

# Consumer Preferences for Rice Quality Characteristics in Accra and the Effects of these Preferences on Price

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## Resumé

Al-Hassan, Ramatu M., Agbekpomu, Hayford G. & Sarpong, Daniel Bruce. *Les préférences des consommateurs pour les qualités caractéristiques du riz à Accra et les effets de ces préférences sur le prix* Les préférences des consommateurs pour les qualités caractéristiques du riz à Accra ont des effets spécifiques sur le prix du riz. Des analyses statistiques de la relation entre le revenu et l'éducation des consommateurs et la qualité du riz qu'ils préfèrent, révèlent une relation significative entre le revenu et l'éducation sur la forme et l'arôme. Aussi, le goût, le prix du détail et l'absence de la matière étrangère sont les qualités caractéristiques que la majorité des consommateurs préfèrent. Au contraire, la publicité, le conditionnement, le pourcentage du riz cassé ne sont pas les facteurs qui déterminent le choix des consommateurs à Accra. Une modèle hédonique de l'estimation du prix révèle que les consommateurs du riz à Accra paient beaucoup pour le goût, l'arôme et la forme. Les consommateurs paient aussi quelques primes pour le pourcentage inférieur du riz cassé et la pénurie d'un type du riz au marché. N'importe quel programme de la sélection du riz pour les marchés ghanéens doit insister sur l'inhérente qualité caractéristique préférée par les consommateurs c-à-d le goût, la capacité de gonflement, l'arôme, la durée de la préparation et la forme. Les processeurs et les vendeurs doivent viser à la réduction de la casse du grain et le niveau de la matière étrangère dans le produit final. Les vulgarisateurs doivent incorporer la production du riz de la qualité dans leur messages aux paysans, processeurs et marchands.

**Mots clés:** Les préférences des consommateurs, la qualité du riz, la modèle hédonique.

## Abstract

Consumer preferences for quality characteristics of rice in Accra have specific effects on the price of rice. Statistical analysis of the relationship between income and education of consumers and the quality of rice they prefer, reveal a significant relationship between income and education on shape and aroma. Also, taste, retail price and absence of foreign matter are the quality attributes that most consumers prefer. Low percentage broken, type of packaging and advertisement are the factors least cited by consumers as influencing their choice of rice in Accra. A hedonic price estimation model reveals that consumers of rice in Accra pay highest premiums for taste, aroma and shape. Consumers also pay some premium for smaller percentage broken and scarcity of a type of rice in the market. Any breeding

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programme for rice for Ghanaian markets should emphasize on the inherent quality characteristics consumers are sensitive to and these include taste, swelling capacity, aroma, cooking time, and shape. Processors and marketers should aim at reducing breakage of grain and levels of foreign matter in the final product. Extension systems should incorporate the production of quality rice in their messages to farmers, processors and traders.

**Keywords:** Consumer preferences, rice quality, hedonic model.

### **Introduction**

Rice (*Oryza sativa* L.) is a staple food of over half the world's people and is grown on approximately 146 million hectares, more than 10 percent of total available land. Rice is one of the cheapest sources of food energy and protein. Revolutionary changes in the dietary preferences of West African consumers has created a wide and growing imbalance between regional rice supplies and demand. Since 1973, regional demand for rice has grown at an annual rate of 6.0 percent, driven by a combination of population growth of about 2.9 percent and substitution away from the region's traditional coarse grains. While the share in cereals used as food declined from 62 percent in the early 1970s to 50 percent in the early 1990s, the share of rice in cereals consumed increased from 15 percent to 25 percent during the same period. Growth in the sub-region's rice consumption remains high; the FAO projected a growth rate of 4.5 percent until the year 2000, further increasing the total volume of rice consumed in West Africa to 70 percent by the end of 1990s.

The most important factor contributing to the shift in consumer preferences in favour of rice is rapid urbanization and associated changes in family occupational structures. In addition, relatively stable supplies and prices of rice compared to traditional staples as well as increasing population and low production of traditional crops have contributed to the shift. As women enter the work force, the opportunity cost of their time increases and easy to prepare convenience foods such as rice, rise in importance. Similarly, as men work at greater distances from their homes in the urban setting, more meals are consumed from the market where the ease of rice preparation has given it a distinct advantage. These trends have meant that rice is no longer a luxury food but has become a major source of calories for the urban poor.

According to Asafo (1985), rice has become a staple in recent times in Ghana although the crop has been cultivated for several centuries. It is an important food for urban dwellers and has taken over from traditional staples, mainly root crops. Factors influencing increased consumption include rising incomes,

favourable government pricing policies and ease of cooking (Oteng, 1997).

Rice consumption between 2000 and 2002 totaled 1,249,692 metric tonnes out of which an average of about 38 percent was from domestic production, 60 percent from commercial imports and 2 percent was made up of food aid (BMOS Agro-consult Ltd., 2004).

High demand coupled with liberalization of trade in Ghana has led to a steady increase in rice imports into Ghana (SOFRECO, 1996). In 2002, imports were estimated at about 314,630 metric tonnes and total consumption was between 300,000 - 400,000 metric tonnes annually, equivalent to a per capita of 32 kg (MoFA, 2002). The output of paddy rice declined from 296,000 metric tonnes in 2001 to 236,000 metric tonnes in 2006 (ISSER, 2006).

Over time there has been a shift by importers to handle superior quality rice, as it sells faster (Bam *et al.*, 1998). Imported rice is also reported to command higher prices because of the perceived superior quality over locally produced rice. However locally milled rice is preferred by some consumers for the preparation of local dishes (NRI, 1997). Jayne (1993) states that many countries have distinct preference for a type of rice, although not all of them appear willing or able to pay a greater premium for the preferred type.

Ghana spends about 100 million dollars annually on the importation of rice (MoFA, 2003) and it is the policy of government to cut rice imports by 30% by increasing production to about 370,000 tonnes (MoFA, 2002,). The challenge of realizing this goal is not just increasing production of local rice, but producing rice with the quality characteristics that Ghanaian consumers prefer. In Ghana the imported rice sets the standard and price against which local rice is traded. Urban areas, notably Accra and Kumasi are identified as the main consumption areas of rice (NRI, 2000).

Selection for improved milling, cooking, and processing qualities is an essential component of breeding programmes designed to meet industry standards or taste and cooking characteristics preferred by consumers. Factors influencing quality, independent of genetics or the environment, are those associated with handling, storage, and presence of foreign material. Several components of rice quality determine market price and consumer acceptance (RQW, 2003). To tilt the preference of Ghanaian rice consumers towards locally produced rice, production must be tailored towards the quality preferences of consumers.

#### **Objectives of the study**

The primary objective of this study is to determine the quality characteristics of rice that consumers in Accra prefer and the effects of these preferences on price.

The specific objectives are to:

- ? Determine the relation between socio-economic characteristics such as income and education of consumers and the quality characteristics of rice they prefer.
- ? Identify and rank the factors that influence consumers' preference for quality characteristics of rice.
- ? Quantify the effects of the quality characteristics of milled rice on price.

### **Methodology**

The analytical approach adopted was to identify quality characteristics that consumers prefer and use seller information on brands and retail prices, to model the link between quality characteristics and prices. Laboratory techniques were used to measure technical characteristics such as colour, shape and cooking quality. In this section we present the method of identifying quality characteristics that consumers prefer, the model for linking price and quality attributes, and measurement of the attributes.

### **Identifying rice quality characteristics consumers prefer**

Before proceeding to specify the hedonic model, it is necessary to identify the preferred rice quality characteristics. This was done from the literature and a study of rice consumers in Accra. Kendall's Concordance test was used to

rank the quality attributes and to ascertain the level of agreement among consumers about these preferred characteristics. The Kendall's Concordance test is a statistical procedure that is used to identify and rank a given set of constraints or problems (or preference in this case), from biggest to smallest as well as measure the degree of agreement or concordance among the respondents on the preferences. The identified preferences are ranked according to the most preferred to the least preferred using numerals, 1,2,3,4,...,n, in that order. Computing the total rank score for each preferred quality attribute, the attribute with the least score is ranked as the most preferred whilst the one with the biggest score is ranked as the least preferred.

The total rank score computed is then used to calculate the coefficient of concordance (**W**), to measure the degree of agreement among judges (in this case, respondents) in the rankings. The limits for **W** are zero and one. It is one when the rank assigned by each consumer is exactly the same as those assigned by other consumers, and it is zero when there is a maximum disagreement among the consumers.

The computational formula for **W** is :

$$W = \frac{12 \left[ \sum T^2 - (\sum T)^2 / n \right]}{nm^2(n^2 - 1)} \dots \quad (1)$$

where:  $T$  = sum of ranks for factors being ranked,  $m$  = number of rankings (Consumers), and  $n$  = number of factors being ranked. The coefficient of concordance ( $W$ ) is tested for significance by the  $F$  distribution. The  $F$ -ratio is given by:  $[(m - 1) W] / (1 - W)$ , with  $(n - 1) - 2/m$ , degrees of freedom for the numerator and  $m-1[(n - 1) - 2/m]$ , degrees of freedom for the denominator (Edwards, 1964).

The quality attributes of rice assessed in this study are taste, price, absence of foreign matter, aroma, shape, cooking time, texture, colour, percentage broken, unavailability and accessibility of the rice types, and mode of presentation (packaging of rice).

#### **Hypothesis and significance test for $W$ : (F-Test)**

$H_0$ : Respondents do not agree on the rankings of the preferred quality characteristics of rice in Accra.

$H_1$ : Respondents are in agreement with each other on the rankings of the preferred quality characteristics of rice in Accra.

#### **Theoretical framework**

A hedonic price model was used to determine the effect of various factors on price. Hedonic price function relates the price of a product (good or service) to its various attributes or characteristics. Waugh (1928a,b) and Lancaster (1966) made early attempts to relate price to product characteristics.

Rosen (1974) advanced those ideas by providing a theoretical framework for hedonic price analysis. The underlying hypothesis of such analysis is that the product has utility bearing attributes and that the values of those attributes contribute to the price of the product. The observed product price is therefore a composite of the implicit values of the product's attributes.

The theoretical framework suggested by Rosen (1974) assumes competitive market structure where consumers' bid functions and suppliers' offer price functions are always tangential at the equilibrium. So hedonic price function is essentially a function of product attributes and not of individual buyer and seller attributes (Oczkowski, 1994).

Hedonic pricing model has been used extensively in the field of research. Oczkowski (2000) examined hedonic price function for Australian wines and found out significant reputation effects but insignificant quality effects. Weemaes and Riethmuller (2001) investigated the role of quality attributes on the consumption of fruit juices and found that consumers paid a premium for nutrition, convenience and information. Deodhar and Intodia (2002) undertook a study to identify those quality traits that were significantly influencing daily market prices of clarified butter. They indicated that consumers were willing to pay a premium for branded clarified butter over non-branded. This study follows

these steps by quantifying the effect of quality characteristics of rice on price. It estimates the levels of premiums consumers are willing to pay for individual quality characteristics.

The foundation of hedonic price modelling is that consumers derive satisfaction not by the goods themselves but by the attributes or characteristics of the goods that provide utility (Lancaster, 1966). They then strive to attain the attributes or characteristics they most desire, under their budget constraints. This study uses the prevailing market price as a proxy for the price consumers are willing to pay for the rice.

Suppose a consumer consumes a variety of some commodity,  $Q$ , that is composed of  $n$  attributes,  $X = X_1, X_2, \dots, X_n$ . Note that the attributes ( $X$ ) are supposed to vary continuously so that  $Q(X)$  represents a "spectrum" of varieties. Then the utility function can be written as:

$$U = U[Q(X)]$$

Maximizing this utility function subject to an overall budget constraint will yield a spectrum of demand for  $Q$ :

$$Q(X) = g[P_Q, K] \quad \dots \quad (2)$$

where  $P_Q$  is a price vector and  $K$  is a vector of consumer characteristics such as age and education. Here  $P_Q$  is determined by the equilibrium of supply and demand for the commodity varieties and the varieties are defined by the

attributes ( $X$ ). While the price and quantities in a competitive market are theoretically determined by supply and demand simultaneously, it is generally assumed in a demand study that the prices are given to consumers and consumers make their choices by equating the marginal utility of each attribute to its marginal price: and

$$P = f(X_1, X_2, X_3, \dots, X_N, K) \quad \dots \quad (3)$$

$$P_i = \frac{\partial f}{\partial x_i} \quad \dots \quad \dots \quad (4)$$

where  $P$  is the price of the commodity,  $X_i$  is the  $i^{\text{th}}$  attribute, and  $P_i$  is the partial derivative of price with respect to the  $i^{\text{th}}$  attribute or the attribute's marginal value (Freeman, 1993).

### **Empirical hedonic price model for rice**

The many diverse uses of rice in Ghana require that quality be evaluated according to its suitability for specific end uses. Whether rice is acceptable for an intended use is determined by quality testing based on a fixed set of criteria. How these are ranked in importance in evaluating quality depends largely on the consumer. Rice, unlike most other cereals, is consumed as a whole grain. Therefore physical properties such as size, shape, uniformity of grains, and general appearance are of utmost importance. Furthermore, because most rice is milled, the important physical properties are determined primarily by the milled endosperm (RQW, 2003).

**The empirical hedonic price model**

The variables used in the hedonic price model are in Table 1. Description of the variable measurement of each of the explanatory variables and the *a priori* expectation of the effect of the variable on price follow the table.

$$P_{rice} = \alpha_1 + \alpha_2 Colour + \alpha_3 Aroma + \alpha_4 Cooktime + \alpha_5 Cookqlty + \alpha_6 Shape + \alpha_7 Swellingcap + \alpha_8 \%Broken + \alpha_9 Taste + \alpha_{10} Im\ purity + \alpha_{11} Source + \mu \quad \dots \quad \dots \quad \dots \quad \dots \quad (5)$$

**Table 1. Description of variables.**

<i>Variable</i>	<i>Definition</i>
Price	Retail price of rice (¢ kg <sup>-1</sup> )
Lightness	Colour of rice (% of lightness)
Aroma	Perfumed rice = 1, 0 otherwise
Cooktime	Cooking time variable, short = 1, long = 0
Cookqlty	Stickiness of rice is a dummy variable = 1, if sticky and = 0 if not
Shape	Shape of rice is measured as the ratio of length to width
Swelling Cap	Swelling capacity (kg)
%Broken	Percentage broken (%)
Taste	Taste variable, Tasty = 1, 0 otherwise
Impurity	Level of impurity is measured as ratio of weight of impurities to total weight of rice sample
Source	1 = imported, 0 = local
μ	Error term

**Measurement of explanatory variables**

**Lightness**

According to Hal Good *et al.*, (undated), consumers frequently look at a product and make a judgment decision largely based on overall appearance including colour. Therefore colour can have an effect on the price of rice. The instrument used in measuring colour is Chromameter. It uses three dimensional scale namely Hunter L, a, b. It is based

on the opponent colours theory that states that the red, green and blue human eye cone responses are re-mixed into black-white, red-green, and yellow-blue, opponent coders as they move up the optic nerve to the brain. The L, a, b type of scale simulate this as:

? L (Lightness) axis: 0 is black, 100 is white;

? a (red-green) axis: Positive values are red; negative values are blue and 0 is neutral;

? b (yellow-blue) axis: Positive values are yellow; negative values are blue and 0 is neutral.

All colours that can visually be perceived can be measured in L, a, or b scale. Only the lightness scale was used to measure the colour of rice grain since rice grain generally has a white colour. The value falls within the range of 0 to 100%; the larger the value, the whiter the colour of rice grain.

**Aroma** Consumers prefer aromatic fine grain rice due to its pleasant aroma and qualities. Most rice with higher price tends to have perfumed aroma. It is expected that the aroma variable will exhibit a positive effect on the price in the market. There are various types of aroma for various types of rice. But generally, the perfumed rice has the most distinct aroma so this was the quality characteristic used for the analysis.

**Cooking time** Rice was boiled for 10 minutes. If the grain was cooked within the 10 minutes, it was classified as having a short cooking time and assigned a dummy of 1; otherwise the rice was classified as having a long cooking time. Consumers prefer rice with short cooking time. It is therefore expected that rice with long cooking time will have lower price.

**Cooking quality** Some consumers generally prefer sticky cooked rice and others non-sticky. Rice cooking methods can differ between regions and

depend on the rice dish prepared. This variable can exhibit either negative or positive effect on price. Five individuals determined whether the rice was sticky or not by kneading the boiled rice in-between their fingers. A dummy value of 1 was given if the rice was sticky and 0 otherwise.

**Shape** Adair *et al.* (1973), classified grain types according to length, width, length:width ratio, thickness and grain weight. They define shape of rice grain as the length to width ratio. The micrometer screw gauge was used to measure the length and width in the laboratory. The larger the value of the ratio of length to width, the more expensive the rice brand, since consumers are generally perceived to prefer long-grain rice.

**Swelling capacity** Swelling capacity was estimated with the assistance of Rice Specialist of the CSIR - Food Research Institute. A method of measuring swelling capacity used by Tomlins *et al.* (2004) was adapted for the study. Ten grams of rice sample was cooked in 150ml boiling water for 10 minutes. The rice was then decanted and dried with filter paper and then weighed again. The swelling capacity of the rice was measured as the difference between the weight after boiling and weight before boiling. The process was repeated three times to obtain an average swelling capacity. Swelling of rice after cooking is considered very important and consumers believe that swelling of



rice has an influence on the price in the market. Swelling capacity is therefore expected to have a positive relation with price of rice.

**Percentage broken** A sample divider was used to separate the rice into approximate equal parts. The quantity of rice was weighed and a separator used to separate the broken from the whole. The percentage broken was calculated as the ratio of the weight of broken to the weight of the whole rice sample. This attribute has a negative relation with price. Consumers will like to pay less for rice that has greater percentage broken than those with smaller percentage broken.

**Taste** Rice with a better taste (perfumed, No. 2) will have a greater price than other brands (e.g. brands such as AAA, China chalk). The *a priori* expectation of the effect of taste is positive. Taste was based on the perception of the consumer, in a sensory test.

**Impurity** Impurities such as discoloured rice, stones, unmilled rice, molded rice, heat damaged kernels were weighed. Impurity was measured as the ratio of weight of impurities to weight of rice sample. This was repeated three times and the average taken. Rice brands with lots of impurities are expected to fetch smaller price than those with less or no impurity. Therefore the *a priori* expectation on the coefficient of the variable is negative.

**Source** Rice on the Ghanaian market is either imported or local. It is generally believed that local rice is more expensive because of high cost of production. This perception fail to factor in the quality differences between rice from the two sources. In general, imported rice has superior quality therefore it is expected that this variable will have a positive relation with price.

#### **Description of variables and sources of data**

Data for the study was collected from three different sources. The first set of data was collected from rice sellers randomly sampled from nine urban markets in Accra. The markets are Makola, Malata, Madina, Tema Community One, Achimota, Ashaiman, Mamobi, Nima, and Kaneshi. The sellers provided data on quality characteristics of different types of rice and their prices within the period of study (August 2004 - May 2005). The second set of data included the sensory data on rice quality attributes. These were measured in the laboratory as described under the variable measurement of the hedonic model.

The third set of data was on consumer preferences (such as shape, colour, flavour, cooking quality and brand) and this were collected from 100 randomly selected consumers in Madina, Pokuasi, 37 Military Hospital Barracks, University of Ghana campus and Staff village, Amasaman, Baatsona, Tema Community 1, Nima and Mamobi, all

suburbs of Accra. The sample size was allocated equally to the 10 areas. The survey elicited from respondents, general information such as gender, age, educational level, principal occupation and status of respondent in the household. Consumer preferences of quality characteristics such as shape, colour, flavour or aroma, cooking quality and brand were also determined. Finally, respondents were made to rank factors influencing their preference of rice. The instrument of data collection from consumers was a semi-structured questionnaire. Descriptive statistics such as frequency analysis was undertaken to present general information on characteristics of consumers. The relationship between income and education level of respondents on their quality preferences was examined using chi-square analysis.

### **Results and Discussion**

Majority of the respondents sampled (80%) were females. The mean age of the respondents is about 35 years. The minimum age is 21 and maximum is 56 years. Most of the respondents fall within the age group of 21-30 (37%) followed by 31 - 40 (36%). Majority of the respondents (61%) are married. Thirty percent of sampled respondents were household heads out of which females form about 21 percent while the males form 65 percent. Most of the respondents (51%) are highly educated (SHS (senior high school, formerly senior secondary school and above).

Average income of respondents is about Gh¢130 per month, with a range of Gh¢40 per month to Gh¢500 per month. Most of the respondents sampled were made up of housewives (23%) and traders (23%) followed by salaried employees (22%) and self employed artisans (18%). A good number of the respondents (51%) buy prepared rice meal for consumption while the rest prepare on their own. Given the choice of imported rice and locally produced rice of the same quality, about 52% of the respondents will go for locally produced rice.

### **Income and education of consumers and the rice quality preferences**

Income level was computed by converting the extreme poverty income level of GH¢70.00 per annum in 1998 to year 2000 prices. This was categorized into two groups, those with incomes up to GH¢169.12 and those with income above that. A good number of the respondents (78%) prefer long grain rice. More than 70 percent of the respondents in both categories of income prefer long grain rice implying that rice consumers, irrespective of income prefer long grain rice. However, higher income consumers prefer aromatic rice with data showing a significant relationship (at 1% level of significance) between income and preference for aromatic rice. About 83% of the consumers with incomes at or below GH¢169.12 prefer non-aromatic rice brands because they are cheaper.

In terms of education, respondents were grouped into those who completed SHS and above and those with attainment below SHS. Seventy-eight percent of them with reference to educational level prefer long grain rice for their dishes. A greater majority (82%) of consumers in the higher education bracket prefer long grain rice as compared to those at the basic level (74%). Furthermore, majority of the respondents (94%) at the basic level prefer non-aromatic rice as compared with those with higher level of education (73%). Twenty-five percent of the highly educated choose perfumed rice for their major dish as compared to 4 percent at the basic level. The relationship between education and preference for shape and aroma were statistically significant at 10 percent and 5 percent levels respectively. There were no significant relationships between income or education and quality preferences such as colour, brand and cooking quality even though most respondents prefer white or translucent, imported rice and non-sticky texture for the major dish. This could be due to the fact that assessing most rice brands in the market to be non-sticky depends on individual judgement.

#### **Factors that influence consumers' preference for rice**

Table 2 presents results of the Kendall concordance analysis and shows that taste, price and absence of foreign matter are the three most occurring preferences or choice factors for rice

consumption in Accra. The least occurring factors are small percentage broken, type of packaging, and advertisement. The Kendall's concordance analysis shows that 52 percent of the sampled consumers were in agreement about the ranking of the quality characteristics of rice they prefer. The coefficient of concordance (W) is however significant at 1 percent level. It is therefore concluded that the consumer respondents were in agreement about the rankings of the characteristics that influence their preferences for rice.

#### **Effects of rice quality attributes on price**

Average price of rice sampled is about GHp93.00 kg<sup>-1</sup> rice. Several functional forms of the model presented in Equation 5 were fitted to assess the effects of different physical characteristics of rice on the price in cedis per kilogram. The results in terms of significant variables are largely similar for all the functional forms. The linear form, however, has the best fit because it has the highest R<sup>2</sup> and F-statistic values; also most of the explanatory variables had significant coefficients. The model was estimated by the Ordinary Least Squares method and the results are in the Table 3. The standard errors in the regression were corrected for heteroscedasticity using a White Estimator (White, 1980).

Out of a total of ten physical quality characteristics of rice, six have

**Table 2. Identification and ranking of factors that influence consumers' preference of rice.**

<i>Physical attributes</i>	<i>Over all rank</i>	<i>TWS</i>	<i>Rank score of factors</i>												
			<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>
Taste	1	274	41	24	8	9	4	3	6	2	2	0	0	1	0
Price	2	406	18	18	14	9	17	8	5	3	2	3	2	1	0
Absence of foreign matter	3	465	12	11	12	15	12	22	4	3	3	4	0	2	0
Availability	4	514	7	7	9	20	21	10	8	8	6	1	1	0	2
Swelling	5	574	2	13	15	11	7	10	11	16	6	3	3	1	2
Aroma	6	612	7	5	5	6	11	16	22	13	6	6	3	0	0
Cooking quality	7	676	1	5	18	6	5	3	15	11	18	12	3	3	0
Texture	8	679	4	8	4	8	8	8	12	16	13	10	6	1	0
Colour	9	679	8	4	7	8	5	9	10	9	21	12	5	1	1
Shape	10	857	0	3	6	4	4	4	4	11	13	30	16	1	4
Low percentage broken	11	1048	0	2	1	4	3	6	2	4	6	6	19	6	41
Packaging	12	1149	0	0	0	0	2	1	2	2	3	7	15	43	25
Advertisement	13	1171	0	0	0	0	1	0	0	2	1	4	28	39	25

Source: Author's computation.

TWS denotes total weight score.  $W = 0.52$ ,  $F\text{-calculated} = 107.25$ ,  $F\text{-critical} = 2.18$ .

significant coefficients that also meet their *a priori* expectations. Taste, aroma, brand, percentage broken and cooking time are all significant at one percent level and shape of rice is significant at 5 percent level.

The positive sign of the coefficient of taste shows that a premium of GHp 12.06 unit price per kg is paid for rice

brands that consumers perceive to taste better than others. The survey revealed that consumers assess perfumed rice to have the best taste followed by US No. 2 and then US No. 5 and this is generally consistent with the disparities in the prices of these imported brands. Aroma has GHp 59.36 premium on the margin therefore perfumed rice which consumers assess as having the best

**Table 3. Hedonic price analysis of rice.**

<i>Variable</i>	<i>Dependent Variable: Price kg<sup>-1</sup></i>			
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
C	-4303.092	6284.666	-0.684697	0.4952
Taste	1205.695	298.0716	4.044986	0.0001***
Aroma	5936.048	471.8659	12.57995	0.0000***
Source	403.4141	126.5498	3.187789	0.0020***
%Broken	-74.74971	7.640068	-9.783906	0.0000***
Cookqlty	107.7980	175.8755	0.612922	0.5414
Cooktime	-872.9655	290.9929	-2.999955	0.0035***
Swellingcap	127.0946	94.66841	1.342524	0.1827
Shape	2769.587	1091.449	2.537531	0.0128**
Lightness (colour)	6.264161	21.40213	0.292689	0.7704
Impurity	-3629.626	5334.721	-0.680378	0.4980
R-squared	0.896762	Mean dependent var		9261.538
Adjusted R-squared	0.885661	S.D. dependent var		1487.051
S.E. of regression	502.8328	Akaike info criterion		15.37814
Sum squared resid	23514193	Schwarz criterion		15.65783
Log likelihood	-788.6632	F-statistic		80.78284
Durbin-Watson stat	1.816542	Prob(F-statistic)		0.000000

\*\*\*, \*\* denote 1%, and 5% levels of significance respectively.

aroma has the highest price premium. The estimated coefficient of the shape of rice bears an expected positive sign. In effect, this means that, consumers prefer long-grain rice, and a millimetre increase in the length to width of rice leads to GHp 27.70 premium on price paid.

The estimated coefficient for source of rice (imported or local) has the expected positive sign in favour of imported rice; it is also significant at 1 percent level. This suggests that imported rice generally sells at GHp 4.00 per kg more than locally milled rice, *ceteris paribus*. As expected, a long cooking time was found to have a significantly negative influence on the price of rice in the market. Consumers discount the price of rice if it does not cook easily.

The estimated coefficient for foreign matter has the expected negative sign but is not significant even at 10 percent level. This may be due to the fact that most of the rice on the market is imported and is usually clean. Even though the coefficient of colour of rice had the postulated sign, it was not significantly different from zero. This is not surprising because most of the rice is within the white range. Finally, cooking quality in this model did not influence the price of rice in the market.

### **Summary**

This study has brought to light the relation between socio-economic characteristics such as income and

educational level of consumers and their preferences for rice quality characteristics (shape, colour, aroma cooking quality and the brand). Higher income consumers tend to prefer long grain, and aromatic types of rice. Also consumers with higher levels of education tend to prefer long grain and aromatic types of rice while those with a maximum of basic level education prefer long grain and normal scented rice.

Taste, price and absence of foreign matter are the three most occurring rice characteristics preferred by rice consumer in Accra, while low percentage broken rice, packaging and advertisement are the least occurring preference factors that influence consumers' choice of rice in Accra. A hedonic model identifies taste, aroma and long grain as quality attributes that attract price premiums from consumers. On the other hand consumers discount prices for high percentage broken and long cooking time. These are the quality characteristics that the local rice industry should enhance to increase its share in total domestic rice consumption.

### **Conclusion and Recommendation**

Markets require information to operate efficiently. Hedonic price analysis which is the derivation of the values (prices) of attributes embedded within a good has been used to extract information from the rice market in Accra for the benefit of actors in the market. This study finds that consumers

of all income and educational levels consider the quality of rice in their choice of rice types, and pay premiums on the desired quality attributes. Unfortunately these desired attributes are to be found in imported rice and not in locally produced rice. Therefore the drive to decrease rice imports will not be successful unless the quality of locally produced rice is enhanced to match the quality characteristics of imported rice. The preferred quality attributes do command higher marginal values from consumers.

Any breeding programme for rice for Ghanaian markets should emphasize on the inherent quality characteristics consumers are sensitive to: taste,

swelling capacity, aroma, cooking time, and shape. Processors and marketers should aim at reducing breakage of grain and levels of foreign matter (impurities) in the final product. The extension system can aim to incorporate the production of quality rice in their messages. Presently the CSIR - Food Research Institute is undertaking this quality work but on a pilot scale. There is need for increasing their coverage.

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