The food security drive and the preference for local rice consumption among households in south-west Nigeria

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ABSTRACT

Purpose: It is imperative to enhance local production, accessibility and appeal of basic foods like rice to accomplish United Nations Sustainable Development Goal No. 2 aiming for the attainment of zero hunger worldwide. Therefore, the study explored households' preferences for locally produced rice (Ofada) in south-west Nigeria.

Design/Methodology/Approach: Cross-sectional data were elicited from randomly selected 600 rice-consuming households in South-west Nigeria. The study applied the willingness-to-pay choice technique and a logistic regression model to analyze the dataset.

Findings: The findings revealed that the most desirable attributes influencing households' consumption preferences for local rice were nutritional quality and taste. At the time of data collection, consumers were also willing to pay ₦4.26 ($0.012) and ₦2.80 ($0.008) respectively for every unit improvement in those attributes.

Conclusion: The study concluded that attainment of zero hunger in Nigeria is desirable and achievable by boosting local production of high-quality rice to attract sufficient demand.

Practical Implications: This study underscored the effort needed to improve local rice production in Nigeria which should be targeted at improving the desired attributes to make indigenous (Ofada) rice attractive to consumers. This can be driven by stepping up investment in the rice value chain with adequate attention given to the processing stage where quality control and standards remain a top-most priority.

Contribution to the Literature: This study presents a unique perspective by isolating and highlighting the desirable attributes of rice consuming households because these attributes played a critical role in the preference for local rice consumption.

Keywords: *Food security, Local (Ofada) rice, Logistic regression model, Nigeria, Preference, Willingness-to-pay.*

1. INTRODUCTION

Rice is one of the main staple foods consumed by many Nigerians. This is also considered the largest consumption pattern and trend within the West kept African region (Chiaka, Zhen, & Xiao, 2022; Soullier, Demont, Arouna, Lançon, & Del Villar, 2020). The consumption of rice by the Nigerian population was a preference shift from the classical staple foods such as cassava, maize and yam (Global Rice Science Partnership (GRiSP), 2013). This consumption has developed into a habitual food chosen for its intrinsic values such as taste, nutrition and ease of preparation. There is a huge supply gap in the Nigerian rice sector with domestic production of rice at less than 4 million tonnes falling below the demand at about 5 million tonnes per annum (Federal Ministry of Agriculture and Rural Development (FMA&RD), 2012; Ugalahi, Adeoye, & Agbonlahor, 2016). This gap was filled by importation which kept rising over the years such that the Nigerian government spent billions of naira daily on the importation of rice. This volatility in rice imports has a negative impact on Nigeria's foreign reserves (Ekundayo, 2023; Yusuf, Yusuf, Adesope, & Adebayo, 2020). In recent times, there have been efforts to increase domestic rice production

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and reduce imports. However, there has been no clear-cut evidence of a significant drop in rice imports in view of the growing population and increasing demand for rice (Yusuf et al., 2020).

The prominent placement of rice in the Nigerian diet and nutritional needs has made the crop a good candidate for policy discourse in the agricultural and food systems frameworks of the country. The government and stakeholders have been working to enhance the qualitative characteristics of local rice to make it more desirable. This will increase demand and enable local rice to compete with global brands (Obih & Baiyegunhi, 2017). The expectation is that the local rice in Nigeria should be able to compete with the imported (foreign) brands if the production standard is directed towards the attributes desired by the consuming households. Such expectations and the attributed quality (both intrinsic and physical) can indeed drive the expected improvements in the rice sub-sector and its value chain process.

Many efforts by the Nigerian government to improve rice production have been the introduction of the Nigerian Rice Development Strategy (NRDS). The NRDS had a mandate to increase the production of paddy rice from the 3 million tonnes production figure in 2007 to 12 million tonnes by 2018 with the sole aim of self-sufficiency which was initiated in 2009. This move was in addition to the committee earlier set up by the government on the effort to scale up rice production, processing and exports as well as to achieve a self-reliant production system among others. However, domestic production is still lower than demand. Hence, the trend of rice importation keeps surging every year with its attendant consequences for the government's plan (Federal Ministry of Agriculture and Rural Development (FMA&RD), 2012; Yusuf et al., 2020). This is despite the reported quality attributes of many local rice varieties in the country such as Ofada, Abakaliki , Igbemo , etc. over the years (Aondoakaa, 2013).

Ofada rice a significant variety among the many local rice varieties in Nigeria is named after its native production area, a small village in the south-west region of the country. It has been popularized in such a way that ofada rice has become a forename for most of the local rice varieties grown in south-west Nigeria. The Ofada rice variety is unpolished, short-grain with red kernels, an attribute that distinguishes it from other rice production (Gyimah-Brempong, Johnson, & Takeshima, 2016). The demand is gradually gaining momentum in the domestic and export markets with the recognition of the superior quality of the grain of ofada rice.

However, global rice consumption has focused on the ability of rice processing to produce certain quality attributes of milling that are not present in many local varieties. Attributes such as length of grain, impurity free and uniform coloration are associated with most imported rice varieties available across the markets. On the other hand, local rice has the potential for such transformation given appropriate technological and value chain innovations within the context of the Nigerian agricultural system. The drive to develop local rice production and consumption relationships must be examined within the peculiar attributes it provides within cultural and economic contexts. It is important to know that the need to promote consumption of local rice must look beyond an appeal to its indigenous connectivity. The socio-cultural affinity associated with ethnicity and cultural attractions as it relates to the manner of processing, dishing and satisfaction value obtained from consuming them (Ogunleke & Baiyegunhi, 2019).

Therefore, the need to isolate the desirable attributes of rice consuming households in addition to the consumers' socio-economic and demographic factors that drive its demand has become crucial. This is required to provide the evidence needed to improve rice production (towards self-sufficiency), quality of local rice to make it more competitive and affordable given what foreign rice has to offer. It is against this backdrop that this research was conducted.

2. THEORY OF CHOICE EXPERIMENT

An "alternative approach" to the popular consumer theory was proposed by Lancaster (1966). In this theoretical approach, a consumer's satisfaction with a bundle of commodities consumed is the derived utility from the characteristics possessed by that commodity. This postulation is a departure from the conventional opinion in which utility is derived from the consumption of a bundle of goods. Moreover, according to Lancaster (1966) it is also possible for goods to possess several attributes in common with some other bundles of goods. However, the goods collectively can have characteristics that are not the same as those relating to the goods separately. Thus, in the case of consumption of Ofada rice, the collection of attributes of nutritional quality, color, grain shape, ease of cooking, taste, size of grain, aroma etc. are said to be desired. Therefore, a given household, given a budget

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constraint will choose the collective package of attributes that gives optimum utility which is in tandem with the school of thought pushed forward by Lancaster (1966).

The random utility theory provides the rationale for incorporating behavioural economics in modelling choice experiments. According to Lusk and Norwood (2005) in a Choice Experiment (CE), consumers are usually faced with different choice situations differentiated by certain characteristics and price levels. The utility (*V*) derived by a consumer from the consumption of a bundle of goods is said to be a function of the deterministic component (*U*) which is largely due to the characteristics of the commodity good and the random error component (ε) representing unobservable attributes that contribute to the consumer's preference (Lancaster, 1966). In the process of making choices, the assumption underlying the RUT suggests that there are alternatives within which a consumer can make choices among the alternatives to obtain optimal satisfaction (Hensher, Rose, & Greene, 2005). Hence, the possibility of having preference and selecting a certain commodity over another is driven by the satisfaction derived from the consumption of such alternative insofar as such satisfaction is the highest among the many possible choices. For this study, consumers are faced with two rice varieties (local and foreign) from which they can choose. Assuming there is a direct relationship, then, the utility function for i^{th} consumer choosing rice variety *j* is:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (1)$$

The satisfaction (utility), U_{ij} obtained from a chosen variety of rice *j* is the maximum among the j^{th} possible alternatives available to the i^{th} consumer. This likelihood to choose the j^{th} rice variety as preferred is expressed as a probability.

$$prob_{ij} = prob(U_{ij} > U_{i\alpha}) = prob(\varepsilon_{ij} - \varepsilon_{ia} > \hat{U}_{ia} - \hat{U}_{ij}; a = 1,2,\ldots j, a \neq j) \quad (2)$$

Such that $U_{ij} = X_{ij}\beta$

Maddala (2001) stressed that when errors are distributed independently and identically as a result of the type I extreme value distribution function, we have

$$F(\varepsilon_{ij}) = e^{(-e^{\varepsilon_{ij}})} \quad (3)$$

Therefore, the difference in the residual terms specified in Equation 2 has a logistic distribution which permits the use of a logit function to model the likelihood that i^{th} consumer choses j^{th} rice alternative. This relationship can be expressed as:

$$prob(y_i = j) = \frac{e^{x_{ij}\beta}}{\sum_{j-1}^{j} e^{x_{ij}\beta}} for \quad j = 1,\ldots..,J \quad (4)$$

β are the parameters of exogenous variables in measuring utility (Adamowicz, Boxall, Williams, & Louviere, 1998; Boxall & Adamowicz, 2002) and X_{ij} is the vector of exogenous variable values representing the rice characteristics and socio-demographics of the i^{th} consumer.

$$L = \prod_{i-1}^{n} \prod_{j-1}^{j} prob(y_i = j)^{y_{ij}} \quad (5)$$

Where $y_{ij} = 1$ if alternative *j* is selected by the i^{th} household and, *0* otherwise.

According to the logit model, if there are *k* categorical outcomes without loss of generality, the base outcome will be one (Greene, 2012). Therefore, the probability that the response for the j^{th} observation is equal to the i^{th} outcome is expressed as:

$$p_{ij} = Pr(y_j = i) = \begin{cases} \frac{1}{1+\sum_{m=2}^{k} \exp(x_j\beta_m)}, if\ i = 1 \\ \frac{\exp(x_j\beta_m)}{1+\sum_{m=2}^{k} \exp(x_j\beta_m)}, if\ i > 1 \end{cases} \quad (6)$$

Where β_m is the coefficient vector for outcome m. The log pseudo-likelihood is thus expressed as:

$$ln\, L = \sum_j w_j \sum_{i=1}^{k} I_i(y_i)\, ln\, p_{ik} \quad (7)$$

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Where w_j is an optional weight.

$$I_i(y_i) = \begin{cases} 1, if\, y_i = i \\ 0, otherwise \end{cases} \quad (8)$$

3. EMPIRICAL SPECIFICATION

3.1. Empirical Specification of the Logit Model of Consumer Preference

Specification of the utility levels through the logit model about the desired attributes of the chosen commodity is:

$$U_{ij} = X_{ij}\beta_x + P_{ij}\beta_p + \varepsilon_{ij} \quad (9)$$

Where U_{ij} is as defined above, X_{ij} is the component of unseen rice variety attributes, excluding price with β as the parameter while P_{ij} represents the price characteristic for the alternative *j*.

Individual level characteristics were also included in the vector of exogenous variables influencing utility. The respondents' socio-demographic information is likely to function well through product attributes which suggests that respondents' demographic variables can be made to interact with the product's attributes to create "interaction variables" which combine the characteristics of individuals and product attributes. Application of interaction terms in a model is very useful and perhaps, the only way to solve issues related to Independence of Irrelevant Alternatives (*IIA*) property violations (Karaca-Mandic, Norton, & Dowd, 2012).

Consumers' socio-economic characteristics assumed to be associated with the choice of rice variety include the following variables: respondents' age, gender, household size, income and education. Thus, the consumer's choice of a variety of rice is influenced by some specific attributes. This can be investigated using the interaction of rice quality and the socio-economic characteristics of consumers. This expression is given as

$$U_{ij} = X_{ij}\beta + \left(Z_i^* X_{ij}\right)\alpha + \varepsilon_{ij} \quad (10)$$

Z_i = vector of the socio-demographic variables of consumer *i*.

X = attributes of each choice *j*.

$Z_i * X_{ij}$ = *interaction effects.*

α = the associated parameter vector estimated with interaction.

The model specified in equations 9 and 10 were estimated through a maximum likelihood framework to investigate individual's preference for local rice variety under the assumption that there is various combination of attribute cues (see Table 1 for the definition of predictor variables I the model). Explicitly, the estimated model is specified as:

$$V_{ij} = \beta_0 + \beta_1 X_{ij} + \beta_2 Z_{ij} + \beta_3 X * Z_{ij} \quad (11)$$

Where V_{ij} is the observed choice of the individual i choosing alternative j among the various options, (local rice = 1, otherwise imported rice = 0). The predictors are described in Table 1.

Table 1. Definition of variables used in the estimated model.

Variables	Description
Socio-demographics	
Age	Age of respondent (Years)
Gender	Sex of respondent (male =1, female =0)
Years of education	Number of years of formal education (Years)
Household size	Number of household members (Number)
Income	Household's monthly income (N)
Quality attributes of rice	
Price	Amount paid (N)
Nutritional quality	Perception of the nutritional quality of rice
Taste	Perceived taste of rice
Ease of preparation	Convenience of cooking
Grain shape	Varying grain shapes (Long grain, medium grain, short grain).
Impurity	Presence of impurities in rice

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Variables	Description
Swelling capacity	Ability of rice to retain water and increase in size
Interaction effects variables	
Price*age	Ease of cooking*years of education
Price*gender	Ease of cooking*household size
Price*years of education	Ease of cooking*income
Price*household size	Grain shape*age
Price*income	Grain shape*gender
Nutritional quality*age	Grain shape*years of education
Nutritional quality*gender	Grain shape*household size
Nutritional quality*years of education	Grain shape*income
Nutritional quality*household size	Impurity*age
Nutritional quality*income	Impurity*gender
Taste*age	Impurity*years of education
Taste*gender	Impurity*household size
Taste*years of education	Impurity*income
Taste*household size	Swelling capacity*age
Taste*income	Swelling capacity*gender
Ease of cooking*age	Swelling capacity*years of education
Ease of cooking*gender	Swelling capacity*household size
	Swelling capacity*income

Note: * implies and.

3.2. Estimating Willingness to pay (WTP) for Rice Attributes

The utility derived from the consumption of quality attributes of a commodity is unobservable. Therefore, estimating the willingness to pay for the commodity is a function of the observed preference for rice. However, interpreting the parameter estimates of the logit model (Equations 10 and 11) as the direct impact of individual predictor variables may be difficult. The coefficients estimated are rather the effects of the predictor variables on the unobserved utility function (U) and from which the mean WTP can be computed. The willingness of a consumer to let go of a particular attribute of rice for another is the ratio of two parameters estimated in a linear logit model if the attribute can be valued in monetary terms (Enneking, 2004). The mean WTP for each attribute is therefore estimated as:

$$\_\frac{\beta\_attribute}{\beta\_price} \quad (12)$$

Hypotheses: In this study, the major hypothesis tested was the significance of the interaction effect of local (ofada) rice attributes and the households' socioeconomic variables.

H_0: The interaction between the attributes of ofada rice and household characteristics has no influence on rice preference among consumers.

H_A: The interaction of local (ofada) rice attributes and households' socio-economic variables drive consumers' preference for rice variety.

The likelihood functions for H_0 and H_1 were tested as follows:

$$LR(\lambda) = -2[\{ln\,L\,(H_0)\} - \{ln\,L\,(H_1)\}] \quad (13)$$

If the H_0 is right, the test value (γ) has a chi^2 distribution whose degree of freedom is equivalent to the variance between the estimated coefficient under (H_1) and(H_0). On the other hand, if H_o involves $\gamma^1 = 0$, the asymptotic distribution involves a mixed *chi*^{2} distribution.

3.3. Description of Variables Used in the Study

Drawing from theory and empirical evidence, the variables used in this study are presented in Table 1. They include:

- Household characteristics.
- Quality attributes of rice.

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- Interaction variables: The interaction of rice quality attributes and household characteristics in this sense accounts for observed heterogeneity among respondents and verifies the presence of interaction effects influencing consumers' preference for local rice.

3.4. Study Area and Sampling Procedure

This research was conducted in south-west Nigeria and covered 3 states which were selected purposively because the states have been reported to have a high level of local (ofada) rice consumption. A multistage sampling process was adopted given the purposive selection of Lagos, Osun and Ogun states with the large presence of production areas, markets and consumption of local rice. This was followed by the random selection of 2 Local Government Areas (LGAs) from each of the three states. In the third stage, a lucky dip method (Erhabor & Ojogho, 2011) was used to randomly select two geographical wards from each of the six selected LGAs. As a result of variation in population size across the 12 geographical wards, a random proportionate to size sampling selection technique was applied in the last stage to choose 600 respondents which represents the sample size used for this study. A primary dataset was collected from the research subjects using a well-structured questionnaire to elicit the required information such as the respondents' socio-economic characteristics, perceptions of rice attributes, prices of rice varieties and the amount they were willing to pay for the local rice variety.

3.5. Data Analytical Techniques

This research used descriptive statistical tools such as frequency counts and percentages to describe the respondents' socio-economic characteristics while a logit regression analytical tool was applied to model the determinants of consumers' preference for local rice attributes taking into consideration the interaction of some consumers' preference attributes and the influence that attributes could have on consumers' preference behaviour.

4. EMPIRICAL RESULTS AND DISCUSSION OF FINDINGS

The results of the descriptive analysis as presented in Table 2 indicated that rice constitutes a staple diet consumed by most of the respondents in the study area who are also within the active and productive age given the estimated average age and mean monthly quantity of rice consumed by the households which are approximately 39 years and 16kg respectively. Furthermore, more than half (52.0%) of the respondents are of the male gender while 85 percent of them are married. Moreover, the majority (61.0%) of the respondents were civil servants while a few (21.5%) of them also engaged in trading activities. The most important quality attributes sought in local (ofada) rice were nutrient level, aroma, taste, swelling capacity, price and texture.

Table 2. Description of the socio-economic characteristics of respondents.

Variables	Frequency (N = 600)
Age (Years)	
≤ 20	6 (1.0)
21-30	133 (22.2)
31-40	242 (40.3)
41-50	181 (30.2)
51-60	35 (5.8)
> 60	3 (0.5)
Mean age = 38.5 years	
Gender	
Male	312 (52.0)
Female	288 (48.0)
Marital status	
Married	510 (85.0)
Not married	90 (15.0)
Main occupation	
Civil servant	366 (61.0)

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Variables	Frequency (N = 600)
Farming	54 (9.0)
Artisan	51 (8.5)
Trading	129 (21.5)
Attributes preference for Ofada rice	
Colour	322 (53.7)
Grain shape	299 (49.8)
Ease of cooking	206 (34.3)
Size of grain	211 (35.2)
Capacity for swelling	460 (76.7)
Taste	488 (81.3)
Aroma or fragrance	530 (88.3)
Texture	376 (62.7)
Perceived nutrient level	546 (91.0)
Price	398 (66.3)
Quantity consumed per month (Kg)	
≤ 10 kg	222 (37.0)
Above 10 kg	378 (63.0)
Mean value = 15.98kg	-

Note: * show multiple responses and figures in parentheses are percentage values .

4.1. Determinants of Consumer Preferences for Local Rice Attributes

Two logit models were estimated to identify the variables that determined consumers' preferences for ofada rice variety. The first model was without the interaction variables while the second model was fitted with the inclusion of the interaction variables (see Table 1). This was done to investigate any improvement in the model if interaction variables were included. The overall fit of the model with interaction and a likelihood ratio of 265.12 ($p<0.01$) as well as the significance of coefficients supported the inclusion of interaction variables in the model. Hence, the null hypothesis is not accepted while the results favour the alternate hypothesis. The estimates from the fitted lead model are hereby presented in Table 3.

4.2. Attribute Effects

The attributes of nutritional quality (0.999, $p<0.05$) and taste (1.521, $p<0.1$) were the most important attributes influencing consumer preference for the ofada rice in SW Nigeria. Support for this finding has also been reported in the studies of Gyimah-Brempong et al. (2016) who showed that local (Ofada) rice is more nutritious than foreign rice and thus influences its demand. Other studies have also shown that consumers in Nigeria make their choices with respect to taste (Sowunmi, Omigie, & Daniel, 2014).

4.3. Attribute and Socio-Economic Interaction Effect

The interaction of variable age with the attribute price implies that older respondents would rather demand local rice irrespective of the price than younger individual. The ability of age to change the direction of the price effect may suggest some form of age-related preference for locally produced food as a result of retrospective valuation.

The effect of age on nutritional quality as a factor in preference was however negative (-0.04, $p<0.01$) implying that younger people would place a higher premium on the nutritional quality of food than older individuals. However, education further reinforces the influence of nutritional quality on the choice of ofada rice. This suggests that younger respondents who are more educated prefer local (Ofada) rice owing to their knowledge of its nutritional quality (Ogunleke & Baiyegunhi, 2019).

The interaction between education and taste and that of income and taste (taste*education and taste*income) were also found to have statistically significant ($p<0.01$ and $p<0.05$, respectively) effects and indirect relationships with the respondents' preference. This aligns with current realities in Nigeria where highly educated and affluent households consume highly polished foreign rice than the local variety. The results deviate from the study of

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Skårdal, Western, Ask, and Øverby (2014) which reported that people from higher socio-economic backgrounds tend to consume food that are healthier than those of lower socio-economic status.

Furthermore, the interactions of grain shape with gender and income (grain-shape*gender and grain-shape*income) have positive coefficients and are statistically significant (both at *p<0.05*) with the respondents' preference. The implication of this is that male respondents with high income seemed to prefer local (Ofada) due to its short grain feature. A prior expectation would have seen women as the preferred gender determining household consumption for food attributes. However, cultural expectations of men as providers may suggest their influence in determining food choices.

Given the findings, age and years of education, when interacted with the impurities as an attribute (impurity and age as well as impurity and education) have negative relationships and the relationships are statistically significant with preference for local (Ofada) rice by the respondents at p<0.05 and p<0.01, respectively. This is intuitively acceptable as older individuals and educated ones are unlikely to appreciate the time spent cleaning rice with large amounts of impurities. On the other hand, the interaction of impurity and household size (that is, impurity*household-size) is positive and statistically significant (*p<0.01)* suggesting that large-sized households are more likely to prefer local (Ofada) rice not minding the impurities in the grain because of the number of individuals to feed. This result is in line with expectations because large-sized households' preferences may be expected to follow that path given the budget constraints. This result agrees with the study conducted by Sowunmi et al. (2014) on households' choice of local (Ofada) rice in Nigeria.

Similarly, the interaction of swelling capacity as an attribute with the gender of the respondents (swelling-capacity*gender) has a direct and significant (*p<0.05*) relationship with preference for local (Ofada) rice. This implies that male individuals would likely prefer local (Ofada) rice based on how much the grain can swell up (that is, its swelling capacity). Swelling in this sense is the ability of the local rice to absorb water without becoming soggy when cooked. This result reinforces the earlier result showing the influence of men's preference when it concerns households' consumption of local (Ofada) rice. However, swelling capacity as an attribute with household size (swelling-capacity*household size) was inversely and significantly (*p<0.01*) associated with the respondents' preference for local (Ofada) rice. The result suggests that large households would not likely choose local (Ofada) rice owing to its poor swelling capacity (Akaeze, 2010).

Table 3. Logit model estimates with interactions.

Variables	Coefficient	Standard error
Price	-0.357	0.448
Nutritional quality	0.999**	0.470
Taste	1.521*	0.819
Ease of preparation	-1.129	0.873
Grain shape	-0.380	0.556
Impurity	-0.003	0.359
Swelling capacity	-0.919	0.612
Price and age	0.022*	0.012
Price and gender	0.205	0.198
Price and years of education	-0.026	0.057
Price and household size	-0.006	0.054
Price and income	0.000	0.000
Nutritional quality and age	-0.037***	0.012
Nutritional quality and gender	-0.134	0.164
Nutritional quality and years of education	0.128**	0.056
Nutritional quality and household size	-0.043	0.067
Nutritional quality and income	0.000	0.000
Taste and age	-0.004	0.022
Taste and gender	0.262	0.273
Taste and years of education	-0.320***	0.096
Taste and household size	0.003	0.085
Taste and Income	-5.37e-06**	0.000
Ease of cooking and age	0.021	0.024

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Variables	Coefficient	Standard error
Ease of cooking and gender	-1.090	0.328
Ease of cooking and years of education	0.309	0.097
Ease of cooking and household size	0.154	0.118
Ease of cooking and income	0.000	0.000
Grain shape and age	-0.005	0.015
Grain shape and gender	0.609**	0.241
Grain shape and years of education	-0.032	0.072
Grain shape and household size	-0.183	0.092
Grain shape and income	5.35e-06**	0.000
Impurity and age	-0.044***	0.021
Impurity and gender	-0.008	0.181
Impurity and years of education	-0.199***	0.061
Impurity and household size	0.256**	0.057
Impurity and income	0.000	0.000
Swelling capacity and age	0.017	0.015
Swelling capacity and gender	0.433**	0.200
Swelling capacity and years of education	0.007	0.062
Swelling capacity and household size	-0.232***	0.077
Swelling capacity and income	0.000	0.000
Constant	2.406	2.484
Number of observations (600)		
LR chi^2 (84)		
Prob > chi^2		
Log likelihood		-296.13
Pseudo R^2		0.47

Note: ***, ** and * are probability levels at 1%, 5% and 10%, respectively.
Source: Data analysis, 2022.

4.4. Marginal Willingness to Pay (MWTP) Estimates

The marginal WTP estimates in Table 4 shows the average amount that a person would be willing to pay, indefinitely, for each unit increase (or decrease) in each of the specified attributes. Findings (see Table 4) indicated that consumers are more willing to pay for the "taste" attribute (MWTP= 4.26). This suggests the importance of taste in the choice of demand for rice among other quality attributes as also reported in the work of Laizer, Baharanyi, Zabawa, and Kadigi (2018).

Following the attribute of taste, the next important attribute was nutritional quality (MWTP; 2.80). In separate studies in Nigeria, Otitoju, Otitoju, Iyeghe, and Onwurah (2014) and Emumejaye (2014) reported that consumers are willing to pay for rice with good nutritional quality that would improve health and well-being.

Table 4. Marginal willingness to pay (MWTP) estimates.

Attributes	Coef.	Std. error	Z-scores	P>/z	Mean WTP
Nutritional quality	0.99	0.470	2.13**	0.033	2.80
Taste	1.52	0.819	1.86*	0.063	4.26
Ease of preparation	-1.13	0.873	-1.29	0.196	-3.16
Grain shape	-0.38	0.556	-0.68	0.495	-1.06
Impurity	-0.003	0.359	-0.01	0.993	-0.01
Swelling capacity	-0.929	0.612	-1.50	0.133	-2.57
Price	-0.36	0.448	-0.80	0.425	-

Note: ** and * are probability levels at 5% and 10%, respectively.
Source: Data analysis, 2022.

Consumers were unwilling to pay for the impurity attribute given the associated negative MWTP of -0.01. This corroborates the findings of Akaeze (2010) and Ogundele (2014) who reported that consumers in Nigeria had a lower preference for locally produced rice because of the large quantity of dirt and foreign bodies. Similarly,

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households are not willing to pay for short-grained rice (MWTP = -1.06) indicating a higher preference for slim and long grain likely foreign rice to short and round shaped local (Ofada) rice (Oyinbo, Omolehin, & Abdulsalam, 2013). Lastly, consumers in the study area are unlikely to pay for a unit increase in swelling capacity as well as ease of preparation of local rice, at MWTP of -2.57 and -3.16, respectively.Ajayi and Ajiboye (2020) in their study asserted that consumers have a higher willingness to pay for the quality of rice. This study reveals deviations in this demand feature. Perhaps this is likely due to individual differences across geographical space.

5. CONCLUSION AND POLICY IMPLICATIONS

The study investigated the factors governing the choice and willingness to pay for local rice varieties by households in South West, Nigeria through the use of the logit regression model and the Marginal Willingness to Pay (MWTP) technique. Findings indicated that households' rice preference was influenced by attributes such as nutritional quality and taste and respondents were willing to pay ₦4.26 ($0.012) and ₦2.80 ($0.008) for every unit increase in those desirable attributes, respectively. These findings provide a lead-way and undisputable fact on what dictates consumers' preferences for rice varieties as a food crop. This can also inimitably help in making appropriate policies in the agri-food sector in terms of developing new domestic rice production in Nigeria.

This study suggested that priority be given to enhancing the preferred attributes of rice in the drive to sustain local production. This is expected to make the local rice variety attractive to the public, thus enhancing the drive to ensure zero hunger at all levels. Furthermore, there is a need to increase investment in the rice value chain at the processing stage where the quality attributes are further enhanced for consumer appeal.

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INSTITUTIONAL REVIEW BOARD STATEMENT

The Ethical Committee of the University of KwaZulu-Natal, South Africa has granted approval for this study on 29 May 2018 (Ref. No. HSS/0292/018D).

TRANSPARENCY

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

Conceptualization, writing of the original draft and formal analyses, O.A.O.; writing of the original draft, data curation, review and editing, O.S.O.; writing of the original draft, review and editing, A.T.A. All authors have read and agreed to the published version of the manuscript.

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