estimates.

Variables	Consumers of local and imported rice group	Consumers of imported rice group only
	Parameter	Parameter
Income (₦)	3.972(1.156)*	0.916 (16.626)*
Household size	-18.882(4.655)*	-8.250(2.495)*
Educational status of household head	4.517(1.916)*	0.786(16.644)*
Price (₦/Kg)	-1.87E-02(0.275)	9.947E03(0.339)
Constant	15.062(4.898)	11.557(3.523)
Log likelihood		19.572
likelihood ratio ( $\lambda$ )		395.759*
$\rho^2$		91.0
$n$		110

Note: Figures in brackets are the t-value of the estimated regression coefficients.

\* Implies significant at 5 percent level of significance.

Source: Data Analysis (2007).



household consuming either a combination of local and imported rice or the imported rice only relative to the local rice increases as the household size decreases. The income and educational status of the head of household were positive implying that the two variables explain why the household would forgo local rice for a combination of local and imported rice or the imported rice only. The probability of consuming a combination of local and imported rice or the imported rice only relative to the local rice increases as the income increases and as the educational status of the household head rises. For the imported rice only group, only the household size variable was significant.

### CONCLUSIONS

This study examined the nature and patterns of rice consumption in Nigeria, using Kwara State as a case study. The study result shows that a majority of households were agrarian with an average household size of 6. Based on the types of rice consumed by household, households can be classified into three groups: households that consumed local rice type only, those that consume imported rice type only and those that consumed a combination of the local and imported rice types. The poor quality of the local rice was revealed as a deterrent to its consumption by households. These groups constitute 18.2 percent, 26.4 percent and 55.4 percent of the total household respondents in the study area, respectively. The multinomial logit model revealed that household size, income of the household and the educational status of the head of household significantly influenced a household's preference for either a combination of local and imported rice or imported rice only to consuming the local Nigerian rice only. The price per unit kilogramme of rice did not significantly influence a household's preference for a combination of local and imported rice or imported rice only to the local Nigerian rice only.

The study therefore recommends that efforts should be geared towards the provision of modern processing equipment for the local rice industry. Such efforts are expected to improve the Nigerian local rice grade, thereby enhancing its competitiveness amongst the rice varieties consumed by Nigerian households. Also it was discovered that, as the income and the educational status of the household appreciates, households tend to prefer the imported rice to the local rice. In this respect, the study recommends raising the awareness of the middle class and the general populace on the adverse consequences of importing large tonnages of rice into Nigeria, at the expense of the nation's domestic rice market. Government and extension agents can play pivotal roles in such campaigns. Additionally, Government on its part can encourage the consumption of the nation's rice via the enactment of policies like trade embargoes on rice imports to Nigeria. Such efforts would not only be in favour of increased local rice consumption by Nigerians, but will also broaden the local rice market. This, in turn, will encourage private capital investments in the rice milling sector thereby raising the quality of the nation's rice.

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## تجزیه و تحلیل اقتصادی الگوی مصرف برنج در نیجریه

ف. س. بامیدل، ا. ا. آبا یومی، ا. ا. استر

### چکیده

در این بخش با انتخاب ایالت کاوارا به عنوان مطالعه موردی به بررسی طبیعت الگوی مصرف برنج در نیجریه پرداخته شده است. روش تحقیق شامل تکنیک نمونه گیری دو مرحله ای است که به بررسی ۱۱۰ خانوار مصرف کننده برنج از دو روستا و شش شهر در ایالت کاوارا انتخاب شده است. ابزار تحلیل مورد استفاده در تحقیق شامل آمار توصیفی و مدل لوجیت چند جمله ای می باشد. عوامل اصلی که به طور معنی داری رجحان مصرف کننده گان را برای استفاده از برنج وارداتی و یا ترکیبی از برنج داخلی و وارداتی تحت تأثیر قرار داده عبارتند از: درآمد سرپرست خانوار، اندازه خانوار و سطح تحصیلات سرپرست خانوار خواهد بود که قیمت هر کیلو گرم برنج اثر معنی داری بر الگوی مصرف نداشته است. این بخش پیشنهاد میکند که باید تلاشهایی صورت گیرد تا تولید برنج با امکانات استانداردهای لازم افزایش یابد. این امر کمک میکند که مزیت نسبی رقابتی برنج داخلی در مقایسه با برنج وارداتی تقاضای برنج داخلی را افزایش دهد.