

# Factors that Influence Household Demand for Locally Produced Brown Rice in Ghana

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## Abstract

Brown rice has a higher nutrient content than milled rice. This study determines the factors that influence the demand for local brown rice. The study achieves this by investigating the patterns of consumption of brown rice, attributes of the product that influence its consumption, factors that affect its consumption and the institutional support in the rice industry. Primary data on the attributes, factors and patterns of consumption of brown rice was obtained from respondents in the Volta and Greater Accra Regions using semi-structured questionnaire. Information on the functions of identified local institutions was obtained from the institutions. The data was analyzed using simple descriptive statistics, Tobit model and the Chi-square test. The results of the study showed that taste is the major attribute that influence people to consume brown rice. Brown rice consumers are mostly those who have brown rice as a traditional diet. One of the attributes of brown rice that is keen as far as its consumption is concerned is its healthful benefits. The results of the Tobit regression model showed that the price of brown rice and the technical attributes of both brown rice and white rice (colour, taste, nutritional value, texture) and socioeconomic characteristics particularly (income) explain the share of brown rice in total rice consumption. Awareness creation of brown rice was found to be through friends and relatives. Acceptability ratio was found to be low. The results obtained from the chi-square test indicate that the local institutions that were important in brown rice development were the University of Ghana Agric Research Station (UGARS), MoFA, GTZ, JICA, ACDI/VOCA, AgSSIP, FINATRADE, USAID, GAWU, MFCS Ltd., and FBOs. It is therefore recommended that the media should be used more in the awareness creation of brown rice. Advocacy groups should do more in order to sensitize people on the healthful benefits of brown rice. The research also showed that most of the service organizations perform their functions effectively and therefore the government should continue to partner the donor agencies to enhance cooperation among brown rice promoters. These institutions are to cooperate with each other in order to enhance their operations. The Local Governance institutions such as Metropolitan, Municipal, and District Assemblies should provide support to the Department of community development, cooperatives and advocacy groups to lift up the campaign.

**Keywords:** brown rice, consumption pattern, nutritional content, demand, awareness creation, demand.

## 1. INTRODUCTION

### 1.1 Background

Brown (unmilled) rice has a higher nutrient content than milled rice (Kennedy, 1980). According to a study conducted by Sun Q. et al, 2010 on dietary risk factors, higher intake of white rice was associated with a higher risk of type 2 diabetes whilst in contrast, brown rice intake was associated with a lower risk of type 2 diabetes. Rice is the largest cereal imports in Ghana and the demand for imported long-grain aromatic varieties of rice is greatest in the urban market channel. Ghana produces very little long-grain aromatic rice that is competitive in quality to the imported Thai long-grain rice, which is preferred by consumers. (Kulan and Dormon, 2009). Rice is also a staple food for more than 50% of the world's population. (Fageria and Baligar, 2003). According to the FAO (2006), rice is an important cash crop in the communities in which it is produced, besides being an important food staple for both rural and urban communities across the country.

Rice is important to Ghana's economy and agriculture, accounting for nearly 15% of the Agricultural Gross Domestic Product (AGDP). The rice producing area represents about 45% of the total area planted to cereals. The rice sector is an important provider of rural employment. It was estimated that an annual average of 34,600 hectares of land area was under cultivation between 1960-1964, with an annual average paddy production of 35,800 tonnes (Ibrahim, 1984).

Rice is a commodity of strategic importance to Africa and has become the fastest-growing food source to both rich and poor households (Nwanze *et al* 2006). Rice is an important food for both rural and urban dwellers, and is gradually taking over from traditional, mainly root and cereal crops, staples (Quaye *et al* 2000). Factors affecting increased consumption of rice have been identified to include rising incomes, trade liberalization, extensive promotion and effective marketing strategies of rice importers and ease of cooking among others (Oteng 1997; Day *et al* 1997; Tomlin's *et al* 2007).

The United Nations (UN) reports that rice makes up 20% of the world's dietary supply and that 1 billion households in rural areas of developing areas of developing countries depend on rice production as a source of income (USDA, 2004). Commercial rice imports have accounted for approximately 61%, food aid in rice

accounted for about 2% and domestic rice accounted for some 37% per annum of rice consumption in Ghana over the four years between 2000 and 2003. Compared to the 1990s, these figures show a gradual decline in the share of local rice production in the total quantities of rice consumed in the country (Asuming-Brimpong et al, 2008).

Rice is a cereal whose consumption is growing in importance. It is an important commodity in terms of providing a cheap wage good for urban consumers in addition to providing small-scale producers with additional income sources, as rice is produced primarily for commercial purposes in Ghana. A critical policy dilemma facing government is whether to aim at rice self-sufficiency or self-reliance. The former is based on meeting domestic demand through local production and stockholding, whereas the latter is based on a combination of production, stocks and trade to secure national food requirements at the lowest cost to government (Wayo seini,2002).

Although Ghana has been identified as a country with very high potential in rain-fed lowland rice production in the subregion, rice productivity and output have been quite low in recent times. The average yield of paddy rice under rain-fed conditions is around 2.0Mt/ha, compared with potential yields of 6.5 Mt/ha that could be achieved under more effective extension and use of recommended technologies (MOFA, 2001; Seini and Nyanteng, 2003). One of the policies of the Ministry of Food and Agriculture(MoFA) is to support an increase in local rice production in order to reduce imports by about 30% as part of efforts to promote food sufficiency. Its strategy aims to increase mechanization, the cultivation of inland valleys, effective and efficient use of existing irrigation systems and further development of irrigation (ISSER, 2005).

## 1.2 Problem Statement and Research Questions

The process that produces brown rice removes only the outermost layer, the hull, of the rice kernel and is the least damaging to its nutritional value. The complete milling and polishing that converts brown rice into white rice destroys 67% of the vitamin B3, 80% of the vitamin B1, 90% of the vitamin B6, half of the manganese, half of the phosphorus, 60% of the iron, and all of the dietary fiber and essential fatty acids. Fully milled and polished white rice is required to be "enriched" with vitamins B1, B3 and iron. The health benefits of brown rice continue with its fiber; a cup of brown rice provides 14.0% of the daily value for fiber, which has been shown to reduce high cholesterol levels, one more way brown rice helps prevent atherosclerosis. Fiber also helps out by keeping blood sugar levels under control, so brown rice is an excellent grain choice for people with diabetes. The fiber in brown rice can also help to protect you against colon cancer since fiber binds to cancer-causing chemicals, keeping them away from the cells lining the colon, plus it can help normalize bowel function, reducing constipation (whsfoods.org).

When researchers looked at how much fiber 35,972 participants in the UK Women's Cohort Study ate, they found a diet rich in fiber from whole grains, such as brown rice, and fruit offered significant protection against breast cancer for pre-menopausal women. (Cade JE, Burley VJ, et al., 2007). Despite the nutritional values of brown rice and its importance, the patterns of consumption of the product are not the best.

Grain colour is important as far as visual appeal is concerned and most consumers are of the perception that white rice is superior (Adu-Kwarteng et al,2002). For most Ghanaians, preference is for imported rice over locally produced rice. This has been attributed to several factors including variations in physical characteristics, nutritional quality and pasting and cooking behaviors (ibid).

Commercial rice imports have accounted for approximately 61%, food aid in rice accounted for about 2% and domestic rice accounted for some 37% per annum of rice consumption in Ghana over the four years between 2000 and 2003. Compared to the 1990s it is arguably stated that "imports in the case of Ghana have not killed local rice production because the local rice sector has never been capable of producing enough to feed the population over the years." The demand for import rice has a ripple effect on the consumption of local rice and precisely brown rice. Increasing productivity of these varieties on smallholder farms will ultimately drive down prices (and that supply response will benefit food security). This will also drive down prices for local brown rice varieties. Consumption of milled rice in Ghana went up from below 100,000 Mt to over 600,000Mt between 1985 and 2003 (Tomlin's *et al* 2005).

Unfortunately, the sharp rise in consumption has not impacted positively on the local rice production levels since a significant proportion of rice consumed is imported (Quaye 2007). Some of the constraints facing rice farmers identified under the Lowland Rice Development Project (LRDP) were poor farming practices, lack of capital, high cost of production inputs such as fertilizer and seed, lack of access to market as well as lack of price incentive to produce high quality paddy (Quaye, 2010). Brown rice is more nutritious than white but very little rice is consumed in the brown form (Oxfam, 2001).

According to Furuya and Takeshi (2003), enhancing domestic rice supply is an urgent policy issue now. This requires not only an increase of local rice production but also the development of its markets. For the local rice to be competitive in the market, the improvement of post harvest processing, particularly of rice milling, is essential. This urges us to examine the efficiency of rice milling in Ghana.

Therefore the research seeks to address the following questions:

1. What is the pattern of brown rice demand at the community level?
2. What are the attributes of brown rice that affect its demand?
3. What are the socio-economic and technical factors that determine the demand for local brown rice? and
4. How effective is the institutional framework that supports the production and marketing of brown rice?

### 1.3 Objectives

The major objective of this study is to determine the factors that influence the consumption of locally produced brown rice in Ghana.

The specific objectives are to:

1. Describe the pattern of brown rice demand at the community level?
2. Identify the attributes of brown rice that affect its demand?
3. Determine the extent to which certain socio-economic and technical factors influence the demand for local brown rice? and
4. Determine the effectiveness of the institutional framework that supports the production and marketing of brown rice?

### 1.4 Justification of Study

This study seeks to establish a fact on what factors actually influence the consumption of locally produced rice. In Ghana, development efforts have placed more emphasis on rice yields at the expense of grain quality and this affects the competitive nature of local rice in the urban markets. The increasing dependence of many families and communities on rice is reflected by a steady rise in per capita consumption levels. In 1972, it was estimated at 7.5 kg/year/person, in 1994, 13.3 kg/year/person and 1996, 20 kg/year/person (GLG-SOFRENCO, 1997). This increase has been attributed to the changes in our social structure as a result of increase in the number of working mothers.

For most Ghanaians, preference is for imported rice over locally produced rice. This has been attributed to several factors including variations in physical characteristics, nutritional quality and pasting and cooking behaviors. Studies have shown a higher demand for “long-grain” rice than for short, round grain types (GLG-SOFRENCO, 1997).

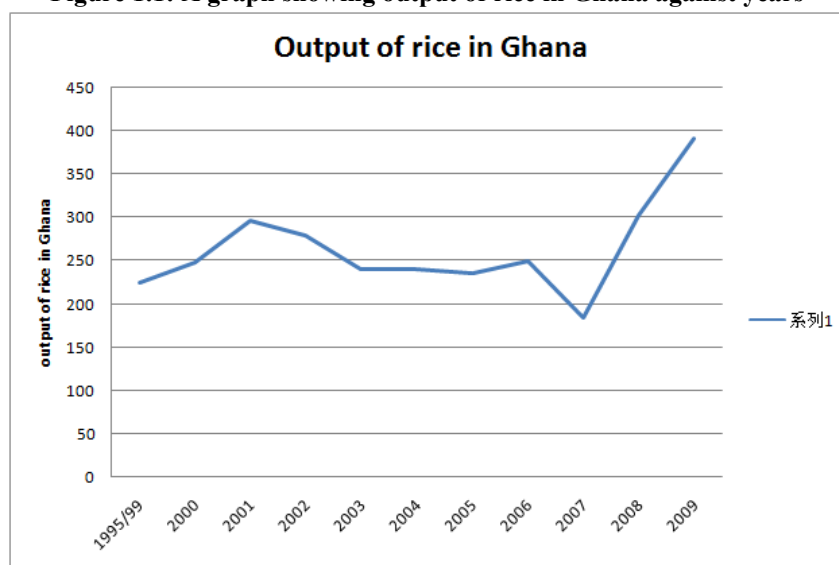
Domestic production of rice in Ghana has been less than consumption needs for a long period of time. Demand for rice began to outstrip supply due to population increase and improved standard of living. Unreliable production and marketing arrangements have also contributed to this situation. Consequently, government imports up to 200% of local production in order to compensate for the short fall in supply (Dogbe, 1996).

The results of this study will determine what influence consumption of local rice in Ghana.

The research measures acceptability in order to direct product development and promotional activities well. If acceptability is found to be low then product modification and promotional mix elements such as advertisement would be heightened.

Price and non-price factors that influence demand for brown rice positively would be isolated and stakeholders would use that as a yardstick for promotion.

**Figure 1.1: A graph showing output of rice in Ghana against years**



Source: ISSER, 2009

The agricultural sector is also the main source of food for the large non-agricultural and mainly urban population. This segment of the population is not only expanding very fast, at a rate of about 6 percent per annum, it is also

acquiring new tastes and demanding diversified food products. The country has been self-sufficient, or nearly so, in the production of several food commodities, particularly, some cereals, roots and tubers, plantain, fruits and vegetables, eggs, etc. For some other commodities such as wheat (not produced in the country at all), rice, beef, fish, dairy products, edible oil, sugar, etc. imports have been regular and increasing in volume in order to meet the demand of the rapidly increasing population. The sector's inability to produce adequate quantities and variety of food for which the country may have some comparative advantage, costs the country several millions of scarce foreign exchange used annually to import the shortfall (Wayo Seini, 2002).

### 1.5 Organisation of the Study

This study comprises five chapters. Chapter One talks about the introduction of the study which comprises: the Problem Statement and Research Questions which provides information about the problems that the study aims at solving, Objectives of the Study, the Justification of the Study and its Organisation. Chapter Two provides information on the reviewed literature of the study. Chapter Three elaborates on the Methodology which comprises the Theoretical Framework, the Method of Data Analysis employed to achieve the specific objectives of the study, and the Method of Data Collection employed in this study. Chapter Four comprises the Results and Discussion whilst Chapter Five presents the Conclusion and Recommendation of the study.

## 2. METHODOLOGY

### 2.1 Introduction

This chapter provides information on the methods employed to achieve the specific objectives. The chapter reveals the Theoretical Framework which served as the basis for selecting the methods to achieve the specific objectives of the study, Method of Analysis and Method of Data Collection.

### 2.2 Theoretical Framework

#### 2.2.1 Consumer Theory

The demand for rice is explained by consumer behavior theory. Consumer behavior theory is the study of what motivates consumers to demand a particular good or service. It studies characteristics of individual consumers such as demographics and behavioral variables in an attempt to explain peoples want. It also tries to assess influences on the consumer from groups such as family, friends, reference groups, and society in general. Customer behavior study is based on consumer buying behavior, with the customer playing the three distinct roles of user, payer and buyer.

Economic theory postulates that the demand for a commodity depends on its price, on the prices of other commodities, on consumers' income and on tastes. This is an exact relationship, because it implies that demand is completely determined by the above four factors. In mathematical economics we express the above abstract economic relationship of demand in mathematical terms.

Thus ,

- $Q = b_0 + b_1P + b_2P_0 + b_3Y + b_4t + u$  (3.1)
- $Q$ = quantity demanded of a particular commodity
- $P$ =price of the commodity , $P_0$ =price of other commodity,  $Y$ =consumers income
- $t$ =tastes

$b_0, b_1, b_2, b_3, b_4$  =coefficients of the demand equation.

(Koutsoyiannis, 1977).

The Tobit Model

The stochastic model underlying Tobit may be expressed by the following relationship:

$$y_t = X_t\beta + U_t = 0 \quad \text{if } X_t\beta + U_t > 0 \quad (3.2)$$

$$\text{If } X_t\beta + U_t \leq 0$$

$$t=1,2,\dots,N \dots\dots(1)$$

where  $N$  is the number of observations,

$y_t$  is the dependent variable,

$X_t$  is a vector of independent variable,

$\beta$  is a vector of unknown coefficient and

$U_t$  is an independently distributed error term assumed to be normal with zero mean and constant variance  $\sigma^2$  , thus the model assumes that there is an underlying, stochastic index equal to  $(X_t\beta + U_t)$

which is observed only when it is positive, and hence qualifies as an unobserved, latent variable.

As Tobin shows, the expected value of  $y$  in the model is

$$E_y = X\beta F(z) + \sigma f(z) \quad (3.3)$$

where  $Z = \frac{X\beta}{\sigma}$ ,  $f(z)$  is the unit normal density, and  $F(z)$  is the cumulative normal density function (individual subscripts are omitted for notational convenience). Furthermore, the expected value of  $y$  for observations above the limit, here called  $y^*$ , is simply  $X\beta$  plus the expected value of the truncated normal error term.

$$E_{y^*} = E(y|y > 0) \quad (3.4)$$

$$\begin{aligned}
 &= E(y|u > -X\beta) \\
 &= X\beta + \frac{\sigma f(z)}{F(z)} \quad (3.5)
 \end{aligned}$$

Consequently, the basic relationship between the expected value of all observations,  $E_y$ , the expected value conditional upon being above the limit,  $F(z)$ , is

$$E_y = F(z)E_{y^*} \quad (3.6)$$

The decomposition that we have found useful is obtained by considering the effect of a change in the  $i^{\text{th}}$  variable of  $X$  and  $Y$  (McDonald and Moffitt, 1980).

### 2.2.2 Measuring effectiveness through performance of functions

According to Adelman and Morris (1972), the effectiveness of financial institutions could be judged by the performance of key functions such as channeling of loans into productive investment.

Effectiveness relates to the quality of the work, consistency and responsiveness (FAO, 2006).

The effectiveness of local institutions in the support of brown rice production is assessed by finding the statutory and non-statutory functions of the local institutions in relation to the production of brown rice. These functions are compared to theoretically defined functions which the local institutions are expected to perform. Local institutions can perform better when they are linked with each other (Uphoff, 1986). Due to this the linkages between the local institutions are critically examined and assessed in this study.

### 2.2.3 Identifying the statutory and non-statutory functions of the local institutions.

In relation to the first specific objective, the statutory and non-statutory functions of the local institutions in relation to the production of rice is obtained from the identified institutions through structured questionnaire and assessed since effectiveness of these local institutions is based on how well they are performing their functions both statutory and non-statutory. The statutory functions are the mandatory functions based on which the institutions were established whilst the non – statutory functions are the supporting functions.

## 2.3 Method of Data Analysis

### 2.3.1 Describing the pattern of brown rice demand at the community level

The nature and characteristics of consumers and non-consumers of brown rice as well as their socio-demographic factors were obtained through the use of questionnaire. These factors comprise age, gender, marital status, family size, household status, religious background, ethnic background, location, and monthly income of both consumers and non-consumers. Also the medium of awareness creation among both consumers and non-consumers was also determined.

### 2.3.2 Identifying the attributes of local brown rice that affect its consumption

Consumers of local brown rice were interviewed to find the characteristics of local brown rice that attracts them to purchase. Also perception of consumers on local brown rice with respect to its quality, colour and taste were taken into account. Information on consumers' preference for local brown rice was obtained based on whether the individual consumers include brown rice as part of their diet or not. Consumers who had brown rice as part of their diet were interviewed on the attributes or qualities that inform their choice. These attributes comprise the technical, economic and institutional factors of the local brown rice. The level of acceptability of brown rice to consumers was also obtained from the individual respondents based on how often they consume brown rice and the quantity they consume in a particular time.

### 2.3.3 Determining the extent to which certain socio-economic and technical factors influence the demand for local brown rice

The alternative method to OLS when the dependent variable response is zero for a significant fraction of the observation is the Tobit model. The model is specified with the proportion of brown rice out of the total rice consumed in a month being the dependent variable and the price of brown rice, taste of brown rice, income of respondents, nutritional value of brown rice, education, location of the respondent, promotion of brown rice, packaging of brown rice, texture of brown rice, colour of brown rice, population (family size), taste of white rice, texture of white rice, colour of white rice, nutritional value of white rice and age of respondents being the explanatory variables.

$$\begin{aligned}
 Qty = & b_0 + b_1PriceBr + b_2TasteBr + ColourBr + b_3Income + b_4NutritionBr + b_5Education + \\
 & b_6Age^2 + b_7Location + b_8Familysize + b_9Promotion + b_{10}Packaging + b_{11}TextureBr + b_{12}TasteWh + b_{13}TextureWh + \\
 & b_{14}ColourWh + b_{15}NutritionWh + b_{16}Age^2 + u \quad (3.8)
 \end{aligned}$$

Where Br =brown rice and Wh=white rice

- Qty= quantity demanded of brown rice in Kg (proportion of brown rice out of the total rice consumed)
- $b_i$ =marginal effects of the explanatory variables
- $u$  is the error term

• **Table 2.2: Measures of the independent variables**

Independent variables	Measure
Price of brown rice	Dummy 1= affordable 0= not affordable
Age	Age in years
Income	Income of individuals in GH ¢
Taste of brown rice	Dummy variable 1=good 0=not good
Health/Nutrition of brown rice	Dummy variable 1=nutritious 0=not nutritious
Educational level	Number of years of schooling
Colour of brown rice	Dummy 1=good 0=not good
Texture of brown rice	Dummy 1=good 0=not good
Location of respondents	Dummy 1=Volta 0=Accra
Promotion of brown rice	Dummy 1=enough promotion 0=no promotion
Packaging of brown rice	Dummy 1=attractive packaging 0=packaging not attractive
Texture of white rice	Dummy 1=good texture 0=texture not good
Taste of white rice	Dummy 1=good taste 0=taste not good
Family size	Dummy 1=large family size 0=small family size
Colour of white rice	Dummy 1= good 0= not good
Nutrition of white rice	Dummy 1=nutritious 0=not nutritious

### 2.3.4 Determining the effectiveness of the institutional framework that supports the production and marketing of brown rice

1. Identification of the different categories of the institutions
2. Assessment of the effectiveness of their functions based on the relevant programs rolled out by the identified institutions

Identification of the different categories of the institutions was done and the assessment of the effectiveness of their functions based on the relevant programs rolled out by the identified institutions was analyzed. The Local Institutions were identified and selected based on purposive sampling and grouped into five (5) categories as Local Administrations, Local Government, Service Organizations, Membership Organizations and Private Businesses.

There was a study of how well the Local Institutions perform their statutory and non-statutory functions based on best practice from literature (theory and empirical). As to whether the selected institutions are performing their functions well or not was determined using the chi- square goodness-of-fit test to test the performance of their functions based on the activities carried out in the last five years.

The Chi-square test was used to analyze the performance of the identified functions of the selected institutions.

The indicators used for assessing the performance were ‘very well done’, ‘well done’, ‘fairly well done’ and ‘not well done’. The expected (very well done or well done) was scored as ‘1’ whilst the observed was scored as ‘1’ if ‘very well done or well done’ and ‘0’ if ‘fairly well done or not well done’.

The expected data takes a score of ‘1’ whilst the observed takes a score of ‘1’ if it meets expectation and ‘0’ otherwise.

### 2.4 Method of Data Collection

Cross-sectional data on the quantity of brown rice demanded (proportion of brown rice out of the total rice consumed in the month) and variables such as price and other socio-economic characteristics were collected from three hundred (300) respondents in the Greater Accra and Volta Regions of Ghana. There was purposive sampling of Legon and Dzorwulu (AMA) and Madina (Ga East District) and Akpafu (source of production), Ho and Hohoe. Semi-structured questionnaire was used to obtain information from respondents. The questionnaire was developed based on the research objectives as well as inputs from in-store product observations and focus

group results and was pretested among role players and consumers. It contained a wide range of question types including several types of closed questions such as dichotomous choice, multiple choice, likert scale agreement level, importance scale and rating scale questions as well as a few open questions mostly intended to elicit further explanation behind choices

#### **2.4.1 Awareness determination and creation**

Sensitization was done at the University of Ghana campus by the MFCS Ltd. (sponsor of the research). Students and staff were sensitized on the nutritional benefits of brown rice through a circular on notice boards and also cooked brown rice was sold to students who were later interviewed with the use of a questionnaire. Other sensitization was through the print media (Ghanaian Times), audio (Radio Universe Agroscope and Joy FM-Nestle Nutrition line and visual (Net2 TV). The City Veg retail point at the University of Ghana College of Agric and Consumer Science also stocked quantities of brown rice for daily sale by MFCS. There was a scan of Hohoe, Ho, Madina, Kaneshie and Makola markets to determine availability of the brown rice. It was established that the *vivonor* variety of brown rice existed in these two regions.

Respondents who have accepted the brown rice and whose demand will be modeled are those who have been introduced to the product and continue to purchase/consume at least once in a month.

### **3. SUMMARY, CONCLUSION AND RECOMMENDATION**

#### **3.1 Introduction**

This chapter elaborates on the summary, conclusion and recommendations of the study based on the results obtained.

#### **3.2 Summary and conclusions**

The study provides information on the factors that influence household demand for locally produced brown rice in Ghana. The study areas comprise the Volta and Greater Accra Regions. First, sensitization of brown rice was done at the University of Ghana campus where articles on the quality of brown rice were posted on departmental notice boards and brown rice was sold to students. Semi-structured questionnaires were used to obtain information from respondents. The pattern of consumption of local brown rice and the attributes of brown rice that affect its consumption were studied and analyzed. Consumers of brown rice were identified as those who were mostly introduced by their relatives and friends. Relatives and friends were found to be the major medium of awareness creation. Also Tobit regression model was run to determine the factors that affect the share of brown rice to total rice consumption per month. The model was run for all the 300 questionnaire respondents using their monthly consumption data. Effectiveness of the institutional framework that supports the production and marketing of brown rice was also determined using the chi-square test. The results showed that taste is the major attribute that influence consumption of brown rice. Also, brown rice consumers are mostly those who have brown rice as a traditional diet. From the results of the likert scale most of the brown rice consumers indicated they strongly agree that brown rice has healthful benefits. Thus one of the attributes of brown rice that is keen as far as its consumption is concerned is its healthful benefits. The results of the Tobit regression model showed that the attributes of brown rice (price, colour, taste, nutritional value, texture), attributes of white rice (taste, colour, nutritional value), and socioeconomic characteristics of the respondent (income) are statistically significant in explaining the share of brown rice to total rice consumption. The results obtained from the chi-square test indicates that the local institutions that were found to be significant are University of Ghana Agric Research Station (UGARS), Ministry of Food and Agriculture (MoFA), GTZ, JICA, ACDI/VOCA, AgSSIP, FINATRADE, USAID, General Agricultural Workers Union (GAWU), MFCS Ltd., Individual farmers. The overall performance of the institutions was not significant. This is due to the fact that 11 out of 37 institutions were found to be significant in the performance of their functions as far as brown rice is concerned. This reflects why institutional factors such as promotion and packaging were not significant in the tobit model.

#### **3.3 Recommendations**

The media should be used more in the awareness creation of brown rice. Advocacy groups should do more in order to sensitize people on the healthful benefits of brown rice.

Also proper packaging of brown rice should be the priority of retailers since the research findings proved that a lot of people do not consume brown rice because it does not attract them and even those who consume brown rice indicated that the packaging is not attractive. The government should intervene to help solve the problem since one of the policy measures of government according to literature (Vordzogbe and Caiquo, 2001) is to encourage food processing, packaging and marketing. This would bridge the gap between white and brown rice in terms of competition and also facilitate awareness creation of brown rice.

The research also showed that most of the Service Organizations perform their functions effectively and therefore the government and donor agencies should provide the necessary assistance that would be required by them. These institutions are to cooperate with each other in order to enhance their operations. The Local Governance institutions should be strengthened by the government in order to render their support to the rice industry since none of them was found to be effective in the performance of their functions.

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#### LIST OF ABBREVIATIONS

ADB	Agricultural Development Bank
CBMS	Computer Based Management System
EDIF	Export Development and Investment Fund
FAGE	Federation Association of Ghanaian Exporters
FAO	Food and Agricultural Organisation
FASDEP	Food and Agricultural Sector Development
GEPC	Ghana Export Promotion Council
GTZ	German Technical Cooperation
JICA	Japan International Cooperation Agency
MoFA	Ministry Of Food and Agriculture
MoTI	Ministry of Trade and Industry
MTADP	Medium Term Agricultural Development Programme
NARS	National Agricultural Research System
NGO's	Non-governmental Organisations
NTAE's	Non-traditional Agricultural Exports
USDA	United States Development Agency
WARDA	West Africa Rice Development Association
VORADEP	Volta Regional Development Project

MIDA Millenium Development Authority

MFCS Multi Features and Capacity-enhancing Service

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