Determinants of Consumer Preference for Local Rice in Tamale Metropolis, Ghana

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Abstract

This study examined the determinants of consumer preference for domestically processed rice and identified some of the constraints inhibiting the consumption of local rice in the Tamale metropolis. Logistic regression model and Kendell's coefficient of concordance were used to analyze the determinants of consumer preference for domestic rice and some of the factors inhibiting the patronage of local rice respectively. The key variables influencing consumers preference for local rice includes; age, household size, monthly expenditure on food and taste. The results also indicated that about 65 percent of the respondents agreed that poor packaging of local rice is the number one factor inhibiting the patronage of local rice. There is therefore an urgent need to invest into the development and deployment of rice varieties to improve its taste. Local rice processors should also worked at improving the packaging to make it competitive in the market.

Key words: Logit regression model, Kendell's Coefficient of concordance, Local rice, Tamale, Ghana

1.1 Introduction

Rice is a cereal of the family *poeceae* and is considered as the most important food crop and primary source of food for more than 30 percent of the world population. The planting of rice covers about 146 million hectares of land annually representing about 11 percent of the world cultivated land (Kassali et al 2010). Other cereals of paramount importance include maize, sorghum, wheat and millet.

Rice is the fastest growing staple food source in most African countries, providing the bulk of dietary energy to the growing population. In most developing countries in Africa, rice accounts for 715kcal/caput/day, 27 percent of nutritional supply of energy, 20 percent of nutritional protein and 3 percent of nutritional fat (Kassali et al 2010). Rice is positioned as the 5th most prominent source of energy in diet responsible for about 9 percent of caloric intake (FAOSTAT, 2012). Rice also serves as raw materials for industries. In 2006, paddy rice production in the Sub-Saharan Africa (SSA) was estimated at 14.6 million tonnes. Rice production in Africa grew at 3.23% per annum from 1961 to 2005 (Kassali et al, 2010). In Ghana agricultural sector is the most important sector of the economy in that it provides food, raw materials for the industries and generates income for households from production to the sales of the products. Of all the major grain food crops found in Ghana; for example, maize, millet, wheat and sorghum; rice is considered to be the second most important grain food next to maize (MoFA, 2009). Rice is also the first imported cereal in the country accounting for about 58 percent of cereal imports and 5 percent of total agricultural imports over the period 2005-2009 (CARD, 2010).

Other food crops of equal relevance in terms of domestic production are yam, plantain, cassava, cocoyam, and maize. In terms of value of production, rice was ranked 10th among agricultural commodities in Ghana and 8th in terms of quantity for the period 2005 – 2010 (MoFA, 2010). It accounts for about 45 percent of the total hectares cultivated to cereals and about 4 percent of the total agricultural crop harvested hectares. These make rice a very important staple food crop providing income for the urban population as well as an important cash crop for farm households.

1.2 Rice Production in Ghana

The main types of rice cultivated in Ghana are the *Oryza sativa* and *Oryza Glaberima*. The cultivation of rice is basically under six major ecosystems; rain-fed, irrigated, upland, lowland, deepwater and tidal wetlands.

In terms of agricultural area of production, rice is one of the paramount cereals cultivated in Ghana that account for about 19 percent of cereal production. Between 2000 and 2010, hectares of land under rice cultivation increased from 0.09 to 0.16 million hectares whilst productivity fluctuated between 1.7 to 2.7 tons per hectare (FAOSTAT, 2012). In terms of quantity, rice has seen a tremendous increase over the years. Between 2007 and 2010, rice production levels have been more than doubled increasing from 185,000 tons to 491,600 in 2010 with mean annual growth rate of about 15 percent over the period 2005 – 2010 albeit, the drop in production in 2007, that is, from 237,000 tons in 2005 to 185,000 tonnes in 2007 (SRID, 2011). Reasons for such an improvement in production could partly be attributed to the favourable rainfall patterns and Ghana government agricultural policies such as fertilizer subsidy programme implemented in 2008 as well as the block farm programme in 2009.

With reference to a document by Millennium Challenge Account (2006), rice is produced in all the ten regions of Ghana, which covers the major agro-ecological zones; interior savannah, rain forest zone, semi-deciduous, high rain forest zone and coastal savannah. Production is very concentrated in the Northern, Upper East and Volta regions of Ghana accounting for nearly 80% of the total national rice output and 73% of total production area in 2010. Average yield of 2.96 tonnes per hectare in these three regions exceeds the national average of 2.71 per hectare but is significantly lower than the average yield of 5.48 tons per hectare in the Greater Accra regions, suggesting that right technologies and policies could enhance yields and output. The three rice-concentrated regions produced on the average between 45,000 tons and 60,000 per year each with Northern region been the principal producer with about 63,000 tons in 2009 (USAID, 2009).

In Ghana, it is estimated that more than 80 percent of agricultural activities are done by smallholder farm households and rice cultivation is of no exception. In Ghana, rice is cultivated under three different ecologies; low-land rain-fed ecology (78 percent of production) upland rain-fed ecology (6 percent of production) and irrigated ecology (16 percent of production) (CARD, 2010). Low land rice production is mainly done by farmers (mostly women) in the lowland areas around the receding waters of Volta and other rivers often with no irrigation. Lowland and upland rain-fed rice production account for about 84 percent of current total production with an average paddy yield of about 1 – 2.4 metric tons per hectare. Irrigated land production of rice accounts for just about 16 percent of current production but with the highest yield of about 4.5 metric tons per hectare (CARD, 2010). Currently, there are 22 public irrigation schemes in Ghana covering about 10,900 hectares of land and 8,100 hectares of irrigated lands are been operated privately.

1.3 Rice Consumption in Ghana

Rice is considered to be one of the paramount staple food crops in Ghana with consumption in 2011/2012 estimated to hit 620,000 tones (CARD, 2010). Per capita consumption of rice was pegged at about 28kg with urban population accounting for about 76 percent of the consumption (CARD, 2010).

The high consumption demand for rice could partly be attributed to the rapid increase in fast food restaurants and vendors in the urban centers and the fact that rice is easy and convenient to prepare and it also allows for wide range of dishes. According to report by food and agriculture organization 2006, per capita consumption of rice has increased by over 35 percent due to changes in food consumption pattern of Ghanaians motivated by urbanization. According to Ministry of Food and Agriculture, just about 20 percent of domestically produced rice is been consumed by the urban population due to their preference for long grain aromatic rice popularly known as perfume rice.

1.4 Determinants of Consumer Preference for Rice

Despite the recent increase in Ghana's production of rice, rice importation is still required to meet the national demand. The inability of Ghana to supply enough rice to meet the national demand could partially be attributed to challenges facing local rice farmers which include unpredictable weather, shortage of storage facilities and low farm returns.

A number of factors could explain consumer's preference for a specific brand of rice whether local or foreign. Usually, consumers are more concerned about the price and the quality of the commodity they purchase (Diako et al 2010). Consumer preference for rice may vary from one country to the other. Whereas consumers in America have high preference for rice with specific cooking types, menu and processing characteristics, consumers in Middle East have high affinity for long grain and well-milled rice with strong aroma; however, consumers in Europe tend to favour long grain rice with no scent (Musa et al, 2011). Ghanaian consumer's high affinity for imported rice could partly be attributed to the poor quality and non-availability of the domestically produced rice. Domestically milled rice is of poor quality and only a small portion of it is made available at the key urban markets. This is because local rice is produce mostly by farm households at subsistence level of which a portion is kept for family and the surplus been sold at the village market centers. Moreover, Nwanze et al (2006) and Tomlins et al (2005) reported that consumers in Africa pay particular attention to grain quality and favourable pricing in their choice for rice types. Similarly, Asante et al (2013) reported that Ghanaian consumers prefer imported rice to locally produced rice because of absence of foreign material, better grain quality, ease of cooking and fragrance.

Apart from price and grain characteristics that influence consumer's rice preference, there are other socio-economic factors that could explain consumer's preference for rice in Ghana and other parts of the world. Kassali et al (2012) in analyzing the determinants of rice in Ife Central Local Government area of Osun state, Nigeria concluded that income of household head and household size among other factors significantly influence consumer's demand for rice. In analyzing the determinants of consumer purchasing behavior for rice in Malaysia, Musa et al (2013) found out that attributes such as flavor, taste of cooking and price significantly affect their choices of brands available in the market. In another study of consumer preferences for rice, Ogunlede (2013) applied multinomial logistic regression analysis to identify a set of socio-economic and physical factors that determine consumer preference for local rice. Their results indicated that age of household head, educational attainment, and marital status, primary activity of the household head and sex of household head were all significant factors influencing consumer preference for local rice.

Different types of imported rice compete with the locally processed rice in both urban and village market centers. Some of these imported rice include sultana, lele, royal feast, Uncle Sam, gino, crown, rice master, etc. These brands differ from each other as well as the local rice base on taste, flavor, ease of cooking as well as the price offered. Although all of these brands appeared to be available, information with regards to factors that could explain consumer preference for locally processed rice are limited in Ghana. Knowledge on the nature of preference for locally produced rice and its determinants would be a necessary first step for Ghana to reposition itself in the food crop sector and find ways to improve on both consumers and producers welfare.

The study therefore analyses consumer's preference for locally produced rice. Specifically; to identify factors that influence consumer's preference for domestically produce rice and to identify some of the constraints that may inhibit the purchase of locally produced rice in the Tamale metropolis, Ghana.

2. 0 Methodology

2.1 The Study Area

The study was conducted in the Tamale Metropolis of Ghana. Tamale is the capital city of the Northern region of Ghana which lies mainly in the Savannah climate region of West Africa. Tamale metropolis is the largest settlement in Northern Region and reported to be one of the fastest growing cities in West Africa. The Metropolis lies between latitude 9°18'N and 9°26'N and between longitude 1°15'E and 1°23'W. The Metropolis covers a total land area of about 922 km² with estimated population (2000 population census) of about 293,900 equally distributed between the two sexes. The population is made up of people of different culture and socio-economic background. It has a unimodal rainfall pattern with about 1000mm of rainfall per annum. The rainy season begins in April and lasts till September and the dry season (Harmattan) begins in December and ends in March. The average annual temperature of the Metropolis is about 26°C.

2.2 Sampling Technique, Sources and Types of Data

The data used were obtained from consumer survey conducted within the Tamale metropolis between the month of November 2013 and January 2014. The study followed a multi-stage sampling technique. Stratified sampling was used to select six communities from the metropolis and simple random sampling was used to select 20 respondents from each community making a sum total of 120 respondents. The communities under consideration were Kalpohin estates, Viting target, Gumani, Jisonayili, Moshiezongo and Hausa zongo. The rationale behind the choice of stratified sampling was for the study to be a fair representation of the Tamale Metropolis. Semi-structured questionnaires were administered to collect information on consumption of rice from household heads or those with fair knowledge on household food expenditure and consumption pattern. Some of the information solicited from them includes; age, sex, marital status, household size, educational attainment, occupation, monthly income, monthly budget share on food, quantity of rice consumed per month and other attributes of rice that may influence their purchasing behavior.

2.3 Theoretical Analysis

Both qualitative and quantitative were used to analyze the data. Qualitative data were analyzed using descriptive statistics such as mean, percentages, frequency tables etc. A binary logistic model (logit) which best fit the model was used to analyzed the determinants of consumer preference for local rice while the Kendall's coefficient of concordance was used to rank consumers constraints.

2.3.1 Logistic Model

Logistic model was employed to analyze the determinants of consumer preference for local rice in the Tamale Metropolis. The logit model allows for a relatively straight forward computation of the relative mean of the dependent variable or elasticity given the estimated coefficient of the regressors. Thus, whether a consumer prefers local rice or not is explained by observable individual socio-economic characteristics or factors within the logit framework. In this analysis, the outcomes of the response; preference for local rice or not does not matter. The major interest is the likelihood or probability of the outcome. The binary response in the study is whether the respondent prefers local rice ("Success") or does not prefer local rice ("Failure").

If Y is a random variable (dichotomous), it can then be assumed that Y takes the value of 0 or 1, where 0 denotes the non-occurrence of the event in question and 1 denotes the occurrence. $X_1 \ldots . X_p$ are the characteristics to be related to occurrence of this outcome, and the logistic model specifies that the conditional probability of event (i.e., that *Y=1*) gives the values of $X_1 \ldots \ldots \ldots X_p$ as follows:

$$P_i(y_i = 1/x_i\beta_i) = 1 - e^{-x^1\beta}/(1 - e^{x^1\beta})$$
$$= e^{x^1\beta}/(1 + e^{x^1\beta}) \quad [1]$$

The binary model as a regression model is written as: $y_i = 1 - f(x_i\beta) + \varepsilon_i$ where y_i is the dependent variable denoting a consumer's demand for local rice X_i is a vector of factors influencing a consumer's preference for local rice and ε_i is the residue representing the deviation of the binary from its conditional mean.

The empirical model specified to analyze the consumer preference for local rice can be specified as:

$$\text{Log}\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon_i \quad [2]$$

Where p_i denotes the probability of a respondent's preference for local is rice and $\left(\frac{p_i}{1-p_i}\right)$ is the odd ratio in favour of a respondents preference for local rice and $X_1 \ldots\ldots\ldots X_{10}$ represent the socio economic characteristics namely; age, age2, gender, marital status, household size, educational background, taste, monthly income, share of monthly income on food and number of times rice is consumed (weekly), respectively. ε_i is the error term and β is the logistic coefficient for the independent variables.

2.3.2 Kendall's Coefficient of Concordance

The Kendall's coefficient of concordance was employed to rank some of the constraints that may inhibit consumer's preference for local rice. The Kendall's *W* is a measure of the agreements among several judges (respondents) who are assessing a given set of *n* objectives (constraints) (Legendre, 2005). *W* is an index that measures the ratio of the observed variance of the sum of ranks to the maximum possible variance of the ranks. The idea behind this index is to find the sum of the ranks for each constraints been ranked. If the ranking are in perfect agreement, the variability among this sum will be maximum (Mattson, 1986). According to Legendre (2005), the Kendall's coefficient of concordance *(W)* is given by the relation:

$$W = \frac{12S}{p^2(n^3 - n)} - p^T \quad [3]$$

Where *W* denotes the Kendall's coefficient of concordance, *P* denotes number of respondents ranking the constraints, *n* denotes the number of constraints, *T* denotes correction factor for tied ranks and *S* denotes sum of squares statistics over the row sum of ranks (R_i). The sum of square statistics (*S)* is given as:

$$S = \sum_{i-1}^{n} (R_i - R)^2; \quad [4]$$

Where R_i is row sums of rank and *R* is the mean of R_i

The correction factor for tied ranks (T) is also given as:

$$T = \sum_{k=1}^{m} (t_k^3 - t_k); \quad [5]$$

Where t_3 is the number of ranks in each *(k)* of *m* group of ties

The test of significance of the Kendall's coefficient of concordance was done using the chi-square statistics which is computed using the formulae:

$$X^2 = P(n-1)W \; ; \qquad [6]$$

Where n is the number of constraints, P is the number of respondents and W is Kendall's coefficient of concordance.

The decision rule is that if the calculated chi-square is greater than the chi-square critical, then the null hypothesis is rejected in favour of the alternative hypothesis that there is agreement among the ranking of the constraints by the respondents.

3.0 Results and Discussions

3.1 Demographic Characteristics of the Respondents

The results in table 1 indicates that majority of the respondents (84.16%) are females while the remaining 15.84% are males. This reflects the fact that women are mostly the household decision makers with regards to household food consumption. The results also show that most of the respondents (51.67%) were in the age bracket 30-39 years followed by those within the age range 40-49 years representing about 30.0%. Moreover about 9.16% of the respondents were found within the age bracket 20-29 years while the group 50-59 years had about 7.5% of total respondents. Only 1.67% of respondents were above age 60. Majority of the respondents (62.5%) had tertiary education with about 20.83% of the respondents having SHS education while about 10.0% had JHS /Middle school education. Also about 5.0% of the respondents had primary education and only 1.67% of the respondents had no formal education. The large percentage of educated respondents could partly be attributed to the fact that the study area is one of the fastest growing cities in West Africa and the presence of a public university in the metropolis.

The results again revealed that about 47.5% of household had less than 5 people, 45.83% had 5-9 people while about 6.67% had 10-14 people. Moreover, majority (83.33%) of the respondents were married while only few (16.67%).

3.2 Determinants of Consumer Preference for Local Rice

Logistic regression analysis was conducted to ascertain factors that contribute significantly to consumer's preference for local rice in the Tamale Metropolis. This is presented in table 2. The marginal effect is used to describe the effects f the variables on consumer preference for local rice. From the results, the pseudo R^2 was estimated to be 0.7162, implying that about 71.62 percent of the variation in the dichotomous dependent variable (consumer's preference for local rice) was explain jointly by the predictors. Six out of ten variables were found to have significant influence in explaining consumer's preference for local rice in the study area.

The results indicate a positive and significant relationship between consumer preference for local rice and gender. The results conform to the assertion that a decision on household food consumption is mostly done by female. Age of the respondents from the results was found to have a negative relationship with consumer's preference for local rice though statistically significant. This is contrary to the a priori expectation because as the age of the respondents increases one will expect their preference for rice to decline because older people are likely to resort to traditional staple food like "T.Z" and "Banku". It was also revealed in the regression result that household size is a significant factor that affects consumer preference for local rice. Household size had a positive relationship with preference for local rice and statistically significant at 0.05% significance level. Consumer's monthly expenditure on food had the expected significant positive effects on their preference for local rice. The marginal effects indicated that when consumers increase their expenditure on food by a unit, the probability of their affinity for local rice decreases by a factor of 0.015 units. The taste of local rice was also found to exhibit positive significant influence on consumer preference for local rice. Thus, increasing the taste of locally processed rice increases the probability of consumer's preference for local rice by 12 percent.

3.3 Ranked Constraints by Respondents

The results of the ranking are presented in table 3. Poor packaging of local rice was ranked by consumers as most influential constraints inhibiting consumer's preference for local rice with the mean rank of 2.32. The next most influential inhibitor was texture followed by relative attractiveness with the mean rank of 3.18 and 3.30 respectively. The least influential factor among them was the relative price of the local rice. The Kendell's coefficient of concordance obtained in the analysis was 0.681 and significant at 1 percent level of significance suggesting that 68 percent of the respondents agree on the outcome of the rankings.

4.0 Conclusions and Policy Recommendations

The study examined the determinants of consumer preference for local rice as well as the factors inhibiting consumer's behavior towards the purchase of local rice in the Tamale metropolis. The key variables that significantly influence consumer's preference for local rice were; age, household size, sex, taste and consumer's monthly expenditure on food. Poor packaging was ranked as the most influential factor inhibiting the purchase of local rice in the study area while relative price of local rice was the least influential factor.

4.1 Implications for Policy and Further Research

Generally, consumers make their choice on specific goods and services that will give them maximum level of utility. Since consumer's preference for local rice is affected by its taste, efforts towards addressing the issue of taste would boost the demand for locally processed rice which will in turn boost rice production in the country. Researchers should consider improving on the quality of rice by way of inculcating some foreign attributes such as long grain, white colored, fragrances and preferred cooking type of rice in their rice breeding efforts. This will improve consumer's acceptability and boost rice production in the country.

Further studies on farmer's perception and opinions on the issues concerning the production of local rice would be very imperative. Rice producer's adoption of new rice varieties as well as the constraints inhibiting the production of local rice could be a starting point to addressing the challenges of rice production in the country. Finally, the study was conducted in Tamale metropolis which may not be a representative of the whole country. Therefore, extending the study to other parts of the country is highly recommended for future research.

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Table 1: Demographic Characteristics of Respondents

Variable	Frequency	Percentage
SEX		
Male	19	15.84
Female	101	84.16
Total	120	100
MARITAL STATUS		
Married	100	83.33
Single	20	16.67
Total	120	100
AGE		
20-29	11	9.16
30-39	62	51.67
40-49	36	30
50-59	9	7.5
> 60	2	1.67
Total	120	100
EDUCATIONAL ATTAINMENT		
None	2	1.67
Primary	6	5
JHS/Middle School	12	10
SHS	25	20.83
Tertiary	75	62.5
Total	120	100
HOUSEHOLD SIZE		
< 5	57	47.5
5 - 9	55	45.83
10 - 14	8	6.67
Total	120	100

Source: Field survey, 2014

Table 2: Estimated Consumer Preference for Local rice

Variable	Marginal Effects	Std Error	P-Value
Sex	0.1536021	0.0810412	0.058*
Age	-0.0504421	0.0235824	0.032**
Age 2	0.0006866	0.0002612	0.009***
Marital Status	0.0628918	0.0883293	0.476
Household size	0.1055613	0.0141161	0.000***
Education	0.0118172	0.0086692	0.173
Monthly income	0.000018	0.0000396	0.648
Monthly exp. On food	-0.0152857	0.0012645	0.000***
Taste	0.119101	0.0532454	0.025**
Frequency of consumption	0.0178692	0.0174734	0.306
Number of Observations	120		
Wald chi2 (10)	45.6		
Prob > Chi 2	0.000		
Pseudo R2	0.7162		
Loglikelihood	-23.399385		

***, ** and * denotes 1%, 5% and 10% respectively.

Table 3: Rank of Local Rice Consumption Inhibitors

Constraints	Mean Rank	Rank
Packaging	2.32	1st
Texture	3.18	2nd
Attractiveness	3.3	3rd
Flavour	3.85	4th
Taste	4.51	5th
Availability	5.18	6th
Relatively price	5.67	7th

N=120 Kendall's W[a]=0.681 Chi-square=274.532