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## Consumer preferences for rice quality characteristics and the effects on price in the Tamale Metropolis, Northern Region, Ghana

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### ABSTRACT

Rice has become an important staple in Ghana where it serves as a convenience food for both urban and rural consumers. In Ghana rice has become the second most important staple food after maize and its consumption continues to increase with population growth, urbanization and changes to consumption habits. The study aimed to determine influential factors on consumer preference for various rice brands in the metropolis of Tamale and the quality characteristics which affect prices. One hundred (100) respondents were randomly sampled and interviewed using a semi-structured questionnaire. The Kendall's coefficient of concordance was used to determine the factors that influence consumer preference. The hedonic price model was used to analyze the effect of these preferences on price. The attributes that define the quality of rice most preferred by consumers were taste, cooking quality, cooking time and aroma. The attributes least preferred by consumers were price, impurities (presence of foreign matter) and the source of rice. The hedonic price model showed that the consumer paid higher premiums for aroma and source of rice (local or foreign). Rice processors, distributors and retailers must ensure that their product is free of foreign matter while breeding programmes for rice need to emphasize the quality attributes preferred by consumers, namely: taste, cooking quality, cooking time and aroma.

**Keywords:** Consumer preference, Hedonic price model, Ranking, Rice quality characteristics

### INTRODUCTION

Rice (*Oryza sativa* L.) is a staple food for nearly one half of the world's population (Zhou et al. 2002; Jafar et al. 2008) and an important staple food crop for millions of Ghanaians. It is ranked as the world's number one food crop (Itani et al. 2002). According to Tomlins et al. (2005), rice has become a staple in Ghana and much of West Africa where it serves as an important convenience food for urban consumers. Rice has become the second most important food staple after maize in Ghana (Ministry of Food and Agriculture, 2009) and its consumption continues to increase as a result of population growth, urbanization and change in consumer habits.

In terms of consumption, world rice consumption has increased by 40 percent in the last 30 years. In Ghana, rice consumption per annum over the period 2000 to 2003 is made up of the following: commercial rice imports accounted for approximately 61%, food aid accounted for 2%, and domestic rice production accounted for approximately 37% (Asuming-Brempong and Osei-Asare 2007). The share of local rice in the overall quantities of rice consumed in Ghana has steadily declined over the past two decades. In 1998 the market share of local rice was 88%. In 2003, the market share of local rice was only 24%. This shows a gradual shift in consumer

preference for rice brands in the Ghanaian market. Consumers do not patronize local rice because of poor post harvest handling, non-availability, and a general perception of poor quality (Diako et al. 2010).

According to Kramer (1988), consumer choice is generally governed by taste, price, convenience, variety, and quality. Brand preference also depends on retailer influence and brand image (Gaur and Vaheed 2002). According to Jafar et al. (2008), rice consumers, as in Japan and other countries were demanding a wide range of added values for rice. These characteristics include food texture (stickiness and hardness), rice nutrients and constituents (protein, amylase allergens) and aroma, colour, size and shape of the rice kernel. Reports show that rice can also be affected by processing factors (Rousset et al. 1995) and cooking methods (Perdon et al. 1999).

According to Ministry of Food and Agriculture (2009), there is a wide variation consumer preference for rice in Ghana on the basis of grain characteristics. Diako et al. (2010) indicated that both cooked and raw sensory attributes of rice dictate consumer preference. They showed that the physical appearance of raw rice was critical to consumer choice whilst taste and aroma determined consumer preference for cooked rice. Not only has consumer preference for rice brands changed over the years, but the per capita consumption of rice is also on the increase. According to Ministry of Food and Agriculture (2009), over the past 10 years (1999-2008) rice per capita consumption in Ghana increased from 17.5kg to 38.0kg. By 2018 the figure is estimated to grow to 63kg as a result of rapid population growth and urbanization. According to Asuming-Brempong and Osei-Asare (2007), rice consumption in Ghana has increased because it has become part of the main diet in every Ghanaian home due to the convenience of its preparation and suitability for favoured dishes. Additionally,

increasing numbers of fast food vendors in the major cities in Ghana have also increased the demand for rice. They indicated that rice has become a major competitor of staple foods in Ghana.

The increased per capita rice consumption as well as the shift in consumer preference in favour of imported rice has impacted on the rice sector in Ghana especially with regard to the National Rice Development Strategy (NRDS) which seeks to double rice production in Ghana. Furthermore, considering the important role of rice in the food system and assurance of food security in Ghana, this study aimed to investigate factors which determined consumer preference for various rice brands in the Tamale metropolis and the quality attributes of rice which impact on price.

#### **OBJECTIVES OF THE STUDY**

The main objectives of this study were to determine the quality characteristics of rice that consumers in Tamale metropolis prefer and the effects of these preferences on price. The specific objectives include:

- Identification and ranking of the factors influencing consumer preference for quality characteristics of rice in the Tamale metropolis.
- Quantification of the effects of quality characteristics of rice on price.

#### **MATERIALS AND METHODS**

##### **The Study area**

Tamale is the capital town and administrative headquarters of the Northern Region of Ghana, and lies mainly in the savannah climatic region of West Africa. The metropolis lies between the latitudes 9° 18'N and 9° 26'N and between longitudes 1°15'E and 1° 23'W and covers a total area of about 922km<sup>2</sup>. Tamale metropolis which is the largest settlement in Northern Ghana and the fourth largest city in Ghana is reputed to be one of the fastest growing

cities in West Africa. It had in the year 2000 a population of 293,900 which is equally distributed between the sexes. It has a unimodal rainfall pattern with about 1000mm of rainfall per annum. Economic activities are predominantly centered on farming and trade.

**Sampling and data collection**

A preliminary survey was conducted to determine rice brands available in the market and to identify the quality characteristics that consumers seek. The second step involved a face-to-face interview with 100 respondents. Respondents were selected by simple random sampling. The location for the interview was the Tamale central market, Abuabo market, selected supermarkets and retail shops.

**Data analysis**

The data was analyzed with the SPSS statistical package. Kendall’s Coefficient of Concordance was used to rank factors that identify consumer preference for quality attributes of rice. The hedonic price model was then used to determine the effect quality characteristics on price.

**Identifying Rice Quality Characteristics Preferred By Consumers**

The Kendall’s Concordance test was used to identify quality characteristics of the preferred rice. The Kendall’s Coefficient of Concordance is a statistical procedure used to identify and rank a given set of constraints or problems (preference in this case), from the most influential to the least influential as well as measure the degree of agreement or concordance among the respondents on the preferences. The identified preferences were ranked from the most influential to the least influential using numerals, 1,2,3,4.....n, in that order. The

total rank score for each preferred factor was computed and the factor with the least score was ranked as the most preferred whilst the highest score was ranked as the least preferred. The total rank score computed was then used to calculate the coefficient of concordance (W), which measures the degree of agreement among judges (in this case respondents) in the rankings.

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

Where T= sum of ranks for factors being ranked

m = number of respondents (consumers)

n = number of factors being ranked

W = coefficient of concordance

The Coefficient of concordance (W) was tested for significance in terms of the F-distribution.

The F-ratio is given by  $F = (m - 1) * (W) / (1 - W)$ , with numerator and denominator degrees of

freedom being  $(n - 1) - (2/m)$  and  $m - 1[(n - 1) - 2/m]$  respectively.

The null and alternative hypotheses were stated as:

H<sub>0</sub>: Respondents did not agree on the rankings of the preferred quality characteristic of rice in the Tamale metropolis

H<sub>1</sub>: Respondents were in agreement with each other on the rankings of the preferred quality characteristic of rice in Tamale metropolis. The decision rule was that we rejected the null hypothesis (that there was no agreement between the rankings of the preferred quality characteristics) and accepted the alternative hypothesis if F-calculated > F- tabulated.

## Theoretical framework of the hedonic price model

The many diverse uses of rice in Ghana required that quality be evaluated according to its suitability for specific end uses (Al-Hassan et al. 2008). Whether rice was acceptable for an intended use was determined by quality testing based on a fixed set of criteria. How these criteria were ranked in order of importance to evaluate quality characteristics depended largely on the consumer. Rice, unlike most other cereals, was consumed as a whole grain. Therefore physical properties such as size, shape, uniformity of grain, and general appearance were of the utmost importance to consumers. As most rice is milled, the important physical properties were determined primarily by the milled endosperm.

The hedonic price model was used to determine the effect of rice quality characteristics on price. The hedonic price function related the price of a product to its various attributes or characteristics. 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. Deodhar and Intodia (2002) also studied the quality traits that significantly influenced daily market prices of clarified butter and concluded that consumers were willing to pay a premium for branded clarified butter over the non-branded. Our study aimed to estimate the premiums that consumers were willing to pay for individual quality characteristics of rice.

## The empirical hedonic price model for rice

Table 1 shows the variables used in the hedonic price model and the description of the variable measurement of each of the explanatory variables as well as the a priori expectation of the effect of the variable on price.

$$P_{price} = \alpha_0 + \alpha_1 \text{Aroma} + \alpha_2 \text{Source} + \alpha_3 \text{Cooktime} + \alpha_4 \text{Taste} + \alpha_5 \text{Im purities} + \alpha_6 \text{Cookquality} + \mu \dots \dots \dots (2)$$

$\mu = \text{error term.}$

**Table1.** Description of variables used in the hedonic price model

VARIABLES	DEFINITIONS
Price	Retail price of rice per kg
Aroma	Perfumed rice = 1, otherwise = 0
Cooking time	Cooking time variable, short = 1, long = 0
Cooking quality	Stickiness of rice, if sticky = 1, not sticky = 0
Taste	Taste variable, Tasty = 1, otherwise = 0
Impurity	Presence of foreign matter in the rice, present = 1, otherwise = 0
Source	Local = 1, Imported = 0
$\mu$	Error term

## RESULTS

### Socio-economic characteristics of respondents

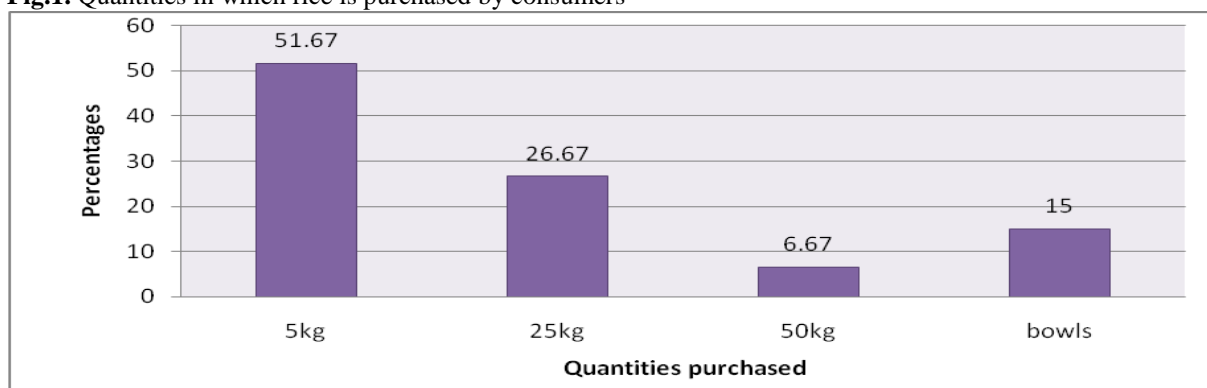
Fifty two (52) percent of the respondents interviewed were female. The mean age of respondents was 29 years. The minimum age was 18 and the maximum was 56. Forty three (43) percent of the respondents were within the age group 15 – 25 years while 40% were within 26 – 35 years. Forty two (42) percent of the respondents were married. Most of the respondents (85%) were educated beyond senior high school. Forty four (44) percent were salary earners, 29% were business owners/traders, 25% were students and 2% were farmers. About 20% of respondents had monthly incomes below GH¢100 and close to thirty four (34) percent had monthly incomes between GH¢100- GH¢200. Only three (3) percent of respondents had a monthly income above GH¢500. The results showed that respondents were generally low income earners.

### Consumers Buying Behaviour

The study showed that over thirty six (36) different rice brands were found at the market in the Tamale metropolis. This included both foreign and local brands. Royal Feast, Sultana, and Texas rice were identified as the most preferred foreign brands of rice at the Tamale market. Prominent local brands included Bolga rice,

Dagomba rice and Navrongo rice. The local brands were preferred by consumers for preparation of certain local dishes and for price. Close to fifty two (52) percent of consumers purchased their rice in 5 kg bags while 27% preferred the 25 kg bag. Fifteen (15) percent of respondents bought their rice in 2.5 kg bowls.

**Fig.1.** Quantities in which rice is purchased by consumers



### Influential Factors on Consumer Preference for Rice

Consumer preference for a particular brand of rice depended on the quality characteristics of that particular brand. The rice quality characteristics that consumers in Tamale metropolis looked out for were aroma, taste, cooking quality, source of rice, impurities (presence of foreign matter), cooking time and price. Results of the Kendall concordance analysis are presented

in Table 2 and showed taste, cooking quality, cooking time and aroma as the quality characteristics most preferred by consumers in the Tamale metropolis. Price, impurities (presence of foreign matter) and source of rice (whether local or imported) were the least favoured preferences that influenced the consumer's choice of rice in the Tamale metropolis.

**Table2.** Identification and ranking of factors that influence consumers' preference of rice

Quality characteristics	Overall Rank	TWS (T)	Rank score of factors						
			1	2	3	4	5	6	7
Taste	1	95	32	21	7	0	0	0	0
Cooking quality	2	140	6	12	13	16	7	6	0
Cooking time	3	192	6	12	13	12	14	3	0
Aroma	4	199	10	12	11	10	10	7	0
Price	5	254	4	4	10	15	12	13	2
Impurities	6	345	0	1	4	4	9	17	24
Source	7	372	0	0	1	3	10	15	31

TWS = total weight score; W = 0.62; F-calculated = 25.3; F-critical = 2.28 (at 5% significance level)

Kendall concordance analysis showed that 62% of the sampled consumers were in agreement with each other on the ranking of

the preferred quality characteristics of rice in the Tamale metropolis. The Kendall coefficient of 0.62 implied a high degree of agreement among the respondents.

### Effects of Rice Quality Characteristics on Price

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

Variables	Coefficient	Std. Error	t	Significance
(Constant)	1.273	.194	6.561	.000
Aroma	.468	.172	2.718	.009***
source of rice	1.183	.204	5.797	.000***
Cooking time	-.463	.237	-1.955	.056*
Taste	.069	.182	0.378	.707
Impurities	-.345	.221	-1.564	.124
Cooking quality	-.320	.149	-2.149	.036**

Dependent Variable: Price per kg

R <sup>2</sup>	0.66
Adjusted R <sup>2</sup>	0.62
Standard error of regression	0.341
F-statistic	17.075
Significant at 10%	*
Significant at 5%	**
Significant at 1%	***

Out of the total of six physical quality characteristics of rice, four had significant coefficients that also met their a priori expectations. Cooking quality was significant at 5 percent; cooking time was significant at 10 percent level and source of rice and aroma were significant at 1 percent.

## DISCUSSION

### Factors influencing consumer preference for quality characteristics of rice

The rice quality characteristics preferred by consumers in the Tamale Metropolis were identified as aroma, taste, cooking quality, source of rice, impurities (presence of foreign matter), cooking time and price: of these, taste, cooking quality, cooking time and aroma were identified as the most preferred quality characteristics. The results are consistent with the findings of other researchers. Prameela and Husain (2007) showed that product features such as taste and freshness determined consumer choice

The mean price of rice sampled was GH¢ 2.18 kg<sup>-1</sup>. The model presented in equation (2) was estimated by the Ordinary Least Squares method and the results are shown in Table 3.

while Kramer (1988) indicated that consumer behaviour was generally dependent on taste, price, convenience, variety, and quality. Diako et al. (2010) also showed that taste and aroma determined consumer preference for cooked rice. As income levels rise, consumers are expected to demand tastier foods, and this showed in the preference of consumers for tasty rice. The cooking quality of rice affects the type of dish, with rising incomes consumers are expected to prefer rice with desirable cooking qualities (non-sticky). Most local rice varieties take a longer time to cook and this may influence consumer preference for rice with shorter cooking time. Rice with a good aroma has become fashionable especially among the higher income group.

### Effects of Rice Quality Characteristics on Price

Consumer preference for rice quality characteristics was found to effect price.

From the hedonic price analysis, aroma had a positive sign which showed that a premium of GH¢ 0.468 per kg was paid for rice brands that consumers perceived to have better aroma. Royal Feast, Sultana and Texas rice were identified as the most preferred rice brands which were also noted to be perfumed and sold at a higher price compared to other rice brands on the market. The estimated coefficient for source of rice (local or imported) had the expected positive sign in favour of imported rice. The result showed that imported rice generally sold at GH¢ 1.183 unit price 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 Tamale metropolis. Consumers discounted the price of rice if it did not cook easily (in this case faster). The estimated coefficient for impurities had the expected negative sign but not significant even at 10 percent. An explanation for this could be that most of the rice on the market

was imported and did not usually contain impurities. Consumers also discounted the price of rice if it was sticky when boiled. Finally, taste in the model did not seem to influence the price of rice in the market. Taste had the expected positive sign but it was not significant even at 10 percent.

From equation (3), the constant ( $\alpha_0$ ) is positive (1.273) implying that even when all the quality characteristics are zero, consumers still chose to pay a premium for the rice brand they most preferred. The error term which accounted for almost 34 percent of the variation in price could be attributed to environmental effects and other undetermined factors. The coefficient of determination ( $R^2$ ) of 0.66 meant that the independent variables explained 66 percent of the dependent variable even though the *t*-test did not show significance for all the individual coefficients.

The regression equation can thus be stated as follows:

$$P_{price} = \alpha_0 + 0.468Aroma + 1.183Source - 0.463Cooktime + 0.69Taste - 0.345Impurities - 0.320Cookquality + \mu \dots \dots \dots (3)$$

**CONCLUSION AND RECOMMENDATIONS**

Several factors affected consumer preference for rice brands in the Tamale metropolis. Consumer preference for quality characteristics of rice also has specific effects on the price. The study found that consumer choice of specific brands of rice in the Tamale metropolis was influenced by certain quality attributes, and consumers were willing to pay premiums for those desirable qualities. Taste, cooking quality, cooking time and aroma were the quality characteristics that most consumers preferred. Consumers paid premiums for aroma, taste and source of rice (imported rice). The results show that consumption of imported rice brands was likely to continue

to increase as those brands possessed the quality attributes consumers looked out for. Efforts to improve rice production in Ghana must therefore aim to introduce these desirable attributes into breeding programmes to make local rice attractive to consumers. Elimination of foreign matter from local rice, improving the taste, cooking quality and cooking time of local rice are important steps to improve the patronage of local rice in Ghana. Rice processors in particular must ensure that local rice is clean and devoid of foreign matter. The production of quality rice must also be part of an extension delivery by the Ministry of Food and Agriculture.



## REFERENCES

- Al-Hassan RM, Agbekpomu HG, Sarpong DB (2008) Consumer preferences for rice quality characteristics in Accra and the effects of these preferences on price. *Agric and Food Sci J Ghana* (7): 575-591
- Asuming-Brempong S, Osei-Asare Y (2007) Has imported rice crowded-out domestic rice production in Ghana? What has been the role of policy? *African Association of Agricultural Economists (AAAE) Conference Proceedings* (2007) 91-97
- Deodhar SY, Intodia V (2002) Does Ghee sold by any brand smell as sweet? Quality attributes and hedonic price analysis of ghee. *Indian Food Industries* March-April (21):2
- Diako C, Sakyi-Dawson E, Bediako-Amoa B, Saalia FK, Manful JT (2010) Consumer Perceptions, Knowledge and Preferences for Aromatic Rice Types in Ghana. *Nat and Sci* 8(12):12-19
- Gaur SS, Vaheed KA (2002) Study of buying behavior for branded fine rice *Indian J Mark* 32(7):33-36
- Itani T, Masahiks T, Eiks A, Toshroh H (2002) Distribution of amylase, Nitrogen and minerals in rice kernel with various characteristics *J Agric Food Chem* 50:5326 - 5332
- Jafar ME, Basem FD, Maha MAJ, Khalil IE (2008) Variation in Physio-Chemical Characteristics, Mineral Concentrations and Cookability of Rice Marketed in Jordan. *Pak J Nutr* 7 (1):141-145
- Kramer CS (1988) Consumer demand – a balancing act versus agriculture in a global setting. An agenda for the future research for the future *Indian J Agric Econ* 43(1): 105-122
- Ministry of Food and Agriculture (2009) *National Rice Development Strategy Draft* February 2009
- Perdon AA, Siebenmorgen TJ, Buescher RW, Gbur EE (1999) Starch retro gradation and texture of cooked milled rice during storage. *J Food Sci* 64:828-832
- Prameela V, Husain AS (2007) Consumer choice of branded agro-processed products in Kannur municipality of Kerala state. *J Tropical Agric* 45 (1-2): 72-74
- Rousset S, Pons B, Pilandon C (1995) Sensory texture profile, grain physicochemical and instrumental measurements of cooked rice. *J Texture Stud* 26:119-135
- Tomlins KI, Manful JT, Larwer P, Hammond L (2005) Urban consumer preferences and sensory evaluation of locally produced and imported rice in West Africa. *Food Qual and Pref* 16 (1): 79-89
- Weemaes H, Riethmuller P (2001) What Australian consumers like about fruit juice: Results from a hedonic analysis. Paper presented at the World Food and Agribusiness Symposium, International Food and Agribusiness Management Association. Sydney 27-28 June 2001
- Zhou Z, Robards K, Helliwell S, Blanchard C (2002) Composition and functional properties of rice. *Int J Food Sci and Technol* 37: 849 - 868