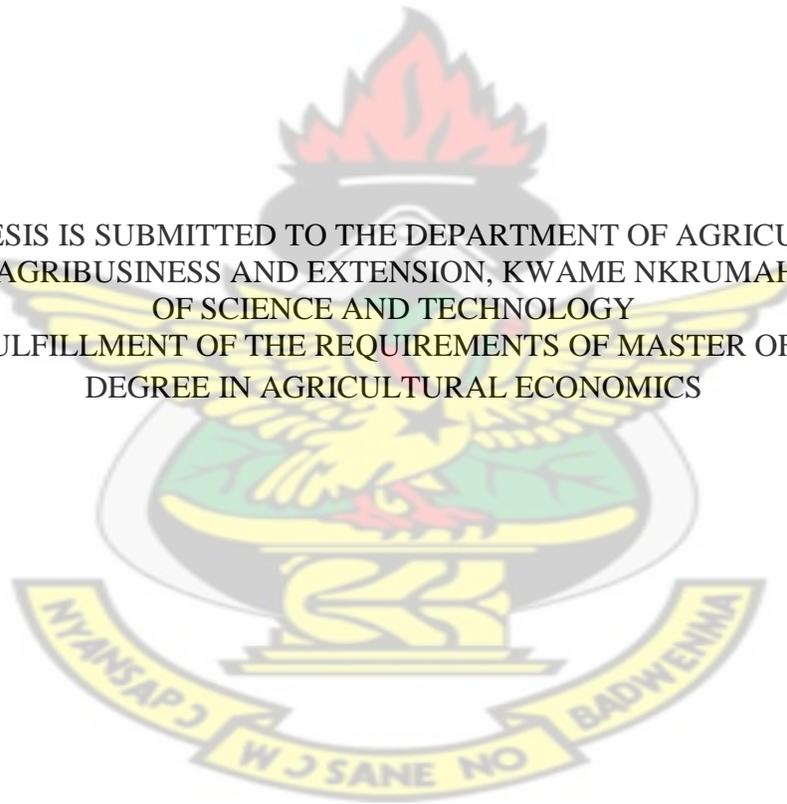


CONSUMER PREFERENCES AND WILLINGNESS TO PAY FOR LOCALLY PRODUCED  
RICE IN  
KUMASI METROPOLIS OF GHANA

BY  
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THIS THESIS IS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL  
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DEGREE IN AGRICULTURAL ECONOMICS



NOVEMBER, 2013

**DECLARATION**

I, Kwakwa Sampson, the author of this thesis titled, “Consumer Preferences and Willingness to Pay for Locally Produces Rice”, do hereby declare that, with the exception of references duly quoted; this work was undertaken by me towards my MPhil degree in the Department of Agricultural Economics and Agribusiness. I hereby declare that, this work has not been submitted either in part or whole for a degree or diploma in this University or elsewhere.

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## **DEDICATION**

I dedicate this work to my late father, Mr. Andrews Kofi Sarpong and my brother Akwasi Acheampong Andrews, for the care, support and love they have given me throughout my education. God richly bless them.

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## ABSTRACT

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. Even though rice continues to form a major part of the Ghanaian diet, locally produced rice is not largely patronized. A survey of 400 rice consumers was conducted in Kumasi, Ghana to ascertain consumer preferences and willingness to pay for locally produced rice, as a basis for quality improvement of local rice. There is little information about the preferences of consumers toward the quality characteristics of this staple. Consumer analysis was undertaken on preference for rice consumption in Ghana with the aim to study which attributes of rice consumers valued. The specific methodological approach employed was Choice Experiment (CE) Technique which is used to evaluate non-market goods by eliciting people's stated preference for different options in a hypothetical setting. It is capable of eliciting respondent preferences for new products and outcomes that do not currently exist in the market place. The study also involves consumer Willingness to Pay (WTP), which is defined as the maximum value of money that an individual contributed to equalize utility. The findings suggested that the most important attribute for rice was food safety, followed by aroma and length of grain. Consumers were willing to pay premium prices for the demanded attributes. The result of the analysis shows very useful information regarding consumer demand that can uniquely assist Ghana policy makers, particularly the government and farmers, in developing new domestic rice production and marketing strategies. The study therefore recommends that 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.

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## LIST OF ABBREVIATIONS

AAAE	African Association of Agricultural Economists
BPI	Benefit Perception Index
CE	Choice Experiment
EAAE	European Association for Agricultural Economist
FAO	Food and Agriculture Organization
IRRI	International Rice Research Institute
JICA	Japan International Cooperation Agency
KMA	Kumasi Metropolitan Assembly
MDGs	Millennium Development Goals
MiDA	Millennium Development Authority
MoFA	Ministry of Food and Agriculture
MPI	Marketing Perception Index
MWTP	Marginal Willingness to Pay
METASIP	Medium Term Agriculture Sector Investment Plan
NGOs	Non-governmental organizations
NRDS	National Rice Development Strategy
QPI	Quality Perception Index
SRID	Statistical Research and Information Directorate
WARDA	West Africa Rice Development Association
WTP	Willingness to Pay



## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background of the study

Rice (*Oryzasativa*, L; *Oryzaglaberrima*, Steudel) is one of the world's most important food crops and serves as a staple food for a large percentage of the world's population, especially in India, China, other parts of Asia, and Africa (Zhou *et al.*, 2002). It is ranked as the world's number one food crop (Itani *et al.*, 2002). 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). 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 a major staple in Ghana in recent times although the crop has been cultivated for several years. It is an important food for both rural and urban dwellers, and is gradually taking over from traditional, mainly root and cereal crops, staples. Among cereals in Ghana, the per capita consumption of rice is second to maize (SRID-MoFA, 2009).

Consumption of rice in Ghana has increased tremendously over the last few years and this is mainly as a result of increased urbanization, population growth, industrialization, income growth, and the relative ease with which it can be cooked and according change in consumer preference (WARDA, 2008). Between 1999 and 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 (METASIP, 2009).

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 (Asuming-Brempong and Osei-Asare, 2007). In addition, 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. However, the increasing demand for rice (both in quantity and quality) far outweighs local production. Over the past few years rice production in Ghana has stagnated around 235,000 metric tons of milled rice with a self-sufficiency ratio of 30 percent (SRID-MoFA, 2009). To make up for the shortfall, greater part of rice consumed in Ghana is imported.

The need to increase production and improve the quality of locally produced rice to make it more competitive with imported rice cannot be over emphasized. Due to self-sufficiency considerations the rice sector should not be neglected. In addition, it has a potential to provide employment opportunities especially in the rural areas, hence easing the socio-economic pressure in the urban areas. Consequently, the government has aggressively carried out various programs and plans in order to increase rice production (FAO, 2006). The National Rice Development Strategy (NRDS) was therefore introduced in 2008 to double local rice production and curb the negative impact of rice importation on Ghana's economy. Since 2001, there have been about 16 completed and on-going rice-related development projects implemented by MoFA and some donor partners with the objective of doubling rice production in Ghana (SRID-MoFA, 2009).

Notwithstanding the government effort to increase rice production in Ghana, consumer preference plays a dominant role in localization and adoption of rice varieties. The market of rice in Ghana is growing as the number of people willing to eat rice and pay premium price is increasing (Tomlins, 2005). The future of local rice therefore will, to a large extent, also depend on consumer preferences and their motive for paying extra price for locally grown rice. Thus, a consumer-oriented approach to understanding the market for local rice varieties is important for pursuing better management of local rice farming. It is also important to understand consumer decision-making regarding local rice produced and seek strategies about how consumption can be promoted.

In Ghana, the objectives of rice breeding programs have been concentrated primarily on improving yield and resistance characteristics, such as, pest and diseases, drought and salinity (JIKA, 2007). Consumer preferences and willingness to pay in the rapidly growing urban markets in Ghana are almost undocumented (Tomlins *et al.*, 2005). Most farmers and merchants intuitively understand the preferences of their immediate customers, but they lack information on the preferences of new clientele in distant cities. Currently, producers are struggling with issues of market access of local rice and this can be answered through producing rice varieties, which meet consumer needs and preferences. In order for producers and government to follow an appropriate strategy regarding the marketing, certification and export of local rice varieties, consumer surveys are necessary. The study therefore tries to elicit characteristics of consumers'

preferences and willingness to pay toward multiple attributes of local rice by conducting a Choice Experiment.

## **1.2 Problem statement**

Rice has become an increasingly important crop in Africa, with imports into the continent accounting for more than a third of world trade in rice (FAO, 2006). Industrialization, urbanization, population growth, income growth and accordingly change in consumer preferences have over the past three decades drastically increased the demand for rice in West Africa (WARDA, 2008). High incomes in low income countries translate into high demand however, as income grows, consumer tastes and preferences change.

In Ghana, rice has become an increasingly popular food as it is tasty and quick to cook. However, most of the rice eaten in the country is actually imported. Locally produced rice has failed to compete with imports because large scale local rice production has been weak and consumers especially, urban consumers have become used to the grain and sensory qualities of imported rice (Tomlins *et al.*, 2007). One of the major challenges for Ghana is therefore how to produce sufficient and affordable rice that suits the preferences of its fast growing and increasingly urbanized population (WARDA, 2008).

Over the years, several government programs have attempted to stimulate domestic rice production with the goal of addressing the increasing demand-supply gap and making Ghana more self-sufficient in rice (METASIP, 2009). Importation of rice continues to increase currently reaching the tune of \$200 million per annum. It is the government's objective to reduce rice importation by 30 percent by increasing local production of rice (Ministry of Trade and Industry, 2009).

Research on rice over the years has largely focused on new varietal releases, production and cultural practices, reduction in post-harvest losses, and improved storage technologies (Adu-Kwarteng *et al.*, 2003). Other studies have focused on explaining the growth of rice consumption (Tomlins *et al.*, 2005). Little attention has focused on demand-driven or market research by investigating consumer preferences and willingness to pay for locally produced rice. For

instance, research has not focused on local rice varieties that Ghanaian consumers prefer and at what quality levels but rather placed undue emphasis on high yielding varieties regardless of its market demand and appeal. Thus emphasized is been placed on production side rather than the consumption side.

Nevertheless, traditional marketing, which was characterized as “production-oriented market”, where farmers and processors had significant power in the past, now seems to be irrelevant. Today’s market has turned to a “consumer-oriented market”, where affluent consumers have more power to demand, especially in terms of quality, healthy and safety for their food consumptions (Henson *et al.*, 2006). As the marketing process becomes more complex, identifying consumers’ decision-making process when purchasing the rice is very vital for today’s agricultural development. One of the determinants for consumers’ decision-making is the attribute of the rice varieties. Jang *et al.*, (2009) pointed out that food attributes has become a main criteria in the consumers’ decision-making process and therefore have received much attention in the food marketing literature.

In general, quality attributes of rice products is largely determined by individual preferences. Rohr *et al.*, (2005) supported the idea that food quality attributes are heterogeneous term and consumers’ definitions of food quality are formed by individual preferences. Any interaction between a consumer and a rice product involves the consumer considering and evaluating a range of quality attributes in the rice. These attributes will contribute, in differing proportions, to the overall level of satisfaction derived from purchasing or consuming the product.

Understanding the relative importance of product attributes influencing rice choice at the point of sale is important in the success of new rice product development (Enneking *et al.*, 2007). They find out that attributes like taste, texture, aroma and food safety influence rice choice. In order to improve marketability, these attributes need to be incorporated into new rice products so as to satisfy consumer preferences and demands. However, demands for rice attributes may vary from one consumer to another. In Ghana there are limited studies on local rice attribute measurement. Consumers determine the survival of new crop varieties in any given reference area by choosing whether or not to consume them and in what proportion (Dalton, 2004). Thus the successes of

any new rice varieties will to a large extent depends on whether it is accepted and consumed in significant quantities by the target population. Development of a new variety becomes successful when it is accepted by the ultimate users (Enneking *et al.*, 2007). Consumers' preference and acceptances govern the traders' acceptance and during cultivation farmers consider the preference pattern of these two groups. Knowing the rice qualities acceptable to the market will enable researchers to develop rice cultivars with acceptable end-user attributes. Local rice producers are struggling with issues of market access for local rice and this can be answered through producing rice varieties, which meet consumer needs and preferences (Adu-Kwarteng *et al.*, 2003).

Some of the domestic rice varieties currently in Ghana are Marshall, Ex-Baika, Aromatic Short, Basmati Pusa and Jasmine 85 (Diako *et al.*, 2010). In order to promote the consumption of locally produced rice, the quality characteristics should match those of the imported brands. There is, therefore, the need to have information on the consumer preferences as a basis for local rice production.

The issues discussed above raise a number of research questions especially concerning consumer preference for local rice in Ghana. It's in the view of this that it has become essential to study and understand consumer preference and willingness to pay for locally grown rice.

These raises the following pertinent research questions:

1. What are the most important attributes that consumers consider when purchasing rice?
2. What are consumer's perceptions towards local rice?
3. Are consumers willing to pay for the attributes of local rice varieties?
4. What are the magnitudes of the effect of the rice attributes on consumer willingness to pay for the improved local rice?
5. What are the roles played by consumer socio-demographics on preference for each of the attributes?
6. What are the constraints to the local rice consumption in Ghana?

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

The overall objective of this survey is to study consumer preferences and WTP for local rice attributes in Ghana. The specific objectives of the study are;

1. To find out the most important attributes that consumers consider when purchasing rice.
2. Analyze consumers' perception towards local rice.
3. Determine the premium consumers are WTP for the attributes of the local rice varieties
4. Determine the magnitude of the effect of the rice attributes on consumer willingness to pay for improved local rice.
5. To test the role played by consumer socio-demographics on preference for each of the attributes.
6. To examine the constraints to local rice consumption in Ghana.

### **1.4 Justification of the study**

The Ghana government sees agricultural development as one of the strategies toward economic diversification. It is one of the most important sectors because it provides food security in the country while having the potential to contribute greatly to the country's economy (SRID-MoFA, 2009).

Food self-sufficiency is an important agenda because Ghana imports a large bulk of overall food requirement from foreign countries. Although rice is a major staple food for Ghanaians, domestic or local rice production is still at an unsatisfactory level. Rice breeding programs in Ghana have been concentrated primarily on improving yield and resistance characteristics, such as, pest and diseases, drought and salinity, reduction in post-harvest losses, and improved storage technologies (JICA 2007; IRRI, 2008). Other studies have focused on explaining the growth of rice consumption in Ghana (Asuming-Brempong and Osei-Asare, 2007). Nothing had been written about consumers' preferences and willingness to pay for locally grown rice. The present study will fill this gap by providing a pioneering application of consumers' preferences and willingness to pay for locally produced rice in Ghana.

Why and how are consumers' preferences for rice variety traits relevant for today agricultural and modern technology adoption? According to the characteristic model developed by Lancaster

(1966), consumers derive utility not from goods themselves but from the attributes they provide. Accordingly, this implies that consumers are maximizing their household utility by consuming their preferred variety attributes not by directly consuming the varieties embedding those preferred attributes. Hence, what consumers are looking for at the end of the day is variety attribute, and the demand for varieties can be considered as a derived demand revealed from consumers' preferences for variety attributes (Enneking *et al.*, 2007). Therefore, understanding consumers' variety attribute preferences will be useful to predict the likelihood of survival of varieties embedding those attributes. This enables policy makers to identify varieties for which policy incentives are required. In agricultural research priority setting too, understanding farmers' and consumers' variety attribute preferences will serve as an input for developing varietal technologies with more chance to be adopted and be successful (Edilegnaw, 2004).

A better understanding of consumer preferences for rice is also needed to understand the rice value chain and facilitate rice market development in Ghana. Studies have shown that consumers are the beginning of the value chain whereby the flow of information about food preference moves back to retailers, manufacturers, farmers, and scientific laboratories (Kinsey, 2001). Likewise, Boehlje (1999) emphasized the importance of information in the value chains. He elucidates the fact that customer information is the resource that can be used to understand markets better. Researchers, extension staff, producers and NGO personnel need a way to identify the rice traits on which they should focus on in order to increase local rice production. This is because an increase in farm output should go hand in hand with improved marketing, as it is not economical to produce any product if it has no market. In fact the greatest risk a producer can face is not having a market for the products. Important market information on attributes that influence market acceptability and consumers' willingness to pay (WTP) for local rice varieties is needed so as to understand the performance of the improved rice varieties in Ghanaian markets.

Better market information for rice producers will assist them in making better decisions to produce appropriate rice qualities and maximize their returns (Kingsey, 2001). Emerging products often require extensive research and development using innovative technology, food

manufacturers want to ensure sufficient demand exists and that their return on investment will be justified.

The results of this study could help policymakers and marketers to make more informed decisions about consumer response to some important attributes and promotion of locally grown rice. For policymakers and marketers, estimates of the premiums that consumers are willing to pay for the locally grown rice attribute can guide promotion investment decisions and efficient fund allocation. For producers, the information contained in this study may help select most profitable marketing strategies. The need to understand consumers preferences and willingness to pay (WTP) for local grown rice varieties justifies undertaking this study.

### **1.5 Organization of the study**

The study is organized into five chapters. Chapter one comprises of the background of the study which is followed with problem statement with research questions relevant to the study. Moreover, chapter one contains the objectives of the study followed by the justification of the study. Chapter two is on literature review which takes stock of what has already been written on the topic in terms of theories or concepts, scientific research studies and the overall goal of clarifying how the present study intends to address the gap silence or weakness in the existing literature.

The third chapter contains the methodology employed in this study. Here, the choice of the study area and sampling procedure as well as the data collection method are elicited. It also includes the theoretical framework and the empirical model employed. Chapter four deals with the analysis pertaining to the data collected and discussion of the outcome. The study therefore concludes with chapter five, and it is concerned with summary of the major findings of the study, the main recommendations and limitations of the study.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter presents the theoretical and empirical literature relevant to the study. The first section of the chapter presents a review of literature on origin of rice. The second section deals with the economic importance of rice. The third section looks at the overview of the Ghanaian rice industry. Product market testing and acceptance of new product and consumer choice and consumption is also reviewed in the fourth and fifth sections respectively.

The sixth section reviews empirical literature on consumer preferences for product attribute of food items. A review of consumer willingness to pay for local products is presented in the seventh section. Literature on previous studies on consumer preferences for rice attribute is also reviewed. Another purpose of this chapter is to review methods of evaluating non-market commodities and their application to agricultural commodities with the aim of identifying the best method for meeting research objectives outlined in chapter one..

#### 2.2 Origin of rice

The origin of the rice plant has long been debated. At one time it was speculated that rice was originally an upland rather than wetland crop (Chang, 1976). Among several existing rice species, two are important for human nutrition, i.e., *Oryza sativa*, grown worldwide, and *O.glaberrima*, grown in parts of West Africa. Little is known with certainty about the rice domesticated in West Africa, and archaeological evidence is mostly lacking. As a result, the subject still remains open to speculation by various authors (Ng, *et al.*, 1991).

Mobil and Okran (1985) posits that rice has been cultivated in Ghana for a long time. During the 17th and 18th centuries, it was already one of the major commercial food crops in the sub-region. However it was not until 1960, that rice became an important crop in Ghana (Bozza, 1994). Its importance was next to millet and maize and it was cultivated more than yam and sweet potato, the two principal root crops in the country. Until the 1920s, most of the rice in Ghana was grown in the Volta and Western Regions, with cultivation carried out mostly by females, while males focused on cash crops such as cocoa, rubber and coffee. Since the 1960s, the bulk of Ghana's

rice has come from the Northern Sector of the country. From 1978-1980, the Northern Region produced 170,000 metric tonnes of paddy rice. This formed 61% of the total rice production in Ghana during the period (Akanko *et al.*, 2000). It is therefore possible to conclude that promoting paddy yield of rice in Ghana could help the country achieve its food policy objective of attaining self-sufficiency in rice production.

### **2.3 The economic importance of rice**

The significant role the rice crop plays in the environments led Fageria *et al.* (2003) described rice as a main source of 35-60% dietary calories consumed by more than 3 billion people and probably the most versatile crop. The two species of domestic rice *Oryza sativa*, grown throughout the world and *Oryzaglaberrima*, cultivated mostly in West Africa.

Rice is the foremost food of the developing world (Singh, 1985). It provides about 4/5 of the calories of the more than two billion people of Asia and 1/3 the calorie intake of the nearly one billion people of Africa and Latin America. Singh further notes that food self-sufficiency and food security in majority of the Asian countries largely depends on rice self-sufficiency and rice security. Many countries including Bangladesh, Thailand, Pakistan and Vietnam have their economies sustained largely through rice production. Such countries earn foreign exchange from the export of rice (*ibid*).

Calpe (2002) described rice as a major staple food for the rural population, and mainly cultivated by small farmers in holdings of less than 1 ha. Rice served as a “wage” commodity for workers in the cash crop and non-agricultural sectors. Its duality gave rise to conflicting policy objectives, with policy-makers to save farmers when prices drop, and or defended consumer purchasing power when sudden price increases. Additionally, rice crop vitality can be seen in its nutrition to much of the population in Asia, Latin America and the Caribbean and Africa. It is central to the food security of over half the world population, not to mention to the culture of many communities. Rice is therefore considered a “strategic” commodity in many countries and is, consequently, subject to a wide range of government controls and interventions (Calpe, 2002).

Francesco (1994) in a study about self-sufficiency in rice production notes that the growth of the Bangladeshi rice production and market development has induced positive outcomes such as the relatively stable food grain price environment and the declining incidence of poverty in the Bangladeshi economy. He further notes that the incidence of malnutrition has also shown improvement.

Vaughan *et al.* (2003) considered rice crop as a major source of nutrition for about two-third of mankind. This phenomenon involuntarily provides an avenue for an increased production in order to keep pace with the growing population in spite of its productivity seriously being affected by biotic and abiotic stresses (Zafar *et al.*, 2004).

At the African continent level, Jones *et al.*, (1998) considered rice crop as the main staple food in at least 8 of the 17 countries of West Africa and rapidly gaining popularity as a major food among other crops. However, self-sufficiency in West African rice production is declining because demand is increasing faster (5.9% annual growth since 1970) than its production (4% annual growth over the period). In spite of exact non available statistics, it is estimated that over 80% of the resource poor rice farmers in West Africa grow rice as a subsistence crop.

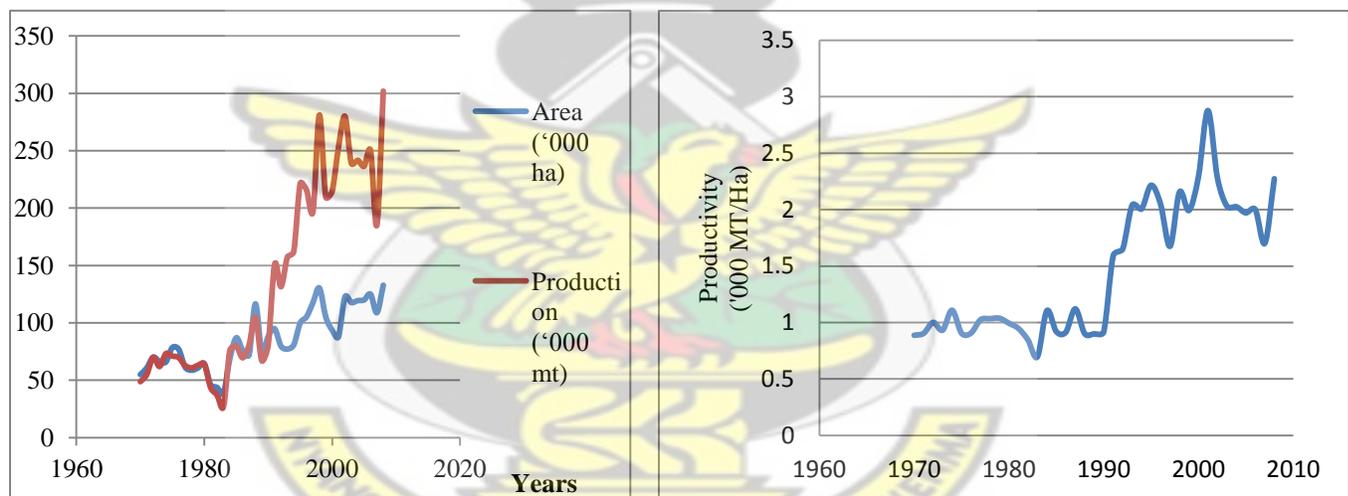
Ghana's inability to produce rice to self-sufficiency levels is indicative of the presence of major constraints in the rice industry requiring urgent attention. It is necessary to stem the trend of over-reliance on imports to meet the increasing demand for rice. Local potential resources for production should be exploited with sustainable strategies at all levels of the rice industry. This creates an urgent need to increase and improve the production of rice in Africa, particularly Ghana in order to meet the high demand (Ogunbayo *et al.*, 2005). The need for expansion of rice cultivation does not only depend on cultural practices and management, it also depends on the suitability of rice varieties which suits the preferences of the ultimate user.

## **2.4 Overview of the Ghanaian rice industry**

In Ghana rice production has been recognized as an important factor in the development of the agricultural sector for the improvement of the overall national economy since the nation attained independence in 1957. Various governments have supported rice production by adopting various

measures with incentives for increasing food production for the achievement of food security objectives. Rice is cultivated in four main ecological areas in Ghana. These include rainfed upland (in Northern Ghana), rainfed lowland (Northern Ghana), and Inland swamp-inland valley of central Ghana and irrigated – Northern and Southern Ghana. The major challenge faced by local farmers is the high cost of production since most of the agricultural inputs are imported (Khor, 2006). Other constraints limiting production include lack of access to credit, shortage of water, pests, diseases, unavailability of suitable varieties, low quality of locally processed rice and inefficient markets for inputs and produce (Furuya and Sakurai, 2003; Adolph and Chancellor, 2006). The trend in rice production in Ghana over the years has been influenced by changes in both the area cultivated and productivity. Figure 2.1, shows the trend of production over the period 1970 to 2008:

**Figure 2.1: Area and Production of Rice in Ghana 1970 to 2008.**



Source: SRID-MoFA, 2009

During the seventies, rice production was relatively stable with a peak of 73.2MT in 1974. In the early eighties, production dropped steeply but from 1984, production increased reaching a peak of 301.9MT in 2008. In spite of appreciable level of increases in the production of rice over the years, its importation has also increased.

As in the case of most economies in Africa, Ghana is not self-sufficient (currently, the country has a self-sufficiency level of 30%.) in rice production and therefore rely heavily on imported

rice to make up for the gap in domestic demand (SRID-MoFA, 2009); despite the recorded increases production growth (EAAE, 2007). It is estimated that the country currently spends over US \$500 million annually to import rice for local consumption. Apparently, countries in the West African sub-region are in similar position and depend on imports to fill the gap between domestic demand for rice and production. By early to mid-1970s, Ghana was self-sufficient in rice production and even had some for export. However, currently commercial rice imports account for over 60%, food aid about 2%, and domestic production about 37% of total rice consumption (Asuming-Brempong and Osei- Asare, 2007). The Ghanaian economy has since the year 2000 witnessed rapid increases in rice imports. This is said to be the result of structural changes in consumer behaviour as induced by continuous increase of per capita income in a society that has become more urbanized (EAAE, 2007).

Domestic rice production in Ghana has lagged behind domestic demand. Furthermore, domestic rice varieties cultivated have not kept up with changing consumer preferences toward aromatic and long-grain white rice. As a result, rice imports from South East Asia and America have grown considerably to fill the increasing demand gap for quality rice. Average rice imports were 348,182 metric tonnes between 2003 and 2008, representing 69% of total national rice consumption. While average local rice were 242,416 metric tonnes during the same year. Imported rice was sold at average wholesale prices of \$1,100-\$1,250 per metric tonnes in 2008-2009 (MiDA, 2009) with the average local rice at a wholesale price of \$683-\$700.

Dietary habits in Ghana show a shifting tendency towards rice. As such rice is becoming an increasingly important staple food consumed throughout the country. The growing trend in the consumption of rice is attributed to increasing population, rapid urbanization, the relative ease of cooking and preservation and the development of the rice trade as a result of trade liberalization.

The huge rice import bill has become a source of concern to government. In view of food security and foreign currency savings, increased production of domestic rice with higher competitiveness against imported rice is paramount to Ghana's agricultural sector development (JICA, 2007).

## **2.5 Product market testing and acceptance of new product**

Product testing is a very important type of consumer research any company ever conducts, and achieving product superiority is the surest way to build brand share, customer loyalty and boost profitability (Thomas, 2002). Product testing is done to build product awareness, educate the potential consumers about the product usage and develop a market for the product. Since the mid-1990s, acceptance of new product or service has gained considerable importance as a field of research. Acceptance research has provided important insights in explaining the success or failure of new products or services (Silberer and Wohlfahrt, 2001).

For any new product to be successful on the market there is need to gauge the reaction of potential customers, determine the relative importance of various product attributes/features, and understand the customer's definition of product quality through consumer testing of the product. Consumer tastes and preference evolve over time and that is why product testing must be viewed as a strategic, ongoing activity “Real environment” testing. Testing a product the way it is typically used by consumers is always the most accurate method of product evaluation (Nielsen, 2003). Market testing helps the trader to manage risk of new products on the market by quantifying consumer response to the new products tested. Failure to know the specific needs for a new product on the market can be costly, both financially and to the image of the company (Nielsen, 2003).

In a market place, many new products are introduced to the market each year and fail due to failure in meeting the consumer requirements: lack of a compelling need for the product or service in the market place; poor understanding of the user needs; lack of competitive analysis and errors discovered late in the product development cycle (Wilson and Gilligan, 1997). Sensory quality should be considered as a key factor in food acceptance because consumers seek food with certain sensory characteristics. The acceptance of a food will depend on whether it responds to consumer needs and on the degree of satisfaction that it is able to provide (Heldman, 2004).

Test marketing is a major source of information as to whether the new product will succeed or not, if it is introduced on the market. An individual cannot start using a new product he/she is not aware of and this can only be achieved through market testing. Once the individual becomes

aware of a product, he/she may adopt it right away or engage in an evaluation process whereby he/she compares the new product with the existing ones.

To minimize the rate of failure of a new product, it is essential to carry out a market test to determine the potential customer his /her perception of the product and the price he/she is willing to pay.

## **2.6 Consumer choice and consumption**

The consumer is assumed to choose among available alternatives in such a manner that the level of satisfaction derived from consuming commodities (in the broader sense) is the highest (Henderson and Quandt, 1980). Grunert *et al.* (2006) considers product attributes as one of the perspectives to increase understanding of consumer or buyer choice.

Consumer food choice is influenced by food products' prices and quality and consumers' income. But what consumers regard as 'quality' has undergone considerable change during the past decades. We can approximate consumer food quality perception by distinguishing four groups of attributes for food products: sensory attributes, health attributes, process attributes (Brunsø *et al.*, 2002).

In choosing food, consumers look beyond the physical product alone. Normally, the consumers will form their own value and expectations on the various market offerings (Kotler and Armstrong, 2010). Among the things demanded by consumers are varieties of food, quality, nutritious content, and safe foods and at a reasonable cost. As mentioned by Peri (2006), food quality is a very important key that consumers will always look for to satisfy their needs and expectation towards the food they choose. In order to win the competition in today's market, producers have taken efforts to offer good value of their food and provide customers with a favorable ambience (Soriano, 2002). It will guarantee a continuous demand if the value of the product exceeds the expectation and satisfaction of the customer (Shaharudin *et al.*, 2011).

The attributes of food quality depend on the type of food and the individual's food preference itself. The attributes that constitute quality in the mind of the consumer, and especially their weights, may change over time as well (Grunert, 2005). In general, consumers prefer products of

high quality including the choice of food that they are consuming. Thus, it is essential to understand consumers' own perceptions of quality as consumers usually will be making purchasing decisions on these beliefs (Rijswijk and Frewer, 2008).

Hence, it is essential to link the quality attributes with the consumer's quality understanding. Thus, this study takes a step in determining the customer's significant quality attributes towards the overall rice quality. Such discovery especially in the rice industry is vital in the sense that the result can be used to benchmark the 'actual performance' against the 'perceived requirement'. By this way, the discrepancies or differences surfaced can be channeled for immediate improvement for the sake of building long term profitable relationship with the consumers.

## **2.7 Consumer preferences for product attribute of food items**

There exists a large pool of preference studies on food attributes, as the subject matter has become an important concern for researchers due to the increased interest of consumers as well as producers. Willingness to pay estimates has often been included in the study in order to provide with more straightforward suggestions on the value placed on product features.

Cavard and Moreau (2003) undertook a survey among 2000 French consumers in 2002 to study their behaviour regarding the purchase of fruit and vegetables. It first appraised purchasing frequency; the weekly purchase being prevalent. Regarding places of purchase, supermarkets came first, followed closely by open markets. In terms of modes of purchase, the self-service with assisted weighing was the preferred option. Cavard and Moreau (2003) further indicated that consumer expectations concern better control of labelling and quality on the selling place, with an indication of consumed-by date (expiring data). The main consumers, the old-aged people, appear, however, to be less concerned with the expiring data.

Devlin *et al.* (2003) conducted a study on means-end chain analysis of the food sector and explored the extent to which the findings made can be used to inform the retail positioning strategy of food retailers in the UK, using data obtained from 15 consumers. Using means-end theory as the theoretical underpinning of the study, the study employed laddering methodology to identify the linkages between food retail store attributes and personal values. The findings of

the study presented a more personally relevant representation of consumer's perceptual orientations towards food retail store image. At the attribute level, "good quality products", "good reputation", "store has additional services", and "value for money", were most sought after. These were linked to the consequences "feel good" and to "save time". Overall, the findings support previous value driven research, concluding that "happiness" and "quality of life" were the most strived for personal values.

Sampathkumar (2003) studied brand preference in soft drinks in Telangana region of Andhra Pradesh. He found in rural market that about 37.5 per cent of consumers preferred Thumbs-up (urban 30%) followed by Coco cola (28.5%) (urban 37.5%), Pepsi (12.5%), (urban 9%), Limca (4%) (urban 8.5%). Most of the urban consumers purchased soft drinks in nearest Kirani stores i.e., 67 per cent (rural 73%), followed by super bazaar (27%), (rural 26%) and others (6%), (rural 1%). Thus the market distribution played very vital role in company's success and failure in the market.

Kinsey *et al.* (2004) in their study identified seven forces that have converged to create a demand-driven food system in the USA, namely, (1) more diverse consumer characteristics and tastes; (2) the universal product code (bar code) and all the information technology that followed; (3) the early adopter of information technology and the mother of efficient supply chain management; (4) efficient consumer response (5) concentration of retail ownerships; (6) global concentration of food processing and manufacturing; and (7) new business models.

Manivannan and Raghunathan (2004) observed that there was no close relationship between the age, sex, education, occupation of consumers and extent of utilizing departmental stores, whereas income alone had shown a close relationship with the extent of utilizing departmental store at 1 per cent significance level, which shows that there was a close relationship between consumers income and extent of utilizing department stores.

Haese and Van (2005) in their study stated that since late 1990s, the number of supermarkets in South Africa has steadily being growing. Due to a more effective and efficient management and procurement system, the supermarkets can benefit from economies of scale and sell food at a

relatively low price. In their study, they presented a case study of two villages in the Transkei area of South Africa. In these poor rural communities, majority of households bought their main food items from supermarkets rather than from local shops and farmers. While presenting an important step towards livelihood development and food security, these supermarkets also acted as a strong competitor for local agricultural sales. The supermarkets provide many food items at lower prices. With an increase in income, the households look for variety and exoticism in their food products and will most likely find this in the supermarkets, rather than the local stores.

Ramasamy *et al.* (2005) in their study suggested that the buying behaviour of instant food products was strongly influenced by awareness and attitude towards the product. Commercial advertisements over television was said to be the most important source of information, followed by displays in retail outlets. Consumers do build opinion about a brand on the basis of which various product features play an important role in the decision making process. A large number of respondents laid emphasis on quality and felt that price is an important factor, while others attached importance to image of the manufacturer.

## **2.8 Consumer willingness to pay for local products**

In recent years, a growing number of consumers are increasingly interested in food products that are produced locally. One possible reason for this increased interest in local foods is the industrialization and globalization of agriculture and the food safety, food security and environmental issues associated with it. Hence, consumers are becoming more concerned about where and how food products are produced.

Chambers *et al.* (2007) referred to local products as those food products grown, produced and sold within a single region, whereas Groves (2005) and La Trobe (2001) considered local food products that are produced and sold within 30-50 mile radius of a consumer's house. Therefore, the definition of local food clearly refers to the area from which a locality derives its food supply, extending beyond geographic boundaries where consumers care about how and whom the food is produced, distributed and marketed (Hand and Martinez, 2010).

Previous studies revealed that consumers' preferences towards local foods are derived not only from preferences for product quality, freshness or taste, but also from the demand for public benefits related to job and income generation in the community as well as improvement of the environment (Weatherell *et al.*, 2003; Jones, 2002; Roininen *et al.*, 2006; Chambers *et al.*, 2007; Pieniak *et al.*, 2009).

Weatherell *et al.* (2003) found that moral and health concerns are the most important reasons why British consumers choose local food, whereas taste and freshness attributes are perceived as less important. They also found that approximately 25% of urban and 30% of rural respondents are willing to pay up to 5% and 10% premiums for local foods.

Jones (2002) investigated British consumer behaviour towards local and regional foods and found that freshness and sustainability are the main reasons why consumers buy local and regional food, followed by high quality and taste. In addition, Roininen *et al.* (2006) explored consumers' perceptions of local food in Finland and revealed that locally produced food was perceived fresher than conventional ones. In the same line, Chambers *et al.* (2007) revealed that consumers were enthusiastic towards local food and perceived them as of higher quality than imported foods. In addition, the authors stated that respondents endorsed the idea of supporting local farmers and their national economy.

Williams and Schiek (2000) found that 60% of Indiana consumers were very likely to consume locally produced food products. The remaining 40% of Indiana consumers in their study were either neutral or somewhat likely to purchase locally produced food products. Loureiro and Hine (2002) show that Colorado consumers are willing to pay a higher premium for local than for organic or "GMO-free" potatoes. In contrast, Brown (2003a) indicated that 58% of surveyed Missouri consumers were unwilling to pay a premium for locally grown food products if they were of the same quality as other products. However, 22% of respondents indicated that they would pay at least a 5% (and in some cases much greater) price premium.

In developing countries, preference for local products tends to be weaker.

For instance, in a study conducted in Nigeria by Agbonifoh and Elimimian (1999) and Okechuku and Onyemah (1999), the results showed that products from the developed countries were viewed more positively by nationals of developing countries, than those produced locally.

Saffu and Walker (2006) have also examined the impact of country-of-origin effects and consumer attitudes towards buy local campaign initiatives. Basically, the attitudes of consumers in these studies to the buy locally-made campaigns can be characterized as protectionist, nationalistic, and self-interest. In assessing the hiring preferences among organisations in one developing country,

Galawat and Yabe (2010) found that consumers in Brunei tend to purchase imported rice rather than local one due to its availability in the market. In addition their study examined the consumers' preferences and their willingness to pay for native rice in Brunei. Their results indicated that urban consumers prefer rice which has long grains and were willing to pay for this rice attribute.

A study by Akaeze (2010) found that consumers in Nigeria prefer imported rice to locally produced rice. He found that imported rice became a consumer choice in Nigeria due to their cleanliness and swelling capacity, taste, availability and grain shape. These characteristics of imported rice also are mostly preferred by restaurants and fast food industries to be used in their businesses. Tomlins *et al.* (2005) investigated consumer preferences and acceptability of domestic and import rice in Ghana. He found that consumers prefer import raw and parboiled rice to domestic. The preceding empirical evidence, suggests that consumers in developing economies view products from developed countries more favourably than products from their own country.

The literature reviewed here supports the argument by Giraud *et al.* (2005) that the premiums consumers are willing to pay for locally branded products vary by state and by product. Given that less information is available about consumer's preferences and willingness to pay for locally grown rice products in Ghana, the primary objective of this study is to evaluate Ghanaians consumers' willingness to pay for the locally grown characteristics in rice products.

## 2.9 Previous studies on consumer preferences for rice attributes

Consumer preference for rice varies from country to country. Usually consumers are very much concerned about the quality and price of the commodity when they make a purchase (Diako *et al.*, 2010).

In America, consumers preferred rice which is associated with specific cooking types and menu as well as the processing characteristics. Whereas, in the Middle East they mostly favored a long grain and well-milled rice with strong aroma compared to the Europeans who tend to prefer the long grain with no scent. The Japanese on the other hand gave high priority on the well-milled, very recently processed, short-grain Japonica rice. The well-milled and long grain Indica rice however, were preferred by consumers in Thailand (Lancon *et al.*, 2003, Galawat and Yabe, 2010, Suwannaporn and Linnamenn, 2008). Suwannaporn and Linnemann (2008) and Basorun (2008) reported that consumers in Japan, Korea, North China and Taiwan, prefer to purchase rice at low price. There were increasing demands for local rice in these countries as the price was cheaper than imported one. High price will be a factor that prevents consumers to purchase certain brand of rice that they preferred.

In contrast, the imported rice became a consumer choice in Nigeria due to their cleanliness and swelling capacity, taste, availability and long grain. These characteristics of imported rice also are mostly preferred by restaurants and fast food industries to be used in their businesses (Akaeze, 2010).

The dominance of the demographic factors was also highlighted in a number of studies. Consumers who lived in urban area and had high standard of living, high income and education, tend to purchase rice of high quality based on their nutritional content (Tomlins *et al.*, 2005).

Kassali *et al.* (2010) found that income, age of the consumers and frequency of purchase were the important factors that influence household food consumption. Consumers tend to make a purchase at the retails closer to their homes because it makes them easier to get the rice and will purchase whichever rice brand that is available in the market (Azabagaoglu and Gaytancioglu, 2009).

The consumers in Brunei tend to purchase imported rice rather than local one due to its availability in the market and family inherent where consumers have been using imported rice since childhood (Galawat and Yabe, 2010).

The effects of the marketing factors such as branding, advertising and promotions were discussed in the studies conducted by Hogg and Kalafatis (1992) and Opoku and Akorli (2009). Opoku and Akorli (2009) reported that consumers from United States, for example, had a strong response on brand name and packaging of rice. Whereas consumers in Ghana prefer to purchase imported rice brand rather than the local ones.

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.

Prameela and Husain (2007) showed that product features such as taste and freshness determined consumer choice while Kramer (1988) indicated that consumer behaviour was generally dependent on taste, price, convenience, variety, and quality.

Wong *et al.* (2010) suggested that in future, in order to cope with the demand and changing lifestyle and consumer preference, rice should be made available in different forms: pre-cooked or instant rice, easy-to-cook and ready meal, and various packaging. In addition it was also reported that changes in lifestyle and time constraints on women would also affect the purchasing behavior on rice brands in the market. Some of them may prefer to eat outside rather than preparing cook at home (Abdullah *et al.*, 2011).

Knowing what consumers want, how they want to buy, prepare and consume food, what features are important to them and what characteristics they are willing to pay for, can provide valuable insights into meeting consumer expectations and growing a food business.

## 2.10 Consumers preference models

There are different approaches to determine consumer preferences for a particular good. Revealed preference and stated preference are the two main approaches that have been commonly used in economic valuation of market and non-market goods (Bateman *et al.*, 2002).

### 2.10.1 Stated preference methods

Stated preference approaches seek to reveal how respondents value goods presented to them in different hypothetical scenarios (MacKerron *et al.*, 2009). They are very common in the field of environmental valuation (Birol *et al.*, 2006; Hanley *et al.*, 2001) and other large scale assessments concerning different social policy issues. Stated preference methods differ from revealed preference methods in that the choice situations are hypothetical and the data obtained are expressed preference data, or the individuals' statements on how they would act in a similar real life situation. In revealed preferences methods, however, the data are market or other data containing observations of actually realized behaviour.

The hypothetical characteristics of stated preference methods give rise to limitations that need to be carefully considered: many economists have stated their doubts on the capability and willingness of individuals to give truthful and accurate answers, which leads to questionable validity of the results. For instance Kemp *et al.* (2010) undertook a study on the impact of food miles or product origin on consumers' purchase decisions by using both stated and revealed preference methods: they found that the preferences stated by the consumers gave a clearly biased impression of the actual purchase behaviour recorded in the revealed preferences part of the research.

This effect can, however, be partly avoided by good survey design. For instance, the number of choice sets presented to the respondent in choice experiments may have a significant effect on the responses and thus the results (Hanley *et al.*, 2001). In addition the type of method has been found to matter, the results may differ depending on whether the model used is a choice experiment or a ranking model. The validity of the willingness to pay estimates can be evaluated by checking whether the results are in line with actual behavioural observations revealed by other studies (Brown, 2003b). However, in many types of studies, there might not be reasonable

references for revealed preferences if the object of the preferences is not for instance available at the market place.

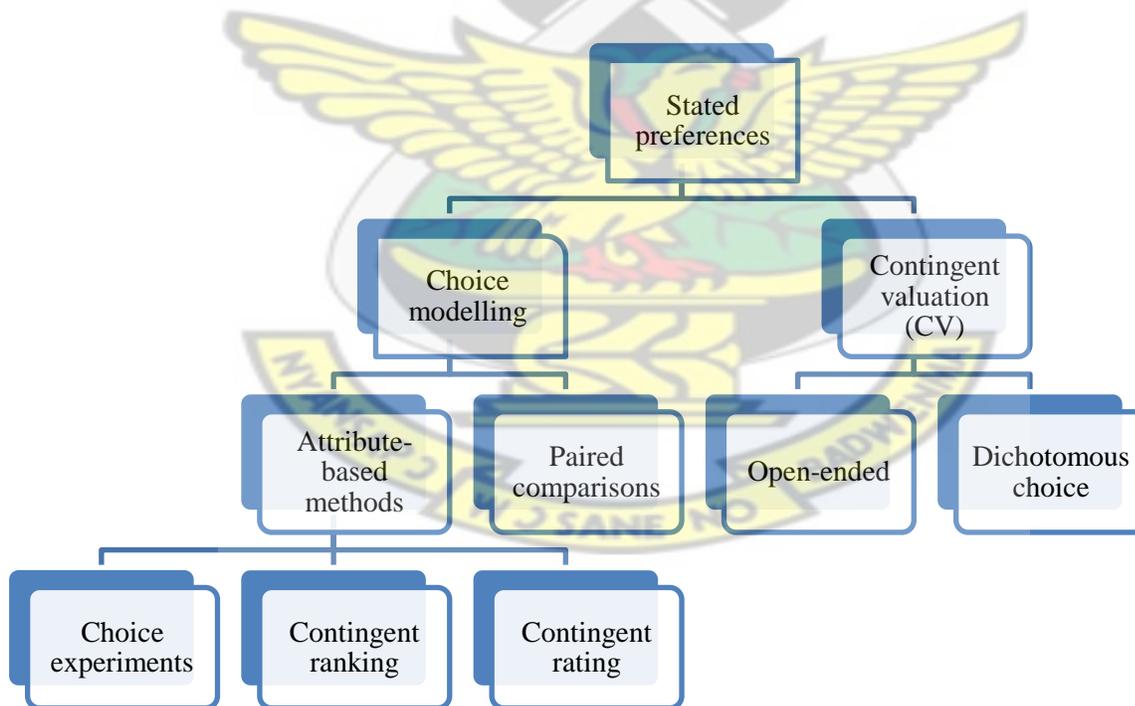
According to Adamowicz *et al.*, (1998), stated preference methods would serve as a useful tool in improving estimates generated in revealed preference studies. Using both stated and revealed preference methods in a complementary manner would clearly be ideal in consumer studies, as the scale of the hypothetical bias present in the former would then be tested and the limitations of the latter would be supplemented with the flexibility of the stated preference methods. Mark and Swait (2004) conducted a study using both stated and revealed preferences methods in the context of health economics and physicians' prescription choices. They concluded that the stated preference methods would describe actual behaviour somewhat in line with revealed preference methods, at least in the context of their study.

The meta-analysis of Cicia and Colantuoni (2010) on consumers' WTP for meat traceability also suggested that the non-hypothetical setting of the WTP studies did not have a significant impact on the WTP estimates, even though the sign of the coefficient was negative, suggesting that the influence of non-hypothetical research situations, if existing, would be negatively proportionate to the WTP premiums.

However, various studies presenting contradictory findings to Kemp *et al.* (2010) have also been published. For instance, Maria (2006) found that consumers' positive preferences and WTP for improving animal welfare were not consistent with actual consumption. Chang *et al.* (2009) also concluded that preference estimates based on non-hypothetical settings are better approximates of real behaviour than hypothetical ones. Kemp *et al.*, (2010) found that the preferences stated by the consumers gave a clearly impression of the actual purchase behaviour while that of Maria (2006) found that consumers' preferences were not consistent with actual purchase behavior. The hypothetical setting of a stated preference study nevertheless offers possibilities that are unachievable with revealed preferences methods, as it enables, for instance, the description and examination of new products and limiting of the choice set available for the individual (Brown, 2003b).

Stated preference methods can be divided into direct and indirect methods, where the former include techniques that provide the researcher with estimates of monetary value. The latter approaches only indicate preferences, including response techniques using ranking, rating and choice, out of which the monetary valuations can then be derived by including further steps in the analysis (Brown 2003b). Brown (2003b) classified the stated preference methods into contingent valuation, paired comparison and attribute-based methods. The last of these includes the choice experiment, contingent ranking and contingent rating methods, and is in line with Holmes and Adamowicz's (2003) categorization. Bateman *et al.*, (2002) and Hanley *et al.*, (2001) used the header of choice modelling techniques to encompass the paired comparison, choice experiment, contingent ranking and contingent rating.

Combining the indirect and the direct approaches leads to the classification presented in Figure 2.2, where the stated preference methods are divided into contingent valuation (CV) and choice modelling (CM).



**Figure 2.2 Stated preference methods**

Source: adapted from Bateman *et al.*, (2002)

The objective of contingent valuation methods is to provide the researcher with monetary valuations of the target goods, whereas choice modelling methods target either monetary valuations or preference order outcomes (Brown 2003b). Open-ended CV is a direct method asking the respondents to state their maximum willingness to pay or minimum willingness to accept for a change in their utility compared to the status quo situation (Hanley *et al.*, 2001). In dichotomous-choice contingent valuation the respondents are instead asked to choose whether they would accept or reject a fixed price for a certain product (MacKerron *et al.*, 2009).

According to Hanley *et al.* (2001), the open-ended and dichotomous contingent valuation models have been found to lead to significantly different results. This might indicate that respondents are tempted to take an “easy way out” solution and agree with paying the values suggested to them, even though their own suggestions would be lower. On the other hand, open-ended CV has in particular been accused of causing the respondents a cognitive burden, and according to Hanley *et al.* (2001), neither method conforms well to multidimensional changes in the target goods.

Choice modelling (or conjoint analysis) techniques partly respond to the above-mentioned problems. In a paired comparison the respondent is asked to choose the preferred good from two alternatives (Brown, 2003b), whereas the attribute-based methods model consumer preferences for similar goods that differ in the levels of their common attributes: they allow for the estimation of the preference order of the attributes as well as welfare measures such as the willingness to pay for various types of goods. The latter is enabled by adding a price attribute to the product features and the random utility function. (Brown, 2003b; Hanley *et al.*, 2001; Holmes and Adamowicz, 2003).

### **2.10.2 Attribute-based methods and the choice experiment**

Attribute-based methods can be either binary or multinomial, meaning that respondents can be asked to choose between, rank or rate two or multiple items. The choice experiment, in particular, can be used in survey studies such as this thesis, but it is also utilizable in the context of laboratory or field experiments.

A choice experiment consists of several choice sets with two or more alternative goods that are presented to the respondent. The alternatives are typically goods that differ in the levels of their attributes: for instance in the case of rice in this study their price, taste or grain size can be different. The consumer is then asked to choose one of the alternative goods or a possible no-choice option. This no-choice option gives the respondent the possibility to choose not to buy any of the goods presented in the choice set and it improves the realism of the choice situation as the respondents are not forced to choose any of the options (Hanley *et al.*, 2001; Vermeulen *et al.*, 2008).

This allows choice experiments to be consistent with utility maximization theory, and the welfare measures and parameter estimates to be consistent with demand theory (Birol and Rayn, 2008). Each respondent faces several choice sets presenting different combinations of different alternatives. The choices made between the alternatives reveal consumers' relative implicit preferences for the particular attributes according to random utility theory. The cognitive burden faced by the individual is, according to Hanley *et al.* (2001), the main disadvantage of attribute-based methods, causing potential increases in the random error terms compared to CV. The estimation of willingness to pay becomes more difficult if the good being valued is complex and unfamiliar to the individual (Brown, 2003b), and in such cases learning effects, respondent fatigue and the use of rules of thumb in answering may arise.

Complex choice sets may also lead to the choice of satisfying rather than utility-maximizing options (Hanley *et al.*, 2001). The problem of hypothetical bias can be seen as being less important for choice experiments than contingent valuation methods (Bateman *et al.*, 2002) but as few studies have actually tested this phenomenon, Hanley *et al.* (2001) stated that the claim can scarcely be made at least not with certainty. According to MacKerron *et al.* (2009), hypothetical bias also more probably arises in the case of less knowledgeable respondents or if the monetary valuations are large instead of small.

The respondents may in addition answer strategically, which might bias the resulting coefficients (Brown, 2003b). They might in such a cases try to encourage favourable policies through the study, even though, in reality they would not be willing to pay such sums for products oriented

towards rice varieties. Likewise, some respondents might try to answer in line with socially desirable behaviour and norms, and in such a manner bend their answers from their true preferences.

The advantages of attribute-based methods and choice experiments include the possibility to derive a valuation for each attribute level and to present several alternatives to the respondent at the same time, so the choice situation resembles the one individuals face in real purchase situations (MacKerron *et al.*, 2009). As attribute-based techniques are multidimensional in that several attribute levels may be varied simultaneously, they generate a richer portrayal of preferences than contingent valuation methods (Holmes and Adamowicz 2003).

Also, as choice modelling techniques do not involve explicitly asking for monetary valuations and the willingness to pay measures are thus derived indirectly, some of the challenges of CV may be alleviated: the task may be easier for the respondents to understand (Bateman *et al.*, 2002,) and, for instance, conformation to the presented option may be lower (Hanley *et al.*, 2001), potentially reducing the magnitude of hypothetical bias.

The current study basically relies on Choice Modeling Technique which is used to evaluate non-market goods by eliciting people`s stated preference for different options in a hypothetical setting. Choice modeling (CM) that used attribute based technique is used to value nonmarket goods, which is specifically rice attributes in this study. It involves eliciting people`s stated preference for different options in a hypothetical setting. Therefore, being a stated preference technique, it is capable of eliciting respondent preferences for new products and outcomes that do not currently exist in the market place. Therefore, one of the main contributions of CM to the study is that it can help identify what attributes are significant determinants people has place on non-market good (rice).

## **CHAPTER THREE**

### **METHODOLOGY OF THE STUDY**

#### **3.1 Introduction**

The understanding of consumer and household attributes that impact consumer willingness to pay premium prices for rice is paramount in order to understand the rice marketing and trade, so as to be able to facilitate rice market development in Ghana. The chapter begins with the description of the study area. The chapter gives a comprehensive description of the theoretical framework on analyzing the behavior of Ghana rice consumers in the choice of specific rice attributes in order to address the objectives of the thesis. The specification and estimation of the empirical models are also discussed. This chapter also presents the design and administration of the choice experiment survey. The chapter ends with the description of the method of data collection and sampling design

#### **3.2 Theoretical framework on Choice Experiment Modeling**

A “Choice Experiment” (CE) is a stated preference (SP) method that was first developed in transport and marketing research (Louviere *et al.*, 2001). Due to the advantage of CE to allow for simultaneous elicitation of multi-attribute benefits (use and nonuse, e.g. in a policy scenario), CE was preferred over the other popular stated preference technique (contingent valuation) for the purpose of this study. Proponents of CE claim that elicitation of the willingness-to-pay and/or willingness-to-accept is more subtle or delicate in choice experiments than in a CVM interview and, as a consequence, the danger of strategic answers and protest bids by respondents is reduced (Ahlheim and Neef, 2006; Yabe and Yoshida, 2006). The use of CE helps in eliciting trade-offs that individuals make when choosing among alternative options or attributes. Through determining the amount of money that respondents would be willing to pay to effectuate a proposed change, it is possible to compute the marginal value of changes in each attribute. In many situations, such an approach may provide more realistic outcomes than focusing on a single change in the provision of the whole good which is a characteristic of most CVM studies (Mogas *et al.*, 2006).

With its emphasis on the combination of various attributes and levels, CE can be used for designing multidimensional policies, for conducting a cost–benefit analysis of such policy

measures and for supporting conflict resolution and negotiations over the protection and use of non-market goods (Bateman *et al.*, 2002; Mogas *et al.*, 2006; Hanley *et al.*, 2007).

Further advantages include its conformity to Lancaster's approach to consumer theory (Lusk and Schroeder 2004; Carlsson *et al.*, 2007).

The theoretical framework of this research is rooted in the Lancasterian approach to consumer theory. A break from the traditional view that utility is derived from a good, Lancaster proposed that a good per se does not give utility to the consumer. Rather, a good possesses characteristics, and these characteristics give rise to utility. Furthermore, Lancaster generalized that goods can possess multiple characteristics which can be shared by multiple goods and that goods in aggregate can possess characteristics different from those pertaining to the goods separately (Lancaster, 1966). In the present context, rice, the good of interest, can be viewed as a collection of its food safety informational attributes, taste, size of grain, aroma and price. Following Lancaster, a consumer with preferences over each of the aforementioned characteristics will choose the bundle of attributes of the good that maximizes his/her utility subject to a budget constraint. In CE, consumers are usually confronted with a series of choice questions that are characterized by specific attributes, levels and prices (Lusk and Norwood, 2005). Lancaster proposes that utilities for goods can be decomposed into separate utilities for their component characteristics or attributes, and random utility theory.

The Random Utility Theory (RUT) is the theoretical basis for integrating behavior with economic valuation in the CE. According to RUT, the utility of a choice is comprised of a deterministic component  $V$  and an error component  $\varepsilon$ , which is independent of the deterministic part and follows a predetermined distribution. This error component implies that predictions cannot be made with certainty. Choices made between alternatives will be a function of the probability that the utility associated with a particular option  $j$  is higher than those for other alternatives (Hensher *et al.*, 2005). The relationship between utility and attributes is linear in the parameters and variables function, and that the error terms are identically and independently distributed with a Weibull distribution.

The basic assumption of random utility theory is based on the premise that individuals act rationally, selecting the alternative that yields the highest utility. Consequently, the probability of selecting a given alternative will be higher if the utility provided by such alternative is the highest among the different choices.

Thus, we can represent an individual  $i$  utility associated with the choice of an alternative  $j$  as,

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

Such that  $V_{ij}$  is the indirect utility function influenced by the attributes of the good and  $\varepsilon_{ij}$  is a random error component, implying from the researcher's view point, that the true utility remains unobservable. From the consumer's viewpoint, the process of maximization of utility consists of selecting an alternative that yields the highest utility. Thus, if the  $i^{th}$  consumer selects type  $j$ , then  $U_{ij}$  is the highest utility obtainable from among the  $J$  possible choices. Hence, the statistical model of the probability that alternative  $j$  is chosen by individual  $i$  is given by

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

where  $\hat{U}_{ij} = X_{ij}\beta$ .

Maddala (2001) shows that when the residuals are independently and identically distributed following a Type I Extreme Value distribution, such as:

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

Then it follows that the difference in error terms, displayed in equation (2), has a logistic distribution. Therefore, a multinomial (conditional) logit model can represent the  $i^{th}$  consumer's probability of selecting the  $j^{th}$  rice choice:

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

where  $\beta$  refers to parameters that weight exogenous variables in determining the utility (Boxall and Adamowicz, 2002; Adamowicz *et al.*, 1998).; and  $X_{ij}$  is a row vector of exogenous variable values corresponding to the rice characteristics, and socio-demographics of the  $i^{th}$  consumer.

The log likelihood of the multinomial conditional logit is given by:

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

where  $y_{ij} = 1$  if alternative  $j$  is chosen by the  $i^{\text{th}}$  individual, and zero otherwise

### 3.3 Empirical specification for the choice model

The empirical specification of the utility levels underlying the multinomial conditional logit which make references to the attributes of each choice is formulated below:

$$U_{ij} = X_{ij}\beta_x + P_{ij}\beta_p + \varepsilon_{ij} \quad (6)$$

Since  $U_{ij}$  is the latent unobservable utility level that the  $i^{\text{th}}$  consumer obtains from choosing the  $j^{\text{th}}$  rice variety, the observed choice is a reflection of this latent unobservable utility.

Note that  $X_{ij}$  represents explicitly the vector of intrinsic rice variety attributes (not including the price attribute), with  $\beta$  being the parameter vector to be estimated including an alternative.

Specific Constant (ASC) and  $P_{ij}$  is the price attribute for alternative  $j$ . The model described in (6) was formulated based on the attribute levels and the responses to the choice experiment survey.

In addition to product attribute variables, other factors may also be important in determining utilities associated with various products. A natural extension of the above model would be to consider respondent individual characteristics. This demographic information is likely to function through product attributes. Thus, interaction terms can be created between respondent demographic variables and attribute variables, and these interaction terms can be included in the model (Colombo *et al.*, 2007).

Inclusion of these interactions of individual-specific characteristics with choice-specific attributes has two advantages. First, these interactions enable accounting for preference heterogeneity across respondents. Accounting for preference heterogeneity in turn enables unbiased estimations of individual preferences and enhances the accuracy and reliability of estimates of demand, participation, marginal and total welfare (Boxall and Adamowicz, 2002).

Furthermore, accounting for preference heterogeneity enables prescription of services/policies that take equity concerns into account. An understanding of who will be affected by a service/policy change in addition to understanding the aggregate economic value associated with such changes is necessary (Boxall and Adamowicz, 2002). Second, inclusion of interactions of individual-specific characteristics with choice-specific attributes is a common solution to dealing with problems arising from violations of the independence of irrelevant alternatives (IIA) property (Rolfe *et al.*, 2002).

To determine the impact of the respondents' socio-demographic variables on the rice choice, and thus, additional specifications including variables such as respondents' age, gender, income and education was estimated. Interacting the rice attributes included in the choice set with the respondent's socio-demographic variables, allows testing whether consumers are more or less likely to select a rice variety given the presence of a given attribute. In particular, an empirical specification of the following form was estimated:

$$U_{ij} = X_{ij}\beta + (Z_i * X_{ij})\alpha + \varepsilon_{ij} \quad (7)$$

Where  $Z_i$  is the vector of the socio-demographic characteristics of individual  $i$ , which is interacted with the different attributes of each choice  $j$  that any given participant  $i$  faces, with  $\alpha$  being the associated parameter vector estimated. The conditional multinomial logit models based on equation 6 and 7 was estimated within a maximum likelihood framework to analyze consumer choice behavior under the condition that different rice choices had different attributes.

The actual model estimated is specified as:

$$\begin{aligned} V_{ij} = & \beta_0 ASC + \beta_1(taste) + \beta_2(food\ safety) + \beta_3(aroma) + \beta_4(long\ grain\ size) + \beta_5(med\ grain\ size) + \\ & \beta_6(price) + \beta_7(taste * gender) + \beta_8(food\ safety * gender) + \beta_9(aroma * gender) + \beta_{10}(long\ grain * gender) + \\ & \beta_{11}(med\ grain * gender) + \beta_{12}(taste * age) + \beta_{13}(foodsafety * age) + \beta_{14}(aroma * age) + \\ & \beta_{15}(long\ grainsize * age) + \beta_{16}(med\ grainsize * age) + \beta_{17}(taste * hhsiz) + \beta_{18}(foodsafety * hhsiz) + \\ & \beta_{19}(aroma * hhsiz) + \beta_{20}(long\ grainsize * hhsiz) + \beta_{21}(med\ grainsize * hhsiz) + \beta_{22}(taste * educ) + \\ & \beta_{23}(foodsafety * educ) + \beta_{24}(foodsafety * educ) + \beta_{25}(long\ grainsize * educ) + \beta_{26}(med\ grainsize * educ) \\ & + \beta_{27}(taste * income) + \beta_{28}(foodsafety * income) + \beta_{29}(foodsafety * income) + \beta_{30}(long\ grainsize * income) + \\ & \beta_{31}(med\ grainsize * income) \end{aligned} \quad (8)$$

Where  $V_{ij}$  is the choice of individual  $i$  choosing alternative  $j$  among the various options.

### 3.3.1 Estimating Willingness to pay for rice attributes used in the model

As expressed above, in the conditional logit the coefficients cannot be interpreted directly as the direct effects of the respective explanatory variables on the probability of choosing each particular rice type. Rather, they represent the direct effects associated with each of the explanatory variables on the (unobservable) utility function, which can be used to calculate the mean willingness-to-pay estimates (WTP) for the rice attributes used in the model. The ratio of two coefficients describes in a linear conditional logit model the willingness of a respondent to trade off one attribute against another. This ratio corresponds to the willingness-to-pay (WTP) for a quality changed attribute, if the attribute in the denominator is a monetary variable (Enneking, 2004). The mean WTP for each attribute is therefore estimated as  $-\frac{\beta_{\text{attribute}}}{\beta_{\text{price}}}$  which the price change is associated with a unit increase in a given attribute.

### 3.3.2 Description of variables and a priori expectations

Taste of the improved rice varieties under evaluation by consumers was included in the model to see how it influenced willingness to pay. It is expected that taste has a positive influence on consumer's preference and willingness to pay for improved local rice varieties. Satisfaction of taste improves consumer's perception of the product and finally influences consumers' willingness to pay for the improved local rice under consideration.

Food safety of each rice type under evaluation was included in the model to see how it influenced the willingness to pay. Thus, whether rice is produce using insecticides and pesticides or free chemical produced. It is expected that food safety has a positive influence on consumer's preference and willingness to pay for improved local rice varieties.

Aroma of the improved rice varieties under evaluation by consumers was included in the model basically to known how it influenced consumers' willingness to pay for the improved local rice varieties. Aroma involves the perception of volatile compounds by receptors in the nose both

before and during the eating process. It is expected that aroma has a positive influence on willingness to pay for the improved local rice varieties.

Another rice attribute included in the model is the size of the rice grain. This is the size of the rice grain irrespective of the shape. It was included in the model to see how it influenced consumers' willingness to pay for the improved local rice varieties. It is expected that the size of the rice grain has a positive or negative influence on willingness to pay for the improved local rice varieties.

Gender of the respondent is included as a demographic factor. The study collected information on the gender of the consumers including male or female. For the purposes of modeling, gender will be recorded as a dummy variable factor where code 1 will be assigned if the respondent is a female and 0 if he is a male. It is assumed that Women are well-known to take decisions on what to eat at home and therefore are likely to know the attributes good rice should have. In a family setting, women are more often responsible for food expenditure in the household (Lancon *et al.*, 2003) as a result, are therefore expected to have a positive impact on the willingness to pay for improved local rice varieties.

Household size and composition (Total number of persons given as the sum of men, women and children) that live in a household was included in the model. This study expects a positive willingness to pay for the improved rice varieties with the household size and its composition. Larger households usually have more food needs (Tshiunza, *at al.*, 2001), and those families that have more children are likely to purchase more improved rice and as a result are likely to pay for improved local rice varieties for home consumption.

Income of the respondent was recorded from the study and included in the model. Income is the total income of the household from crop sales, livestock and non-farm activities. It is hypothesized that consumers' income is expected to cause variations in prices paid for improved local rice varieties due to its effect on consumer behavior (Boccaletti *et al.*, 2000). As income increases, the more consumers are willing to pay for these improved rice varieties and as it decreases, the less the consumers are willing to pay for improved rice.

Education level of the respondent was included in the model as a proxy for willingness to pay for improved local rice varieties. This is literacy of the household head. The study collected data on education levels attained, including none, primary, High school and tertiary. It is assumed that consumers with high levels of education (number of years spent in school) is likely to have high acceptability and willingness to pay for local rice varieties. This is because educated household heads are more knowledgeable on the requirements for adequate nutrition.

It has been suggested that respondents in different age groups and other social groups have different preferences for many food attributes (Pitman and Reinhardt, 2000). It is assumed that younger respondents are more likely to have high acceptability and willingness to pay for improved local rice varieties. It is assumed that younger consumers are active and to meet their daily energy requirements, energy given food is needed (Thomas, 2002).

### **3.4 The choice experiment design of the study**

The first step in CE design is to define the good to be valued in terms of its attributes and their levels (Blamey *et al.*, 2001). The good to be valued in this study is the improved local rice varieties. In this study, we employed a choice experiment approach to evaluate consumers' preferences for the various attributes of rice varieties. In a choice experiment, individuals are given a hypothetical setting, and then asked to choose their preferred alternative from several alternatives in a choice set (Burton *et al.*, 2001). Each alternative is described by a number of attributes that take on different levels. In the case of this study, the consumer households were given choice sets with different alternative rice varieties.

A number of methods exist to identify the demanded attributes for rice products (Alpizar *et al.*, 2003). These include crop breeders and researchers with hands-on experience, literature review, focus group discussions, and individual interviews. Amongst the techniques, a focus group was used. Thirty adult respondents participated in the focus group session; participants were in various age, gender, ethnic, and education level in order to reflect the actual Ghanaian population. Advantages of focus group research include an increased interaction between all participants and the researcher, visual aids and tangible products can be circulated, and areas of

specific interest can be covered in greater depth (Hanis *et al.*, 2012). The aim was both to establish the factors that influence purchasing of rice and to gather information on the most commonly consumed rice which is suitable for use in the main CE study.

Primarily, in the focus group session, there were eight potential attributes (taste, packaging, food safety, aroma, size of grain, texture, color and price) that could be selected by respondents. Respondents were asked to rank the eight potential attributes based on their preferences. Based on the mean score for each attribute, five attributes were selected as the most important attributes for rice, which are taste, food safety, size of grain, aroma and price. The package of attributes that was used in the study is shown in Table 3.1

**Table 3.1 Package of Attributes and Respective Levels Used in the Study**

Attributes	descriptions	Attributes levels	coding
Taste	Taste of rice	Yes No	Dummy variable
Food safety	Whether rice is produce using insecticides and pesticides or free chemical produced	Convectional Organic	Dummy variable
Aroma	Smell of rice after cooking	Perfumed Non-perfumed	Dummy variable
Grain size	The size of the rice grain irrespective of the shape	Small Medium Long	Dummy variable
Price	Amount that consumer will pay for their preferred rice per 5kg	GHC15.00 GHC10.00 GHC9.60	Actual values

The fact that our analysis is based on consumers' preferences for only five traits (taste, food safety, size of grain, aroma and price) of rice should not be translated into saying that these are the only attributes in consumers' variety choice criteria. In almost all choice experiment studies, the researcher has to make a trade-off between being comprehensive (inclusion of all relevant attributes) and the complexity of the choice experiment (Alpizar *et al.*, 2003). That is, as one

tries to include too many attributes in a choice experiment, the associated cognitive demand from respondents in making choices would be too much and respondents may simply answer carelessly or employ some strategic behaviour, which is not a true reflection of their attribute preferences. Thus, the five attributes under study in this thesis reflect the balance between including the most important attributes in our choice experiment with the complexity of the task involved in making choices. Therefore, our stated preference analysis of consumers' preferences for rice variety traits covers only the five attributes mentioned above.

### **3.5 Statement of hypothesis**

The basic hypothesis presented in this study is that consumers are willing to pay a price premium for improved local rice.

1. Taste of rice positively influence consumers' willingness to pay for the improved local rice
2. Aroma has a positive influence on willingness to pay for the improved local rice varieties.
3. The long grain size of rice positively influences consumers' willingness to pay for the improved local rice varieties.
4. Food safety has a positive influence on willingness to pay for the improved local rice

### **3.6 Data collection**

This study is based on data obtained from both primary sources. Primary data that was used for the study was collected from households. Primary data was collected using a structured questionnaire that was administered to the urban rice consumers. One section of the survey was designed to gather information on the socio-economic characteristics of the respondents including, age, education, gender, income, household size, marital status and household expenditure. This information was included to gain insights as to the personal characteristics of the respondents that influence rice purchasing behavior. The second section of the survey covered information on consumers purchasing behavior for rice. The next section of the survey asks consumers about their awareness and knowledge of local rice. Another section of the survey also inquires about information on local rice purchasing habits and factors that influence purchase decisions. A section on consumer perceptions about attributes of rice was added to help

compare consumers' concerns about these perceptions with their corresponding willingness to pay values. The last section (choice selection) of the survey attempts to elicit willingness to pay in an interview format. It was formatted to be as realistic to a real life situation as possible.

### **3.6.1 The study area**

The Kumasi Metropolis is the most popular district in the Ashanti Region. It is second to the Accra Metropolis (5,530) in terms of land area, population size, social life and economic activity. The metropolitan area covers an area of 245 square kilometers as a result of the expansion from the previous area of 150 square kilometers. Generally, the Metropolitan area is located at more or less the central part of the Ashanti region. It lies within latitudes 6°38' north and 6°45' north and longitudes 1°41'05'' west and 1°32' west. It is bounded on the north by the Kwabre districts and on the South by Bosomtwe-Kwanwoma district. On the West and the East, Ejisu-Juaben district and the Atwima districts bound Kumasi metropolis respectively.

The general topography of Kumasi metropolis is undulating with gentle slopes, commonly of 5° to 15°. Its strategic location has also endowed it with the status of the principal transport terminal and has assured its pivotal role in the vast and profitable distribution of goods in the country and beyond. There are ten Sub-Metropolises in the Kumasi Metropolis and these are Bantama, Oforikrom, Asokwa, Tafo, Suame, Manhyia, Kwadaso, Asawasi, Subin and Nhyiaeso (Statistical Service, GES, Kumasi Metropolis).

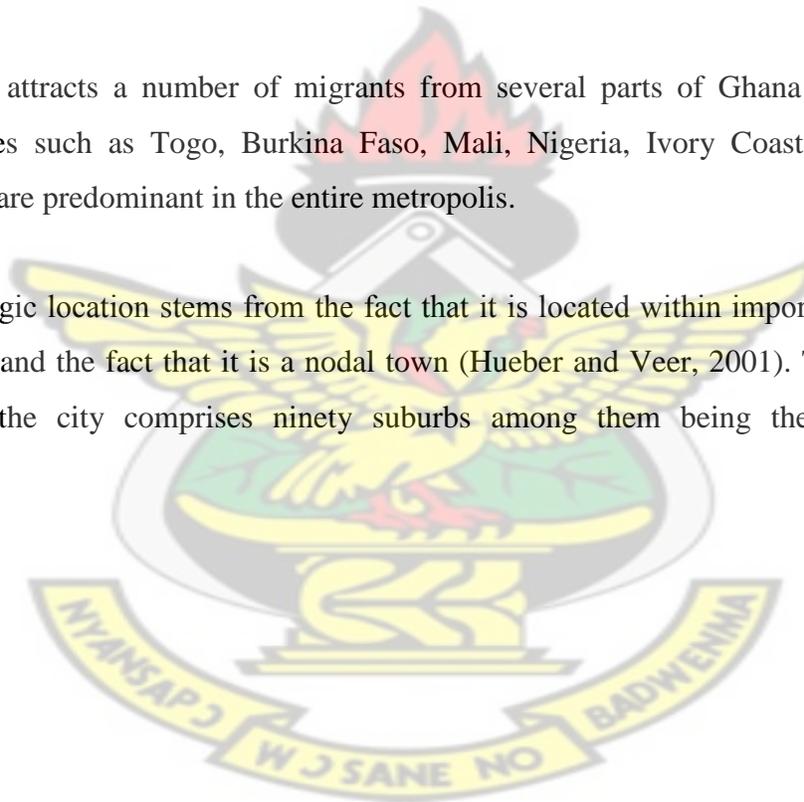
The metropolis lies within the moist semi-humid climatic zone of the country. It experiences two rainfall maxima annually with the annual mean rainfall of about 1345mm. The first rainy season is from mid-March to early July, and the Second season begins from late August to October.

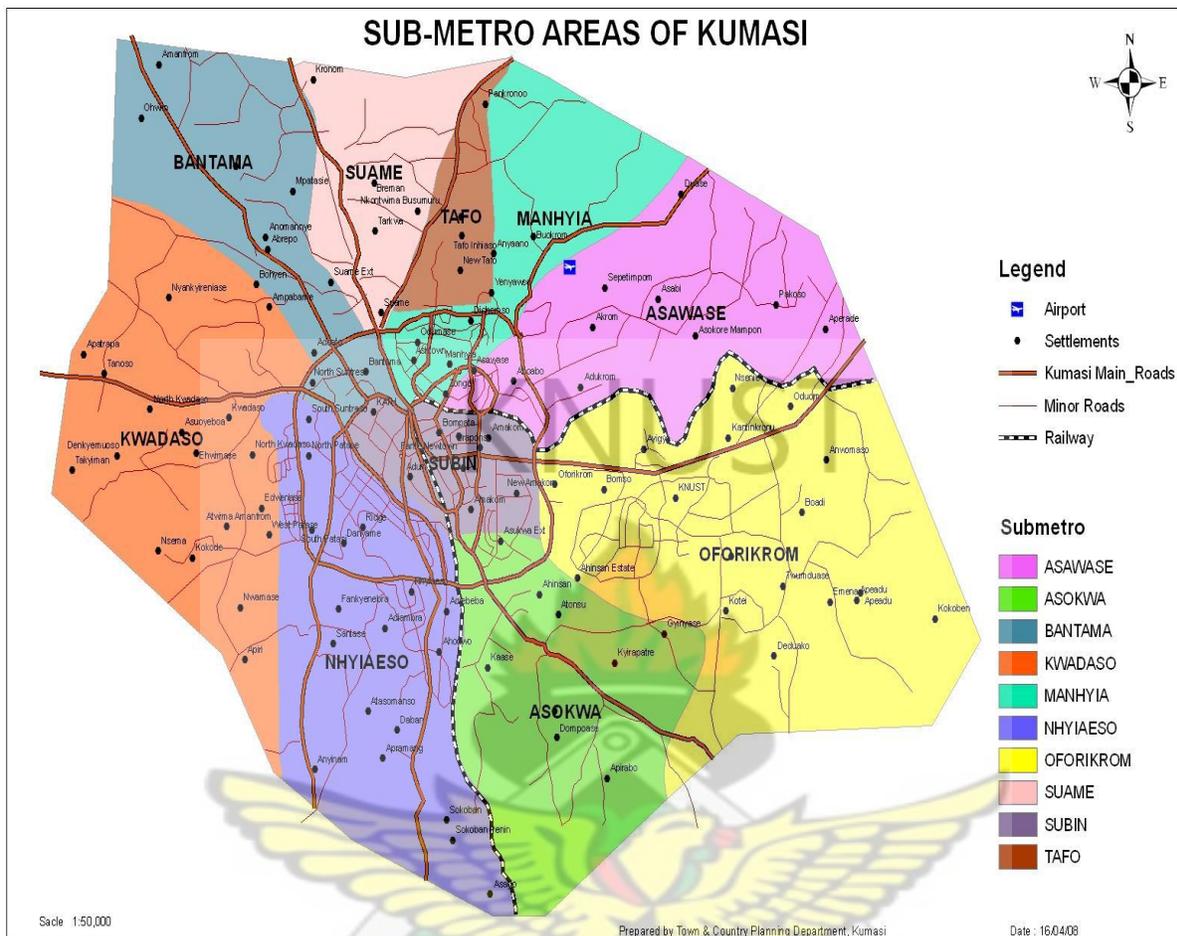
The Kumasi metropolis is the most populous district in the Ashanti Region. According to 2000 population census, the population of Kumasi metropolis was estimated to be 1,170,270 suggesting an annual growth rate over the intercensal period of 4.7 percent (Simon *et al.*, 2001). The future growth of the urban population will undoubtedly be on the increase given this growth rate. Using this rate (on the assumption of higher estimates), the population of the metropolis is projected to increase to about 1,470,000 in 2005 and about 1,850,000 in 2010.

The age structure of the population in the metropolis is skewed towards the youth (2000 Population census). The highest proportions of the population are in the age cohorts 0 – 4 years (13.2%) and 5 – 9 years (12.4%). Cumulatively, 39.9 per cent of the population is below 15 years, in contrast to other districts, which range from 40 to 47 per cent. This may be an indication of a slow, incipient decline in fertility. There are more males (50.2%) than females (48.8%) in the metropolis. The major sectors of the economy fall under Trade/Commerce/Services which accounts for about 71 percent, Manufacturing/Industry which takes up of 24 percent and the Primary Production sector which takes only 5 percent ([www.ghanadistricts.com](http://www.ghanadistricts.com))

The Metropolis attracts a number of migrants from several parts of Ghana and neighboring African countries such as Togo, Burkina Faso, Mali, Nigeria, Ivory Coast. Compound and separate houses are predominant in the entire metropolis.

The city's strategic location stems from the fact that it is located within important road and rail transport routes and the fact that it is a nodal town (Hueber and Veer, 2001). The KMA (2006) estimated that the city comprises ninety suburbs among them being the ten (10) study communities.





**Figure 3.1 Location of Kumasi.**

Source: Town and Country Planning Department, Kumasi, 2002

### 3.6.2 Study population

The target population of interest for this study was all households in Kumasi metropolis. The sampling unit was the household, defined for this study as- a group of people who eat from the same “pot” and share common resources. In order to increase precision and to minimize sampling bias, a total of 400 households were used in this study.

### 3.6.3 Pilot survey

The survey questionnaire was pre-tested to examine its feasibility in line with consumers’ expectations, responses, outcomes, and level of understanding. About 10 consumers were

involved during the pre-test. Following the pre-test, the test results were incorporated in revising the questionnaire in line with consumers' response.

#### **3.6.4 Sampling Technique**

Kumasi metropolis in the Ashanti region was selected for the purpose of this study. The location was purposely chosen because of its cosmopolitan nature in the Ashanti region and as a major consuming area for rice. Rice ranked next to maize as the most important staple in Kumasi, dwellers consume rice between 1 to 3 times a week. (Ghana Living Standard Survey (GLSSV, 2005/06)). At the same time, Kumasi was thought a better area because it has the largest traditional market (Central Market) and other satellite markets within which rice and other food commodities are sold. Therefore studying consumer's preference and willingness to pay for local rice varieties in this area can offer high market potential.

The study employed the multistage sampling method in order to achieve the objectives of the study. Three stage sampling was used to arrive at the respondents interviewed in this study. Stage one involved selection of sub metros, stage two focused on selecting communities while individual households that participated in the survey were the focus of stage three.

In the first stage, out of the ten sub-metros, five of them were used for the survey and these were selected randomly. The selected sub metros includes; Subin, Asokwa, Kwadaso, Asewasi and Oforikrom.

In the second stage two communities from each sub-metro were randomly selected giving a total number of ten communities that is, Asafo and Fante New Town in the subin sub-metro, Atonsu and Ahensan in the Asokwa sub-metro, Kwadaso and Asuoyeboa in the Kwadaso sub-metro, Asawasi and SepeTimpom in the Asawasi sub-metro and Oforikrom and Bomso in the Oforikrom sub -metro.

In the third stage forty household samples were drawn from each of these communities, making the total sample size of four hundred (400). The sampled household in each community was by systematic random sampling; selecting every tenth residential address on a road. This procedure allowed us to obtain a representative sample in the absence of recent census data. Within houses

which have numerous households, systematic random sampling method was also employed in the selection of households. If a household is sampled and it turns out that they do not consume rice, the household is dropped and the next household immediately after that is selected as an alternative. The face-to-face interview method was employed using a structured questionnaire to obtain relevant responses from the sampled household units. This was to provide the opportunity to give explanation to questions which were difficult to answer, to obtain the accurate information required for the study, and also to afford the interviewer the opportunity to educate the respondents. Below is the table showing the distribution of households.

**Table 3.2: Distribution of Households Sampled within the Sampled Residential Communities**

Sub metro	Communities	No of Households
Subin	Asafo	40
	Fante New Town	40
Asokwa	Atonsu	40
	Ahensan	40
Kwadaso	Kwadaso	40
	Asuoyeboa	40
Asawasi	Asawasi	40
	SepeTimpom	40
Oforikrom	Oforikrom	40
	Bomso	40

### 3.7 Data Analyses

Data collected was subject to both descriptive and inferential statistics. Data on the socio-economic characteristics of respondents and consumer evaluation of the rice varieties was coded, summarized and descriptive statistics (mean scores, frequencies counts and percentages) was generated using SPSS and Microsoft Excel 2007 for analysis and interpretation of the information. Empirical models were estimated using STATA 11. Maximum Likelihood Estimation (MLE) Procedure was used.

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSIONS**

#### **4.1 Introduction**

This chapter presents the results and discussions of the study based on the data collected from 400 households from the Kumasi Metropolis. Results are summarized as means, percentages, and coefficients. The chapter has three subsections: the first section looks at the personal and household characteristics of the respondents. The section also discusses results on consumers purchasing behavior for rice and promotional information on improved local rice. The next section presents the empirical estimations results of the conditional logit. The last section presents the results on the Marginal Willingness to Pay.

#### **4.2 Descriptive Results**

This section presents the descriptive analysis based on the survey data collected. The descriptive analyses includes personal and household characteristics, consumers purchasing behaviour for rice, the attributes consumers consider when buying rice, consumers' knowledge and patronage of local rice. Promotional information on improved local rice and perceptions of consumers of improved local rice are also discussed in this section.

##### **4.2.1 Personal and household characteristics**

To position the study in the right frame, it is imperative to understand the personal and household characteristics of rice consumers in the study area. This was done with the hope of identifying those characteristics that may help to explain the consumption and preference for rice in the study area. Characteristics of rice consumers such as sex, age, household size, educational attainment, marital status and income level are important in conducting product market acceptance studies because they influence consumption patterns and willingness to pay (Campiche *et al.*, 2004). Some personal and household characteristics of the respondents in this study are presented in Table 4.1.

**Table 4.1: Distribution of respondents according to personal and household characteristics**

Characteristics	Frequency (n= 400)	Consumers (%)	Mean
<b>Sex</b>			
Male	126	31.5	
Female	274	68.5	
<b>Age</b>			34.30
<b>Marital status</b>			
Single	111	27.8	
Married	289	72.2	
Average Household size			4.94
<b>Educational level</b>			
None	37	9.2	
Elementary/JHS	160	40.0	
Secondary	138	34.5	
Tertiary	65	16.2	
<b>Working status</b>			
Working full-time	342	85.5	
studying	29	7.2	
Working part-time	17	4.2	
Retired	12	3.0	
<b>Main employment</b>			
Government	85	21.2	
Self-employed	187	46.8	
Non- government	101	25.2	
Other	27	6.8	
Average income per month			317.95
<b>Ethnic group</b>			
Akan	281	70.2	
Ewe	26	6.5	
Ga	14	3.5	
Frafra	19	4.8	
Dagomba	28	7.0	
Other	32	8.0	
Household weekly expenditure for food			89.06
Household weekly expenditure for rice			28.79

Source: Field survey, 2012

Results in Table 4.1 shows that greater proportions (68.5%) of respondents were females' while (31.5 %) were males. This finding may not be unconnected with high female participation in the household work in traditional African household. Gender wise, rice purchase is dominated by female consumers. In a traditional Ghanaian household, women (females) are responsible for purchasing and preparing of food (Assibey-Mensah, 1998). It has been reported that women are at the centre-stage in household food consumption; it is the women's duty in most African households to take decisions on the types of food that are made available and the forms in which they are prepared for consumption by members of the household (Isife and Emodi, 2000).

The mean age of respondents was 34.3 years with a minimum age of 19 years and a maximum age of 76 years. The average age of the respondents indicates that most of the respondents are within the working age group, likely to have some disposable income for household expenditure. This also indicates that consumers are active and to meet their daily energy requirements, energy given food such as rice is needed. This is in consonance with Juliano, 1985 who asserted that labouring adults require milled rice to meet the daily carbohydrate and protein needs for sustenance.

It was also indicated in the table that majority (72.2%) of the respondents were married while the remaining (27.8%) were single. Cooking remains the exclusive responsibility of women that are married and the preferred food is rice (Basorun, 2008). Rice availability and prevalence has become major determinants of the welfare of the African consumers (Nwanze *et al.*, 2006).

The size of household to a large extent determined both the frequency and amount of food that would be purchased by the household. Normally, the larger the household size, the bigger the quantity of rice consumed as opposed to those with smaller one. The mean household size as indicated in table 4.1 was approximately 5 persons per household with the minimum household member of 1 and the maximum household members of 10 persons. Earlier studies (Stewart *et al.*, 2004) have suggested that household size and a large number of dependants partly influence food choices.

Respondent's education level was categorized into none/never been to school, elementary/JHS, secondary school and tertiary. Respondents stated the highest level of education obtained when answering questionnaires. Result from the table indicates that about (9.2%) have not been to school before, (40.0%) have attended elementary/JHS, (34.5%) have attended secondary school and (16.2%) have attended tertiary. The average number of years of education among the respondents was 9.32, which is higher than the average Ghanaian schooling years of 5.16 (GLSS, 2000), signifying that most of the consumers captured in this study are to some extent educated. It is expected that consumers with high levels of education (number of years spent in school) are likely to have high acceptability and willingness to pay for the improved local rice varieties.

Respondent working status was grouped into working full-time, studying, working part-time and retired. Full-time workers recorded 85.5% of the respondents', 7.2% were students, 4.2% and 3.0% were working part-time and retirees respectively.

For respondents' employment, the categories of employment were divided into four categories. The categories were; the government sector, self-employed, non-government, and others. Respondents working with the government sector recorded 21.2%, 46.8% were from self-employed, 25.2% and 6.8% were non-government and others respectively. The average monthly income of the survey consumers was indicated in the table as GH¢ 317.95, with the minimum monthly income of GH¢ 50 and a maximum monthly income of GH¢ 1000. The results indicate that most of the respondents are probably in a more convenient financial position to buy rice.

In terms of ethnic, 70.2% were Akans, 6.5% were Ewes, 3.5% were Ga, 4.8% and 7.0 % were Frafra and Dagomba respectively and 8.0 % were from other ethnics. This is not surprising since the study was conducted in the Ashanti region which is dominated by the Akans.

On average respondents indicated that their household spent GH¢ 89.06 weekly on grocery stores and other food stuffs. On the other hand respondents indicated that their household spent GH¢ 28.79 weekly on rice.

#### 4.2.2 Consumers purchasing behavior for rice

The results of the study indicate that most of the respondents are regular consumers of rice (Table 4.2). With 12.8% of the respondents consuming rice at least once a week while 39.2% consumed rice 2 to 4 times a week. Majority (48.0%) of the respondents consumed rice every day. This indicates that as a human food, rice continues to gain popularity in many parts of the world where other coarse cereals, such as maize, sorghum and millet, or tubers and roots like potatoes, yams and cassava have traditionally dominated (Chang, 1985).

As indicated in Table 4.2, majority (62.8%) of the respondents preferred imported rice, while 15.8% of the respondents preferred local and 21.5% preferred both local and imported rice. High preference for imported rice over locally produced rice has been confirmed by an earlier study in Ghana and this has been attributed to factors like variations in physical characteristics, nutritional quality and cooking and pasting behaviors (GLG-SOFRENCO, 1997). There are many factors determining the level of rice consumption at any time: milling quality; cooking, eating and processing quality; nutritive quality; and specific standards for cleanliness, soundness and purity (Webb, 1979). This indicates that quality differential between local and imported rice seems an important consideration in the decision making process. The inability of the local rice to match the imported rice is the major constraint that affects the development of Ghanaian rice sector. Results from the study therefore indicate the need to improve the quality of local rice to attract the attention of the consumers'.

Identifying the retail stores or markets are important in the marketing strategy as it may influence the consumers' preferences and purchasing behavior on the rice brands. A total of (34.2%) of the respondents preferred to purchase rice from supermarket rather than the open market (52.0%) and shop/store (13.8%). It was due to the location of these stores that were proximate to their homes and the availability of various kinds of products which gave them more options and greater choices. The findings of the study is similar to Diako *et al.*, (2010) on Consumer Perceptions, Knowledge and Preferences for Aromatic Rice Types in Ghana

Rice is bought in quantities from as little as “margarine tin” to as much as 25kg size. Results in Table 4.2 show that majority (55.0%) of the respondents usually purchase 5kg of rice while

(18.2%) of the respondents buy rice in Margarine tin with (26.8%) of them purchasing 25kg bag of rice. This indicates that the most preferred packaging of rice is the 5kg bag. This is not surprising though, since most markets where rice is sold are mostly dominated by the 5kg bags.

Majority of the respondents (97.0%) said they usually consumed rice in the house. Few respondents' (0.5%) and (2.5%) consumed rice at the restaurant and work place respectively. Since most of the respondents either hardly or occasionally eats cooked rice sold at the food service points, it indicates that respondents' eat home cooked rice. The result of the study indicate that respondents buy the raw rice from the sales outlet and, therefore, their specific preferences regarding raw rice will very much determine their choice of purchase of a particular rice brand on the market.

Rice is used in a wide range of food products in Ghana, and the most common include jollof rice, rice balls (Emotuo), Waakye, fried rice and rice and stew. The various rice products are fundamentally different in their appearance and characteristics. Respondent were asked their favourite meal that normally contains rice. Many consumers (33.2%) said that jollof rice is the most preferred dish that contains rice. With (17.0%) and (6.5%) of the respondent preferred Emotuo and waakye respectively. Fried rice was consumed by (3.5%) and (39.8%) of regular rice consumers' preferred rice and stew. 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).

**Table 4.2: Purchasing behavior of rice consumers**

<b>Variable</b>	<b>Frequency (n=400)</b>	<b>Percent (%)</b>
<b>Frequency of eating rice</b>		
Once a week	51	12.8
2 to 4 times a week	157	39.2
Every day	192	48.0
<b>Type of rice</b>		
Imported rice	251	62.8
Local rice	63	15.8
Both local and imported rice	86	21.5
<b>Location of purchase</b>		
Open market	208	52.0
Supermarket	137	34.2
Mini shop/store	55	13.8
<b>Quantity of rice consumed</b>		

Margarine tin	73	18.2
5kg bag	220	55.0
25kg bag	107	26.8
50kg	-	
Others	-	
<b>Place rice is usually eaten</b>		
Home	388	97.0
Restaurant	2	0.5
Party	-	-
Work place	10	2.5
Other	-	-
<b>Favourite meal</b>		
Jollof	133	33.2
Emotuo	68	17.0
Waakye	26	6.5
Fried rice	14	3.5
Plain rice and stew	159	39.8

Source: Field Survey, 2012

The popularity of rice among people of different socio-economic backgrounds as seen from this study is because rice in Ghana continues to satisfy the need for an inexpensive and convenient food above the perishable traditional staples like cassava, yam and potatoes in the urban centres (FAO, 2005).

#### 4.2.3 The attributes consumers consider when buying rice

Consumers who purchased rice were asked to rank the attributes they consider when buying rice on a scale from most important to least important with 1= most important, 2= second most important... and 8= least important. Majority of the respondents ranked taste as the first most important characteristic considered when purchasing rice. Food safety of rice was ranked second, aroma was ranked third, price was fourth, color of rice grain was fifth, grain size was sixth ranked and texture was the seventh-ranked attribute. Packaging of rice was considered the least-important attribute. This is indicated in the Table 4.3. (Note: Mean importance is calculated with the values of 1 for most important and 8 for least important. Hence, a lower mean indicate a greater importance).

**Table 4.3: Relative Importance Rankings by Consumers for rice attribute**

Attributes	Mean rank
Taste	2.00
Food safety	3.00
Aroma	3.14
Price	4.96
Color	5.49
Grain size	5.76
Texture	5.77
Packaging	5.87

Source: Field Survey, 2012

To determine whether or not rice consumers differentiate between these various rice attributes, the Kendall's coefficient of concordance were applied. The test results are presented in Table 4.4 below.

**Table 4.4 Kendall's Coefficient of Concordance**

Test Statistics	
N	400.00
Kendall's W	0.40
Chi-Square ( $\chi^2$ )	1081.00
Degree Of Freedom	7.00
P-Value	0.00

The Kendall's Co-efficient of Concordance (W) for the rankings of rice attributes as shown in table 4.4 above is 0.40. This means that the degree of agreement on a zero to one scale is 0.40. The degree of unanimity as measured by the W-statistics is about 40% since the score is zero for random ranking and 1 for perfectly unanimous ranking. Thus, to a large extent, there is agreement among respondents with regards to the rankings provided. The asymptotic distribution gave a significance level value of 0.000, which is less than 0.05. Thus, the null hypothesis (the rankings disagree) is rejected and the alternative hypothesis (the rankings agree) is accepted. Thus consumers in the study area can therefore, be said to generally agree that the most important attributes of rice are more related first to taste, secondly to food safety, followed by aroma, price, color, grain size, texture with packaging been the least important attributes.

#### 4.2.4 Consumers' knowledge and patronage of local rice

Respondents were asked if they are aware of the benefit of eating local rice. Majority (62.0%) of the respondents affirmed the benefit of eating local rice while 38.0% of the respondents are not aware of the benefit. Majority (60.5%) of the respondents admitted that they have not purchase local rice for the last six month. Consumers who have not purchase local rice were asked to rank the most important reasons why they choose not to purchase locally produced rice on a scale from most important to least important with 1= most important, 2= second most important... and 6= least important. Majority of the respondents ranked less availability as the number one reason (Table 4.5). This was followed by inferior taste, poor appearance, and low nutrition, expensive and do not trust the quality of local rice was ranked last. The result is reported in the Table 4.5. (Note: Mean importance is calculated with the values of 1 for most important and 6 for least important. Hence, a lower mean indicate a greater importance).

**Table 4.5: Reasons consumers do not patronize locally produced rice.**

Reasons	Mean rank
Less availability	2.34
Taste is inferior	3.02
Poor appearance	3.37
Low nutrition	3.86
Do not trust the quality of rice produced locally	4.10
Expensive	4.32

Source: Field survey, 2012

Those respondents (39.5%) who buy locally grown rice, however, were then asked their reason for buying local rice. Different aspects influenced their purchasing behavior. With (10.5%) of the respondent who buy local rice claimed that they purchase local rice because of the belief that local rice has high nutritional quality and therefore good for their health while (8%) of the respondents indicated that the availability of local rice in their market was one of their reasons why they buy local rice. Another essential aspect was the belief that local rice was delicious or has good taste (13.0%) and that local rice has a cheaper price compared to the imported rice (8.0%). Other reasons for purchasing local rice not included in the questionnaire were also identified. Some respondents pointed out that they buy the improved local rice because they wanted to try it and check its quality or they wanted to try something new. Few

respondents claimed that they buy the improved local rice because they wanted to help the local economy.

All (100%) of the respondents affirmed that upon buying rice they can differentiate between local and imported rice. This indicates that consumers' pays attention to the attribute of rice and it therefore influences their purchasing decision. This also indicates that quality differential in terms of attributes between local and imported rice seems an important consideration in the decision making process.

The study in addition intended to find out five main characteristics that respondents can use to differentiate local rice from imported ones when buying or eating rice. The results show that cleanliness (74.2%) is the most important characteristic for consumers to differentiate local rice from imported ones. Consumers indicated that the general trend on the market showed that most of the imported rice was cleaner than local rice. Therefore on the basis of cleanliness most consumers considered imported rice to be superior in quality.

After cleanliness, presence or absence of foreign material (72.0%) was another important characteristic for consumers to differentiate between local and imported rice. Respondents indicated that imported rice is superior in terms of quality attribute. The high level of foreign materials (stones and others) in local rice makes it less superior to imported rice. Stones are virtually non-existent in imported rice.

This was followed by whiteness or color of rice grain (67.2%). Though some local rice is whiter than some imported rice, the general trend on the market according to respondents showed that most of the imported rice was whiter than local rice. Therefore on the basis of colour most consumers considered imported rice to be superior in quality and can therefore used this to differentiate between the local and the imported rice. This was followed by taste (61 %). Respondents indicated that upon eating rice they are able to differentiate between local and imported rice. About (56.8%) of the respondents indicated aroma as the main characteristics they can use to differentiate between local and imported rice. Respondents indicated that most imported rice is perfumed.

In general, consumers' perceptions about the current price of local rice compared to the imported rice are very positive. Majority (45.8%) of the respondents reported that the price of local rice products compared with imported rice is reasonable while (3.5%) and (12.0%) of the respondent reported that the price is higher and lower respectively. About (38.8%) of the respondent reported that the current price of local rice compared to imported rice is the same.

Only (7.0%) of the 400 respondents stated that they are satisfied with the quality of local rice at present while (46.2%) of the respondents said that they are averagely satisfied with the quality of local rice at present. Majority (46.8%) of the respondents were definitely not satisfied with the quality of local rice. This indicates that, quite a lot of people are quite doubtful of the quality of local rice. Therefore efforts should be made to improve the quality of local rice.

#### **4.2.5 Promotional information on improved local rice**

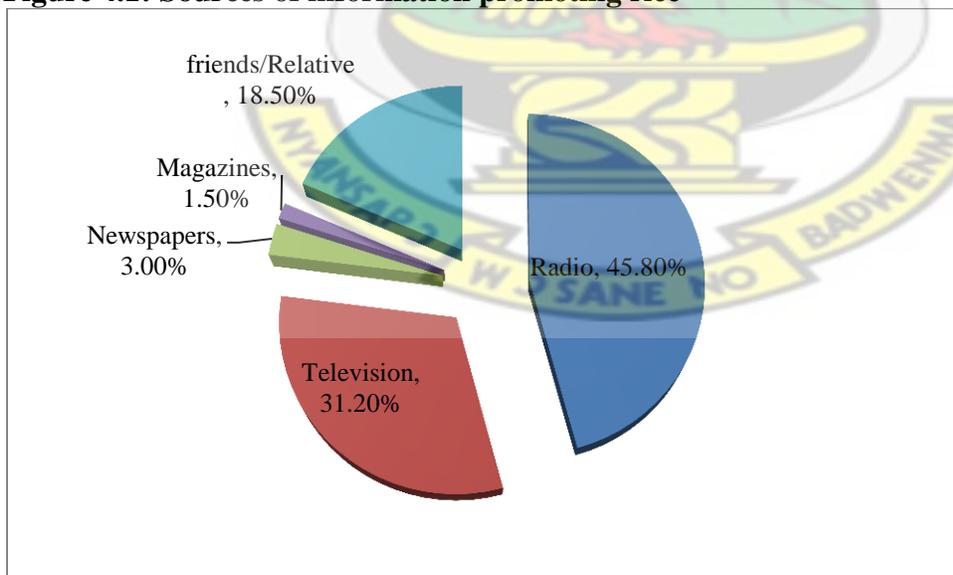
Awareness is a major promotion tool. It is useful to create maximum interest and offered adequate knowledge of the product. The majority of respondents (71.8%) do not know of any locally improved cultivated rice type in the country. Only few people (28.2%) acknowledged having bought locally improved rice. This results show that the knowledge and awareness level among the surveyed consumers about improved local rice was very low and not adequate. One important reason for the low patronage of improved local rice can be attributed to unfamiliarity and lack of promotions. Consumers who are not familiar with improved local rice might not be keen to try it. Zellner (1991) observed that familiar foods are generally liked more than unfamiliar foods. However, through identifying the relevant market segment with offering improved local rice at a price that consumers are willing to pay and creating a distribution system can make the product available to the customer in the right place at the right time. Improved local rice is expected to be preferred compared to imported rice due to the nutritional level offered. The supply sides have to find the right products for the right customers, rather than the right customers for the products.

There were various reasons why consumers' preferred to purchase new rice brand in the market. Generally, the rice attributes become the main reasons and normally used to judge rice quality and taste. Respondents purchase a particular type of rice largely due to its nutritional or health

properties (34.2%). Price (13.5%) was also becoming the important factor for respondents to concern during purchasing new rice product. With (35.5%) and (1.5%) of the respondent indicating that they buy new rice product due to advertisement and premium offered by company respectively. About (13.8%) of regular rice consumers' indicated that they buy new rice because of product appearance while (1.5%) buys new rice due to attractive packaging. According to them, packaging can link with the quality and can easily attract and persuade respondents to purchase the product.

Access to information about local rice is important. During the survey all (100 %) of the respondents have received information promoting imported rice before. As indicated in the figure 4.1 majority (45.8%) of the respondents have received information promoting imported rice on the radio. With (31.2%) and (3.0%) of the respondent have received information from Television and newspapers respectively. Only (1.5%) of the respondents have received information on rice from magazines. About (18.5%) of the consumers' have received information from friends/relatives. It can be inferred from the analysis that rice promotion is very popular on the media, especially on radio and television. Therefore, in order to promote local rice the media, especially radio and television should not be left out.

**Figure 4.1: Sources of information promoting rice**



Source: Field Survey, 2012

Respondents who have received information on rice were then asked what the promotion of rice was about. About (20.0%) of the respondent said the promotion was on taste. With (11.8%) and (47.0%) of the consumers' claiming that the promotion about rice was on quality and nutritional benefit respectively. Only (11.2%) of the respondent said aroma while (10.0%) of the respondents said price.

In order to find means of promoting locally improved rice respondents were asked which medium they wish to receive information on local rice. Majority (58.0%) of the respondent wish to receive information on improved local rice on the television, while (38.2%) of the respondent opted for radio. Only (3.8%) of the respondent chose newspaper. Radio and Television, the most popular media and primary channel for advertising of local rice among the survey consumers' is intended to attract consumer's attention. Hence, the consumer who gains information on local rice from the radio and television are intended to pay more.

About (93.8%) of respondents claimed that they are willing to buy local rice. This could bring in a positive sign that there will be demand for local rice in the future and prospects for developments of rice industry in Ghana.

Consumers' willingness to purchase is influenced by various factors. To identify the factors influencing the consumption of locally grown rice, respondents were asked to identify factors that would lead to increased consumption of local rice in the future. The key factors accounting for the low consumption of local rice from the respondent includes the following; Taste is inferior, poor quality as compared to the imported rice, Packaging not attractive, poor appearance, Less availability of local rice compared to imported rice, Discoloration, presence of impurities (e.g. stones), Undesirable odor and taste and lastly absence of promotional campaign about local rice as compared to the imported rice. Besides, some of the consumers also mentioned that they do not trust the product (local rice) as pure because there is no proper mechanism that ensures its safety.

Some respondents also advocated for developing public awareness campaigns to promote local rice and also to maintain a reasonable/affordable price to attract consumers. Some of the

consumers reported that there is urgent need to work on processing of local rice, packaging and labeling to inform the consumers. In such cases, consumers have put forward their opinion for the certification of the products with authorized certification body, which can be helpful to promote local grown rice products in the market. Information on the products including the nutritive value, origin, manufacture and expiry date as well as brand name whether it is pure organic or not are the important aspects of the product development and meantime will also encourage consumers to buy without any hesitation.

#### **4.2.6 Perceptions of consumers of improved local rice**

In order for consumers to accept and pay for a product, that particular product must possess attributes that are considered most important and attractive to consumers' attention. Benedict *et al.*, (1996) suggested that the product' quality attributes forms the basis for consumer preferences for a product.

Respondents were asked that, in their decision to buy improved local rice, how they will rate the importance of the following rice attributes. Each attribute was measured on a four point likert scale from (very important to important). The value four was the highest degree of importance. The positive scores were 0.5 for important, 1 for very important, -1 for not important and -0.5 for somewhat important. The rice attributes which include price, convenience of packaging, food safety, aroma, size of grain, after cook texture, taste, ease of preparation and brand name or labeling when purchasing improved local rice.

About (50%) of the consumers agreed that food safety was important factor to be considered in their purchasing decision and (40.8%) agreed that food safety was very important factor to be considered in their purchasing decision. The average score for the food safety attribute was 0.64. Most (56.5%) of them also agreed that aroma was important factor to be considered in their purchasing decision, while (28.2%) agreed that aroma was very important attribute to be considered in their decision and the average score for the aroma attribute was 0.49. About (55%) agreed that grain size was an important factor in their decision to purchase improved local rice while (18.8%) agreed that grain size was very important with the average score of 0.33. Also (50.2%) of the respondents agreed that texture was important attribute to be considered in their

decision to purchase local rice whites (17.2%) considered the attribute to be very important. The average score for the texture attribute was 0.26. In addition (51%) of the respondents claimed that they consider color of grain to be important attribute to influence their decision to purchase local rice whites (23.2%) agreed that color of grain was very important with the average score of 0.36. Lastly (55.2%) of the respondents claimed that taste was important with (29.8%) of the respondents supporting that taste was very important attribute. The taste attribute recorded an average score of 0.50. Averaging the six scores on product attribute gave a product attribute index (PAI) of 0.43.

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About (63%) of the respondents claimed that convenience of packaging was important attribute and (16.2%) considered convenience of packaging to be very important with an average score of 0.37. Also (57%) agreed that branding was important attribute while (20.8%) of the respondents claimed that branding was very important attribute with the average score of 0.39. About (42%) of the respondents agreed that price is a very important factor to be considered in their purchasing decision and (53.2%) considers price to be important while 5.2% considers price to be somewhat important. The price attribute recorded an average score of 0.66. Averaging the mean scores gave a marketing attribute index (MAI) of 0.47.

More than half (53.8%) of the consumers were of the view that ease of preparation was an important attribute to consider in their decision to purchase local rice whites only (9%) of the respondents claimed that the attribute was very important and the cooking attribute index (CAI) was 0.15.

**Table 4.6: Perception of consumers of improved local rice attributes**

Attributes		Very Important	Important	Somewhat Important	Not Important	Mean Score
Product Attributes	Food safety	163 (40.8)	212 (53.0)	25 (6.2)		0.64
	Aroma	113 (28.2)	226 (56.5)	61 (15.2)		0.49
	Size of grain	75 (18.8)	220 (55.0)	104 (26.0)	1 (0.2)	0.33
	Texture	69 (17.2)	201 (50.2)	130 (32.5)		0.26
	Color of grain	93 (23.2)	204 (51.0)	103 (25.8)		0.36
	Taste	119 (29.8)	221 (55.2)	60 (15.0)		0.50
	PA index					0.43
Marketing attributes	Convenience of packaging	65 (16.2)	251 (62.8)	83 (21.0)		0.37
	Branding	83 (20.8)	228 (57.0)	86 (21.5)	3 (0.8)	0.39
	Price	166 (41.5)	213 (53.2)	21 (5.2)		0.66
	MA Index					0.47
Cooking attribute	Ease of preparation	36 (9.0)	215 (53.8)	131 (32.8)	18 (4.5)	0.15
	CA index					0.15

Percentages are in parentheses

Source: Field survey, 2012

In addition to purchasing behaviour, respondents' perception about local rice was elicited by giving a series of statements. Each perception statement was measured on a five point likert scale with score from (-1 for strongly disagree to 1 for strongly agreed). The positive scores were 0.5 for agree, 1 for strongly agree, 0 for undecided, -1 for strongly disagree and -0.5 for disagree. The study investigated consumer's perception on the quality, benefit and marketing associated with the consumption of local rice.

Most (73.8%) of the consumers sampled agreed and (11.0%) strongly agreed to the statement that rice produced in other countries is more likely to be of higher quality than local rice. About (2.0%, 11.0% and 2.2%) of the consumers respectively said they are undecided, disagreed and

strongly disagreed to the statement above with the average score of 0.40. Most of them also agreed (78.5%) and (11.5%) strongly agreed to the statement that, they are willing to pay more for improved local rice of better quality, wherein only (9.2%) disagreed to the statement. However, 0.8% was neutral to the statement. The average score for the statement was 0.23. Averaging the two scores on quality gave a Quality perception index (QPI) of 0.32.

A perception statement was read and explained to consumer's understanding. With (12.8%) of the consumers sampled strongly agreed to the statement that rice produced from other countries are likely to be safer or healthier than local rice while (79.8%) agreed to the statement. Respondents, who were undecided, disagree and strongly disagree were (1%, 5.5% and 1%) respectively. The average score for this perception statement was 0.49. Most of them also agreed (44.4%) and strongly agreed (8.2%) that if Ghana could buy all its rice from other countries cheaper than it can be produced. Respondents, who were undecided, disagreed and strongly disagreed were (2.0%, 39.5% and 6.0%) respectively and the average perception was -0.12. Majority (49.2%) of the respondents agreed and (37.5%) strongly agreed to the statement that they will buy improved local rice if they are more nutritious with an average score of 0.57. Respondents also agreed (48.5%) and strongly agreed (38.2%) to the statement that they will buy improved local rice if they are tastier with an average score of -0.19. Averaging the four scores on benefits gave a Benefit perception index (BPI) of 0.19.

More than half (55.5%) agreed and (26.2%) strongly agreed that they will buy improved local rice if it becomes more available. This gave the mean score of -0.07. Also (33.0%) agreed and (6.2%) strongly agreed that they will buy improved local rice if is not labelled or branded. Respondents, who were undecided, disagreed and strongly disagreed to the statement were (4.2%, 46.0% and 10.5%) respectively and this gave a mean score of 0.10. Most of the respondents strongly agreed (45.2%) and agreed (33.0%) to the statement they will buy improved local rice if they are well packaged with the average score of 0.45. Averaging the mean scores gave a marketing perception index (MPI) of 0.16.

**Table 4.7: Consumer perception on local rice**

Perception Statement		Strongly agree (1)	Agree (0.5)	Undecided (0)	Disagree (-0.5)	Strongly disagree (-1)	Mean score
Quality	Rice produced from other countries are likely to be of higher quality than local rice	44 (11.0)	295 (73.8)	8 (2.0)	44 (11.0)	9 (2.2)	0.40
	Am willing to pay more for improved local rice of better quality	46 (11.5)	314 (78.5)	3 (0.8)	37 (9.2)	0 (0.0)	0.23
	Quality perception index (QPI)						0.32
Benefit	I will buy improved Local rice if they are more nutritious	150 (37.5)	197 (49.2)	14 (3.5)	39 (9.8)	0 (0.0)	0.57
	I will buy improved Local rice if they are more tastier	153 (38.2)	194 (48.5)	14 (3.5)	39 (9.8)	0 (0.0)	-0.19
	If Ghana could buy all its rice from other countries cheaper than they could produce they should	33 (8.2)	177 (44.2)	8 (2.0)	158 (39.5)	24 (6.0)	-0.12
	Rice produce from other countries are likely to be healthier or safer	51 (12.8)	319 (79.8)	4 (1.0)	22 (5.5)	4 (1.0)	0.49
	Benefit perception index (BPI)						0.19
Marketing	I will buy improved Local rice if it becomes more available	105 (26.2)	222 (55.5)	10 (2.5)	61 (15.2)	2 (0.5)	-0.07
	I will buy improved Local rice if is not labeled or branded	25 (6.2)	132 (33.0)	17 (4.2)	184 (46.0)	42 (10.5)	0.10

I will buy improved Local rice if they are well packaged	181 (45.2)	132 (33.0)	11 (2.8)	14 (3.5)	62 (15.5)	0.45
Marketing perception index (MPI)						0.16

Percentages are in parentheses  
Source: Field Survey, 2012

The statements discussed above means a lot for local market potential for the crop, if promoted and strengthened, it can become a stable delicacy for all income and age groups, as there are signs that respondents are willing to buy the improved local rice if it becomes available in the market.



### **4.3 Empirical results**

This section discusses the conditional logit estimates and also calculates the willingness to pay estimates. The results for these estimations are presented in Table 4.7. The data was first edited in SPSS in order to match the requirements of the conditional logit analysis. The data was then coded so that each respondent faced 10 options, or two alternatives not including the no-choice option for each of the 5 choice sets.

The dependent variable in the model was the choice probability of alternative  $i$  from the choice set, explained by the attribute levels of the alternatives. The choice was then coded as a dummy variable being equal to one if the alternative had been chosen and zero if not. Price was treated as a continuous variable and the other attributes were coded as dummy variables, taking either the value -1 or 1. For every dummy attribute one level was defined as a reference level and it was left out of the model to avoid perfect multicollinearity. Some of the attribute levels were interacted with the socio economic variables in order to account for observed heterogeneity among respondents (Jaffry *et al.*, 2004; Pouta *et al.*, 2010). The interaction was also done in order to find out whether significant interaction effects exist.

#### **4.3.1 Conditional logit model statistics, models with and without interactions**

The conditional logit estimation was first run without interaction variables in order to see whether the inclusion of the interactions actually improved the model fit. Table 4.8 illustrates that the conditional logit model without the interactions had a poorer fit than the one with interactions: the log-likelihood (LL) for the model without the interactions was smaller than the one with interactions, and also the pseudo  $R^2$  value was smaller for the model without interactions than the one with the interactions. This suggests that the model with the interactions described better the choice probabilities of the respondents.

**Table 4.8: Conditional logit model statistics, models with and without interactions**

	Log-likelihood	Pseudo- R <sup>2</sup>
Model without interactions	-4233.78	0.2234
Model with interactions	-4210.2341	0.2277

Source: Author's calculations, 2012

### 4.3.2 Consumer preferences for rice attribute

The results of the conditional logit model with and without interactions are reported in Tables 4.9 and 4.10. The constant term, referred to as “alternative specific constant”, or ASC in the literature, is dropped from the final indirect utility function and therefore not included in the model estimation because, although the choice sets included status quo or an opt-out option, none of the respondents chose the status quo and this therefore justifies its exclusion from the final model (Bateman *et al.*, 2003).

The coefficients obtained as the result of the estimations explain the impact that each attribute had on the choice of the product. Significant positive coefficients indicate that the attribute level in question had a positive impact on the probability that the consumers' choose the alternative and negative ones mean that the consumers had some degree of aversion for that product attribute. For continuous variables such as the price a negative coefficient means that the smaller variable value the larger the utility derived from the alternative and the probability to select it. A coefficient value near zero implies that the consumers were indifferent for the rice attribute.

**Table 4.9: Conditional logit without the interaction**

Attributes	Coefficients	Std. Err	Z-value
Taste	-1.4831***	0.0553	-26.77
Food safety	2.2562***	0.0571	39.46
Aroma	0.1661***	0.0481	3.45
Price	-0.4574***	0.0222	-20.57
Long	1.7617***	0.0592	29.72
Medium	-0.1134**	0.0500	-2.27
Number of observations			400
LR chi2 (6)			2435.64
Prob> chi2			0.0000
Log likelihood			-4233.78
Pseudo R-Squared			0.2234

Note: \*\*\*, \*\* and \* indicates significant at 1%, 5% and 10% respectively

Source: Author's own calculation

Result of the conditional logit without the interaction terms (Table 4. 9) shows that all the choice specific attributes of rice are statistically significant. However, basic conditional logit as indicated in table 4.9 assumes homogeneous preferences across households presented with each version of the choice experiment questions (Birol, 2004). However, preferences across households are in fact heterogeneous and accounting for this heterogeneity enables estimation of unbiased estimates of individual preferences and enhances the accuracy and reliability of estimates of demand, participation, marginal and total welfare (Greene, 2000). One way of accounting for preference heterogeneity is by separating the respondents into various groups (segments) and by estimating the demand function for each group separately (Kontoleon, 2003). A second way of accounting for preference heterogeneity is by using household and decision-maker level contextual characteristics directly as interaction terms (Birol, 2004). Interaction of individual-specific demographics characteristics with choice specific attributes of the indirect utility function is a common solution to dealing with the heterogeneity problem as well as with violations of the IIA (see for example Rolfe *et al.*, 2002; Birol, 2004).

While respondents' unobserved heterogeneity can be detected by applying the conditional logit models, they are not well suited for explaining the sources of heterogeneity (Boxall and Adamowicz, 2002). The study therefore opted for the second way of accounting preference heterogeneity thus, interacting the relevant socio-economic parameters with the choice specific

attributes. A log-likelihood ratio test showed that including interaction terms led to an improvement in model fit. The results of the final conditional logit with interaction terms are presented in Table 4.11 below.

**Table 4.10: Variables used in the conditional logit models**

Variable	Definition Of Variable	Mean	Std. Dev't
<b>Dependent variable</b>			
<b>Choice</b>	Choice of rice		
<b>Independent variables</b>			
<i>Demographics</i>			
Gender	Sex of respondent	1.69	0.46
Age	Age of respondent	34.30	10.14
Hhsize	House size of the respondent	4.94	1.46
Yrs of Edu.	Number of years of education	9.32	4.25
Inc.	Household monthly income	317.83	175.43
<i>Attributes</i>			
Taste	Taste of rice	-0.20	0.98
Food safety	Whether rice is convectional or organic	0.001	1.00
Aroma	Smell of rice	-0.20	0.98
Price	Amount to be paid for the preferred rice	12.37	2.62
Long	Long grain size of rice	-0.30	0.78
Medium	Medium grain size of rice	-2.00	0.87
<i>Interactions</i>			
Taste*gender	Interaction between taste and gender of respondent	-0.34	1.72
Taste*age	Interaction between taste and age of respondent	-6.82	35.12
Taste*hsize	Interaction between taste and household size	-0.98	5.02
Taste*yrs of Edu.	Interaction between taste and years of education	-1.85	10.07
Taste*inc.	Interaction between taste and income	-63.35	357.49
Food safety*gender	Interaction between food safety and gender	0.001	1.75
Food safety *age	Interaction between food safety and age	0.04	35.77
Food safety *hsize	Interaction between food safety and household size	0.01	5.15
Food safety *yrs of Edu.	Interaction between food safety and years of education	0.01	10.24
Food safety *inc.	Interaction between food safety and income	0.24	363.06
Aroma*gender	Interaction between aroma and gender	-0.34	1.72
Aroma *age	Interaction between aroma and age	-6.86	35.10
Aroma *hsize	Interaction between aroma and household size	-0.10	5.06
Aroma*yrs of Edu.	Interaction between aroma and years of education	-1.86	10.07

Aroma*inc.	Interaction between aroma and income	-63.47	357.47
long*gender	Interaction between long and gender	-0.50	1.37
long*age	Interaction between long and age	-10.25	28.11
long*hhsz	Interaction between long and household size	-1.48	4.05
long*yr of Edu.	Interaction between long and years of education	-2.78	8.12
long*inc.	Interaction between long and income	-94.90	288.51
Medium*gender	Interaction between medium and gender	-0.34	1.52
Medium *age	Interaction between medium and age	-6.84	31.23
Medium *hhsz	Interaction between medium and household size	-0.98	4.50
Medium *yr of Edu.	Interaction between medium and years of education	-1.86	8.96
Medium *inc.	Interaction between medium and income	-63.28	318.37

Source: Field Survey, 2012

**Table 4.11: Conditional logit estimates with interactions**

Attributes	Coefficients	Std.Err.	Z-values	P>{z}
Taste	-1.5100***	0.2675	-5.65	0.000
Food safety	1.9714***	0.3071	6.42	0.000
Aroma	0.6630**	0.3014	2.20	0.028
Long	1.2334***	0.3970	3.11	0.002
Medium	-0.0978	0.3519	-0.28	0.781
Price	-0.4533***	0.0224	-20.22	0.000
Taste*gender	0.0245	0.0835	0.29	0.769
Taste*age	-0.0049	0.0039	-1.28	0.202
Taste*hhsz	0.0439*	0.0262	1.68	0.094
Taste*yr of edu.	-0.0265**	0.0107	-2.48	0.013
Taste*income	0.0006**	0.0003	2.39	0.017
Food safety*gender	0.2250**	0.0974	2.31	0.021
Food safety*age	-0.0035	0.0045	-0.77	0.444
Food safety*hhsz	-0.0112	0.0293	-0.38	0.703
Food safety*yr of edu.	0.0105	0.0122	0.86	0.391
Food safety*income	-0.0001	0.0002	-0.56	0.576
Aroma*gender	-0.2704***	0.0962	-2.81	0.005
Aroma*age	0.0040	0.0044	0.90	0.369
Aroma*hhsz	0.0207	0.0288	0.72	0.473
Aroma*yr of edu.	-0.0260**	0.0120	-2.17	0.030
Aroma*income	-0.0001	0.0003	-0.20	0.845
Long*gender	0.3361***	0.1260	2.67	0.008
Long*age	-0.0040	0.0059	-0.68	0.498
Long*hhsz	-0.0508	0.0391	-1.30	0.194

Long*yrs of edu	0.0339**	0.0160	2.12	0.034
Long*income	0.0001	0.0004	0.21	0.833
Medium*gender	-0.0656	0.1117	-0.59	0.557
Medium*age	0.0025	0.0052	0.47	0.639
Medium*hhsz	-0.0242	0.0346	-0.70	0.485
Medium*yrs of edu	0.0042	0.0142	0.29	0.768
Medium*income	0.0002	0.0003	0.71	0.478
Number of observations		400		
LR chi2 (6)		2482.73		
Prob> chi2		0.000		
Log likelihood		-4210.23		
Pseudo R-Squared		0.23		

Note: \*\*\*, \*\* and \* indicates significant at 1%, 5% and 10% respectively

Source: Authors own calculation

The pseudo  $R^2$  values were fairly low for both models with and without interactions, implying that the results explain only a limited proportion of the choices. However, the pseudo R-squared suggest that the attributes selected for the choice experiment survey are, by and large, what consumers considered to be among the most important attributes in rice variety selection.

The price variable as expected has a negative and statistically significant, indicating that, holding other factors constant, respondents will be less likely to choose an option if its price is higher. Thus, increments on the price decrease the associated utility level provided by the choice option.

From the estimation, it can be noted that taste variable have a negative coefficient and statistically significant. Almost all empirical studies reported that taste tends to play an important role in consumer preferences. The empirical observation from this study disagrees with Pant (2009) study of different species of rice in the Nepal. His results showed that taste of rice had meaningful relationship with the willingness to pay. In contrast, the findings of this study show that consumers are not so much concerned with the taste attribute and therefore not willing to pay more for this attribute.

On the other hand, the variable food safety exhibited positive coefficient and statistically significant, signifying that rice consumers who are willing to pay for this rice product attaches

more importance to its food safety. This result may be explained by the relatively good correlation between organically produced rice with the consumers' health consciousness. The present findings seem to be consistent with researches conducted by Rohr *et al.* (2005) and Schobesberger *et al.* (2008), which indicated that food safety is an important attribute which needs to be considered in terms of food choice. This empirical result also agrees with the studies conducted by Grazia (2007) for consumers in the South of Italy and Ara (2003) for Philippines consumers which showed that organic food was highly valued by consumers due to perceived benefits to the environment and consumer's health. The findings suggest that the Ghanaians consumers have a health and safety perspective while consuming rice. Greater consumer preference for organic rice indicated enough market potential for the local farmers. More infrastructure development such as upgrading the production sector to use organic method in production of rice can be applied in local rice product.

The estimated coefficient for long grain was also positive and statistically significant. This significant positive relationship for long grain suggests that consumers' preference for grain size of rice depends on the longest of the grain. This study is in consonance with Efferson (1985) study conducted in Thailand which he concluded that consumers in Thailand prefer well-milled and long grain rice. Efferson (1985) further conducted a study in Middle East where consumers generally prefer long grain rice and they were willing to pay for the product. The result of the current study also seems to be in agreement with a similar study conducted by Galawat and Yabe (2010). In their study, they examined the consumers' preferences and their willingness to pay for native rice in Brunei. Their results indicated that urban consumers prefer rice which has long grains and were willing to pay for this rice attribute. Therefore, Ghanaian farmers can use this opportunity and by increase in crop quality, improvement of productivity they can re-stabilize the position of domestic rice. The result also indicates that consumers' are more concerned about grain length (long grain) when purchasing rice. This is a challenge to rice local farmers and millers to ensure that the consumer is supplied with milled rice with long length and excellent physical characteristics. Result of the study further indicates that rice consumers would be willing to pay higher price premium for local rice if it meets their size.

On the other hand, the estimated coefficient for medium grain was negative and statistically significant. The negative coefficient of the medium variable in the model indicates that consumers who pay more attention to grain size of rice are less likely to pay more for this attributes. This result supports that of Galawat and Yabe (2010) study in Brunei where consumers' prefer long grain rice than small and medium grain. This suggests that complementary research needs to be done in order to improve the grain size to meet consumer demand for the product.

The coefficient calculated for dummy variable of rice aroma has positive sign and represents the positive relationship between this trait in the rice and consumers' willingness-to-pay. This result represents the high importance of aromatic rice for consumers in Ghana. The obtained result is similar to that of Anang *et al.*, (2011) study in Ghana, Galawat and Yabe (2010) study in Brunei and Pant (2009) in Nepal. Consumers in Ghana as in Anang *et al.*, (2011) study concluded that consumers' prefer aromatic rice and also rice aroma was one of the most effective traits on the price among Brunei consumers' as shown by Galawat and Yabe study and Nepal consumers prefer aromatic rice as well, as Pant (2009) presented in his study.

Diako *et al.*, (2010) also showed that aroma determined consumer preference for rice and consequently influence their willingness to pay. This result is promising for producers and other stakeholders in the local rice industry. Following this observation, an obvious improvement in this attribute will serve as a marketing strategy for local rice products. Thus, is to develop a system that allows the rice products to have the needed aroma to attract consumers and meaningfully differentiate it from other similar products produced elsewhere. Rice with a good aroma has become fashionable especially among the higher income group. The result of this study is supported by a similar study conducted by Unnevehr *et al.*, (1985). They reported that consumers in the Philippines, Indonesia and Thailand have strong preferences on milling quality (fewer broken grain and more polished) with strong aroma. This result shows that improvement in local rice quality such as aroma is considered important because it enhances consumer welfare and expands market potential. If consumer welfare is enhanced through rice quality improvement, consumers will demand more rice and producers may thus benefit from an expanded market.

During the study it was realized that consumers' preferred imported rice brands which were also noted to be of good aroma (perfumed) and sold at a higher price compared to other rice brands on the market. This therefore indicates that aroma is a unique characteristic and an important quality trait that consumers' value. Therefore, enhancing aroma in local rice production will attract consumers' to have repeated purchase of local rice.

Table 4.11 also reports the results obtained with the interactions of the socio-demographic and the choice specific attributes. Results indicate that when the socio-demographic characteristics are included, grain size (*medium grain*) attribute is not statistically significant in the selection of rice, while the rest of the choice specific attributes remain statistically significant.

When looking at the role of the socio-demographic variables, the interaction term between gender (gender = 1 if respondent is a female) and food safety (*Food Safety\*Gender*) is statistically significant. The results indicate that females are more sensitive to food safety problems than their male counterparts (Arbindra *et al.*, 2005). Thus, female shoppers are more likely to be concerned about food safety issues and this may therefore influence their willingness to pay for the rice product.

The variable income, which represent the income of the household, has a positive effect and statistically significant when interacted with the choice attribute denoting taste (*taste\*inc*). This shows that higher income consumers are more likely to select rice brand with a good taste.

The variable household size, which represents the number of people within a specific household also, has a positive and statistically significant when interacted with the choice attribute taste. This indicates that the larger the number of people in a household the less likely they will be concerned with taste.

The variable education, which represents the number of years of education of the respondent, has a negative and statistically significant effect when interacted with the attribute taste (*taste\*edu*). This indicates that, all things been equal, individuals with higher levels of education are less likely to be more concerned about taste.

The variable gender (gender = 1 if respondent is a female) has a negative and statistically significant effect when interacted with the attribute denoting aroma (*aroma\*gender*). This indicates that female shoppers are less likely to be concerned about aromatic rice. It is also interesting to note that education is only statistically significant (with a negative sign) when interacted with the attribute aroma (*aroma\*edu*). Thus, ceteris paribus, individuals with higher levels of education are less likely to choose local rice as aromatic.

Further, the variable gender (gender = 1 if respondent is a female), has a positive and statistically significant effect when interacted with the attributes denoting grain size (long grain) (*long\*gender*). This indicates that female households prefer long grain rice and are therefore willing to pay for any rice brands with long length. This therefore challenges local rice producers to produce rice which have this characteristic so as to attract more customers.

It is worth noting that the variable education also carries a positive effect when interacted with the choice attribute long grain (*long\*edu*). Consequently, individuals with higher levels of education are more likely to select a rice brand with long grain attribute present.

#### **4.3.3 Marginal willingness to pay estimates**

In the conditional logit model, the coefficients cannot be directly interpreted as the direct effects of the respective explanatory variables on the probability of choosing each particular rice options. Rather, these represent the direct effects associated with each of the explanatory variables on the (unobservable) utility function which can be used to calculate the mean WTP for each attributes. In other words, each of the WTP estimates is calculated as the ratio of the coefficient associated with the attribute of Price coefficient. Therefore, in order to calculate the

marginal WTP for each rice attribute, the study estimates the corresponding ratios  $\frac{-\beta_{attribute}}{\beta_{price\ coefficient}}$ .

Each of these ratios is understood as a price change associated with a unit increase in a given attribute.

**Table 4.12: Marginal Willingness to Pay (MWTP) estimates from conditional logit model**

Attributes	Coefficients	Standard Error	Z-values	P>{z}	MWTP
Taste	-1.5100	0.2675	-5.65	0.000	- 3.33
Food safety	1.9714	0.3071	6.42	0.000	4.35
Aroma	0.6630	0.3014	2.20	0.028	1.46
Long	1.2334	0.3970	3.11	0.002	2.72
Medium	-0.0978	0.3519	-0.28	0.781	-0.22
Price	-0.4533	0.0224	-20.22	0.000	

Source: Author's own calculation, 2012

The MWTP indicates, for each attribute, the average amount that a person would prepare to pay, indefinitely, for an increase (decrease) of one unit in the attribute level. Result in the table indicates that consumers are willing to pay more for food safety, with an associated MWTP estimated of 4.35. This result is intuitive and according to expectations and previous results. Similar to the results obtained in this study, Dickinson and Bailey (2002) found that consumers placed the highest relative value on food safety certification. This could indicate preference for organic rice. Increase in health concern or awareness as well as education are expected to be the main factors for consumers choosing organic rice, where it is the first preferred attribute with the highest WTP estimate. This therefore challenges local rice farmers to produce organic rice because there will be a market for it.

The size of the rice grain (long grain) which has significant utility for consumers is the second most favored attribute, with an associated WTP estimate of 2.72. This empirical result agrees with the studies conducted by Juliano *et al.*, (1992) for consumers in Hong Kong which showed that consumers pay high premiums for long grain. This clearly indicates that consumers are more willing to pay for long grain rice than medium grain rice which had an estimated MWTP value of -0.22. This therefore creates opportunity for local rice farmers to produce more long grain rice to attract the needed consumers'.

The third preferred attribute is aroma with estimated MWTP value of 1.46. This appears to support previous results that consumers generally have a strong preference for aromatic rice. The obtained result is similar to that of Galawat and Yabe (2010) study in Brunei where consumers were willing to pay for this attribute.

However, consumers are found not willing to pay for the taste attribute where MWTP estimate showed negative sign (-3.33). Our findings from this study contradicts that of Anang *et al.*, (2011) in a research examined the consumer's preferences for rice by different brands and the effect of different qualitative traits on the prices of these rice species. Their study concluded that consumers have higher willingness-to-pay for the traits of taste and other attributes like aroma, cooking quality and time. This contradiction could be due to difference in respondents studied and the methodology used. This appears to show that some consumers do not attach so much importance to taste as compares with other attributes like food safety, long grain and aromatic rice.



## **CHAPTER FIVE**

### **CONCLUSIONS**

#### **5.1 Introduction**

This chapter is divided into four sections. The first section summarizes the main findings of the study. The second section presents the conclusions of the study. The third section presents policy recommendations. The final section describes the limitations of this study and provides recommendations for future research.

#### **5.2 Summary of Findings**

This study was designed to analyze consumer preference and willingness to pay for local rice in the Kumasi Metropolis. Four hundred (400) rice consumers were selected from five randomly selected sub metros in the Kumasi Metropolis. Information was collected using semi-structured questionnaire.

It was revealed from the study that rice consumption, especially demand or purchase, was dominated by women in the study area. The implication of this is that the actual purchase of rice is done mostly by women. Thus any improvement in rice production systems at the research centres and farm levels must consider the peculiar attributes of women who are the major decision makers in the households especially with respect to what quality and quantity of rice to purchase at homes.

It was also discovered that most rice consumers sampled were in their youthful age with the average age of 34.3 years. Thus innovation on rice production can take advantage of this knowledge to design rice products that will meet the peculiar high calorie and protein requirements as well as tastes of these young individuals.

The current study revealed that knowledge and awareness level among the surveyed consumers about local rice was very low and not adequate. The study is therefore of the view that advertising and packaging of rice products, should be done to appeal to the emerging customers. The need therefore arises for forming mass campaign motivated by nutritionist pointing out the overshadowing benefits of consuming locally produced rice when they well processed.

The study revealed that knowledge and consumption of local rice in general is very limited. It was indicated that many consumers in the study area were more familiar with imported rice than local rice and this is reflected in their patronage pattern. This could have an impact on the country's local rice production should the population prefer imported rice than local rice creating doubt if there is any interest to consume, should Ghana produce its own local rice.

However, when respondents were asked whether they are willing to buy local rice should its production increase, majority of respondents claimed that they are willing to buy local rice. This could bring in a positive sign that there are demands for local rice in the future and prospects for developments of rice industry in Ghana.

The study also brought to light some of the reasons why consumers' do not patronize locally produced rice. Prominent among the reasons consumers' do not patronize local rice are poor post-harvest handling (which is known to result in the presence of stones and other foreign materials in the milled rice), uneasy access and poor quality of rice produce locally.

On the other hand, it was revealed that those who consume local rice do so out of preference, perceived good nutritional quality and relatively lower cost of local rice.

The empirical results from the study shows that consumer choice of rice was influenced by certain quality attributes, and consumers were willing to pay for those desirable attributes. Food safety, aroma and long grain were the quality characteristics that most consumers preferred. 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.

This study also reveals that there is an increase in health awareness among Ghanaian consumers as health and food safety is priorities when choosing food. This information also can be used as a guide to develop the first organic rice in Ghana as there will be a great demand for organic rice.

### **5.3 Conclusions**

This study has examined the consumer preferences and willingness to pay for improved local rice in the Kumasi metropolis. The aim of the study was to fill an information gap about consumer preferences for quality characteristics in order to help rice producers and researchers to develop varieties more attractive for the markets. Knowledge about implicit values of quality characteristics indicates which attributes should be focused on. A survey of 400 rice consumers was conducted in Kumasi, Ghana to ascertain consumer preferences and willingness to pay for locally produced rice, as a basis for quality improvement of local rice. The study applies the Choice Experiment (CE) Technique which is used to evaluate non-market goods by eliciting people's stated preference for different options in a hypothetical setting. The study also involves consumer Willingness to Pay (WTP), which is defined as the maximum value of money that an individual contributed to equalize utility. The empirical results revealed that consumer choice of rice is influenced by food safety, aroma and long grain attributes, and consumers were willing to pay for those desirable attributes. The finding of the study indicates that consumers are willing to pay more for food safety, with an associated MWTP estimated of GH¢ 4.35 (\$2.47). The second most favored attribute is the size of the rice grain (long grain), with an associated MWTP estimate of GH¢ 2.72 (\$ 1.55). The third preferred attribute is aroma with estimated MWTP value of GH¢1.46 (\$0.83). The result of the analysis shows very useful information regarding consumer demand that can uniquely assists Ghana policy makers, particularly the government and farmers, in developing new domestic rice production and marketing strategies. The study therefore recommends that 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.

### **5.4 Policy Recommendations**

Basing on the study findings and conclusions, the following recommendations can be drawn.

Consumers demonstrate to have firm preference for food safety, aroma and long grain rice by observing the high amount of MWTP for these attributes. Therefore, it is recommended that Ghana should produce rice that have these attributes, since these attributes were found to affect market, consumer acceptance and willingness to pay.

This study also reveals that there is an increase in health awareness among Ghana consumers as health and food safety is priorities when choosing food. This indicated enough market potential for organic rice. This information also can be used as a guide to develop the first organic rice in Ghana as there is great demand for organic rice. It is therefore recommended that the use of pesticides and insecticides in rice production should therefore be reduced.

The private sector should be encouraged to invest in the local rice industry to invest in the procurement of rice processing facilities and inputs. Research has shown that milling machines in Ghana are inadequate and in the case where there are some, most of them are outmoded without modern milling accessories like de-stoners and rice graders. This tends to put local rice at a disadvantage as the consumers tend to prefer the imported rice, which in most cases are free of stones and impurities. Hence, private sector investment in modern processing facilities for local rice would place the commodity in a better position when compared with imported rice commodity. This will encourage local rice consumption and also afford the farmers a good price for the local commodity being produced.

### **5.5 Limitations and Suggestions for Future Research**

Some limitations that characterized the study include the following:

First, the present study took place in the Kumasi Metropolis alone due to time and budget constraints, future studies should be replicated for other metropolis in the country to determine the overall consumer WTP for locally produced rice.

The second limitation of the study relates to the selection of the attributes for rice. While the results of this study demonstrate the potential for using choice experiment to determine consumers' preferences for rice attribute. One such limitation is the selection of attributes and levels of attributes for rice products, which is difficult to make what attributes to include in the study design and what to exclude. For example, the fact that our analysis is based on consumers' preferences for taste, food safety, aroma and grain size attributes of rice should not be translated into saying that these are the only relevant attributes in consumers' variety choice criteria. Among attributes of rice that are not covered in this study but nevertheless important to

consumers' are texture, swelling capacity, appearance of grain (color) and cooking time. Studying consumers' preferences towards these and other attributes is, therefore, an interesting area for future research as it provides a more complete picture regarding the relative importance of the variety attributes.

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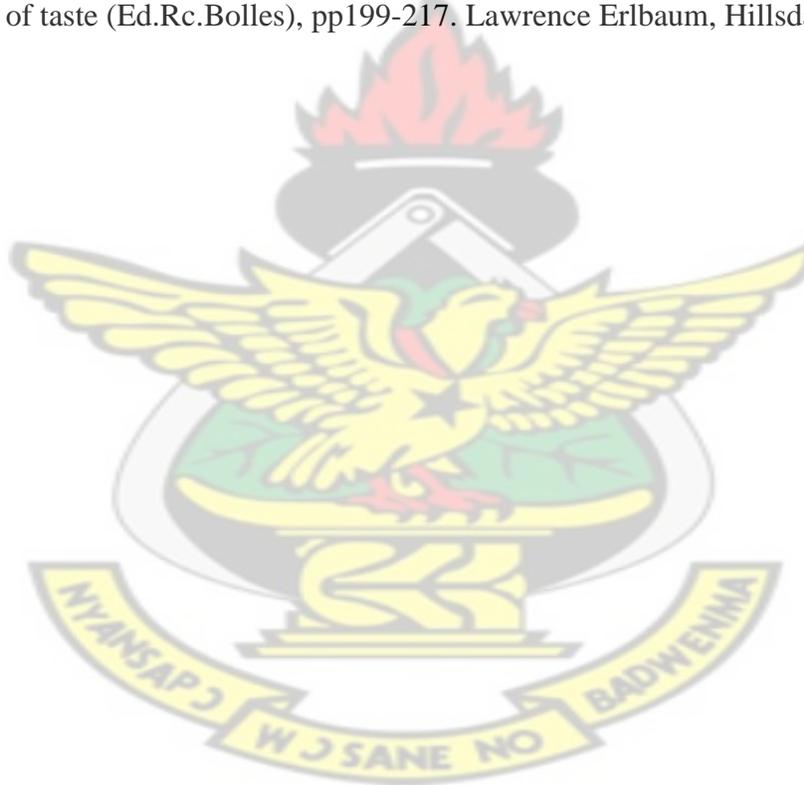
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## QUESTIONNAIRES FOR RICE CONSUMERS

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DEPARTMENT OF AGRICULTURAL ECONOMICS, AGRIBUSINESS AND EXTENSION

### Questionnaire for Rice Consumers

#### Consumer Preferences and Willingness to Pay for Improved Local Rice in Ghana

Name of the interviewer..... Date of interview.....

Name of the respondent..... Metropolitan area.....

Sub-metro..... Community.....

Mobile phone: .....

#### Section A: Personal and household characteristics

1. Please indicate your gender

Male  Female

2. What is your age? .....

3. What is your marital status?

Single  Married

4. How many people live in your household? .....

5. What is your highest level of education?

None  Elementary/JHS  Secondary/SHS  Tertiary

6. What is your working status?

Working full-time  Studying  Working part-time

Retired  Other

7. What is your main employment?

Government  Self-employed  Non-government  Other

8. What is your income level per month? .....

9. Which ethnic group do you belong to?

Akan  Ewe  Ga  Frafra

Dagomba  Other

10. Are you the primary shopper for groceries in your household? (The primary shopper is the person responsible for at least 50% of food purchased for the household.)

Yes  No

11. Approximately how much (in GHC) does your household spend each week in grocery stores and other food sellers (like farm markets)? .....

12. Approximately how much (in GHC) does your household spend each week to buy rice? (Enter 0 if none).....

**SECTION B: Consumers purchasing behavior for rice**

13. How often do you eat rice?

Once a week  2 to 4 times a week  Every day   
Every month  Rarely

14. What type of rice do you usually eat? (tick all that apply)

Imported rice  Local rice  Both local and imported rice

15. Where you do usually purchase rice? (tick all that apply)

Open Market  Supermarket  shop or store

16. What quantity of rice do you usually purchase per month?

Margarine tin  5kg bag  25 kg bag  50kgbag

other

17. Where do you usually eat rice?

Home  Restaurant  Party  Work place/school

Others

18. What is your favorite meal that contains rice?

Jollof  Emotuo  Waakye  Fried rice

Rice and stew  Other

19. Please can you rank, (in the order of importance) the characteristics you consider when buying rice in general (please use the codes). Enter a ranking for each, with 1= most important, 2=second most important . . . and 8=least important

Taste  Packaging  Food safety  Aroma

Size of grain  Texture  Color  Price

### SECTION C: Consumers knowledge and patronage of local rice

20. Are you aware of the benefits of eating local rice?

Yes  No

21. Have you purchased local rice for the last six month

Yes  No

22. If yes to 22, why do you purchase local rice?

Easy to buy (Available)  Easy to consume (Convenience)

Delicious  Nutritious  Cheaper price

23. If no to question 22, please rank the reasons why you have not purchase local rice for the last six month. Enter a ranking for each with 1= most important, 2= second most important ... and 6= least important

Less availability compared to the imported rice  Taste is inferior

Poor appearance  Expensive  Low nutrition

I do not trust the quality of rice produced locally

24. Can you tell upon buying rice whether it is local or imported?

Yes  No

25. If yes to 24, how do you differentiate local rice from imported rice (use code) and give up to 5 criteria?

1. Price
2. No foreign materials
3. Cleanliness (absence of bran)
4. Whiteness
5. Number of broken kernels
6. Shape of kernels
7. Ease of cooking
8. Cohesion of kernels after cooking (very sticky)
9. Cohesion of kernels after cooking (non-sticky)
10. Taste
11. Aroma (perfume)
12. Swelling capacity
13. Hard texture
14. Soft texture

26. When purchasing rice, do you normally care whether produce is of foreign origin or local origin?

Yes  No

27. Are you satisfied with the quality of local rice at present as compared to the imported rice?

Definitely yes  Average  Definitely no  Indifferent

28. What do you think about the current level of price of local rice compared to the imported rice?

Higher  Reasonable  The same  Lower

29. What do you think of the current level of rice self-sufficiency in Ghana?

Low  Slightly low  Slightly high  High  Do not know

#### **SECTION D: Promotional information on improved local rice**

30. Do you know of any locally improved cultivated rice type in Ghana?

Yes  No  Not sure

31. If yes to 32, have you ever bought some of the improved local rice before?

Yes  No  Not sure

32. Why do you buy new rice product?

Nutrition or health promoting properties  Not expensive

Advertisements (any media)  Premium and specialties offered by company/shop

Product appearance  Attractive packaging

33. Have you received information promoting local rice before?

Yes  No

34. If yes, where did you get the promotional information on the local rice from? (tick all that apply)

Radio  TV  Newspapers  Magazines

Friends/relative

35. What were they promoting about the improved local rice? (tick all that apply)

Taste  Quality  Nutritional benefit  Price

Aroma  Convenience

36. If you can differentiate the improved local rice from the imported ones, will you choose it at the same price?

Yes  No  Indifferent

37. If you are to receive more information about local rice, which would be best?

Radio  TV  Newspapers  Magazines

Friends/relative

38. Are you willing to buy the improved local rice if they are more available?

Yes  No  Don't Know

44. Will you buy the improved local rice even if it is not yet certified?

Yes  No  Don't Know

39. In your opinion what do you think are some of the problems accounting for the low consumption of local rice in Ghana?

- a) .....
- b) .....
- c) .....

40. What are some of the key factors that would lead to increased consumption of local rice in Ghana?

- a) .....
- b) .....
- c) .....

**SECTION E: Consumer perceptions about the attributes of local rice**

A. In your decision to buy newly improved local rice, how will you rate the importance of the following characteristics (tick appropriately).

	Not Important	Somewhat Important	Important	Very Important
Price				
Convenience of packaging				
Food safety				
Aroma				
Size of grain				
Texture				
Color of rice				
Taste (from past experience)				
Easy of preparation				

Brand/Labeling				
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B. Please indicate the degree to which you agree or disagree with the following statements relating to local rice improvement in Ghana. (tick appropriately )

Statements	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Rice produced from other countries are likely to be safe than local rice					
If Ghana could buy all its rice from other countries cheaper than it can be produced and sold here, we should.					
Rice produced in other countries is more likely to be of higher quality than local rice.					
I am willing to pay somewhat more for a local rice of better quality.					
I would buy local rice if it sells at the same price as the imported but was much more nutritious.					
I would buy local rice if it sells at the same price as the imported rice, but tasted better.					
I would be willing to buy local rice if they were more available.					
I have no problem with buying local rice					
I would be willing to buy local rice if they are not Labeled or branded					

## SECTION F: Choice selection of various rice products

Please place an “X” in the “I choose” box, below the option that you would choose from each of the following 5 scenarios:

Choice set 1

Attributes	Option A	Option B	Option C
Taste	No	yes	I choose
Food safety	Convectional	organic	not to
Aroma	Perfumed	perfumed	purchase
Grain size	Small	long	either A or B
Price per 5kg (GHC )	15	10	
I choose ...			

Choice set 2

Attributes	Option A	Option B	Option C
Taste	No	yes	I choose
Food safety	Organic	organic	not to
Aroma	Perfumed	non-perfumed	purchase
Grain size	Medium	small	either A or B
Price per 5kg (GHC )	15	9.6	
I choose ...			

Choice set 3

Attributes	Option A	Option B	Option C
Taste	No	no	I choose
Food safety	Organic	convectional	not to
Aroma	non-perfumed	non-perfumed	purchase
Grain size	Small	medium	either A or B
Price per 5kg (GHC )	15	9.6	
I choose ...			

Choice set 4

Attributes	Option A	Option B	Option C
Taste	No	no	I choose
Food safety	Convectional	convectional	not to
Aroma	non-perfumed	perfumed	purchase
Grain size	Long	small	either A or B
Price per 5kg (GHC )	15	10	
I choose ...			

Choice set 5

Attributes	Option A	Option B	Option C
Taste	Yes	yes	I choose
Food safety	Convectional	organic	not to
Aroma	non-perfumed	non-perfumed	purchase
Grain size	Medium	small	either A or B
Price per 5kg (GH¢)	10	15	
I choose ...			

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