Original Research Article

Households' Socioeconomic Assessments and Effects on Purchasing Decisions of Rice Types in Oyo State, South-West Nigeria

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Abstract: Consumers' purchasing decisions are influenced by their demographic and socioeconomic factors. This study analyzed the effects of socioeconomic characteristics of rice-consuming household heads on purchasing decisions among alternative rice types in Oyo State, Nigeria. A multi-stage sampling procedure was used to select 174 household heads, and data from the sample were collected through a structured questionnaire. Both descriptive statistics and multinomial logit regression were used to analyze the data. Findings show that many rice consumers have formal education, and their preference for various types of rice is highly heterogeneous. Ease of rice preparation was the most important reason for opting for imported rice. The low preference for brown local rice was mainly due to high prices, perceived poor quality, and lack of knowledge about its health benefits. Households' choice among alternative rice types was significantly determined by marital status, total expenditure, educational status, rice market price, and access to credit. Households' socioeconomic characteristics strongly influence the types of rice purchased. The differential effects of households' total expenditure, education, and market prices on the choice of rice types should be taken into account when developing rice interventions aimed at changing dietary habits. In addition, policies and programmes for developing the rice sector and good consumer health should involve reorienting people's values and educating them on the best types of rice. The findings can also be used for proper policy options to address the price of the local nutritious brown rice, expand its production and ensure its full commercialization from possible export.

1. Introduction

Rice is Nigeria's second most significant staple food, accounting for 10.5% of total calorie consumption (FAO, 2019) and about 5.7% of households' food expenditure (NBS, 2019). The commodity is a primary grain for developing global food security, providing an average of 20% of calories to millions living in poverty (Alexandratos & Bruinsma, 2012). Rice consists of nutrients such as carbohydrates, minerals, vitamins and a proportion of protein, fibre and lipids (Glover & Reganold, 2010) and is classified based on factors like length, colour, region of origin, quality and texture. Oryza sativa planted worldwide, and Oryza glaberrima, grown in parts of West Africa, are the two most essential rice kinds (Vaughan, 1994). Rice is farmed in around 11 states (Ebonyi, Kaduna, Niger, Kano, Kaduna, Kebbi, Cross-River, Enugu, Taraba, Borno, and Benue) in Nigeria, with smallholder farmers accounting for 80% of the annual harvest (PWC, 2017).

Rice preferences differ from one person to the next. While some households are worried about the commodity's quality and price when purchasing it, others want rice linked with specific cooking styles, menus, and processing features. When buying rice, it is crucial to know how it is classified to get the type or variety that is right for his/her recipe. The three most popular forms of rice are long-grain, medium-grain and short-grain rice. These varieties describe the length and shape of the grain.

Simply put, long-grain is longer, whereas short-grain rice is shorter and broader. Long and medium/short-grain rice each contain two forms of starch: amylose (dry starch) and amylopectin (sticky starch), but the quantities of each distinguish long and short-grain rice has a chewy texture, whereas long-grain rice is softer and sticks together easier than medium-grain rice. After cooking, long-grain rice varieties like basmati, brown, and jasmine stay distinct and fluffy. In Nigeria, however, both long and short-grain rice are famous. Consumers in the Middle East want long-grain, well-milled rice with a strong aroma, but Europeans prefer long-grain rice with no scent. On the other hand, the Japanese placed a premium on short-grain Japonica rice that had been freshly milled and prepared. However, well-milled and long-grain Indica rice is preferred by consumers in Thailand (Galawat & Yabe, 2010).

Rice is divided into two colour categories: white and brown rice. Brown rice (unmilled) is healthier than refined grains (white rice). More than half of the vitamins, minerals, and fiber in the outer layer of brown rice are lost during the milling process to produce white rice (Babu *et al.*, 2009). The quantity of milling determines how much nutrition remains. Rice with bran and hull layers removed (white, table, polished, or milled rice) cooks faster and has a longer shelf life than brown rice. Brown rice is higher in minerals, including magnesium and B vitamins, than white rice. Brown rice consumption is linked to a decreased incidence of type 2 diabetes (Sun *et al.*, 2010). A cup of brown rice has 14.0 per cent of the daily fibre requirement, which aids in reducing high cholesterol levels in the body. Brown rice's high fibre content helps to keep blood sugar levels in check. Brown rice fibre

can help prevent colon cancer by binding to cancer-causing substances and keeping them away from the cells lining the colon. It can also assist with regular bowel function and reduce constipation (Danquah & Egyir, 2014). Because of its cleanliness, swelling capacity, taste, price, availability, and grain form, imported rice has become a popular choice among Nigerians (Miebaka *et al.*, 2017). Furthermore, the urban market channel has the highest demand for imported long-grain aromatic rice varieties. Although the quality of local rice is inferior to that of imported short and long-grain rice, which most consumers choose, the price of both local and imported rice has recently become competitive.

Rice consumers confront challenges while deciding between different types of rice. The majority of producers are unaware of the crucial qualities that influence consumer decisions to buy rice. Most consumers are also unaware of the health benefits of some of the rice purchased. Therefore, the study's general objective was to analyze socioeconomic factors influencing household heads' purchasing decisions on rice types in Nigeria.

Specifically, this study presents the socioeconomic profile of rice-consuming household heads, analyzes the socioeconomic drivers of purchasing decisions on rice types and assesses households' awareness of the health benefits of local brown rice types, which existing studies have seldom neglected.

1.1. Motivating Factors

A number of the empirical literature (such as Ogundele, 2014; Wahyudi *et al.*, 2019; Sisang *et al.*, 2019; Hagan & Awunyo-Vitor, 2020) have shown that socioeconomic and rice-specific variables have significant influences on consumers' preferences for specific variety of rice, relatively few have assessed the effects of these factors on consumers' purchasing decision for types of rice not in terms of varieties in the study area—the outcomes of having important policy implications for rice food security. Producers, suppliers, and retailers of rice products should be familiar with customers' important features and socioeconomic factors that impact their decision to purchase rice products to improve profit. This will help minimise losses from producers, suppliers, and retailers of rice products who purchase rice products. The findings will assist those in the rice industry develop marketing and rice product development strategies for rice consumers.

1.2. Consumer Relevance and Contributions

Consumers' socioeconomic characteristics strongly influence the types of rice purchased. The differential effects of households' total expenditure, education, and market prices on the choice of rice types from the findings of this study affirm that these factors should be taken into account when developing rice interventions aimed at changing dietary habits. In addition, the findings show that policies and programmes for developing the rice sector and good consumer health should involve reorienting people's values and educating them on the best types of rice.

The research findings can be used for proper policy options to address the price of the local nutritious brown rice, expand its production and ensure its full commercialization from possible export. In addition, findings can positively impact research at upstream and downstream brown rice value chains. Societies that ensure nutrition security and health promotion can also benefit from the findings.

2. Literature Review

2.1. Empirical Studies on Demand Analysis

Consumer demand is a function of the price of the commodity, prices of substitutes, income, and other socioeconomic variables and is often measured as an elasticity. A demand system is deemed regular if it satisfies the restrictions imposed by the paradigm of rational consumer choice. Three major approaches to demand analysis based on simple parametric specifications of the indirect utility functions are identified in the literature (Barnett & Serletis, 2008). In the first approach, the demand equations are derived literally by specifying a direct utility function and solving the constrained maximization problem. An alternative approach is the direct demand system specification known as the Double-Log/ Cobb-Douglas (CD) model, Constant Elasticity of Substitution (CES). This approach (CD) was taken as a starting point in the development of the Linear Expenditure System (LES) by Stone (1954) and further extended to include a term that is quadratic in discretionary expenditure (QES). Other generalizations of the LES are based on an assumption of direct, implicit additivity known as "AIDADS" focused on introducing marginal budget shares with varying expenditures (Rimmer & Powell, 1996). AIDADS focuses on increasing the flexibility of the price and expenditure effects as one moves across the expenditure spectrum, thereby solving the problem of constancy of the marginal budget shares in LES. The AIDADS model has been applied to Modeling the consumption behaviour of Iranian households for selected food commodities (Salami & Shahbazi, 2009). The constant subsistence parameters in AIDADS have also been modified to a function that fluctuates with utility and, consequently, with expenditure. The modified AIDADS (MAIDADS) model allows subsistence levels to vary across expenditure levels (Cranfield *et al.*, 2005).

The second approach is the differential approach. The differential approach in demand analysis builds on a relationship among differentials in quantities demanded, income, and prices. The relationship is derived by taking the total differential of a demand equation that satisfies utility theory (Khicher, 2017). The classic example is the Rotterdam model of Theil (1965), which is usually estimated with time-series data. This approach attempts to impose the regularity restrictions on log-differential approximations to the demand equations. The Rotterdam model has spawned extensive literature and occupies a status similar to the LES in consumer demand. Examples of recent studies that have applied the Rotterdam model include Nguyen *et al.* (2019) and Atasoy (2019).

The third approach is the duality approach. This approach introduces a class of demand systems based on simple parametric specifications of the indirect utility functions but allows for the parsimonious imposition of global regularity (McLaren & Yang, 2016). Members of this class exhibit a clear and valid homothetic asymptotic behaviour as income approaches infinity (Diewert & Wales, 1987) and allow complete price flexibility (Banks *et al.,* 1997). Members of the demand systems follow the steps of the Almost Ideal Demand System (AIDS) by Deaton and Muelbauer (1980), Linear Approximation of the Almost Ideal Demand System (LA/AIDS) after Blancifirti and Green (1983), Inverse AIDS (IAIDS), Modified AIDS model (MAIDS) by Cooper and McLaren's (1992), the quadratic AIDS (QUAIDS), rational rank four AIDS model (RAIDS) by Lewbel (2003) and Exact Affine Stone Index (EASI) demand system of Lewbel and Pendakur (2009). The EASI demand system does not impose any particular functional form on the income and food consumption relationship but allows for arbitrarily complex Engel curves. In addition, it allows us to control for individual preference heterogeneity across households and time-specific factors rather than leave them as part of the error term, as is done in other models (Lewbel & Pendakur, 2009).

AIDS is the most popular demand model with the ability to test homogeneity and symmetry constraints and also provides the first-order approximation for any demand system (Ozçelik & Şahinli, 2009) arbitrarily. This model has been used in several studies (for instance, Adetunji and Rauf (2012), Robert (2009), and Zhou (2015)) both in developed and developing countries. The LA/AIDS with the Stone index has been used by Blanciforti and Green (1983), Chalfant *et al.* (1987), Moschini and Meilke (1989), Gould *et al.* (1991) and many others, the IAIDS Inverse AIDS, which retains all of the desirable theoretical properties of the AIDS model except consistent aggregation was used by Grant *et al.* (2010) to analyze demand for North American fresh tomatoes, U.S. meat demand (Eales & Unnevehr, 1994). Critics of the LA/AIDS model state that this model does not provide a direct estimate of income elasticity, which typically leads to estimating the Engel function Chern *et al.* (2003) to derive income elasticity from expenditure elasticity. This model has been used in several studies (such as Hayat *et al.* (2016), Khalil and Yousaf (2012), and Erhabor and Ojogho (2011)) to analyze foods. QUAIDs generalized the AIDS model by incorporating a term that is quadratic in the logarithm of actual expenditure, and this model has been used in several studies such as Adeyonu *et al.* (2021); Obayelu *et al.* (2009); Abdulai and Aubert, (2004); Abdulai (2002) among others. MAIDS is a fractional system that satisfies the conditions for effective global regularity. Like the AID system, MAIDS is non-homothetic and has attractive regularity properties. Combined with its non-homothetic characteristics, it is a valuable platform for examining demographic influences on demand. For example, while Boyle (1996) applied MAIDS to analyze meat demand in Ireland, Vu (2020) applied it to estimate food demand patterns in Vietnam.

RAIDS includes a general polynomial of deflated expenditure in the AIDS model. Studies such as Cranfield (2005) have shown that RAIDS is preferred over MAIDS and

QUAIDS and is used to estimate consumer demands for final goods and services in countries spanning the development spectrum. EASI was currently applied to analyze the demand for imported versus domestic fish in Nigeria (Liverpool-Tasie *et al.* 2021).

In all, QUAIDS, MAIDS, RAIDS and EASI have higher order rank than the accurate AIDS model (rank 2) with the advantage of generalizing existing demand systems and being able to test systems of lower order rank and estimating Engel curves that inform policy analysis (Cash & Goddard, 2006).

2.2. Empirical Studies on Choice of Rice

Evidence shows that food choice is influenced by a complex interplay of factors that have converged to affect demand for consumer goods brands (Agwu *et al.*, 2019). Consumers select the type(s) of rice they wish to eat based on their personal and household tastes and available resources. According to Custodio *et al.* (2019), consumers' awareness of different rice varieties via their labelling demonstrates the importance of extrinsic quality cues in generating product value (such as equity of a specific variety) and forming quality expectations (such as intrinsic attributes of a specific variety). Rice is a bundle of characteristics that gives rise to its utility. Households buy types of rice and other market commodities to maximize utility or well-being based on their preferences. According to fundamental economic theory, they are subject to the constraint that the cost of such goods is less than or equal to the sum of all sources of income. The amount of utility and relative relevance of each attribute in a product can be used to determine consumer preference. The initial appeal that can affect consumers is caused by the physical features exhibited on a product. The consumer's attitude toward a product is described by its assessment, representing the consumer's purchasing and consumption behaviour (Widayanti *et al.*, 2020). Customer attitudes are often known as buying behaviour shaped by consumer preferences. Before making a purchase, customers compare the prices available.

In India, Tamil Nadu households prefer a short-and-bold-grain type of rice, while Punjab households favour an extra-long-and-slender type of rice grain (Mottaleb & Mohanty, 2012). The international rice market is probably considered a "thin" market due to substantial heterogeneity in grain-quality preference structures across nations and even within a country (Cuevas *et al.*, 2016).

Mottaleb and Mishra (2016), in their study of rice consumption and grain-type preference by households in Bangladesh using a fixed-effect regression approach, observed that highly educated household heads and spouses tend to consume less rice than others. The wealthy and urban households increasingly consume fine-grain (long-and-slender-grain) rice, replacing ordinary-grain (short-and-bold-grain) rice.

Abdullahi *et al.* (2011) used a multinomial logit model to measure Malaysian consumers' purchasing behaviour of special rice, looking at socio-demographic aspects of product features. Marriage status, household size, income level, and number of children have

all been found to have a substantial impact on rice purchasing decisions. Rice qualities such as flavour, taste, and scent were also discovered to impact rice purchasing decisions in Malaysia substantially.

The information provided for food packaging products determines consumers' desire to purchase (Zul Ariff *et al.,* 2016). Kassali *et al.* (2010) concluded that household heads' income and household size significantly influenced consumers' demand for rice types. Musa *et al.* (2011) surveyed consumer purchasing behaviour regarding rice in Malaysia. He reported that consumers preferred local white rice in small packs to imported rice. Also, 70% of the respondents preferred to buy local rice due to its lower price and availability at the retail stores.

Several studies have documented the beneficial effects of brown rice (whole grains). For instance, Malik *et al.* (2019) and Panlasigui and Thompson (2006) found that brown rice reduces postprandial blood glucose levels, improves lipid profiles, and is inversely associated with the risk of type 2 diabetes. Sun *et al.* (2010), in addition, found that greater than two servings per week of brown rice compared to less than one serving per month was associated with a lower risk of diabetes, whereas more significant than five servings of white rice compared to less than one serving per month was associated with a higher risk of diabetes. Brown rice is more nutritious than white, but very little rice is consumed in the brown form (Oxfam, 2001). Significant barriers to consumer choice for brown rice were a lack of general awareness and nutrition knowledge (Kumar *et al.*, 2013).

3. Methodology

3.1. Conceptual Framework

The study is built on consumption theory. Household characteristics such as gender, age (Renner *et al.*, 2012), education, marital status, household size, frequency of consumption of food driven by taste, convenience, as well as socioeconomic factors like access to credit, household income, price of the food (Konttinen *et al.*, 2021), prices of the alternative foods are influential drivers of the choice of food (Figure 1). Young adults emphasise convenience more than middle-aged and older adults (Konttinen *et al.*, 2021). Also, a household with a child (ren) looks for convenience in the type of food they purchase, while the singles appreciate cheapness. The desire for less nutritious food decreases with increasing household income (Darmon & Drewnowski, 2015). Education improves nutrition and food literacy and socializes individuals to adopt healthy dietary patterns (Yen & Moss, 1999). Other non-socioeconomic and household characteristics that can influence consumers' food purchases include exchange rate climate change, but these are not hypothesized in this study.
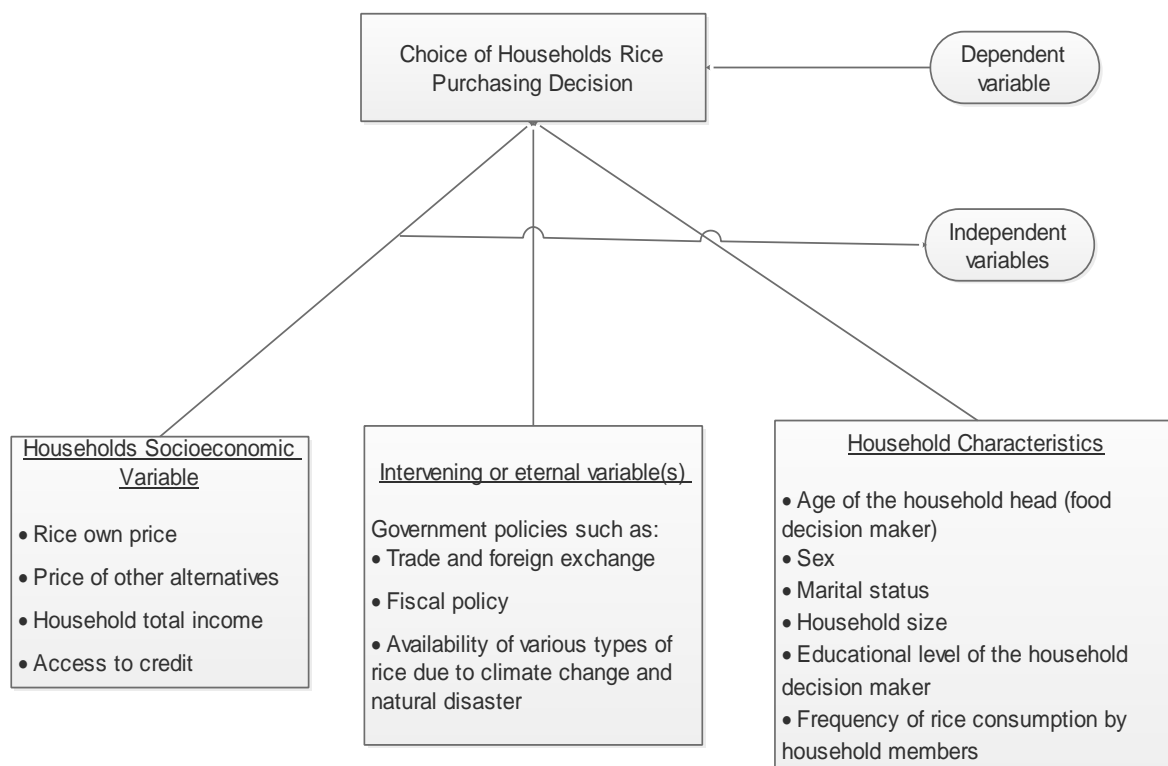
Figure 1. Conceptual framework of links between households' rice purchasing decision and their socio-demographic characteristics

3.2. Study Area

The study was conducted in Oyo State (Figure 2). Oyo State is located within longitude 8000N and latitude 4000E with an annual rainfall of 1,702.1mm. The state is located in the Southwest geopolitical zone of Nigeria; it consists of 33 local government areas, including Akinyele, Afijio, Ibadan Northwest and Ibarapa central. The state covers 28,454 square kilometres of land mass and is bounded in the South by Ogun State, in the North by Kwara State and in the East by Osun State. The landscape consists of old hard rocks and dome-shaped hills, which rise gently from about 500 metres in the Southern part and reach a height of about 1.219 metres above sea level in the Northern part. According to the 2006 census, the state population was 5,501,589, comprising 2,809,840 males and 2,781,749 females (NPC, 2006). Agriculture is the primary source of income for the most significant number of people and the mainstay of the economy. The climate in the state favours the growth of food crops such as yam, cassava, millet, maize, rice, plantain, rice, palm tree, and cashew. Three vegetation regions are identified: forest, savannah and derived savannah. The Ibadan/Ibarapa zone falls within the forest region, while the Ogbomosho and Oyo zones are in the derived savannah region.
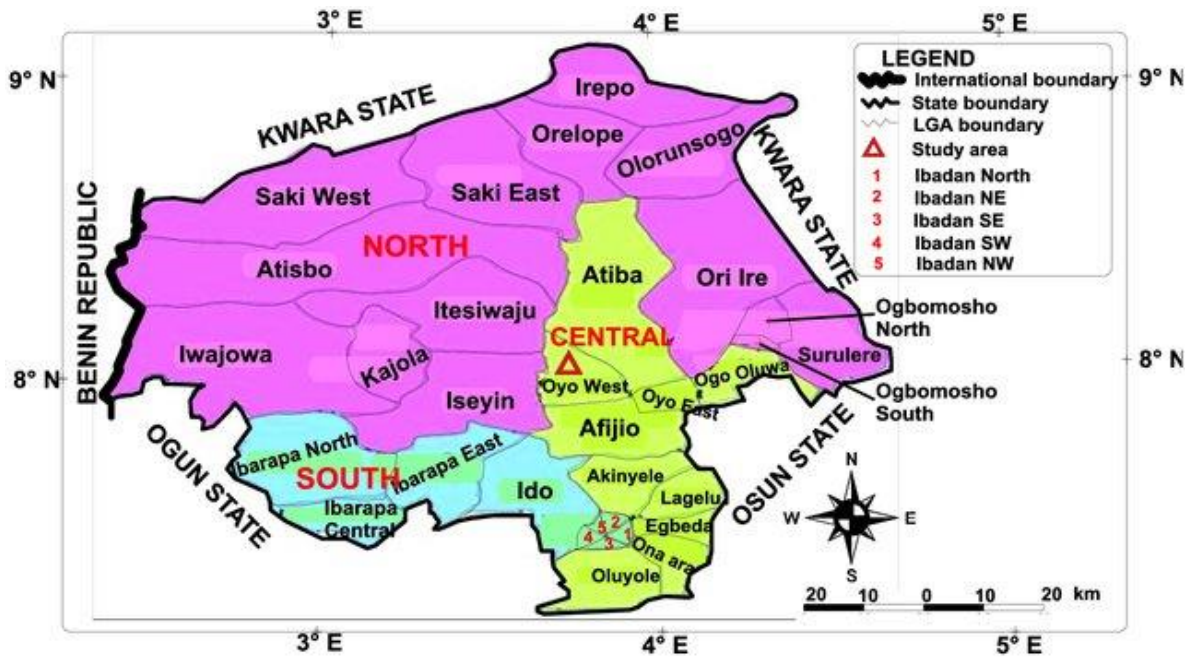
Figure 2.   Map Showing the Study Area

3.3. Type of Data and Sampling Procedure

Primary data used in this study were collected from the household heads using a structured questionnaire administered with the assistance of trained enumerators in 2020. A multi-stage sampling procedure was employed to select 174 respondents. The first stage involved a random selection of five (5) Local Government Areas (LGAs), which are Ibadan North, Ibadan Northeast, Egbeda, Ogbomosho South and Oyo East Local Government Areas out of the thirty-three local government areas in the state. The second stage involved randomly selecting three (3) wards each out of the 5 LGAs. In Ibadan North (Yemetu, Mokola and Bodija wards), Ibadan Northeast (Idi-Ape, Iwo Road and Monatan wards), in Egbeda (Egbeda, Olodo/Kumapayi and Olode/Alakia wards), in Ogbomosho South (Arowomole, Ijeru and Molete), while in Oyo East, (Kosobo, Araromi and Owode wards) were selected. The final stage involved the purposive selection of 12 household heads from the chosen wards, which gave a total of 180 household heads because of the non-availability of the sampling frame at the time of the study. However, 174 household heads out of the 180 were found helpful for the study and the remaining six were discarded due to incomplete information.

3.4. Data Estimations

This study used tables, mean, and standard deviation to summarize the socioeconomic characteristics of the respondents and inferential statistics such as the multinomial logit regression to analyze factors determining consumers' choice of rice types.

3.4.1. Multinomial logit regression model

Multinomial logit regression model (MNL) is the standard method for estimating unordered, multi-class or polytomous dependent variables (Greene, 2003). According to Freese and Long (2000), the tests that are frequently used in connection with MNL are: (i) test that all of the coefficients associated with the independent variables are simultaneously equal to zero, (ii) test whether the independent variables differentiate between two outcomes and (iii) test of assumption of independent Irrelevant Alternative (IIA) using either Hausman test, Likelihood-Ratio test or Small-Hsia test. The IIA assumption states that MNL is valid if the characteristics of one particular choice alternative do not impact the relative probabilities of choosing other alternatives (Vijverberg, 2011). MNL was employed to evaluate how households decide which types of rice to buy after studies like Sisang *et al.* (2019) and Romadhon *et al.* (2021).

MNL model was chosen because it can meet the numerous rice purchasing options (dependent variable) by household heads. Following a study by Hosmer and Lemeshow (2000), the model is typically stated as Equation 1:

$$Ln\left(p/1-p\right) = Y_i = \propto_0 + \beta_1 X_1 + \beta_2 X_2 + - - - \beta_n X_n - - - \varepsilon_i + - - - - - \quad (1)$$

Where:

Ln = Natural logarithm

P = Probability of household's preference choosing a particular type of rice

$\propto\_0$ = Regression constant

Xi ---- Xn represents the vector of the socioeconomic variables hypothesized to influence rice purchasing choice (Table 1)

Table 1. Summary of a priori expectation of factors affecting households´ choice of rice types with the MNL

Symbol	Variables	Definition	A priori expectation on rice categories		
			LWGR	ILGR	ISGR
X_1	Age	Age of the household head (year).	+	-	-
X_2	Marital Status	Whether single or married (single= 0 and married = 1).	+	+	+
X_3	Total expenditure (a proxy for total income)	Expenses of households on food and non-food expenditure or the total household income.	±	+	+
X_4	Household size	Number of adults and children who are resident member	-	-	-
X_5	Price of local brown rice	Cost of buying 1kg of imported long-grain rice (in naira)	-	-	-

Symbol	Variables	Definition	A priori expectation on rice categories		
			LWGR	ILGR	ISGR
X_6	Price of imported short grain rice	Cost of buying 1kg of imported long-grain rice (in naira)	-	-	-
X_7	Price of long short grain rice	Cost of buying l kg of imported long-grain rice (in naira)	-	-	-
X_8	Price of local white rice	Cost of buying l kg of local white grain rice (in naira)	-	-	-
X_9	Educational level	Years of formal education by the household head	+	+	+
X_{10}	Frequency of rice consumption	Number of times rice is consumed per week by members of the household	+	+	+
X_{11}	Access to credit	This is the ability to obtain credit for households for consumption (1 if having access, 0 if otherwise)	+	+	+

Source: Authors

$$Y_0 = P_{0i} = \propto_0 + \beta_{01}X_{01} + \beta_{02}X_{02} + - - - \beta_nX_n - - - \varepsilon_i + - - - - - - - \quad (2)$$

$$Y_1 = P_{1i} = \propto_1 + \beta_{11}X_{11} + \beta_{12}X_{12} + - - - \beta_nX_n - - - \varepsilon_i + - - - - - - - \quad (3)$$

$$Y_2 = P_{2i} = \propto_2 + \beta_{21}X_{21} + \beta_{22}X_{22} + - - - \beta_nX_n - - - \varepsilon_i + - - - - - - - \quad (4)$$

$$Y_3 = P_{3i} = \propto_3 + \beta_{31}X_{31} + \beta_{32}X_{32} + - - - \beta_nX_n - - - \varepsilon_i + - - - - - - - \quad (5)$$

The dependent variable (Yi) = Rice purchasing household heads´ preference [0 for those who purchase local brown-grain rice (LBGR), 1 for those who purchase local white-grain rice (LWGR), 2 for imported short-grain rice (ISGR) and 3 for those that purchase imported long-grain rice (ILGR)]. P0, P1, P2 and P3 are the probability of choice for LBGR, LWGR, ISGR and ILGR, respectively, α0, α1, α2, α3 are the constant terms. Y0 was the reference group because brown rice was the least consumed. Therefore, Po was used as the baseline concerning other categories leading to Equations 6 - 8:

$$Ln\frac{p_1}{p_0} = \alpha_{01} + \beta_{01}X_{01} + - - - - - - - - - - - \beta_nX_n + \varepsilon_i - - - - - \quad (6)$$

$$Ln\frac{p_2}{p_0} = \alpha_{02} + \beta_{02}X_{02} + - - - - - - - - - - - - \beta_nX_n + \varepsilon_i - - - - - \quad (7)$$

$$Ln\frac{p_3}{p_0} = \alpha_{03} + \beta_{03}X_{03} + - - - - - - - - - - - - \beta_nX_n + \varepsilon_i - - - - - \quad (8)$$

4. Result and Discussion

4.1. Rice Supply and Consumption Status in Southwest Nigeria

Consumption of rice in Nigeria has multiplied over the past decade. It is at an all-time high of 7 million MT, while local production by farmers has always been below 5 million MT in most cases. Results of the analysis of the rice demand-supply gap (Figure 3) revealed that there is a continuous demand for rice in Nigeria despite a series of policies (such as the imposition of tariffs on rice importation and the provision of various subsidies to encourage local producers) and programmes (which include, the Abakaliki Rice Project and the Presidential Initiative on Rice) on rice production and importation in the country to stem the trend. Demand for the various rice types depends on rice-consuming households' demographic and socioeconomic characteristics. This section presents the analysis results of the household heads´ (the primary food decision-makers) characteristics such as age, household size, educational status, occupational status, monthly income, per capita weekly rice consumption and access to credit by rice types in the study area.
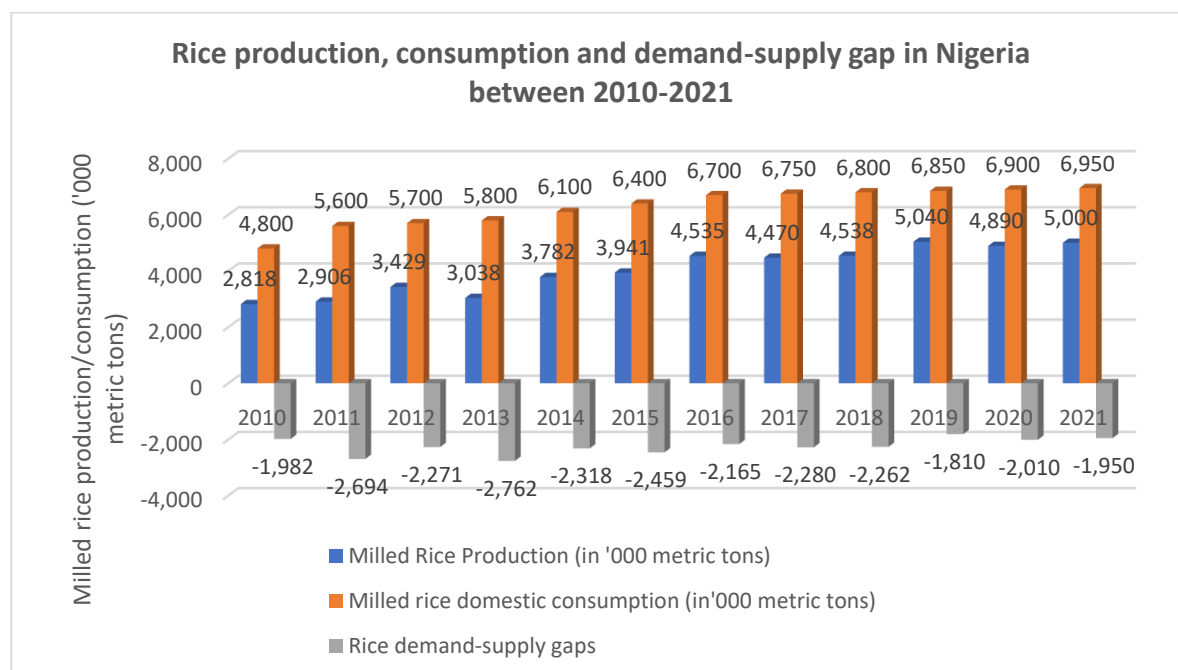
Figure 3. Rice production, consumption and demand-supply gap in Nigeria between 2010-2021
Source: Data from USDA (2022)

4.2. Socioeconomic Characteristics of Rice Consuming Household Heads and Preference for Rice

The socioeconomic profile of the respondents is presented in Table 2. The results show that 55.8%, 11.5%, 13.2% and 19.5% of household heads decide to purchase imported long-grain (ILGR), imported short-grain rice (ISGR), local brown-grain rice (LBGR) and local white-grain rice (LWGR) respectively. This indicated the movement of the majority of households toward imported long-grain rice relative to other types of rice in the study area,

contrary to the findings of Ajayi and Ajiboye (2020), who reported that most (87.0%) rice consumers in Ekiti State, Nigeria prefers local rice. In addition, about 44.3% and 60.0% fall within the age bracket of 31-40 years. The mean age of 35 years showed that most respondents in the study area were mature enough to make an informed decision on their preference for rice.

On the other hand, about 43.5% and 50.0% of those who purchased LBGR and LWGR are 41–50 years old, respectively. This indicates that most household heads purchasing imported rice (long or short-grain rice) are younger than those buying local (brown and white rice). This is expected as younger people require milled rice to meet their daily carbohydrate and protein needs for sustenance. In contrast, the elderly require rice containing a lot of fibre, like local brown rice, to prevent them from developing diabetes.

Furthermore, the results indicate that households that decided for long grain and brown local rice had a mean size of 5 persons per household, while the short grain and white grain consuming households had four persons. This implies that respondents had a moderate household size. Most (96.9%, 85%, 91.3% and 100% of ILGR, ISGR, LBGR, and LWGR, respectively) household heads had formal education, with only very few without formal education. The high educational level indicates that household heads could read and write. Literate consumers understand rice packaging labels or other helpful information that can impact their choice of a desired product. Hence, this trait is significant. This is in line with the findings of Sisang *et al.* (2019) that the majority of the sampled population of rice consumers in Cameroon has formal education.

The distribution of the respondents based on their monthly income showed that 37.1% of the ILGR-consuming household heads earn between N50,000–N99,000, and 55%, 56.5%, 58.8% ISGR, LBGR, and LWGR rice-consuming households respectively earn this same range of income (Table 3).

Rice consumption patterns show a movement toward the acceptable ILGR type (55.7%) in the study area. Consumers purchase more (67.2%) imported rice (long-grain and short-grain) than the local rice (brown and white). The mean weekly per capita consumption of ILGR is 3.10 kg (Standard Deviation = 1.9kg), ISGR, 4.4kg (SD=2.7kg), LWGR, 3.3kg (SD=1.4kg), while the least consumed type of rice is the LBGR with the mean weekly per capita consumption of 2.8 kg (SD=1.3kg) (Table 3). This high preference for imported rice is due to its perceived reasons ranging from ease of cooking to health status of the household (Table 4).

Table 2. Preference for rice and distribution of socioeconomic characteristics of household heads

Characteristics	Frequency (Freq.)	Percentage (Perc.)	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.
	Imported long-grain rice (N = 174)		Imported short-grain rice (N = 174)		Local brown-grain rice (N = 174)		Local white-grain rice (N = 174)	
Preference for rice	97	55.7	20	11.5	23	13.2	34	19.5
Age (yr)								
≤30	35	36.1	5	25.0	4	17.4	9	26.5
31-40	43	44.3	12	60.0	9	39.1	8	23.5
41-50	19	19.6	3	15.0	10	43.5	17	50.0
51-60	0	0	0	0	0	0	0	0
Total	97	100	20	100	23	100	34	100
Means (SD)	35 (5.5)		35(5.8)		39(6.1)		39(6.7)	
Household Size								
2-4	33	34.0	11	55.0	11	47.8	19	55.9
5-7	55	56.7	9	45.0	7	30.44	13	38.2
8-10	9	9.28	0	0	5	21.7	2	5.9
Total	97	100	20	100	23	100	34	100
Means (SD)	5 (1.8)		4 (1.5)		5(1.8)		4 (1.8)	
Educational Status								
Tertiary	52	53.6	10	50.0	12	52.2	23	67.6
Secondary	29	29.9	5	25.0	7	30.4	7	20.6
Primary	13	13.4	2	10.0	2	8.7	4	11.8
No formal Edu.	3	3.1	3	15.0	2	8.7	0	0
Total	97	100	20	100	23	100	34	100
Main Occupation								
Artisanship	10	10.3	2	10.0	1	4.3	2	5.9
Trading	30	30.9	6	30.0	6	26.1	7	20.6
Civil Service	30	30.9	5	25.0	8	34.8	8	23.5
Corporate Workers	10	10.3	5	25.0	7	30.4	10	29.4
Farming	17	17.5	2	10.0	1	4.3	7	20.6
Total	97	100	20	100	23	100	34	100

Source: Data from field survey, 2020

Table 3. Distribution of households' income, per capita consumption, access to credit by preference for rice types

Income Distribution (₦)	Imported long-grain rice		Imported short-grain rice		Local brown-grain rice		Local white-grain rice	
10,000 - 49,000	28	28.9	7	35.0	7	30.4	10	29.4
50,000 - 99,000	36	37.1	11	55.0	13	56.5	20	58.8
100,000 - 149,000	24	24.7	1	5.0	2	8.7	4	11.8
≥150,000	9	9.3	1	5.0	1	4.3	0	0
Total	97	100	20	100	23	100	34	100
Means (SD)	₦80,886 (₦24,116.8)		₦65,025 (₦32,077.8)		₦68,434.7 (₦18,873.0)		₦67,147.1 (₦28907.4)	
Per Capita Weekly consumption (Kg)								
1-3	68	70.1	10	50.0	16	69.6	25	73.5
4-6	23	23.7	5	25.0	7	30.4	8	23.5
7-9	5	5.2	4	20.0	0	0	1	2.9
≥ 10	1	1.0	1	5.0	0	0	0	0
Total	97	100	20	100	23	100	34	100
Means (SD)	3.10 kg (1.9kg)		4.4kg (2.7kg)		2.8 kg (1.3kg)		3.3kg (1.4kg)	
Access to credit								
Yes	47	48.5	9	45.0	10	43.5	20	58.8
No	50	51.5	11	55.0	13	56.5	14	41.2
Total	97	100	20	100	23	100	34	100

Source: Data from field survey, 2020

4.3. Households' Preference Point to Purchase Rice and Reasons for Low Preference for Brown Rice

Concerning households' preference points to purchase rice presented in Table 4, the results revealed that 56.3% preferred buying rice at the retail shop, 40.2% preferred the local market, and 3.5% preferred the supermarket. This is contrary to Sisang *et al.* (2019), who found that 41.3% of the consumers in Cameroon bought rice from local small stores or shops around their neighbourhood, 25.3% directly from local rice millers or retailers, 22.0% from local markets and 11.3% bought from supermarkets. The biggest obstacles to introducing and maintaining brown rice intake are its accessibility, higher price, and lack of understanding about its health benefits. This finding is similar to the case reported in a study by Das *et al.* (2012), who found that lack of rice milling technology, local market, high price, poor quality, and lack of knowledge are constraints for the supply chain of brown rice.

Table 4. Perceived reasons for high preference for imported rice and low preference for brown rice and point of purchase

Reasons	MI	I	U	LI	NI	Mean	Rank
	F	F	F	F	F		
Ease of preparation	98	49	15	7	5	4.31	1
Swelling capacity	81	43	23	14	13	3.95	2
Household size	32	114	16	1	11	3.89	3
Taste	62	65	22	14	11	3.88	4
Cleanliness	43	92	18	7	14	3.82	5
Age of the consumer	75	39	27	15	18	3.79	6
Nutritional quality	49	66	18	19	22	3.58	7
Grain shape	35	75	22	19	23	3.46	8
High price of substitute	24	77	36	24	13	3.43	9
Low income	35	60	44	13	22	3.42	10
Price of Rice	35	66	25	23	25	3.36	11
Health reason	30	53	25	26	40	3.04	12
Perceived reasons for low preference for brown rice						**Frequency**	**Percentage**
Unavailability in all markets						49	28.2
High cost						58	33.3
Lack of knowledge of health benefits						57	32.8
Poor quality						10	5.7
Total						174	100
Preference point for rice purchase						**Frequency**	**Percentage**
Retail shops						98	56.3
Local Markets						70	40.2
Supermarkets						6	3.5
Total						100	100

Note: MI, I, U, LI and NI indicate Most Important, Important, Undecided, Less Important and Not Important, respectively.

Source: Data from field survey, 2020

4.4. Factors Influencing Purchasing Decision of Rice Types

The results of the multinomial logit model are summarized in Table 5. The multinomial regression model passed the minimum requirement for robustness where the log-likelihood (−1780.9295) was significant at one per cent. We tested the assumption of independence of irrelevant alternatives (IIA) hypothesis under the null hypothesis that coefficient differences are not systemic. The results showed that the IIA had not been violated, suggesting that our model is appropriate for modelling consumer choice behaviour for rice. The P-value, $P < 0.000$, indicated that the model fits or, better still, that at least one of the coefficients in the model was not equal to zero. It clearly showed that the rice-consuming household groups were heterogeneous. The overall adequacy of the model was also judged by its F-statistics with a chi-square value (105.31).

The coefficient for marital status is harmful and is a significant factor influencing consumers´ preference for local white (at $P<0.01$) and ISGR (at $P<0.05$). This implies that married household heads are more likely to reduce LWGR and ISGR than single, and the likelihood of a married to reduce their preference for LWGR and ISGR relative to LBGR holding other factors constant decreases by 9.4% and 10.6%, respectively. This may be due to the burden of reducing per capita expenditure with increased household size.

The coefficient of household total expenditure (income) is positive and significantly affects the household preference for LWGR relative to LBGR. This suggests that as the level of the total expenditure of the household head increases, there is a probability that the preference for LWGR will increase. This may be due to the perceived poor quality of the LBGR. A marginal effect of 0.06737 indicates that, as the level of expenditure increases by 1 unit, the preference for LWGR increases by 6.7%. The direction and significant results of this variable agree with the findings of Kassali *et al.* (2010) and Ogundele (2014), who found that among other socioeconomic characteristics, the income level of rice consumers had a significant influence on the households´ choice of rice consumption in Ghana and Nigeria respectively.

The coefficient of the price of LBGR is positive with a significant (at 10% level) effect on purchasing decisions for ISGR. This suggests that, as the price of LBGR increases, there is a probability that a consumer will increase his/her preference for ISGR. A marginal effect of 0.004023 indicates that a unit increase in the price of LBGR leads to an increase in the preference for ISGR by 0.40%. This is, however, expected as consumers look for less affordable substitutes.

The coefficient of the price of ISGR is a negative and significant (at 10% level) factor influencing the purchasing decision for LWGR and ISGR. This suggests that as the price of

ISGR increases, there is the likelihood that a consumer will reduce his or her preference for ISGR and LWGR. A marginal effect of -0.00152 for local white rice and -0.00245 for ISGR indicates that, as the price level increases by 1 unit, the preference for LWGR and ISGR decreases by 0.15% and 0.25%, respectively. This corroborates the finding of Ogundele (2014), who found that as the prices of foreign rice increase, households tend to reduce their consumption of foreign rice by resorting to the consumption of low-priced local rice or other food items as a substitute for foreign rice. The coefficient of education is positive and significantly affects the household preference for local white rice. This suggests that as the household head's education level increases, there is a probability that the preference for LWGR will increase. A marginal effect of 0.009234 indicates that as the level of education increases by 1 unit, the preference for LWGR increases by 0.92%.

Access to credit facilities has a positive and significant influence on the probability of households' preference for imported long-grain rice. The higher the access to credit, the higher the probability of preference to purchase ILGR. A marginal effect of 0.0868 indicates that as access to credit increases by 1 unit, the preference for ILGR increases by 8.7%.

Table 5. Estimation of multinomial logit model

Variables	Local white rice (p₁)	P>Z	$\partial y / \partial x$	Imported short-grain rice (p₂)	P>Z	$\partial y / \partial x$	Imported long-grain rice (P₃)	P>Z	$\partial y / \partial x$
Age	-0.0301		-0.00103	-0.0351		-0.00331	-0.0347		-0.0026
	(0.0523)	0.563	(0.00328)	(0.0364)	0.335	(0.00451)	(0.0371)	0.349	(0.00377)
Marital	-1.5223***		-0.09424***	-0.8819**		-0.10551**	0.6502		0.0991
Status	(0.4828)	0.002	(0.02871)	(0.4162)	0.034	(0.04783)	(0.7417)	0.381	(0.0758)
Total household expenditure	0.8773*		0.06737**	-0.4249		-0.06543	-0.0768		-0.00545
	(0.4845)	0.07	(0.03104)	(0.5037)	0.399	(0.06258)	(0.4387)	0.861	(0.0446)
Household size	-0.2248		-0.00586	-0.0428		0.004646	-0.3194		-0.0310
	(0.3984)	0.573	(0.02507)	(0.246)	0.862	(0.03071)	(0.2798)	0.254	(0.0288)
Local brown rice price	-0.0267		-0.00118	0.0312*		0.004023*	0.0171		0.00132
	(0.0284)	0.347	(0.001768)	(0.0181)	0.084	(0.002202)	(0.0199)	0.392	(0.00201)
Imported short grain rice price	-0.036*		-0.00152	-0.0255*		-0.00245	-0.0146		-0.00071
	(0.0215)	0.094	(0.001339)	(0.0149)	0.086	(0.001817)	(0.0150)	0.332	(0.00150)
Long short grain rice price	0.0121		0.00075	0.0126		0.001206	0.0111		0.0008
	(0.0135)	0.367	(0.000834)	(0.00995)	0.205	(0.001216)	(0.0110)	0.315	(0.00111)
Local white rice price	0.0265		0.003332	-0.0053		-0.00075	-0.0145		-0.00161
	(0.0267)	0.321	(0.00169)	(0.0176)	0.763	(0.002185)	(0.0181)	0.424	(0.00186)

Variables	Local white rice (p_1)	P>Z	$\partial y / \partial_x$	Imported short-grain rice (p_2)	P>Z	$\partial y / \partial_x$	Imported long-grain rice (P_3)	P>Z	$\partial y / \partial_x$
Education	0.134*		0.009234**	-0.0511		-0.00806	-0.0193		-0.00193
	(0.0733)	0.067	(0.004617)	(0.0632)	0.419	(0.007794)	(0.0689)	0.779	(0.007030)
Frequency of consumption	-0.2298		-0.01378	0.0805		0.01192	0.0783		0.00823
	(0.2303)	0.318	(0.01448)	(0.1402)	0.566	(0.01732)	(0.1584)	0.621	(0.01630)
Credit	0.1336		-0.00556	0.3669		0.02549	0.9083*		0.0868
	(0.6573)	0.839	(0.04077)	(0.4624)	0.428	(0.05667)	(0.5179)	0.079	(0.05311)
Constant	-20.9761	0.374		14.9187	0.349		-25.3155	0.164	
	(23.5777)			(15.9347)			(18.1987)		
Diagnostic statistics	Observations: 174								
	Wald chi^2 = 105.31								
	Prob > chi^2 = 0.0000								
	Log Likelihood = -163.8472								
	Pseudo R^2 = 0.1300								
Base categorical variable	Local brown grain rice								

Note: Figures in parenthesis are S.E, *, **, and ***, significant levels at 10%, 5 %, and 1%, respectively.

5. Conclusions and Recommendations

The households´ socioeconomic characteristics have a strong influence on the types of rice purchasing decisions. Mostly, household heads usually make consumption decisions, and socioeconomic factors such as marital status, total household expenditure (proxy for total household income), market price of rice, level of education and access to consumption credit inform the preference decisions of the households. The most popular type of rice purchased in the study area was imported long-grain rice. The demand for imported rice has a ripple effect on the consumption of local rice.

In addition, while households' purchasing decision of local white rice is influenced by the marital status of the household heads, total household expenditure (proxy by household total income), price of ISGR and level of education of the household heads, the purchasing decision of ISGR is significantly influenced by marital status, own price and price of LBGR which is an alternative commodity. Preference for ILGR is significantly influenced by household heads´ access to consumption credit. The study, therefore, concluded that households' socioeconomic characteristics strongly influence the types of rice purchased. Hence, these characteristics should be considered in influencing households' preference for rice while holding other factors constant. The findings also support the potential of price

interventions to reduce socioeconomic inequalities in households' choice of consuming foods of higher nutritional quality, such as brown rice.

There is a need to implement flexible and synergic import restrictions and strategic marketing policies that sustain wide price differentials between local and imported rice brands while sensitizing consumers to narrow their perceptions of the quality differential between them. Even though a combination of staples, vegetables, and fruits may be more suitable from a nutritional standpoint, it is crucial to encourage preference for LBGR for health reasons. The findings can be used for proper policy options to address the price of the local nutritious brown rice, expand its production, and ensure its full commercialization from possible export. Policies aimed at lowering the price of LBGR can generate a sizable increase in the demand for this type of rice. The findings can favour studies in the upstream and downstream brown rice value chains and society's efforts to provide nutrition security and health promotion.

Future research studies can look at the following: First, assessing households' perceptions, enablers, barriers, and facilitators of acceptance of brown rice. Second, consumers' demand and willingness to pay for rice attributes in developing countries. Third, households' rice demand response and its determinants in Nigeria.

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