CONSUMER PREFERENCES AND WILLINGNESS TO PAY FOR BEEF ATTRIBUTES IN GHANA

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I, Enoch Owusu-Sekyere, hereby declare that this thesis work submitted for the degree of Master of Science in Agricultural Economics in the Faculty of Natural and Agricultural Sciences, Department of Agricultural Economics at the University of the Free State, is my own independent work, and has not previously been submitted by me to any other university. I furthermore cede copyright of the thesis in favour of the University of the Free State.

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DEDICATION

This thesis is dedicated to my wonderful and supportive family especially my parents for their financial and spiritual support and encouragement throughout my education not forgetting Mr William Selover for his financial support and prayers.

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ABSTRACT

As Ghana makes transition into a developed economy, a greater percentage of the population is demanding and eating high quality and safe food products. The demand surge for beef needs to be met by increasing supply and an efficient supply-chain. Using a survey and choice experimental data collected from 400 beef consumers in the Kumasi Metropolis and Sunyani Municipality of Ghana, this study examines consumers' preferences and willingness to pay for beef product attributes. The results show that, Ghanaian consumers' in general prefer and rate shopping environment, packaging, leanness, certification, tenderness, steak colour and freshness as the most important attributes considered in purchasing beef products respectively. The empirical results show that, young, low and middle income consumers are more concerned with origin, steak colour and certification of beef products. Female consumers place high importance on beef leanness, origin, certification and freshness as key attributes compared to males. It is suggested that beef and other livestock distributors should focus on Ghanaian consumers with particular attention to shopping environment, packaging, leanness, inspection and certification, tenderness, colour and freshness attributes of beef products. The results further suggest that beef and other livestock distributors should focus on Ghanaian female consumers and young consumers considering origin, certification leanness and freshness as a key attributes. Ghanaian consumers with less formal education placed higher importance on product certification, shopping environment and tenderness. Larger Ghanaian households placed less importance on product leanness, slaughter men, certification and packaging. Creating attractive packaging, making products easy to cook, provision of certification label, specification of method of production and creating a suitable shopping environment are marketing strategies to be considered by investors. The empirical results from random parameter logit indicate preference heterogeneity for beef product attributes, and higher willingness to pay exist for pasture-raised beef, certification label and low fat content (lean beef) respectively. Consumer characteristics including age, income, gender and education significantly influence preferences and willingness to pay for beef products. Further evidence suggests that, the beef investors such as importers and exporters could use selective demographic targeting to maintain or build its own market share among competing beef products.

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LIST OF ABBREVIATIONS

CV   Contingent Valuation

CIE   Center for International Economics

FAO   Food and Agricultural Organization

FDB   Food and Drugs Board

GDP   Gross Domestic Product

GSS   Ghana Statistical Service

GLSS   Ghana Living Standards Survey

SPSS   Statistical Package for Social Sciences

SRID   Statistics, Research and Information Directorate

MFA   Ministry of Food and Agriculture

USDA   United States Department of Agriculture

WTP   Willingness to Pay

PHC   Population and Household Census

PRA   Participatory Rural Appraisal

RPL   Random Parameter Logit

MAV   Multi Attribute Valuation

Chapter One

Introduction

1.1 Background

The contribution of livestock towards meeting food needs, providing draught power and generating cash income indicates that livestock production is an important feature of Ghana's agriculture (World Bank, 2011). The livestock sub-sector contributes an estimated 6.2% to agricultural gross domestic product (GDP), hence it makes a significant contribution to overall agricultural development (United Nations Development Programme, 2011) . The sector plays a key economic, social and cultural role in the lives and livelihoods of small holder farmers, processors and traders. It is a source of protein hence contributes to balanced human nutrition. It acts as a bank and insurance in times of urgent financial needs since it generates cash income (Statistics Research and Information Directorate "SRID", 2009). It helps to maintain soil fertility and structure through manure. Livestock also provides draught power, particularly in the northern regions, which enables bullock-owning households to cultivate 60% more land than those who do not. Women benefit from livestock since they are able to own pigs and small ruminants, and are capable of controlling income generated from this livestock (Ministry of Food and Agriculture "MFA", 2010).

 Ghana is a net importer of live animals, and meat products implying that the local producers are not able to produce to meet the local demand and therefore creates excess demand. The excess demand creates an opportunity for livestock product exporters to step in to fill the gap. The vision of the ministry of food and agriculture for the poultry and livestock industry is to reduce Ghana's dependence on imported livestock products by stepping up local production (MFA, 2010). The net import of beef as a percentage of consumption has been decreasing since 2000 to 2013. The decreasing net import may be due to a rise in domestic production of livestock due to government policies to boost domestic production of livestock.

Demand for meat and dairy products has been increasing fast in Ghana as in other developing countries, driven by income, population growth and urbanization (Food and Agricultural Organization "FAO", 2010). Although nearly 39.5% of the population live below the poverty line, reasonably good economic growth during the past few years has created an expanding middle and high-income population. Especially in the urban areas, the expanding middle income and high population caused dietary patterns to change toward higher levels of consumption of high-value products like milk, meat, eggs, fish, fruits and vegetables (FAO, 2010).

As Ghana makes its transition from a developing economy to a developed one, a percentage of its population is becoming wealthier, demanding more goods, and eating more high-quality food (MFA, 2009). Beef, being one of the primary meats in Ghanaian diets, will face a demand surge that will need to be met by increasing supply and an efficient supply-chain. Demand for beef products has been increasing rapidly in Ghana due to urbanization and increases in per capita income (SRID, 2010). There are fundamental indications that demand for improved food quality and safety has also been increasing (FAO, 2010). However, there is little empirical evidence on the criteria and indicators of quality and safety that consumers use in their buying decisions, or that suppliers use in differentiating products to promote sales, and the extent to which consumers are willing to pay for these attributes.

The Ghanaian food sector is modeled by society's development. The recent food-safety crises have put strong emphasis on quality and safety of production, marketing and consumption of livestock products (FAO, 2010). As Ghanaian consumers' expectations become more and more demanding, quality and safety become keyword for producers as well as consumers.

Growing concern over environmental influences and other credence characteristics of food has ensued in increasing interest in the production methods, healthiness and other attributes of meat products (Jabbar and Islam, 2010). Conferring to former studies, especially food safety, the country of origin, organic production and animal welfare have been particularly requested

attributes for beef (Koistinen, 2010). Some of these have been in the headlines of public discussion in Ghana, especially food safety as for instance most butchers or producers of beef use car tyres in the preparation of some parts or cuts like the skin, leg piece, and head. This further raises a popular subject of the effect of the smoke or carbon footprint in contaminating the beef products thereby making it chemically unsafe as well as negatively impacting on the climate.

Consumers are progressively more sensitive to food production processes. Livestock products in particular stir consumer sentiment concerning livestock treatment, production process attributes such as environmentally friendly impact, food safety consequences, and social implications of production methods and animal welfare when selecting food products (Frewer *et al*., 2005). Consumers select the package of food products that offers them with the highest utility, as long as they can accurately determine the quality attributes of those food products. Consumer assurance in the available information regarding food process attributes may depend on several factors, including the specific livestock product, which attribute is verified, and the source of verification information (Olynk *et al*., 2010).

1.2 Problem statement

There is a decreasing domestic consumption of beef products from 37000 to 34000 metric tonnes from the years 2010 and 2011 respectively (FAO, 2011; United States Department of Agriculture, 2011) with a low per-capita consumption of 1.08 kg beef per annum. These are only 6.7% of Africa's average per capita consumption and 2% of FAO recommended. This can be attributed to the fact that farmers and producers of beef do not meet consumers' expectations with respect to attributes or characteristics of beef or they fail to convince consumers that the meat meets the requirements or expectations.

Recent studies on preferences and willingness to pay for meat attributes and other livestock products have centered on developed countries with little research on Sub-Saharan Africa,

including Ghana (Gracia and De-magistris, 2013; Grebitus *et al*., 2013; Holmes *et al*., 2012; Lim, 2012). This has resulted in scanty market information availability on livestock products and attributes consumers prefer and willing to pay in Ghana.

The marketing environment in which smallholder beef sellers operate is primarily comprised of informal distribution channels where safety and quality standards are either lacking or inadequately defined (FAO, 2009). The flow of information upstream towards farmers may be lacking. Furthermore, factors that influence Ghanaian consumer's preferences and willingness to pay for beef attributes are not known because of absence of empirical literature on consumer preferences and willingness to pay for beef (FAO, 2010). Reliable food safety and information on animal husbandry and geographic origin have long been recognized as value-adding differentiation mechanisms in the developed world (SRID, 2010). Empirical evidence suggests that this is as well the case in developing countries (Adzitey, 2013). However, little consistent rigorously researched evidences have been published on this subject in Ghana.

The Ghana Food and Drugs Board (FDB) have no defined standards for quality and safety of most fresh beef cuts produced and marketed in the country (FDB, 2004). However, they provide guide lines and regulations to registrations, health certificate of the animal, maximum fat content that the beef is supposed to possess, but these are not visible or revealed to consumers in the retail market because producers and sellers have failed to provide these food label information. This has placed most consumers in an uncertain state regarding beef safety and quality. It is generally believed that consumers use local informal standards based on specific criteria and indicators to differentiate quality and safety attributes of such products, and market actors and producers respond based on those attributes and consumer preferences (Adzitey, 2013). Ultimately, little is known on the specific characteristics of beef products that are preferred by consumers. Thus, no information is available to advise players along the value chain as to what characteristics to strive for or how to market beef products to meet customers' expectation and increase profit.

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1.3 Objectives of the study

The main objective of the study is to contribute to the limited knowledge base by examining consumers' preference and willingness to pay for beef attributes in Ghana. Such findings or information will help by better informing farmers and producers of beef products with respect to the characteristics or attributes their beef products should exhibit to meet the requirements of consumers. To obtain the main objectives, the following specific objectives are addressed:

1. To identify the attributes of beef that consumers prefer and use in the purchasing decision.
2. To determine factors influencing consumers' preferences for beef attributes.
3. To determine the indicators of beef safety and quality in Ghana.
4. To determine consumers' willingness to pay and factors that influence consumers' willingness to pay for beef product attributes.

1.4 Justification of the study

Both consumers and suppliers perhaps use certain criteria and indicators to differentiate qualities and standards, e.g. various notions of 'quality' that may not be easily measurable (e.g. texture, taste), convenience and of trust and reputation in sellers. Some of these may be associated with rather significant 'price premium' (Saba and Gonzalez-Zorn, 2012). However, an understanding of the nature of beef cuts and their quality and safety attributes that consumers prefer and are willing to pay for is essential for market actors and producers to respond to those preferences.

Furthermore, Jabbar *et al*. (2010) iterated that, understanding beef attributes and their price premium may provide a basis for initiating specification and harmonization of localized grades and standards. Such research work will help refine official standards on quality and safety for regulatory purposes based on regional empirical information rather than theoretical western standards, which are sometimes used but cannot be enforced and have no real relevance for the level of economic development in the country. The study would aim to contribute to better understanding of consumer behaviour by examining preferences and attitudes of consumers, which can serve as a reference for producers and other research works.

The study has the potential to improve the incomes and livelihoods of small holder farmers and other market participants and to be an avenue for the overall development of the livestock sector (FAO, 2009). Livestock production offers rapid growth opportunities, as the necessary internal market exists, the potential for increased production of feed is high and the technology for controlling diseases and improving productivity is available. Increased livestock production will increase farmers' incomes, which will, in turn, contribute to reduction of poverty. However producers will only produce the livestock when consumers prefer and are willing to purchase the animal product (World Bank, 2011). Similarly, consumers will only buy the products when their preferences and requirements are met. The study will ultimately help the Ghana livestock sector by generating important information that may help the farmers to better meet the requirements/ preferences of local consumers. Thus better match supply and demand.

1.5 Organization of the study

The remainder of the thesis is organized as follows: Chapter Two contains an overview of the relevant literature on the consumer preferences and willingness to pay for beef products. Specifically, methods of eliciting consumer preferences and willingness to pay for beef products as well as theoretical discussion on consumer preferences and willingness to pay for beef products. Theoretical discussion on choice experiments is also discussed. Chapter Three consists of two sections. The first section involves the description of the data which includes the description of the study area, how the questionnaire was developed and the sampling approach used in the study. Also included in this section are the survey and the characteristics of the respondents. The second section is the procedures employed in analysing the specific objectives of the study and the conclusions. The results of the study are presented and discussed in Chapter Four. Conclusions and policy recommendations based on the study's findings are provided in Chapter Five.

Chapter Two

Literature review

This chapter gives an overview of the relevant literature on livestock production and products in Ghana. The theory of consumer preference and willingness to pay as well as methods of eliciting consumer preferences are well discussed in this chapter. Also a thorough review of relevant literature on consumer preference for beef products and empirical factors influencing consumer preference and willingness to pay for beef product attributes are discussed. Finally a conclusion section is included to relate the existing knowledge to the study.

2.1 Livestock production and livestock products in Ghana

Ghana has no key pastoral or transhumance population relying on thorough cattle and small stock production. The main production structure is based primarily on comprehensive grazing or free range among smallholder farmers with only a few commercial farmers operating principally in the Coastal Savannah zone (MFA, 2010). The smallholder agro-pastoralism, the main cattle production system in Ghana, is geared towards beef production. It is linked with the milk production system whereby milk is shared between the herdsman and the calf, with the surplus going to the market (Opong-Anane, 2005). Ownership may be direct, personal and individual, or in the form of trusteeship for family group property held in trust. Opong-Anane (2005) found that, where a large herd is found, the owning family group may be several, varying widely in size and in relationship. It frequently occurs that the apparent owner is not the sole owner, and he is unable either to authorize or approve extensive interventions without consultation with the co-owners.

The SRID (2010) reported that, in peri-urban areas, backyard small ruminant rearing is popular. In this system, simple pens are usually provided for sheep and goats within or attached to the owner's house. The pens are constructed from locally available materials such as timber offcuts, bamboo, tree branches and mud, and roofed with leaves, split bamboo or metal sheets. Children often undertake daily management, such as the provision of water, feed and bedding as well as

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cleaning of pens. The system is based on cut and carry of forages, and the use of household wastes, mainly cassava and plantain peels, crop residues and crop by-products (SRID, 2010).

The growth of the native ruminant livestock industry has been hindered by a number of constraints such as lack of improved breeding stock, disease, poor nutrition, inadequate stock water, poor marketing, lack of capital, high interest rate on loans and lack of a grassland policy (Opong-Anane, 2005). Ruminant livestock plays a major role in the socio-cultural life of the farming communities as a partial determinant of wealth, payment of dowry, and acts as a bank and insurance in times of difficulty (MFA, 2010). Thus, these livestock can be used as collateral for securing loans for farming and can be converted to physical cash in times of need.

Livestock production in Ghana is concentrated in the Guinea and Sudan Savannah vegetation zones of the three northern regions accounting for about 75% of the cattle population in Ghana (MFA, 2010). The domestic production of meat has not been consistent; it recorded a small increase in 2008 and started decreasing over the last five years as shown in Table 2.1. Between 2006 and 2010, production levels decreased by 13.71% for beef while the production for other livestock products increased. Off take rate for cattle is about 11% while for sheep and goats it is about 30% (SRID, 2010). This compares with 8% and 25%, respectively for cattle and sheep in purely pastoral systems of livestock production in Sub-Saharan Africa. In 2011, the country produced 20,592 tonnes of beef, 20,341 tonnes of goat meat, 17,491 tonnes of mutton, 19,072 tonnes of pork and 36,923 tonnes of chicken (FAO, 2013).

Table 2.1 shows the domestic meat production in Ghana. Domestic livestock meat production is low and cannot meet the local demand for meat. However it is clear from Table 2.1 that the total domestic productions for other livestock are increasing with time whereas the production of beef is decreasing in all the years except in 2008 where the country recorded an increase. This calls for policy intervention through research to find out the possible ways of reviving the beef industry.

Table 2.1 Domestic meat production (ton) in Ghana from 2006 to 2011

Species	2006	2007	2008	2009	2010	2011
Cattle	23865	23419	25350	19773	19993	20592
Sheep	10370	10773	15881	16389	16916	17491
Goats	11170	13083	13663	18315	19226	20341
Pigs	15456	16506	16968	17506	18010	19072
Poultry	29582	36836	42335	32919	35558	36923

Source: FAOSTAT, 2013

2.2 Consumer preferences and willingness to pay for products

Based on the discussion on the livestock production and products in Ghana, it is important to discuss the theory of consumers' preferences and willingness to pay for beef products. The analysis of consumer preference for beef products stalks from microeconomic theory and Lancaster's characteristics methodology where consumption utility is derived directly from a well-defined set of characteristics or attributes of beef cuts and indirectly from consumed goods (Lancaster, 1991; Nicholson, 2001).

The economic foundations of attribute-based and choice experiment models are in Lancastrian consumer theory and random utility theory (Jaffry *et al*., 2004). Lancastrian consumer theory suggests that the utility consumers derive from a product is actually equal to the combined utilities the beef consumer derives from the attributes of the product (Loureiro and Umberger, 2007; Lusk *et al*., 2003).

Neoclassical economic theory assumes that the utility function of the beef consumer enables him to rank different beef alternatives in a consistent manner and to select the option providing him with the highest utility (Anderson *et al*., 1992). Under such an assumption, the individual's preferences are presumed to be reflexive, complete, transitive, continuous and strongly monotonic (Anderson *et al*., 1992). The neoclassic postulations also suggest that consumers have the competence to make discriminating rankings and the capability to process information flawlessly. It is, however, acknowledged that consumers may take decisions that do not maximize their utility (Tiffin *et al*., 2006). This behaviour may result from errors in

perception resulting from the lack of information on product attributes or discounting inability, market failures such as price structures that do not reveal the real costs of production for the society, or limitations in the set of products available to consumers (Tiffin *et al.*, 2006).

In reality, consumers are influenced by an even larger variety of factors causing inconsistency in their choices and making them encounter uncertainty according to Anderson *et al.* (1992). This has created the need for probabilistic choice analysis that treats consumers as stochastically behaving utility maximizing decision makers (Anderson *et al.*, 1992). The probabilistic approach leads to a model called the random utility model, where the researcher is assumed to be imperfectly able to model the consumers' utility function.

Random utility theory is based on the assumption that rational consumers select the products that yields them the highest utility given the constraints (Loureiro and Umberger, 2007). Based on these theories, one can state that the beef consumers' choice between two or more beef cuts described by their attributes reveals his relative preferences for these beef cut attribute levels. Random utility theory models the utility the beef consumer derives from beef by dividing it into a deterministic and a random component as follows:

$$U_{ni} = V_{ni} + \mu_{ni} = \beta X_{ni} + \mu_{ni} \qquad (1)$$

Where U_{ni} is the utility that individual n obtains from good I and V_{ni} is the deterministic and observable part of this utility, which is related to the attributes of the beef cut. The term μ_{ni} is the error term, or the random part of the utility, that is unobservable to the researcher (Bateman *et al.*, 2002). It may result, among others, from measurement errors, misspecification of the utility function, missing attributes, and inattentiveness or fatigue of the respondent during the survey (Koistinen, 2010).

The deterministic component, U_{ni}, of function (1) is further characterized as the vector, X_{ni}, of the exogenous attributes times the vector of the coefficients, β, for the attributes, and is assumed

to be linear in parameters (Bateman *et al*., 2002). Thus, this utility formulation allows beef consumers' choices to disclose their trade-offs between different attributes of the beef cuts. The interaction effects of the beef cut attributes can be added to the model to captures the impact of interactions through the coefficient vector which now measures the joint effect of beef attributes for the consumer's utility (Holmes and Adamowitz, 2003).

A key advantage of the random utility model is that it represents beef consumer preferences in a relatively realistic way, as it takes into account the unpredictability of behaviour (Bateman *et al*., 2002). Consequently, as the error term is unobservable to the researcher, the predictions are made with uncertainty. This leads to the perceiving of utility as a random variable and to perform a probabilistic choice analysis, where the individual makes a choice between beef cut, i and j depending on the resulting utility levels (Bateman *et al*., 2002). The beef consumer chooses beef cut i provided that the condition $U(i) > U(j)$ is fulfilled. From the viewpoint of the researcher, the conditional probability that beef consumer n prefers beef cut i with attributes over j in a different choice set is:

$$\mathbf{P_n}\left(\mathbf{i}\right) = \mathbf{P}_i\left[\left(V_{ni} + \ell_{ni}\right) > \left(V_{nj} + \ell_{nj}\right)\right] = P_i\left[\left(V_{ni} - V_{nj}\right) > \left(\ell_{nj} + \ell_{ni}\right)\right], \mathbf{i},\ \mathbf{j}\ \in\ \beta \quad (2)$$

2.3 Methods of eliciting consumer preferences and willingness to pay

Based on the theory discussed above, different methods of eliciting consumers' preferences have been proposed. Recent literature revealed that measuring consumers' preferences for products and services have been an important task for both academics and practitioners in public and private settings (Castelló, 2003). Entrepreneurs are interested in knowing the perception of people; marketing departments want to know consumers' preferences; and the general public wants to know what others think about public, health and other issues. This implies that assessments of individuals are used for many different purposes, including setting social policies and evaluating the acceptance of a new product in the market.

According to Centre for International Economics (CIE, 2001), consumers' preferences can be sourced using either revealed or stated preference data. The revealed preference data is used to estimate consumers' valuation for attributes when data already exists from past behaviour of consumers whereas stated preference when data does not exist. One of the key differences between the two systems is the data origin and collection method; revealed preference data are obtained from the past behaviour of consumers while stated preference data are collected through surveys (Castelló, 2003). Stated preferences on the other hand hold significant advantages when historical data do not suit the objective function or when data does not exist from history (CIE, 2001). Figure 2.1 shows the family of stated preference methods that have been classified for eliciting consumers' preferences for products. From the Figure 2.1, it is shown that stated preference methods of elicitations include; contingent valuation, conjoint analysis, and discrete choice methods (Castelló, 2003). However, the stated preference techniques are also widely used as a marketing research tool because it reveals attributes of product or what it is about a service that drives customers' interest and influences their final purchase decision (CIE, 2001).
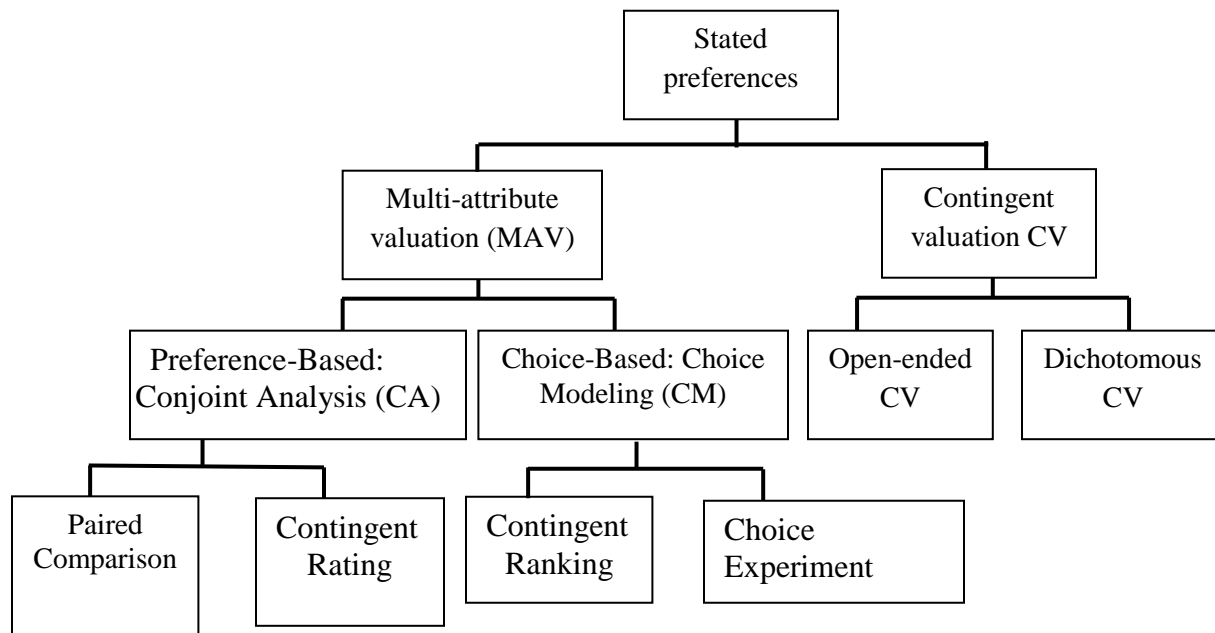
Figure 2.1: The Family of Stated Preference Methods
Source: Castello, 2003

It is shown from Figure 2.1 that a variety of stated preference techniques have been established for eliciting consumers' preferences and measuring WTP for goods and services (Bateman *et al.*,

2002). All these techniques comprise asking respondents to consider one or more hypothetical options and to express their preferences for them through surveys. However, there are significant analytical differences between stated preference techniques contingent valuation, conjoint analysis and choice modeling (CIE, 2001).

The most general and broadly recognized classification of stated preference techniques is that between CV and MAV; thus, between CV and both conjoint analysis and choice modeling approaches (CIE, 2001). CV is a direct survey method which is capable of estimating consumers' preferences by a properly designed questionnaire, a hypothetical market is described where the good or service in question can be traded. This contingent market defines the good itself, the context in which it would be provided and the way it would be financed. Respondents are then asked to express their maximum willingness to pay for, or their minimum willingness to accept, a hypothetical change in the level of provision of the good (Boccaletti and Nardella, 2000). Hanley et al. (2001) stated that, hypothetically, CV is well entrenched in welfare economics, specifically in the neo-classical concept of economic value based on individual utility maximization. The assumption is that stated WTP amounts are associated with respondents' underlying preferences in a consistent manner (Hanley *et al*., 2001) but the open-ended CV method is now seldom used because it is susceptible to an array of biases, for example, respondents find open-ended questions too difficult to answer because they are not familiar to paying for non-market goods and services and that respondents may have a preference for one alternative over the other but do not know their maximum willingness to pay for that good (CIE, 2001).

Koistinen (2010) stated that, due to the complications of eliciting values using an open-ended question; several CV studies are now undertaken using the referendum or dichotomous choice elicitation. The preference data generated using this method is encoded in binary forms, as respondents are only given the option of answering yes or no, which implies the adoption of a random utility function. Both methods seem to have some restrictions for estimating values according to CIE (2001). First of all, only one attribute or scenario can be presented to a sample of respondents for valuation. Secondly, it is a poor method for estimating consumer values because respondents are unlikely to provide an accurate response when presented with a

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hypothetical scenario. A third potential weakness of CV is that it may induce some respondents to behave strategically, particularly when public goods are involved.

Due to the problems of open-ended question and referendum or dichotomous choice, researchers are gradually developing an interest in alternative stated preference formats such as MAV methods, which include conjoint analysis and choice modeling (Hall *et al*., 2002). The core difference between CV and MAV is that the former analyzes one attribute of the product at a time while the latter explores more than one attribute simultaneously (Hall *et al*., 2002). Based on the methodological review, the choice experiment is considered since the study incorporates multiple attributes measured at different levels.

2.3.1 Theoretical discussion on choice experiments

Choice experiments allow an examination of trade-offs among alternatives by replicating realistic purchasing situations and allowing evaluation of multiple attributes according to Lusk *et al*. (2003). According to Lusk and Schroeder (2004), a choice experiment allows numerous choice sets with two or more alternative products that are presented to the respondent. The rule is that the alternatives must be typically products that differ in the levels of their attributes: for instance, their price, fat content or colour, country of origin etc. Choice experiments are commonly used by researchers to evaluate the value of products or trade-offs between product attributes in situations where market data are nonexistent or unreliable (Schroeder *et al*., 2003).

A study conducted by Olynk *et al*. (2010) incorporated five aspects of animal rearing and verification entity in choice experiments. They are of the opinion that consumers must receive information about the attributes and levels included in the choice set. For instance, they investigated whether individual crates/stalls were permitted or not permitted, pasture access was required or not required, antibiotic use was permitted or not permitted, certified trucking/transport was required or not required, and whether the certification entity was the USDA-PVP, the producer (i.e., self-certification), a private third party, or a consumer group. In addition to the attributes, price of the products must be added as an attribute and these prices

must be consistent and comparable with retail prices at the time the survey is administered. This means that the price selected for the study should be consistent and comparable to the existing retail prices at the period the study will be conducted.

Attribute-based methods of evaluating preferences can either be binary or multinomial, implying that respondents can be asked to choose between, rank and rate two or multiple beef cuts at a time (CIE, 2001). Attribute-based techniques are multidimensional in that several attribute levels may be varied simultaneously; implying that they generate a comfortable portrayal of preferences than CV methods as iterated by Holmes and Adamowicz (2003). Likewise, choice modeling techniques is an indirect method eliciting willingness to pay as it does not involve explicitly asking for monetary valuations and thereby eliminating some of the challenges of contingent valuation method (Bateman *et al*., 2002). According to Hanley *et al*. (2001) and Vermeulen *et al*. (2008), no-choice option is added in the design of the choice sets to provides the respondent the probability to choose not to buy any of the goods presented in the choice set, and it improves the practicality of the choice situation as the respondents are not forced to choose any of the options. 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 *et al*., 2006).

Respondents in a choice survey face several choice sets offering different combinations of unique alternatives. The choices made between the alternatives reveal consumers' relative implicit preferences for the particular beef attributes according to random utility theory (Koistinen, 2010). The good thing about attribute-based methods and choice experiments according to MacKerron *et al*. (2009) is that, there is the likelihood to derive a valuation for each beef 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. Lusk and Schroeder (2004) summed the essence of using the choice experiment in their study on beef quality. They posit that, the use of choice experiment is due to its flexibility as numerous beef attributes are simultaneously valued. Secondly, choice experiments are consistent with random utility theory and Lancasters' theory of consumer demand which posits that consumers derive

utility from consumption of attributes embodied in beef. Thirdly, the individual choice questions are typically framed in a manner that closely resembles consumer purchasing decisions. Because choice questions closely mirror actual consumer purchasing situation, it has been hypothesized to be less prone to one of the drawbacks of CV method thus hypothetical bias in willingness to pay (WTP) estimates. Lim (2012) studied WTP for country-of-origin labeled, traceable, and bse-tested beef, the choice experiment was employed to beef attributes like price, food safety, leanness, country of origin and production practices because of the multiple attributes and the different levels.

2.4 Consumer preference for beef products

2.4.1 Consumer preference for beef products in general

Consumers make beef purchasing decisions based on beef product attributes they consider being important. According to Goss *et al*. (2007) consumer perception of beef quality in the Southern Plains influences their preferences and that they purchase beef products they perceive to be of higher quality. Consumers consider tenderness to be the most important palatability attribute of beef (Goss *et al*., 2007). The emphasis is that some segment of consumers prefers tender steaks to non-tender steaks but consumers at times are unsure if the beef they purchase will be tender since quality-grading standards do not exist to give consumers a direct tenderness measurement.

Lusk *et al*. (2003) iterated that, decline in beef consumption in France, Germany, United Kingdome and United States may be due to consumers' inability to differentiate between the qualities of beef products available for purchase. Lapar *et al.*(2010) were able to find attributes like freshness, absence of adulteration, fat content or cover, and various facets of appearance were generally claimed as major quality attributes of interest to consumers across a range of livestock products and these influences their preferences for beef products in Northern Vietnam. Furthermore, consumers prefer packaged beef with a government inspection stamp as a preferred safety attribute.

Curtis *et al*. (2011) iterated that, locally produced beef products have become more popular due in part to the increased separation between food producers and consumers in Nevada. This shows that consumers prefer purchasing food products whose origin can be identified while others find value in supporting local producers. Other attributes of beef examined in earlier research have also been diverse. For example, Pouta *et al*. (2010) conducted a study in Finland on consumer preferences for fillets focusing on attributes concerning the production methods from organic production to animal welfare and consumer health-oriented production, as well as the importance of a country of origin label and of seasoning. They examined collective preferences with a conditional logit model and accounted for preference heterogeneity by using a latent class model. They also found country of origin to be the most important product attribute, followed by animal welfare-oriented production. This suggests that consumers are heterogeneous in the preference for these attributes and the WTP estimates cannot be explained as belonging to a specific group of consumers. The effect of the country of origin on beef choice has been widely examined and revealed to be a relatively dominant attribute. Correspondingly to the discoveries of Pouta *et al*. (2010) the country of origin was the most important attribute followed by animal welfare-oriented and environmental production. Schnettler *et al*. (2009) and Bernués *et al*. (2003) also obtained similar results in their study in Southern Chile and Europe respectively. Consumers have really recommended the attachment of multiple quality cues to the country of origin of food, partly due to the attribute's dominant role in consumer choice in Finland and Germany (Pouta *et al*., 2010; Becker *et al*., 2000).

Both producers and consumers have been found to differentiate qualities and standards in Kenya using attributes like texture, taste, convenience and of trust and reputation in sellers. Some of these may be associated with rather significant 'price premiums but the issue is that some of these attributes cannot be measured (Makokha and Fadiga, 2009). Bosmans *et al*. (2005) found additional attributes that relates with appearance, nutritional value and food safety contrary to what Bernues *et al*. (2003) found, they said consumers are now interested in extrinsic quality attributes such as respect for animal welfare and environmentally friendly production but Bosmans *et al*. (2005) asserted that most of those newly emerging quality attributes are so-called

credence attributes, these product attributes can neither be directly perceived nor verified by consumers. Rather, consumers have to make decision based on trust in the presence of these attributes, e.g. through confidence in personal communication, labels or controlling organisations in Belgium.

Consumer demand for quality information to make rational decision has resulted in an increasing degree of competitiveness within the agricultural-food chains in UK (Northen, 2000). This has created new market and promoted growth of highly differentiated beef products through a series of attributes (search, experience, and credibility) and quality indicators (intrinsic and extrinsic) associated with the beef and the productive processes (Becker, 2000; Northen, 2000) besides, traceability attributes of beef are usually seen as of rising importance to consumers, and food safety and animal welfare-oriented production methods seem to be highly valued among Europeans and North Americans (Cicia and Colantuoni, 2010). Mesías *et al*. (2005) showed that the origin of beef was the most determining attribute guiding the purchase decision in a study carried out in Spain. This concurs with results obtained by other authors (Bernués *et al*., 2003). However, the Ghanaian consumers also have their own idea on the beef cuts marketed in the country. It has been determined that, in particular cases however, information about product quality through labels would be more relevant for beef consumers in Belgium (Verbeke and Ward, 2006). But the beef products in some markets in Ghana are not labeled and consumers on the other hand rely on their personal indicators for quality.

Roininen *et al*. (2001) studied differences in the tastes and health attitudes of Finnish, Dutch and British consumers in the food choice process, ascertaining that Finnish consumers were slightly more health-oriented and had higher positive preferences for low-fat products than Dutch or British consumers, who placed higher value on pleasure. Pouta *et al*. (2010) linked the impact of stating particular product information on a label and in a written form, finding that well known labels have a larger positive impact on the choice of beef cut than the written information whereas unknown labels may negatively impact on the choice of beef. Gracia *et al*. (2009) revealed that consumers preferred fact panels containing nutritional information over nutritional

claims, being willing to pay twice as much for having the former than the latter in Spain. A well-known brand name was, nevertheless, valued higher than the nutritional attributes.

2.4.2 Consumer preferences for beef products in Ghana

Consumer preferences for beef product attributes have received little attention in Ghana. However, studies have shown that during animal slaughter, procedures for humane slaughter, personnel involved and post-slaughter meat handlings are some of the critical factors considered to influence consumer preference for beef in Ghana (MFA, 2009). Religious considerations have been found to be one of the key factors influencing beef slaughter and preferences (Annan-Peprah *et al*., 2012).

Regulations governing animal slaughter are aimed at assurance of good public health (FDB, 2004). This is because contaminated beef can be a source of many zoonotic diseases like Salmonelosis, Campylobacteriosis, Listeriosis, E. coli 0157:H7, Clostridial and Staphylococci infections, as well as diseases transmissible from one animal to the other (Roberts, 2011; Wilson, 2005). Consumers of beef also apparently have their personal criteria for beef preference and purchase which varies across individual consumers in terms of their demographic characteristics like age, education, income and perception of food safety. These criteria used by consumers must be investigated to make sure the safety of consumers is assured.

Table 2.2 shows the Ghanaian consumers' criteria for meat purchases, Annan-Peprah *et al*. (2012) revealed that most Ghanaians eat all types of slaughtered domestic animals and even processed parts like 'coat' (singed and water steeped skin) and smoked cow feet. Further they found that consumers purchase their beef from slaughterhouses, ordinary meat shops, wayside meat-vending tables, supermarkets and a combination of these. Their study revealed that consumers beef purchase decision is usually based on hygiene of meat (37.5%) and a combination of cost and hygiene (38.3%) and these factors formed the principal criteria for preference and purchase of meat.

Table 2.2 Ghanaian consumer criteria for meat purchases

Criteria used to purchase meat						
Region	Cost	Hygiene of meat	Cost & Hygiene	Religion	Hygiene & religion	Cost & religion	Total respondents by Region
Greater Accra	0(0)	6(13.3)	4(8.9)	0(0)	0(0)	0(0)	10(8.3)
Upper East	0(0)	5(11.1)	4(8.9)	4(36.4)	0(0)	2(50)	15(12.5)
Ashanti	7(63.6)	9(20)	4(8.9)	2(18.1)	1(33.3)	1(25)	24(20)
Eastern	0(0)	7(15.2)	7(15.2)	1(9.1)	0(0)	0(0)	15(12.5)
Volta	0(0)	6(13.3)	6(13.0)	0(0)	1(33.3)	0(0)	13(10.8)
Central	0(0)	5(11.1)	7(15.2)	1(9.1)	0(0)	0(0)	13(10.8)
Western	2(18.2)	4(8.9)	6(13.0)	2(18.1)	0(0)	0(0)	14(11.7)
Brong Ahafo	0(0)	1(2.2)	2(4.3)	1(9.1)	0(0)	0(0)	4(3.3)
Northern	2(18.2)	0(0)	3(6.5)	0(0)	1(33.3)	1(25)	7(5.5)
Upper West	0(0)	2(4.4)	3(6.5)	0(0)	0(0)	0(0)	5(4.2)
Total	11(9.2)	45(37.5)	46(38.3)	11(9.2)	3(2.5)	4(3.3)	120

Source: Annan-Peprah *et al*. (2012)

Opoku and Akorli (2009) showed that country of origin is the most important attribute in Ghanaian consumers' preferences. With the use of pair-wise t-tests, they found that country of origin is significantly more important than brand name, price, quality and taste of beef. Thus, consumers associate quality of beef products to the individual country of origin since beef from certain countries are considered more safe and high in quality. Furthermore, they realize the Ghanaian consumer holds the domestic beef label in low regard relative to foreign labels, whilst superior quality and consumer taste are the two most important reasons for the Ghanaian consumers' preference for beef cuts and other beef products.

In order to ensure food safety and quality, the Ghana Food and Drugs Board guidelines for the regulation of beef products requires that

1. Any company/persons wishing to import or put livestock products onto the Ghanaian market for sale will be expected to register with the FDB. In the case of local producers, the slaughter facilities will be inspected before the permission is granted.

2. The animal from which the carcass is derived shall be healthy and be slaughtered in a certified abattoir. Local producers will therefore need FDB authorization to operate an abattoir even if the facility is cited on their own premise.

3. A health certificate of the animals and also a certificate of quality and condition of the product will be required. Inspection or Grade designation marks shall be required on the carcasses or cuts.

4. Deboned beef or mutton carcasses shall not contain more than 25% fat by mass, and back fat thickness shall not exceed 1.5cm.

5. The products shall be delivered solid frozen wrapped first in hosiery or linen cloth, then in Kraft paper or polyethylene films and finally in Hessian cloth.

6. The containers and accompanying documents shall give the following information:

a) Type and Grade of carcass

b) Name of producer

c) Batch or code number

d) Net weight

e) Date of packing

f) Storage instructions

Dabuo (2011) found that the indiscriminate use of drugs, deliberate pollution of the environment and lack of concern about welfare are all problems which cause people to reconsider their automatic acceptance and preference of beef in Ghana and has cause some people to withdraw their consumption of beef. This means that Ghanaian consumers prefer beef which is free from chemical contamination in addition to environmental safety and animal welfare. Beef producers and processors in Ghana modify beef cuts to contribute to preservation, convenience, appearance, palatability, variety and safety giving the consumer a wide choice of beef products from which his preference influence his choice (Dabuo, 2011). This implies that factors such as convenience, appearance, palatability, variety and safety of beef cuts have been found to influence consumer preferences for beef cuts and other beef products in Ghana.

Annan-Peprah *et al.* (2012) iterated that Ghanaian consumers have been increasingly concerned about food-risks and personal health, particularly hygiene and quality and require detectable indications such as health certificates at the market place or veterinary stamps at the butcher stage. This means that when producers are able to satisfy these requirements, consumers' preferences and willingness to pay is expected to increase as they will be required to pay a premium for the added attributes. Dabuo (2011) suggested that, in order to address the concerns and /or expectations of Ghanaian consumers, the health benefits associated with eating low fat products as well as the idea or concepts of freshness and taste need to be incorporated into any new promotional campaign to meet the new trend in consumer preferences. Amongst the attributes of beef eating quality, colour, and the odour of meat are detected both before and after cooking and provide the consumer with a more prolonged sensation than do juiciness, texture, tenderness, taste and most of the odour which are detected on mastication (Dabuo, 2011). It was indicated that, whatever the scientific basis of these attributes may be, their significance will be determined by regional preferences and by the views of the individual consumer where some prefer markedly tough beef, others prefer excessive tenderness. He further stated that at the present, texture and tenderness are rated as most important by the average Ghanaian consumer among the attributes of eating quality and appear to be sought at the expense of flavour or colour. After consumers buy a meat product, they relate its quality to the texture and flavour when eating.

2.5 Empirical literature on factors influencing consumers' preference for beef products

The topic of determinants of consumer preferences has received some attention in recent literature. Consumer preferences for beef products have been found to be influenced by socioeconomic, psychographic, internal/intrinsic, external/extrinsic and food safety and quality factors.

The socioeconomic factors that have been found to influence consumers' preferences for beef products include age, gender, household size, concerns about health, tendency to purchase meat products in outlets, and frequency of in-home meat preparation. Ethnicity, income, religion, education, membership of environmental and animal welfare organizations as well as living in the metropolitan area among other factors have been observed to explain the choices and preferences of consumers in the purchasing of beef products and the potential market segments to whom offer differentiated products (Koistinen, 2010; Renuka, 2008; Pouta *et al*., 2010; Gracia and Magistris, 2008; Froehlich *et al*., 2009; Makokha and Fadiga, 2009; Jamey *et al*., 2012;) Borin *et al*., 2010).

Psychographic factors like attitude of consumers concerning animal welfare, pasture raised production, lifestyle, attitudes, beliefs, values, personality, buying motives, and/or extent of product usage or frequency of beef purchase have been found to influence consumers preference for beef products. Animal welfare concerns for instance has been shown to have a positive impact on the consumer perception of and preference for meat products (Cicia and Colantuoni, 2010; Maria, 2006; Napolitano *et al*., 2007; Schnettler *et al*., 200; Goss *et al*., 2007).

Food safety and quality concerns are an important issue for most consumers and influences their preferences. Concern for microbial, physical and chemical safety of beef as well as hormone, and antibiotic use in beef products has recently become more important factors affecting consumer preferences (Goss *et al*., 2007). However, in developing countries market for animal products, consumers and producers differentiate products based on specific criteria representing quality, safety and convenience, which should be observable and measurable. Consumers prefer organic/naturally produced beef quite highly because of the perception that it is very safe (Pouta *et al*., 2010; Teratanavat and Hooker, 2006). Nagaraja (2004) opined that, consumer buying behaviour of beef cuts is very much influenced by experience of their own and of neighbour consumers and his family.

Internal/intrinsic factors have been found to influence consumers' preferences for beef products. These factors are associated or found in the beef products; tastes, tenderness, cholesterol, sodium, artificial ingredients, fat content, leanness, microwaveability, animal breed, musculature for meat quality; traders considered animal health, vigour and date of last medical treatment and halal methods of slaughtering for religious purposes (Goss *et al*., 2007).

Furthermore, there are external/extrinsic factors that determine beef quality and safety and in turn influence consumers preferences, these characteristics include; packaging, country of origin, display, price, shopping environment (Gracia and Magistris, 2008; Maria, 2006; Schnettler *at al*., 2009; Renuka, 2008; Hoffmam, 2000; Becker *et al*. 2000). It has been determined that in some cases however, information about beef product quality through labels would be more relevant for beef consumers (Verbeke and Ward, 2006). So, consumer buying is more complex and varies just beyond the attributes of the product. The animal welfare is a concept associated not only with production methods respectful of the care and protection of animals during the breeding cycle, transportation, and slaughter, but also related to the quality and food innocuousness of the final meat product (Meehan *et al*., 2002; Shivkumar, 2004; Villalobos, 2005; Froehlich *et al*., 2009).

2.6 Empirical literature on factors influencing consumer willingness to pay for beef products

WTP is a measure for signifying the maximum monetary contribution an individual is willing to make in order to balance for a rise in his utility. This change in utility is classically evoked by a change in the level of some or several attributes of a good (Adamowicz *et al*., 1998). WTP for beef products has received some attention in the consumer choice studies. Consumers' WTP is affected by exogenous factors like processing, packaging, certification, product price, labeling, product brand and consumers' knowledge and awareness about the products (Kamal *et al*., 2009; Fields *et al*., 2006; Millock, 2002; Carlberg *et al.*, 2007).

Socioeconomic factors such as education, occupation, household size, household income, frequency of beef purchase, along with product attributes affects consumer attitude and preference to buy the products (Fields *et al*., 2006; Millock, 2002; Carlberg *et al*., 2007). Internal or intrinsic factors such as pasture-grazed, growth hormone or antibiotic free, fat content, tenderness, cut difference of the beef and steak colour (Fields *et al*., 2006; Millock, 2002; Bonti-Ankomah and Yiridoe, 2006; Chang *et al*.,2012).

Perception and attitudinal factors have also been found to influence WTP for beef products. Among them include consumers' perception about health, safety and quality of beef products, past experience with beef safety incident, consumer concerns for environmental friendly production of the animal, consumer confidence in selecting and purchasing a quality product, consumers' perception of nature friendly, organic, all natural, low carbon footprint, and grass-fed/lean (Millock, 2002; Bonti-Ankomah and Yiridoe, 2006; Wong, 2009; Grunert, 2005; Campiche *et al*., 2004; Franken *et al*., 2011).

Figure 2.2 shows the framework reflecting consumer behaviour towards food products. It is shown from the figure that consumer willingness to pay is not influenced by a single factor. It is rather influenced by a framework of factors comprising of individual, social, economic, product and marketing factors like advertising, promotion and other marketing activities.
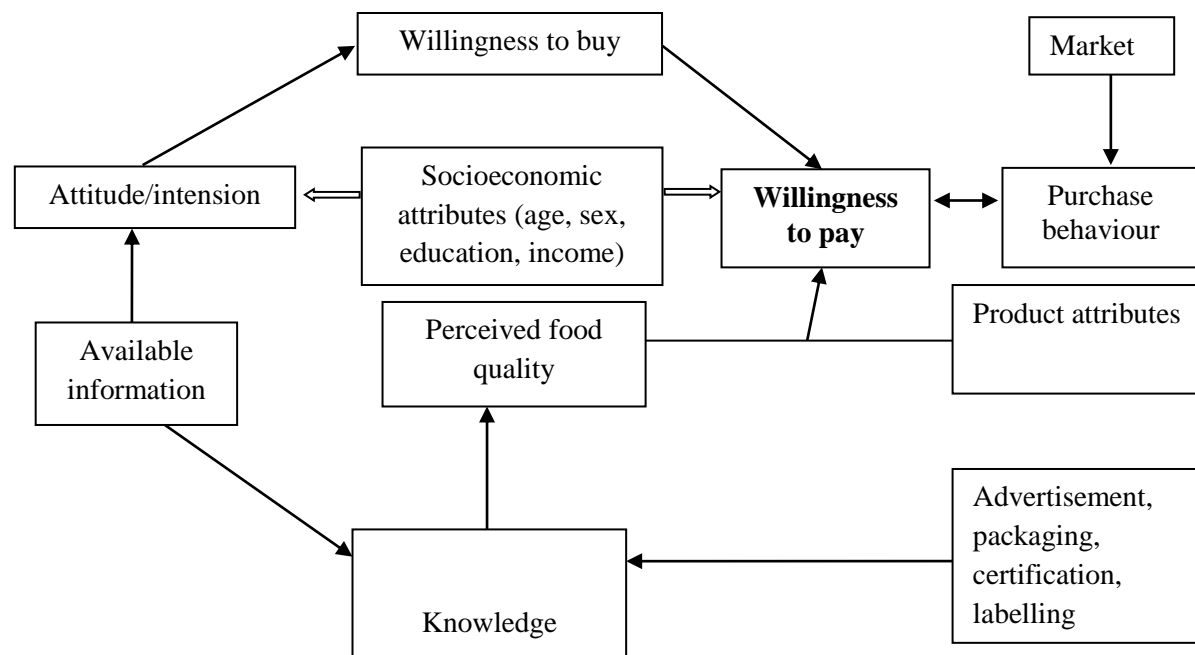
Figure 2.2 Framework reflecting consumer behaviour towards food products
Source: Millock (2002) and Bonti-Ankomah and Yiridoe (2006)

2.7 Conclusion

From the discussion on livestock production and products in Ghana, it was realized that beef production plays a major role in the socio-cultural life of farmers, farming communities, butchers and contributes to the overall economic growth of Ghana. Beef was revealed to be the primary meat and the most important livestock product in Ghana and in order to sustain the declining beef industry, there is the need to study consumers preferences for beef products and this justify why beef was chosen as the livestock product for the study.

The review of literature on theories of consumer preferences and willingness to pay for products revealed that consumers derive utilities from product characteristics or a set of attributes of products. With respect to Ghanaian consumers' beef consumption behaviour, the theories and methodologies allow the analysis of Ghanaian consumers' preferences on selected beef attributes such as price, product leanness (Less fat), product tenderness, product color or appearance,

product freshness/condition, product quality, shopping environment, product inspection (certification by public health/municipal authority) and product preparation ease or convenience which shape their shopping or buying behaviour.

The review of methods of eliciting consumer preferences and willingness to pay revealed that, there are two main methods of preferences and willingness to pay namely revealed and stated preference methods. The stated preference approach is shown to be appropriate in situations where there is no market information or data for explaining the behaviour of consumers. For this reason the stated preference approach is adopted for this study, specifically the multi-attribute base choice experiment is chosen among the other methods of stated preference approaches since the study involves multiple attributes of beef.

The literature review on consumer preferences for beef products showed that, some level of beef consumption decline is due to consumers' inability to differentiate between quality and safety of beef products available on the market. For this reason, the study seeks to determine the indicators of beef safety and quality in Ghana to help improve the consumption of beef products. Beef attributes like freshness, fat content, steak color, shopping environment, trust and reputation in sellers as well as convenience of cooking are safety and quality factors.

Factors such as age, educational level, gender, and income level, frequency of beef purchase, household size, and religion among others were found to influence consumers' preferences for beef products and as such will be hypothesized and included in the models specified for the study. Willingness to pay for beef products were found to be influenced by gender, education, household size, level of income, occupation, region of resident, age and frequency of beef purchase as well as concerns for animal welfare and environmental friendly production.

CHAPTER THREE

Data and methodology

The purpose of Chapter 3 is to describe the data and the procedures employed in the study. The first section involves the description of the data which includes the description of the study area, how the questionnaire was developed and the sampling approach used in the study. Also included in the data section is the survey and the characteristics of the respondents considered in the study. The second section is the procedures employed in analysing the specific objectives of the study and the conclusions.

3.1 Data

3.1.1 Demographic characteristics of Kumasi metropolis

Kumasi is located in the transitional forest zone and is about 270km north of the national capital, Accra. It is between latitude $6.35^{o} - 6.40^{o}$ and longitude $1.30^{o} - 1.35^{o}$, an elevation which ranges between $250 - 300$ metres above sea level with an area of about 254 square kilometres. The unique centrality of the city as a traversing point from all parts of the country makes it a special place for many to migrate to (Ghana Living Standard Survey "GLSS", 2010; Population Household Census "PHC", 2010).

The Kumasi metropolis is the most populous district in the Ashanti Region. During the 2010 Population Census, it recorded a figure of 4,780,380 and this accounts for 19.4 % of the country's population (GLSS, 2010; PHC, 2010). Kumasi has attracted such a large population partly because it is the regional capital, and also the most commercialised centre in the region (GLSS, 2010; PHC, 2010). Other reasons include the centrality of Kumasi as a nodal city with major arterial routes linking it to other parts of the country. Besides, Ashanti Region is currently the second most urbanized in the country, after Greater Accra (87.7%). The large urban population in the region is mainly because the Kumasi metropolis is not only entirely urban but accounts for a third of the region's population (GLSS, 2010; PHC, 2010). The growth of industries and the large volume of commercial activity in and around Kumasi as well as the lofty

migrant number may account partly for the relatively high urban population. It has been estimated to have a daytime population of about 2 million. The population has grown rapidly over the inter-sensual periods from 346,336 in 1970, to 1,170,270 in 2000 and 4,780,380 in 2010. Based on the census report, the estimated population growth rate is 5.47 per cent (GLSS, 2010).

Ashanti Region has a relatively high population density of 148 per sq. km, having increased steadily from 45 persons per sq. km in 1960 and 61 persons per sq. km in 1970 to 86 persons per sq. km in 1984. The region's population density was around the fifth in the country up to 1984, rose to the third densely populated region (148 per sq km) after the Greater Accra (895 per sq.km) and the Central Region (162 per sq. km) in 2000.

The high density of population of the region may be explained by the fact that it has the second-largest economy in the country after the Greater Accra Region, which tends to attract people from all walks of life to the region (GLSS, 2010). The Kumasi Metropolitan Area has a total surface area of 254 sq km (2000 population census) with a population density of 5,419 persons per sq. km. The Kumasi metropolis is second to the Accra metropolis (5,530) (Municipal Planning Coordinating Unit "MPCU", 2010).

Figure 3.1 shows the map indicating the structure of the Kumasi metropolitan area and its structural plan. The structural development as can be seen in the map is an indication that there is an increase in urbanization. This has been found to affect the demand and consumption pattern of consumers in the metropolis.
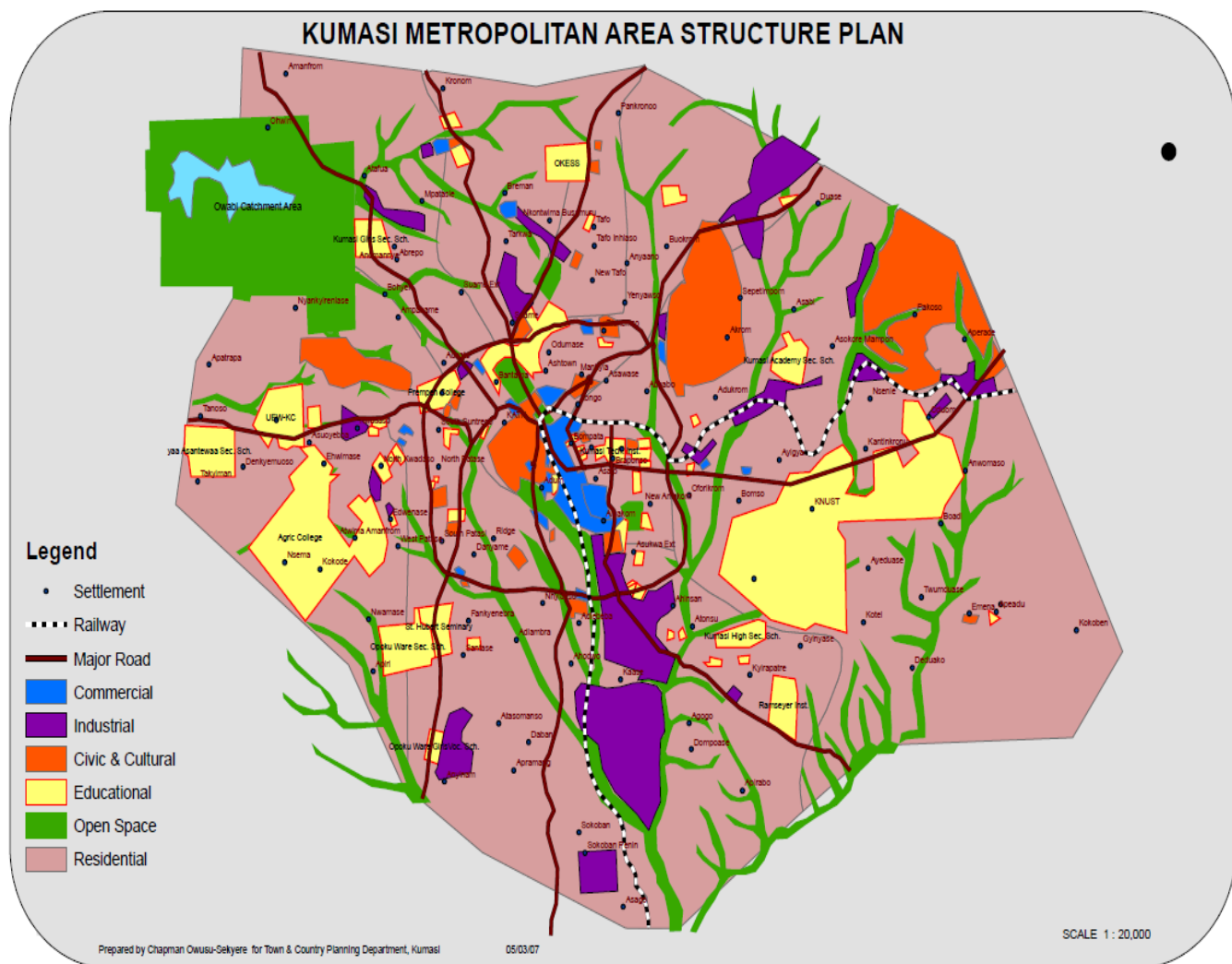
Figure 3.1 Map of Kumasi Metropolis
Source: Kumasi Metropolitan Assembly (2013)

3.1.2 Demographic characteristics of sunyani municipality

Sunyani Municipality is one of the twenty-two administrative districts in the Brong-Ahafo Region of Ghana. It lies between Latitudes 70 20°N and 70 05 ^{o}N and Longitudes 20 30 ^{o} W and 20 10 ^{o} W and share's boundaries with Sunyani West District to the North, Dormaa District to the West, Asutifi District to the South and Tano North District to the East.

There are effective economic and social interactions with the neighbouring districts which promote resource flow among these districts (MPCU, 2010). The municipality has a total land area of 829.3 square Kilometres (320.1square miles). Sunyani also serves as the Regional Capital for Brong- Ahafo. One-third of the total land area are not inhabited or cultivated, which provides arable lands for future investment (MPCU, 2010).

In 2000, the population of Sunyani municipality was 101,145. Currently, with a growth rate of 3.8 percent, the estimated population from the 2010 household and population census is 147,301. Figure 3.2 shows the map of the Sunyani municipality. The settlement areas as shown in the map tell how the municipality is expanding and developing among other factors account for increasing demand for improved food products.
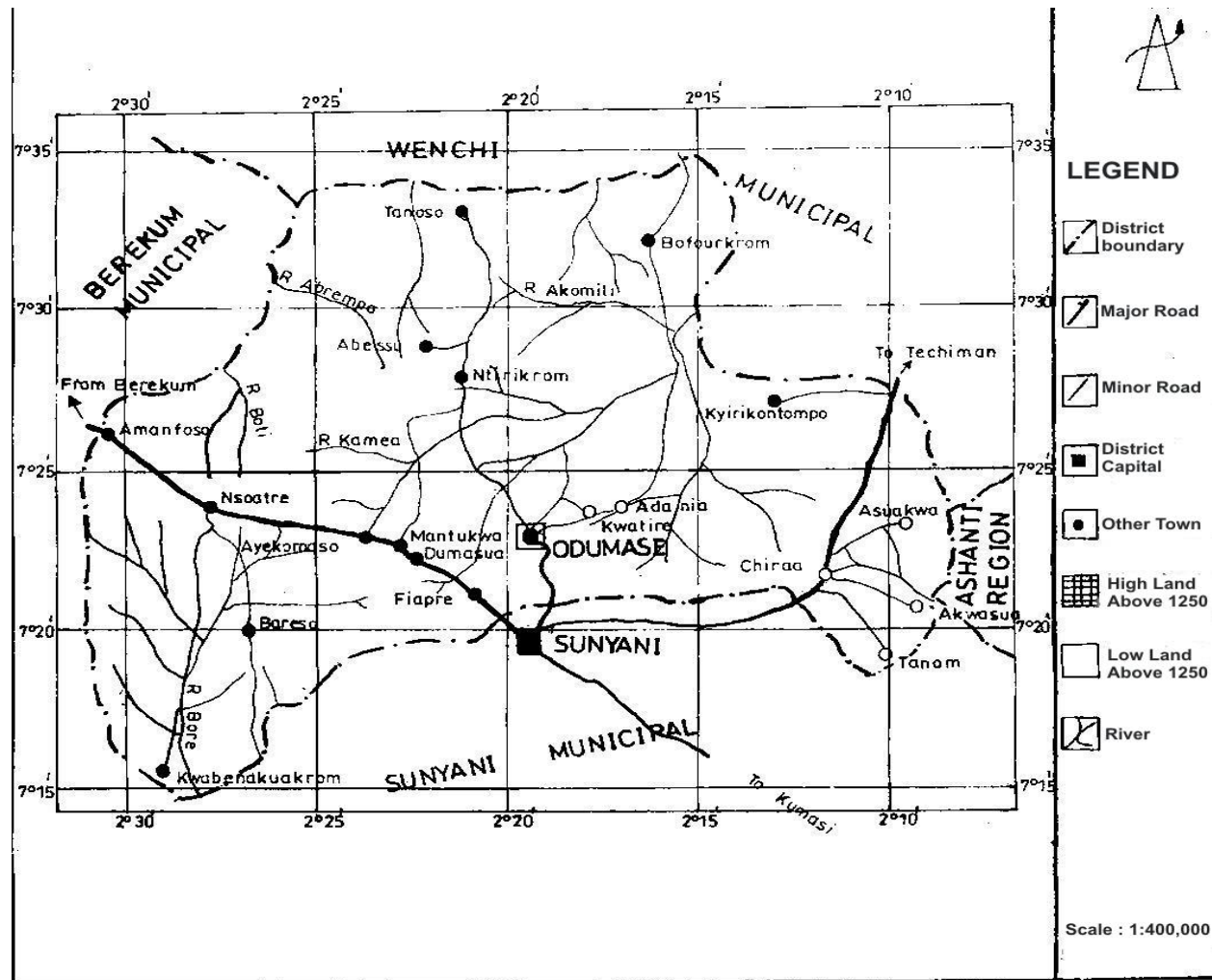
Figure 3.2 Map of Sunyani Municipality
Source: Sunyani Municipal Assembly (2013)

3.1.3 Development of questionnaire

A questionnaire (see Appendix I) was developed to obtain the relevant information on consumers and household characteristics. The information that was obtained included the attributes that consumers generally considered when differentiating quality and safety of beef products as well as their preferences for these attributes. This information used to frame the questions in the questionnaire survey was obtained from focus group discussion and participatory rural appraisal (PRA) with few urban consumers at residences, restaurants or market places and butchers to understand their preferences and choice of beef attributes to differentiate quality and safety of beef products. The factors that influenced consumers' preferences and willingness to pay for beef products were also sourced. The questionnaire used in the interviews comprised of a combination of open ended and closed ended question, Likert type scales and options where the consumer rate his/her choices in level of importance of the attributes presented.

3.1.4 Sampling

Data used in this study was obtained from 400 beef consumers in the Kumasi Metropolis and Sunyani Municipality of Ghana in December, 2012 and January 2013. The city of Kumasi is the second largest and one of the fastest growing urban centers in Ghana with an estimated population of 1.2 million and annual growth rate of 2.6 percent (GLSS, 2010). The economically active population in the metropolis is about 71.4 percent and a majority of them is self-employed in the private informal sector. The Kumasi Metropolitan Assembly, which has the administrative oversight over the city has stratified the metropolis into low (50.7%), middle (30%) and high (19.3%) income residential areas based on the population density, housing quality and the level of community facilities (GLSS, 2010). The low-income area comprises of 28 suburbs, the middle-income areas have 32 suburbs and the high-income areas comprise of 17 suburbs. The current population of Sunyani municipality is 248,496 with a growth rate of 3.8 percent. The growth rate of Sunyani compared with the national growth rate of 2.7 percent indicates a high growth rate.

Multistage sampling was used. The first stage of the sampling was the purposive selection of the Kumasi Metropolis and Sunyani Municipality. The Kumasi Metropolis was selected due to its

cosmopolitan nature and also the fact that it is one of the major beef consuming areas in Ghana with state-of-the art slaughterhouse. Sunyani Municipality was also selected with the aim of capturing the regional differences in the consumer preferences for beef product attributes.

Secondly, stratified sampling was used in this study based on the income stratification of households in the Kumasi city. Three suburbs were randomly selected, one from each of the three income stratification groups in the Kumasi Metropolis. These are: Nhyiaso from the high income group, Kaase from the middle income group and Asuoyeboa from the low income group in order to get a fair representation of the metropolis. The income stratification supports the widely-held view that incomes of households influence their consumption patterns (Boccaletti and Nardella, 2000; Kimenju *et al.*, 2005). The city's suburbs were randomly selected, followed by a random selection of one beef retail shop from each of the three randomly selected suburbs of the Kumasi metropolis. Only Sunyani abattoir retail market was selected from the Sunyani municipal because of the reason that is the major retail market where most consumers in the municipality buy their beef products from.

Finally, random sampling was used in selecting the respondents from the selected beef retail shops. One hundred and fifty consumers were randomly selected from Kumasi abattoir and its meat retail shop since it's the major beef purchasing center in Kumasi, from Kwame Nkrumah, University of Science and Technology Meat and Livestock Unit, fifty consumers were sampled, as well as fifty consumers each from Nhyiaso meat retail shop and Asuoyeboa meat retail shop respectively making a subtotal of three hundred beef consumers in the Kumasi Metropolis. From the Sunyani Municipality, Hundred beef consumers were randomly selected from the Sunyani abattoir meat retail market. In all a total sample size of four hundred beef consumers were selected.

3.1.5 The survey
Data collection involved three stages. First, as Ghana presently does not have official grades and standards for beef cuts, it was necessary to get a preliminary idea about the attributes that consumers generally considered when differentiating quality and safety of beef products as well

as their preferences for these attributes. This information was used to frame questions in the questionnaire survey. Thus, a focus group discussion and participatory rural appraisal (PRA) was conducted among a few urban consumers at residences, restaurants or market places and butchers to understand their preferences and choice of beef attributes to differentiate quality and safety of beef products. Secondly, a survey was conducted to fathom general consumption patterns, with a focus on beef cuts and consumer preference ratings of different beef products based on a number of product attributes. These attributes were identified during the preliminary survey. Finally, a survey was conducted on four hundred beef consumers to collect data for the analysis and address each of the study objectives. The study was conducted in and around the selected meat retail shops in the two selected regions during normal shopping hours (09:00 to 18:00) from Monday to Saturday. This was done in order to capture both working and non-working consumers in the survey.

In the survey design, consumers' perception of selected beef product attributes were assumed to be elicited by their importance ratings of each selected attribute, using a scale from 1 to 5 (1 being not important at all and 5 being extremely important). The selected attributes associated with beef products purchased from beef retail markets were (1) Shopping Environment (2) Packaging (3) Leanness (4) Inspection/certification (5) Tenderness (6) Colour (7) Freshness (8) Tenderness (9) Origin (10) Halal method of slaughtering (religious purpose).

To analyze this consumer choice for beef product attributes, the study employed the multi-attribute based non-hypothetical choice experiment to estimate WTP for the incorporated beef attributes because firstly, the study seeks to consider several beef products simultaneously described in terms of their attributes and the levels that these attributes possess. Secondly, it gives room for an examination of trade-offs among alternatives by replicating realistic purchasing situations whiles allowing evaluation of multiple attributes (Lusk *et al.*, 2003) and also market data are nonexistent or unreliable in Ghana for the value of products or trade-offs between beef product attributes (Schroeder *et al.*, 2003).

The choice experiments incorporated one aspect of animal rearing, food safety indicator and food quality namely method of production, certification or inspection, percentage of fat, and color of

steak/cut respectively. The study incorporates estimated consumer willingness to pay for the four different attributes. Table 3.1 summarizes the attributes and attribute levels evaluated in the choice experiments for 1Kg ordinary boneless beef.

The consumer was then probed to choose one of the alternative beef cuts or a possible no-choice option before then, consumers received information about whether the beef cut is from pasture-raised animal or conventional raised (confined) animal. Secondly whether the beef contains five percent (5%), ten percent(10%), and twenty percent(20%) fat content, consumers also received information about whether they prefer reddish or whitish steak colour and finally whether the beef on the retail market is inspected and certified by public health authorities with a certification label or not.

In addition to the above attributes consumers were presented with three different price levels for boneless beef cuts offered at 15GH¢/kg, 12GH¢/kg and 10GH¢/kg. These prices were selected to be consistent and comparable with the current retail prices. The experimental design of the choice sets, or the combination of the attribute levels into different choice scenarios was determined with an orthogonal main effects design combined with a blocking strategy, which resulted in five choice sets. A full factorial design which includes all possible combinations of the attributes would yield large number of choice sets which is not practically feasible to work with and for that matter was not used. The attributes and the levels are explained as follows:

Method of Production

Pasture-Raised: Pasture raised animals spend much of their lives outdoors, in an open space, where they forage for much of their own food. They are naturally fed and no administration of growth hormones and promoters.

Conventional/Confinement- Raised: Animals spend most or all of their lives housed indoors or in a small area, where their food is brought to them. They are also administered with growth hormones and growth promoters.

Fat Content

Maximum of 5%: Fat content have been trimmed to a maximum of five percent fat in the beef cut.

Maximum of 10%: Fat content have been trimmed to a maximum of ten percent fat in the beef cut.

Maximum of 20%: Fat content have been trimmed to a maximum of twenty percent fat in the beef cut

Colour of Beef

Red: Reddish appearance of beef cut or reddish steak.

White: Whitish appearance of beef cut or white steak

Certification/Inspection

Assured: means there is a label indicating the producer's participation in a certification and process verification or inspection program managed by the municipal health authorities and FDB.

Uncertain: Means there is no label indicating the producer's participation in a certification and process verification or inspection program managed by the municipal health authorities and FDB.

Price

Three prices were chosen, these are 15 GH¢, 12 GH¢ and 10GH¢ for a Kg of Ordinary boneless. Information on these attributes were provided to survey participants as part of a strategy of "cheap-talk" aimed to reduce hypothetical bias by informing participants of this bias prior to participation (Lusk *et al*., 2001).

Table 3.1 Beef product attributes and attribute level in the choice experiment

Product Attribute	Attribute Level
1. Method of production	Pasture raised
	Conventional/confinement raised
2. Fat Content	Maximum of 5%
	Maximum of 10%
	Maximum of 20%
3. Colour of Beef	Red
	White
4. Certification/inspection	Assured
	Uncertain
5. Price (GH¢)	GH¢ 15
	GH¢ 12
	GH¢ 10

3.1.6 Characteristics of respondents

This section presents a discussion on the consumer and household characteristics from the survey data collected. These include gender, age, marital status, educational level, ethnicity, and religion, frequency of beef purchase, primary shopper and household size of the consumers. As indicated in Table 3.2, consumers who purchase beef cuts at the retail shops are mostly within the ages of 19-30 with a 33.7 percent in the Ashanti region whiles in the Brong-Ahafo region, the modal age was 31-40 with a percentage of 47 but in total most of the consumers are within the age group of 31-40 with a percentage of 35.25.

With regards to gender, it was realized that most of the respondents were females with 54% in the Ashanti region, whereas in the Brong-Ahafo region, 67% of the respondents were females. In total 57.3 % of the sample were females. The high female percentage may be attributed to the fact that in most households in Ghana, females (women) are responsible for purchasing and preparing of food. This finding is consistent with the result of Owusu and Anifori (2013).

Seventy eight percent (78%) of the respondents in the Ashanti regions are Christian's whiles in the Brong-Ahafo region only 68% were Christians but in total Christians had the modal class with 75.5%. About 51.3% of the samples were Ashanti's with Ga's being the least with 0.7 % in

Table 3.2 Consumer and household characteristics

Characteristic	Ashanti Region		Brong-Ahafo		Pooled sample	
Age	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
19-30	101	33.7	25	25	126	31.5
31-40	94	31.3	47	47	141	35.25
41-50	83	27.7	23	23	106	26.5
Above 50	22	7.3	5	5	27	6.75
Gender						
Male	138	46	33	33	171	42.8
Female	162	54	67	67	229	57.3
Ethnicity						
Ashanti	154	51.3	8	8	162	40.5
Bono	42	14	78	78	120	30
Northner	70	23.3	13	13	83	20.8
Ewe	17	5.7	0	0	17	4.3
Ga	2	0.7	0	0	2	0.5
Central	15	5	1	1	16	4
Religion						
Christian	234	78	68	68	302	75.5
Muslim	66	22	32	32	98	24.5
Marital Status						
Married	206	68.7	88	88	294	73.5
Single	94	31.3	2	2	106	26.5
Education						
Primary	13	4.3	1	1	14	3.5
JSS/JHS	20	6.7	5	5	25	6.3
SSS/SHS	53	17.7	8	8	61	15.3
Training/poly	72	24	28	28	100	25
1st Degree	86	28.7	44	44	130	32.5
2nd Degree	20	6.7	13	13	33	8.3
PhD	34	11.3	1	1	35	8.8
None	2	0.7	0	0	2	0.5
Shopper						
Yes	191	63.7	82	82	273	68.3
No	109	36.3	18	18	127	31.8
Frequency of Purchase						
Once per month	6	2	1	1	7	1.8
2-3 times/ month	141	47	63	63	204	51
4 or more/ month	3	1	0	0	3	0.8
Once per week	101	33.7	24	24	125	31.3
2-3 times per week	48	16	12	12	60	15
4 or more per week	1	0.3	0	0	1	0.3
Household size						
1-5	213	71	77	77	290	72.5
6-10	80	26.7	21	21	101	25.3
11-15	6	2	2	2	8	2
Above 15	1	0.3	0	0	1	0.3

Source: Authors' calculations, 2013

the Ashanti Region whiles 78% of the respondents in the Brong-Ahafo are Bono's. In total the Ashanti's were the modal class with 40.5%. In Ashanti region 68.7% of the respondents were married whereas in the Brong-Ahafo region, 88% were married and in total 73.5% of the respondents are married.

The average years of education for the pooled sampled consumers was 15.07, in the Ashanti region, the mean years of education was 15 whereas the Brong-Ahafo region had 15.07 this indicates that most of the consumers who specializes in the purchase of beef cuts have attained tertiary education. In both regions it can be seen that most of the sampled consumers were the primary shoppers of their household, with 63.7% in Ashanti and 82% in the Brong-Ahafo region.

In the Brong-Ahafo region, the mean monthly household income of consumers was 960.80 Ghana cedis whereas in the Ashanti region the mean was 1289.30 Ghana cedis, in total the monthly household income was 1206.69 Ghana cedis. It is observed that, the frequency of purchase of beef in the Ashanti region was 2-3 times per month with 47% whiles in the Brong-Ahafo region, the frequency of beef purchase was also found to be 2-3 times per month and the same frequency was observed for the pooled sample. With regards to household size it was observed that both Ashanti and Brong-Ahafo region had 1-5 as the modal class and the same class is observed for the pooled sample. The descriptive statistics of variables used in the model are provided in Table 3.3. The table provides the mean and standard deviation values for the behavioural, attitudinal, and demographic variables. The demographic characteristics of the respondents revealed that, the mean age of the respondents was 37.06 with a standard deviation of 9.18. The average age suggests that beef products in Ghana are actually patronized by younger people. The average years of formal education of the respondents is 15 with a standard deviation of 3.66. This implies that consumers of beef products in Ghana on the average are highly educated. The mean household size of the respondents is 4.79 with a standard deviation of 2.30. It is shown that the average the Ghanaian consumers purchase beef three (3) times in a month. This suggests that beef is one of the primary meat products consumed frequently in Ghana.

Table 3.3 Descriptive statistics of socioeconomic characteristics and beef attributes

Variable	Variable Description	Mean	Standard Deviation
Age	Years	37.06	9.18
Yage	1 If age is less or equal 30, 0 otherwise	0.32	0.47
Mage	1 If age is between 31 to 40, 0 otherwise	0.35	0.48
Education	Years of formal education	15.07	3.66
Prim-SHS	1 if primary to secondary education is attained, 0 otherwise	0.26	0.44
College/poly	1 if college education is attained, 0 otherwise	0.25	0.43
University	1 if University education is attained, 0 otherwise	0.32	0.47
Hsize	Number of people in the household	4.79	2.30
Lincome	1 If monthly income less or equal 500 GHc, 0 otherwise	0.25	0.43
Mincome	1 If monthly income is between 501-1000 GHc, 0 otherwise	0.31	0.46
Fedum	1 if female, 0 otherwise	0.43	0.49
Mstatus	1 if married, 0 otherwise	0.74	0.44
Regdum	1 Ashanti , 0 if Brong- Ahafo	0.74	0.44
Shopper	1 if respondent is the household primary shopper,0 otherwise	0.68	0.47
Religion	1 if Christian, 0 otherwise	0.76	0.43
Pfreq	Frequency of beef purchase(Number of times beef is purchased in a month)	3.08	1.23
Knwl	1 If respondent has knowledge about pasture raised beef products, 0 otherwise	0.71	0.452
Awareness	1 If respondent is aware of health certification, 0 otherwise	0.99	0.07
Price	1 If respondent considers price attribute when purchasing beef, 0 otherwise	0.05	0.21
Leanness	1 If respondent considers leanness attribute when purchasing beef, 0 otherwise	0.96	0.19
Inspection	1 If respondent considers inspection attribute when purchasing beef, 0 otherwise	0.62	0.49
Freshness	1 If respondent considers freshness attribute when purchasing beef, 0 otherwise	0.68	0.47
Tenderness	1 If respondent considers tenderness attribute when purchasing beef, 0 otherwise	0.70	0.46
Breed/origin	1 If respondent considers origin attribute when purchasing beef, 0 otherwise	0.04	0.20
Color	1 If respondent considers Appearance attributes when purchasing beef, 0 otherwise	0.68	0.47
Health concern	1 if respondent agrees that pasture raised production improves health of the animal, 0 otherwise	0.79	0.41
Enviro_Concern	1 if respondent agrees that pasture raised production is improves the environment, 0 otherwise	0.94	0.24
Welfare_concern	1 if respondent agrees that pasture raised production is good for animal welfare, 0 otherwise	0.80	0.40

Source: Authors' calculations, 2013

In total 57.3 % of the sample were females with a mean of 0.43. This result is not surprising, however, given the disproportionate share of household grocery shopping done by females, and is similar to the gender breakdown in other in-store surveys (e.g., Lusk *et al*., 2001). Most of the sampled consumers about 68.3% were the primary shoppers of their household. This suggests that the preferences for beef products by the shoppers have a great influence on the entire household.

Consumers' knowledge, awareness and concerns for pasture raised products and production ranges from 0.71 to 0.99 which suggests that consumers in general have a good knowledge on issues surrounding the pasture raised products and production. The attributes that consumers rely on in their purchasing decisions in the Ghanaian market from Table 3.3 ranges from 0.05 to 0.96. This suggests that some attributes are less important in purchasing decision while others are extremely important.

3.2 Procedures

3.2.1 Identification of attributes consumers prefer and use in their purchasing decision

To determine the attributes' of beef consumers prefer and use in their purchasing decision, descriptive statistics such as frequencies and percentages were used. In determining the attributes consumers prefer and use in their purchasing decision, a focus group discussion and PRA was conducted among a few urban consumers at residences, restaurants or market places and butchers as well as an interview with the meat and livestock section of the department of animal science, Kwame Nkrumah University of Science and Technology to understand and come out with the choice of beef attributes to include in the questionnaire. Consumers were then asked to choose the attributes they rely on in their purchasing and their preferences were rated in order of importance attached to the attributes selected. The multi-attribute base contingent mean rating was then calculated from the individual frequencies and the number of observations for the individual attributes selected to rate the attributes in order of importance using SPSS.

3.2.2 Factors influencing consumers' preference for beef attributes

Factors influencing consumer preferences for beef product attributes was analysed using chi-square and estimated ordered probit model using STATA 11. Ordered probit models was employed because of the ordinal nature of the dependent variable and also the fact that it has been widely used for analysing such categorical data justifies the use of the ordered probit model (Chen *et al*., 2002). Ordinary linear regression is inappropriate due to the non-interval nature of the dependent variable. On the other hand, multinomial logit models or ordinary binary probit models would fail to account for the ordinal nature of the dependent variable.

The utility function or preference ordering of the beef consumer is assumed to be represented by the beef consumer's importance ratings R (R = 1–not important at all, R = 2–not very important, R = 3–somewhat important, R = 4–important, R = 5–extremely important) of the following beef cut attributes price, product leanness (Less fat), product tenderness, product color, product freshness/condition, shopping environment, product certification (inspection by public health/municipal authority), packaging and origin.

The individual beef consumers ratings (Rs) of the attributes are determined by a $i \times j$ vector (Z) consisting of socioeconomic, geographic and demographic factors of the beef consumer. These variables include income, region, age, household size, shopper, gender, education, and marital status. The vector R comprises responses from each survey respondent and is expressed as an ordinal importance rating based on the consumer's utility function (Peng *et al*., 2005).

For a representative beef consumer, i giving his or her importance ratings on the jth beef product attribute, the utility model can be specified as;

$$U_{ij} = \beta^I Z_{ij} + \varepsilon_{ij}, \varepsilon_{ij} \sim N(0,1) \tag{3}$$

where U_{ij} is unobservable utility and Z is defined above. The error term ε_{ij}, is assumed to have standard normal distribution across observations.

$$R = \begin{cases} 1 \ if, & U_{ij} \leq \mu_1 \\ 2 \ if, & \mu_1 < U_{ij} \leq \mu_2 \\ m \ if, & \mu_{m-1} \leq U_{ij}, \quad (m=1,2.....5) \end{cases} \tag{4}$$

The μ_m's is the utility threshold coefficients. The following probabilities can then be observed.

$$P_1 = \Theta(\mu_1 - \beta^I Z) \tag{5}$$
$$P_2 = \Theta(\mu_2 - \beta^I Z) - \Theta(\mu_1 - \beta^I Z), \tag{6}$$
$$P_m = 1 - \Theta(\mu_{m-1} - \beta^I Z) \tag{7}$$

Where *Pm* is the probability that the importance rating $R = m$ (where $m = 1, 2... 5$). Furthermore, $\Theta(.)$ is the cumulative probability function of a normal distribution over the range of utility for the representative consumer.

$$\Theta^{-1}(p_1) = -\beta^I X \tag{8}$$
$$\Theta^{-1}(p_1 + p_2) = \mu_2 - \beta^I X \tag{9}$$
$$\Theta^{-1}(p_1 + ... + p_{m-1}) = \mu_{m-1} - \beta^I X \tag{10}$$

where $p_1 + p_2 + ...p_m = 1$ and Θ^{-1} is the inverse of the cumulative standard normal distribution function. Using the theoretical model specified in equation (4) the explanatory variables Z's are substituted and empirical model of the Ghanaian consumers' importance ratings for each specific beef product attribute is specified in equation (11). Separate model would be estimated for each of the identified beef attributes. Empirically the ordered -probit model is as specified.

$$\Theta^{-1}(pm) = u_{m0} + u_{m1}Yage + u_{m2}Mage + u_{m3}\Pr im - Shs + u_{m4}University(1) + u_{m5}college\_poly$$
$$+ u_{m6}Mstatus + u_{m7}Lincome + u_{m8}Mincome + u_{m9}\operatorname{Re}gdum + u_{m10}Hsiz + u_{m11}fedum$$
$$+ _{m12}shopper + _{m13}\operatorname{Re}lig \tag{11}$$

Where $P1 + P2 + P3 + P4 + P5 = 1$

Table 3.4 presents the hypothesized determinants of consumers' preferences for products. The expected signs and the description of the variables are also included in the table.

Table 3.4 Hypothesized determinants of consumer preferences

Variable	Variable Description	Expected signs
Pm	R (R = 1–not important at all, R = 2–not very important, R = 3–somewhat important, R = 4–important, R = 5–extremely important)	
Yage	1 If age is less or equal 30, 0 otherwise	-
Mage	1 If age is between 31 to 40, 0 otherwise	+
Prim-SHS	1 if primary to secondary education is attained, 0 otherwise	-
College/poly	1 if college education is attained, 0 otherwise	+
University	1 if University education is attained, 0 otherwise	+
Hsize	Number of people in the household	+
Lincome	1 If monthly income less or equal 500 GH¢, 0 otherwise	-
Mincome	1 If monthly income is between 501-1000 GH¢, 0 otherwise	+
Fedum	1 if female, 0 otherwise	+
Mstatus	1 if married, 0 otherwise	+/-
Regdum	1 Ashanti , 0 if Brong- Ahafo	+/-
Shopper	1 if respondent is the household primary shopper, 0 otherwise	+
Religion	1 if Muslim, 0 otherwise	-

The variable *Yage* is expected to have a negative sign. The reason for this is that, young consumers are time constrained and have little time to evaluate product attributes in the beef retail shops, thereby influencing their preferences negatively. Peng *et al*. (2005) revealed that young consumers prefer ready-made food products because they have limited time to prepare their own food and this affected the purchase of fresh beef products negatively.

The variable *Mage* is hypothesized to have a positive influence on preferences for beef products because of the fact that, most consumers within this age group are found to be with families made up of dependants and as such will consider several attributes of beef products when purchasing to avoid risk.

The *Prim-SHS* variable is expected to have a negative effect on the preferences of beef products because all things being equal people with less education are expected to have lower income which affects their preferences and purchase for beef products (Jabbar and Islam, 2010). *College/poly* and *University* variables are expected to have a positive influence on the preference for beef products due to the reason that, consumers who graduate from college in Ghana, are

right away given appointments to work and therefore will have the purchasing power for beef products with improved attributes and therefore influences their purchasing decision. Thus, consumers with higher educational level can afford to purchase beef products with improved product attributes since they are expected to have higher incomes, all things being equal (Lapar *et al.*, 2010).

Hsize is expected to have positive influence on consumers' preferences due to the reason that households with higher numbers of people tends to have higher preferences for improved beef product attributes to avoid the risk of beef safety hazards or infections which will affect the entire people eating from the same house (Owusu and Anifori, 2013).

Lincome variable is expected to have a negative effect on the preferences for beef product attributes. This is because all things being equal low income consumers' will have a lower purchasing power which influences their preferences negatively. *Mincome* variable is hypothesized to have a positive influence on preferences for beef products because consumers' in this category have the purchasing power to purchase the beef products with the improved product attributes (Lapar *et al.*, 2010).

Fedum variable is hypothesized to have a positive influence because of the fact that, in most households in Ghana, females (women) are responsible for purchasing and preparing of food and as such have experience in purchasing products which in turn shape their preferences for beef products (Owusu and Anifori, 2013) and also given the disproportionate share of household grocery shopping done by females, and is similar to the gender breakdown in other in-store surveys (Lusk *et al.*, 2001).

Shopper is expected to have a positive sign because consumers' who are shoppers of the family food products are experienced in the purchasing of food products and this as well influence their preferences for beef products positively. *Religion* is expected to have a negative sign because

Muslims and other religions are much particular about the slaughtering and other process involve in the preparation of the beef products.

3.2.3 Indicators of beef safety and quality

To determine the attributes consumer rely on as safety and quality indicators using confirmatory factor analysis with AMOS GRAPHICS. Theoretically, factor analysis assumes that observed variables $Y = (y1, y2, \ldots, yn)T$ are related to a set of unobserved latent variables $Z = (z1, z2, \ldots, zm)T$ called "factors". The association between vectors Yand X is stochastic and may be stated by a conditional probability function $\pi(Y \,|z)$. In this analysis safety and quality are not measured or observed (latent) but the attributes that consumers rely on for assessing these factors were captured and the validity of the attributes is what is captured by the factor analysis using the Amos Graphics.

A critical assumption with factor analysis is that of conditional independence, where the observed dependence among the Y vector is entirely explained by its dependence on the X vector (Peng *et al*., 2005). Thus, the observed variables (Y) are explained in terms of a smaller number of unobserved latent factors (Z). Respondents were provided with statements in the questionnaire that were formulated as Likert-type questions scaling from 1 to 5. They had to indicate the level of reliance on the identified attributes as safety and quality factors or indicators in the beef industry. A copy of these questions can be viewed as part of the questionnaire in the Appendix I.

A factor analysis was performed to find and interpret the underlying, common factors of consumers' reliance on the attributes for safety and quality indications as well as the variables included in the ordered probit model. The factor analysis furthermore explained the variance in the observed variables in terms of underlying latent factors (Habing, 2003). Firstly, one has to determine whether it actually is necessary and/or worthwhile to perform the factor. This can be done by measuring the adequacy with which the different variables can be sampled. Data need to be correlated to justify the use of factor analysis. In this study the variables hypothesised to

affect the preferences and WTP for beef products were not correlated so there was no need to continue with factor analysis. On the other hand, the indicators of the beef safety and quality were found to be correlated and the confirmatory factor analysis was performed. The goodness-of fit measurements for the confirmatory factor analysis includes: chi-square index, critical ratio, Goodness-of-Fit Index (GFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and the Root Mean Square Error of Approximation (RMSEA). A smaller, non-significant chi-square index and critical ratio scores lower than 1.96 indicates a good fit (Byrne, 2010). GFI, CFI, and TLI values of 0.90 and greater indicate a good fit; values of 0.80 and greater indicate a fair fit (Browne and Cudeck, 1993; Byrne, 2001; Hu and Bentler, 1999). Higher values indicate a better fitting model. RMSEA values <0.05 indicate a good fit, and values up to 0.08 are acceptable if the other fit indexes are high. Comparative Fit Index (CFI) which is equals to the discrepancy function adjusted for sample size. CFI ranges from 0-1 with a larger value indicating better model fit

3.2.4 Factors influencing consumers' willingness to pay for beef attributes

Factors influencing consumers' willingness to pay for beef attributes included in the choice experiment was analysed using estimates of the random parameter logit model with the use of NLOGIT 3. The study employed random parameters logit model, this approach is justified because recent literature and research suggest consumers possess heterogeneous preferences. Therefore, it is appropriate to employ a model that allows heterogeneous preferences (Lusk, Roosen, and Fox, 2003; Tonsor *et al*., 2005, Olynk *et al*., 2010), it is also free of the independence of irrelevant alternatives (IIA) assumption, and allows correlation in unobserved factors over time, thus eliminating three limitations of standard logit models (Train, 2003; Tonsor *et al*, 2005).

Conditional logit model has also been widely used for similar estimations in the choice experiment literature but it has been found to assume a homogeneous preference for consumers resulting in bias estimates according to Lus *et al*. (2003). The random utility of the consumer (U)

underlies the random parameter logit model with the utility of attribute j for individual i in choice set t in the RPL model is generally.

$$U_{ijt} = v_{ijt} + \left[u_{ij} + \varepsilon_{ij} \right] \tag{12}$$

Two specifications of the RPL model were estimated. The first included only choice specific attributes namely the price, production method, certification, steak color and fat content.

$$V_j = \beta_1 pm + \beta_2 cert + \beta_3 sc + \beta_4 fc + \beta_5 price + \varepsilon \tag{13}$$

The second specification of the model included individual characteristics in interaction with the attributes

$$
\begin{aligned}
V_j = {} & \beta_1 pm + \beta_2 cert + \beta_3 sc + \beta_4 fc + \beta_5 price + \beta_6 pm*age \\
& + \beta_7 pm*edu + \beta_8 pm*reg + \beta_9 pm*gen + \beta_{10} pm*inc \\
& + \beta_{11} cert*age + \beta_{12} cert*edu + \beta_{13} cert*reg + \beta_{14} cert*gen \\
& + \beta_{15} cer*inc + \beta_{16} sc*age + \beta_{17} sc*edu + \beta_{18} sc*reg + \beta_{19} sc*gen \\
& + \beta_{20} sc*inc + \beta_{21} fc*age + \beta_{22} fc*edu + \beta_{23} fc*reg + \beta_{24} fc*gen \\
& + \beta_{25} fc*inc + \varepsilon
\end{aligned}
\tag{14}
$$

The value the consumer place on the various attributes differentiating the five steaks/cuts can be determined using the model estimates. For a given beef cut attribute, the total willingness to pay comparative to the beef cut removed from the model, is given by the negative ratio of the steak/cut alternative-specific constant to the price coefficient ($-\beta_j / \alpha$). The average WTP estimate is said to be a representative for the entire consumer group under question, if the standard deviations of the steak alternative constants are not statistically different from zero. If the standard deviations of steak alternative constants are statistically significant, then it means preference heterogeneity exists among the consumers, and average WTP estimates cannot be interpreted as being representative of the population (Tonsor *et al.*, 2005).

Table 3.5 shows the hypothesised determinants of consumers' willingness to pay for beef products. The meanings of the variables in the model and their expected signs or apriori expectations are presented in the table.

Table 3.5 Hypothesised determinants of consumers' willingness to pay for beef products

Variable definition	Meaning	Expected signs
V_i	1 if the alternative is chosen, 0 otherwise	
Production method (PM)	A dichotomous variable1 if pasture-raised beef is selected, 0 if conventional	+
Certification (cert)	A dichotomous variable 1, if certification is assured, 0 if uncertain	+
Steak colour (sc)	A dichotomous variable1, if whitish steak is chosen, 0 if reddis	+/-
Fat content (fc)	Effect coding; 1, if beef cut with 5% fat is chosen, -1 if beef cut with 10% fat is chosen, 0 if beef cut with 20% fat is chosen otherwise	+
Price	Price in Ghana cedis	-
Age	Years	+
Edu	Years of formal education	+
Inc	Monthly income in Ghana Cedis	+
Reg	Regional dummy, 1 Ashanti , 0 if Brong- Ahafo	+/-
Gen	1 if female, 0 otherwise	+

Price is expected to have a negative relationship with consumers' willingness to pay for the beef products. This is because as the price of the product increases, the purchasing power of consumers is reduced and rational consumers will reduce their purchases or seek for substitutes if the utility obtained is less than what they are paying for.

The pasture raised production method variable is expected to have a positive effect on the willingness to pay for beef products. This is because pasture-fed beef has a much better ratio of omega-3s to omegas-6s, a balance critical to human health, providing anti-inflammatory and neuro-protective effects and as such is expected to have a positive effect on willingness to pay (Marano, 2008).

Certification variable is expected to have a positive effect on consumers' willingness to pay since it gives an indication or assurance that the beef product is safe and of higher quality. This in turn reduces the perceived risk associated with beef consumption and increases the consumer confidence in the beef product thereby increasing the willingness to pay (Lapar *et al*., 2010).

The variable steak colour is expected to have either positive or negative sign because individual consumers have been found to have different preferences with regards to steak colour and the perception shapes their willingness to pay. The fat content variable is expected to have a positive effect on the willingness to pay for beef products. This is because recent concerns about the health implication of high fat content has influenced consumers to shift to the consumption of lean meat and as such are expected to pay more for lean beef products with only 5% level of fat (Conner and Oppenheim, 2008).

Age is expected to have a positive influence on the willingness to pay for the selected beef product attributes because as age increases people tend to be cautious about the type of beef products they consume and are willing to pay more for attributes that will not yield any health defects. Peng *et al*. (2005) argued that as age increases consumers tend to spend more on beef products to get the highest quality beef products in order to reduce their risk.

Education and income are expected to have a positive effect on the willingness to pay for beef product attributes. This is because as education of consumer's increase they tend to be much aware and knowledgeable about dietary and health related issues compared with people with less education and as such are more willing to pay more for safety and health. Aside that all things being equal, people with higher education are expected to have higher income and can afford to pay more for improved beef products.

Residing in Ashanti region is expected to have a either positive or negative influence on the consumers' willingness to pay for beef products. This is because the region is made up of consumers' from different income groups namely low, medium and middle income group, making it difficult to predict the effect of the region on the willingness to pay for the product (Owusu and Anifori, 2013).

Female dummy variable is expected to have a positive influence on willingness to pay. This is because most of the beef purchasing decision in Ghana is taken by women. It has been found that they have experience in terms of identifying high value beef products and are willing to pay

higher prices for the improved beef products all things being equal (Loureiro and Umberger, 2006).

This concludes the discussion of the data and the procedures that were followed to meet the objectives of the study. The results of the respective analyses are presented in the next chapter.

CHAPTER FOUR

Results and discussions

The results of the analyses that were performed to meet the objectives of the study, together with a discussion of those results are presented in this chapter. The results of the attributes consumers' prefer and use in their purchasing decision are discussed in Section 4.1. In Sections 4.2 and 4.4 the results of the analyses on the factors that influence the consumers' preferences and willingness to pay for beef product attributes are presented respectively. The results of the confirmatory factor analysis on the attributes of beef consumers' rely on as indicators of safety and quality are discussed in Section 4.3.

4.1 Attributes beef consumers' prefer and use in their purchasing decision

The results of the attributes consumers' prefer and use in their purchasing decision are presented in Figure 4.1. The identified attributes of beef products were rated in order of importance consumers' attached to them and mean ranks were calculated and presented in the Figure 4.1 below. The analysis was done separately for the two regions because the regional difference in preferences and ratings of attributes is vital in designing marketing strategies in the beef product market in Ghana. From Figure 4.1, it is observed that consumers in the Ashanti region rated leanness, certification, shopping environment and packaging attributes as extremely important attributes of beef preferred and considered in purchasing decision.

Tenderness, price and freshness were considered as important attributes in purchasing beef products. Consumers' are of the view that appearance/colour and slaughter men are somewhat important attributes considered when purchasing beef and on the other hand origin of the animal was considered as not very important. The findings are contrary to the results of Makokha and Fadiga (2009) in Kenya who found that origin/breed is an important attribute that consumers rely

on in their purchases; this contradiction may be attributed to the fact that consumers in Ghana cannot trace the origin of the animals at the retail stalls as some beef products are not labelled.
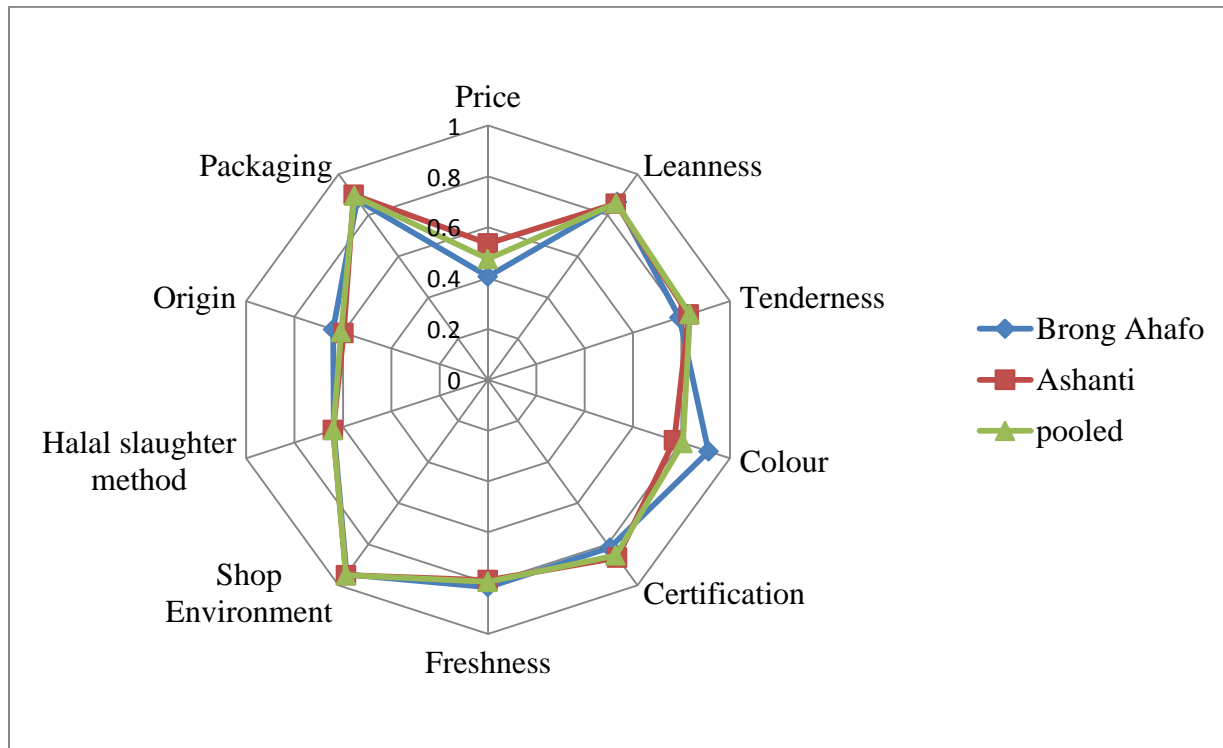
Figure 4.1 Consumer ratings of preferred beef product attributes
Source: Authors' calculations, 2013

In ranking the attributes, the consumers in the Ashanti region rated shopping environment, packaging, inspection/ certification, leanness, tenderness, freshness and colour/appearance as 1st, 2nd, 3rd, 4th, 5th, 6th and 7th respectively.

In ranking the attributes in the Brong-Ahafo region, consumers rated shopping environment, colour/appearance, packaging, leanness, inspection/certification, freshness and tenderness as 1st, 2nd, 3rd, 4th, 5th, 6th and 7th respectively. Most consumers rated price and origin as somewhat important attributes of beef considered in purchasing, slaughter men were also considered as not very important. This result is consistent with the findings of Annan-Peprah *et al*. (2012). The rating may be attributed to the fact that most of the consumers are Christians who are less

conservative or sensitive in general compared to Muslims in the region. Packaging, freshness, inspection/ certification and leanness according to the consumers are rated important attributes of beef cuts considered when purchasing beef.

Shopping environment, colour/appearance and tenderness were rated as extremely important attributes that consumer rely on in purchasing beef and this is in line with the findings of Peng *et al.*(2005). In the pooled sample, consumers rated the attributes; shopping environment, packaging, leanness, inspection/ certification, tenderness, colour/appearance and freshness as 1st, 2nd, 3rd, 4th, 5th, 6th and 7th respectively. The ranking of attributes does not differ from the findings of Dabuo (2012).

4.2 Factors influencing consumers preference for beef product attributes

The ordered-probit model estimates of the factors influencing consumers' preference ratings of the identified beef product attributes are presented in Table 4.2. The log-likelihood test was employed to assess the overall significance of the independent variables in explaining the variations in the importance ratings of the product attributes by the consumers for each model. The chi-square estimates for the Likelihood ratio indicates that all statistical tests reject the null hypotheses of $\beta = 0$ at the 1% confidence level. This suggests that the model can be used to explain the variation in Ghanaian consumers' importance ratings on selected beef product attributes. The Jarque-Bera statistic for the estimated models as indicated are all not significant, therefore the null hypothesis that the residuals of the models are normally distributed is not rejected. Comparing equations (10) and (11) in Chapter 3, it is observed that the estimated coefficients are $-\beta$' instead of β' if no data transformation is conducted.

Table 4.1 Estimates of the ordered probit model on the importance ratings on selected livestock product attributes for pooled sample

Explanatory Variable	Effects Importance Ratings on Livestock Product Attributes Pooled Sample				
	Origin/ breed	Certification	Shopping environment	Packaging	Freshness
Yage (less30)	-0.33*	-0.04**	0.68***	0.28	0.33*
	(-1.84)	(-2.35)	(2.96)	(1.38)	(1.76)
Mage	-0.06	0.73**	0.38*	0.04	0.52**
(31-40)	(-0.40)	(1.79)	(1.87)	(0.23)	(2.96)
Prim-SHS	1.51***	-0.46**	-2.49***	0.37	0.31
	(6.29)	(-1.79)	(-6.34)	(1.46)	(1.23)
University	1.85***	0.01	-1.63***	-0.53**	-0.88***
(honours)	(8.64)	(0.42)	(4.50)	(2.46)	(4.00)
College/polyt	1.45***	-0.07**	-1.79***	0.59**	0.38
echnic	(5.94)	(2.41)	(4.55)	(2.32)	(1.49)
Hsize	0.01	0.08***	0.05	0.07**	-0.02
	(0.28)	(2.72)	(1.33)	(2.19)	(-0.67)
Lincome	-0.77***	0.55***	0.66***	0.64***	0.14
	(-4.05)	(2.65)	(2.79)	(2.97)	(0.70)
Mincome	-0.37**	-0.01	0.34*	0.03	-0.14
	(-2.40)	(-0.03)	(1.76)	(0.15)	(-0.80)
Fedum	-0.28*	-0.33*	-0.27	0.02	-0.69***
	(-1.74)	(-1.82)	(-1.21)	(0.1332)	(-3.73)
Mstatus	-0.13	0.13	0.33*	0.11	0.11
	(-0.84)	(0.77)	(1.67)	(0.64)	(0.66)
Regdum	-0.17	0.21	0.36**	0.27*	-0.22
	(-1.25)	(1.38)	(1.98)	(1.66)	(-1.44)
Shopper	-0.29*	-0.63***	-0.12	-0.02	-0.55***
	(-1.69)	(-3.30)	(-0.49)	(-0.10)	(-2.88)
Religion	-0.40***	0.64***	0.19	0.19	0.44***
	(-2.99)	(4.37)	(1.11)	(1.30)	(2.98)
Observations	400	400	400	400	400
Model(χ^2)	129.06***	80.79***	66.19***	49.18***	72.62***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
JB	2.93(0.23)	2.91(0.23)	2.78(0.21)	2.09(0.19)	2.81(0.24)
Pseudo R^2	0.13	0.11	0.14	0.08	0.10
Log-Likelihood	-439.81	-322.47	-211.52	-298.62	-311.26

*** =significant at 1%, ** =significant at 5%,* = significant at 10%.

Values in parenthesis are Z statistics

Source: Authors' calculations

Table 4.1 Estimates of the ordered probit model on the importance ratings on selected livestock product attributes for pooled sample (continued)

Explanatory Variable	Effects Importance Ratings on Livestock Product Attributes Pooled Sample				
	Price	Leanness	Tenderness	Colour	Halal Slaughter method
Yage	-0.16	0.43**	-0.21	0.12	-0.17
	(-0.94)	(2.26)	(-1.13)	(0.66)	(-0.90)
Mage	-0.43***	0.43**	-0.17	0.39**	-0.25
	(-2.73)	(2.49)	(-1.03)	(2.29)	(-1.44)
Prim- SHS	0.02	0.53**	-0.43*	1.21***	0.74***
	(0.11)	(2.19)	(-1.74)	(4.74)	(3.03)
University	-0.04	0.60**	0.05	1.63***	0.57***
(honours)	(-0.20)	(2.44)	(0.22)	(7.19)	(2.78)
College/poly	0.32	-0.58***	-0.51**	0.92***	0.68***
	(1.39)	(2.80)	(-2.04)	(3.54)	(2.73)
Hsize	0.01	0.09***	0.01	-0.01	0.05***
	(0.58)	(3.22)	(0.26)	(-0.41)	(2.03)
Lincome	0.59***	0.31	0.02	-0.40**	-0.01
	(3.17)	(1.48)	(0.11)	(-2.03)	(-0.07)
Mincome	0.03	-0.20	-0.09	-0.03	-0.23
	(0.18)	(-1.22)	(-0.56)	(-0.20)	(-1.37)
Fedum	0.14	-0.35*	1.02***	-0.21	-0.04
	(0.88)	(-1.92)	(5.48)	(-1.16)	(-0.20)
Mstatus	-0.04	-0.09	-0.12	0.27*	0.12
	(-0.25)	(-0.55)	(-0.79)	(1.70)	(0.81)
Regdum	0.35*	-0.12	-0.27*	-0.97***	0.32**
	(2.59)	(-0.83)	(-1.81)	(-6.37)	(2.15)
Shopper	-0.46***	-0.26	0.35*	0.38**	0.31*
	(-2.76)	(-1.41)	(1.86)	(2.02)	(1.72)
Religion	0.29**	0.41	0.09	-0.22	-2.62***
	(2.16)	(2.91)	(0.61)	(-1.53)	(-13.74)
Observations	400	400	400	400	400
Model(χ^2)	93.27 ***	74.21 ***	93.64 ***	205.70 ***	278.03***
JB	2.06 (0.36)	3.13(0.21)	2.04(0.36)	3.01(0.22)	2.91(0.22)
Pseudo R^2	0.08	0.09	0.12	0.23	0.24
Log-Likelihood	-537.01	-351.31	-353.87	-347.21	-432.92

*** =significant at 1%, ** =significant at 5%,* = significant at 10%.
Values in parenthesis are Z statistics
Source: Authors' calculations

The estimated coefficient with a negative sign indicates that, on average, consumers will achieve a greater utility level and therefore are more likely to give a higher importance rating (R) on the product attribute with the increased level of explanatory variable (xi), holding other variables constant.

The estimated coefficients for age less or equal to thirty (*Yage*) are statistically significant at the 5% level in leanness and certification models and at 10% significant level for freshness and origin and 1% significant level for shopping environment model. The negative signs for origin and certification coefficients indicate that young Ghanaian consumers are more concerned with origin and certification of beef products. This result is in line with the findings of Peng *et al*. (2005). The reason for this may be that young consumers are time constrained and once they get to know the product is certified and the origin is known they may not think of moving from one shop to the other seeking for products that they will consider as safe. The significant positive sign of the leanness, freshness and shopping environment model suggests that on average, young Ghanaian consumers are less likely to give high importance ratings for product leanness, freshness and shopping environment compared to consumers who are above 40 years (the reference category).

The estimated coefficients for consumers between the ages of 31-40 years (*Mage*) are statistically significant at 5% level for leanness, appearance, certification and freshness models and at 1% and 10% significant levels for price and shopping environment respectively. The negative sign of the price model implies that Ghanaian consumers between the ages of 31-40 are more concerned about price of beef products, a result consistent with the findings of Lusk *et al*. (2003). The reason may be that, this age group are found to be with families made up of dependants and as expected will consider price due to higher expenditures. The positive sign of leanness, appearance, certification, freshness and shopping environment implies that consumers within this age group are less likely to give higher importance rating for these attributes. The reason for the difference in these attributes may result from the fact that an improvement in each of these attributes is associated with an increase in price due to the value added.

Consumers with educational background from primary school to senior high school level (***Prim-SHS***) have coefficients which are statistically significant at 1% level for appearance, slaughter men, origin and shopping environment models whereas leanness and certification models estimates were statistically significant at 5% level and 10% level for tenderness. The statistically positive signs of appearance, slaughter men, leanness and origin indicate that Ghanaian consumers with educational background up to the senior high school level place less importance rating to these product attributes when purchasing beef products compared to consumers with masters and PhD level of education. This result is not in line with the findings of Adzitey *et al*. (2013). This suggests that less educated Ghanaian consumers place less importance on appearance, slaughter men, leanness and origin and thus as educational level increases, more educated consumers place importance on these attributes. The negative signs certification, shopping environment and tenderness indicates that consumers are more likely to give high importance rating for these product attributes when purchasing beef products.

The estimated coefficients of consumers who have attained college and polytechnic education (***College/poly***) are statistically significant at 1% for appearance, slaughter men, origin, leanness and shopping environment models and 5% level for packaging, tenderness and certification models. The negative sign of tenderness, leanness, certification and shopping environment indicates that Ghanaian consumers with college education are more likely to give higher importance rating to these beef product attributes when purchasing beef, a result consistent with the findings of (Lapar *et al*., 2010). The reason may be due to the fact that consumers who graduate from college are right away given appointments to work and therefore will have money to purchase beef products with these attributes. The positive signs of appearance, slaughter men, packaging and origin imply that consumers with college or polytechnic education are less likely to give higher importance ratings to these product attributes.

Estimated coefficients for consumers who have attained university education (***Honours***) are statistically significant at 1% level for origin, shopping environment, freshness, appearance and slaughter men and significant at 5% level for leanness and packaging models. The statistically

negative sign of packaging, freshness and shopping environment indicates that on the average Ghanaian consumers who have attained four years university education are more likely to give high importance ratings to these product attributes, this is in line with the results of Lapar *et al.* (2010). The reason may be that, consumers with higher educational level can afford to purchase fresh and package products from reputable shops since they are expected to have higher incomes, all things being equal. Educational level and income levels were all included in order to capture the effect of each educational and income level on individual's preference for the identified attributes. These variables were not correlated after they were dummied and this justifies their inclusions in the results.

The household size (*Hsize*) variable is statistically significant at the 1% level in the leanness, slaughter men and certification models and 5% level for packaging model. The positive sign suggests that larger Ghanaian households in Ghana place less importance on leanness, slaughter men, certification and packaging as expected all things being equal. As expected this is in line with the findings of Owusu and Anifori (2013).

The variable *Lincome* is statistically significant at the 1% level in the price, origin, certification, packaging and shopping environment models and 5% level in appearance model. The negative sign of the appearance and origin model indicates that low-income consumers give high importance ratings to the appearance and origin attributes of beef compared to consumers with higher income groups. The positive sign of price, certification, packaging and shopping environment suggest that on the average low income consumers are less likely to give higher importance ratings to these product attributes. This result is contrary to the findings of Peng *et al.* (2005) who found that on the average low income consumers in China give high importance ratings to shopping environment and price compared with higher income consumer groups. The reason might be due to the difference in economy.

The middle income (***Mincome)*** variable is statistically significant at the 5% level for origin model and 10% level for the shopping environment model. This implies that, on the average, middle-income consumers are less likely to give high importance ratings for shopping environment attribute and the negative sign for the origin model indicates that on the average middle income consumers are more likely to place high importance rating to the beef product origin attribute compared to the reference category of high-income consumer groups. Thus, as income increases, Ghanaian consumers place greater importance on shopping environment and less importance on the origin of the products, a result consistent with that of Lapar *et al*. (2010).

The variable ***Fedum*** is statistically significant at the 10% level in the leanness, origin and certification models and 1% in the tenderness and freshness models which implies that there are no preference differences between males and females on price, packaging, shopping environment, appearance and slaughter men. The negative sign of the leanness, origin, certification and freshness attributes indicates that female consumers place high importance rating on these product attributes compared to male consumers. The finding is consistent with the results of Lusk *et al*. (2001) who found female consumers having significant influence on the preferences of food products.

The estimated coefficient of the ***Mstatus*** variable is statistically significant at 10% level for appearance and shopping environment which suggests that there are no preferences differences between married and unmarried consumers on price, packaging, slaughter men, leanness, tenderness, freshness, origin and certification attributes. The positive sign of the estimated coefficient for appearance and shopping environment models suggests that married consumers on the average are less likely to give high importance rating to the appearance and shopping environment attributes compared to unmarried consumers.

The estimated coefficients for region dummy variable (***Regdum***) are statistically significant at the 5% level in the shopping environment and slaughter men models, and at the 10% level for the

price, packaging and tenderness models as well as 1% level for the appearance model. The negative coefficient on tenderness and appearance attributes indicates that on the average consumers in the Ashanti region are more likely to give higher importance ratings on these product attributes and thus place a higher value on them compared to consumers in the Brong-Ahafo region of Ghana. The insignificant coefficients for the origin, freshness, certification and leanness attributes imply that Ashanti and Brong-Ahafo consumers have similar preferences, whereby Brong-Ahafo is considered the base region. Also the positive coefficients on the price, packaging, shopping environment and slaughter men suggest that consumers in the Ashanti region on the average are less likely to give more importance ratings to these attributes compared to the consumers in the Brong-Ahafo region.

The *shopper* variable is statistically significant at 10% level in the origin, tenderness and slaughter men models, 5% level in the appearance model and 1% level in the certification, freshness and price variable models. The significantly negative coefficient on the origin, certification, freshness and price attributes indicates that on the average consumers who are the primary shoppers of their household are more likely to place higher importance ratings to these attributes compared consumers who are not primary shoppers, a result consistent with the findings of Olynk *et al.* (2010).

Finally, the *religion* variable is statistically significant at 1% level in the origin, certification, freshness and slaughter men models and 5% level in the price model which suggests that there are no preferences difference between Christians and Muslims consumers on tenderness, leanness, shopping environment, packaging and appearance. The significantly negative coefficient on the slaughter men attribute indicates that on the average Muslim consumers place more importance rating to this attribute compared to Christian consumers. The finding is consistent with the findings of Makokha and Fadiga (2009) who found that Muslim consumers have negative preferences due to their concerns about slaughter men for religious reasons.

4.3 Indicators of beef product safety and quality

The results of the attributes of beef products consumers use as indicators of beef safety and quality in the confirmatory factor analysis are presented in Figure 4.2. The maximum likelihood estimates of the analysis are presented in table 4.2. The unobserved latent factors are e1 to e11 in Figure 4.2. The interrelationship between the identified beef attributes were analyzed using IBM SPSS AMOS GRAPHICS VERSION 20 for the latent variables safety and quality.
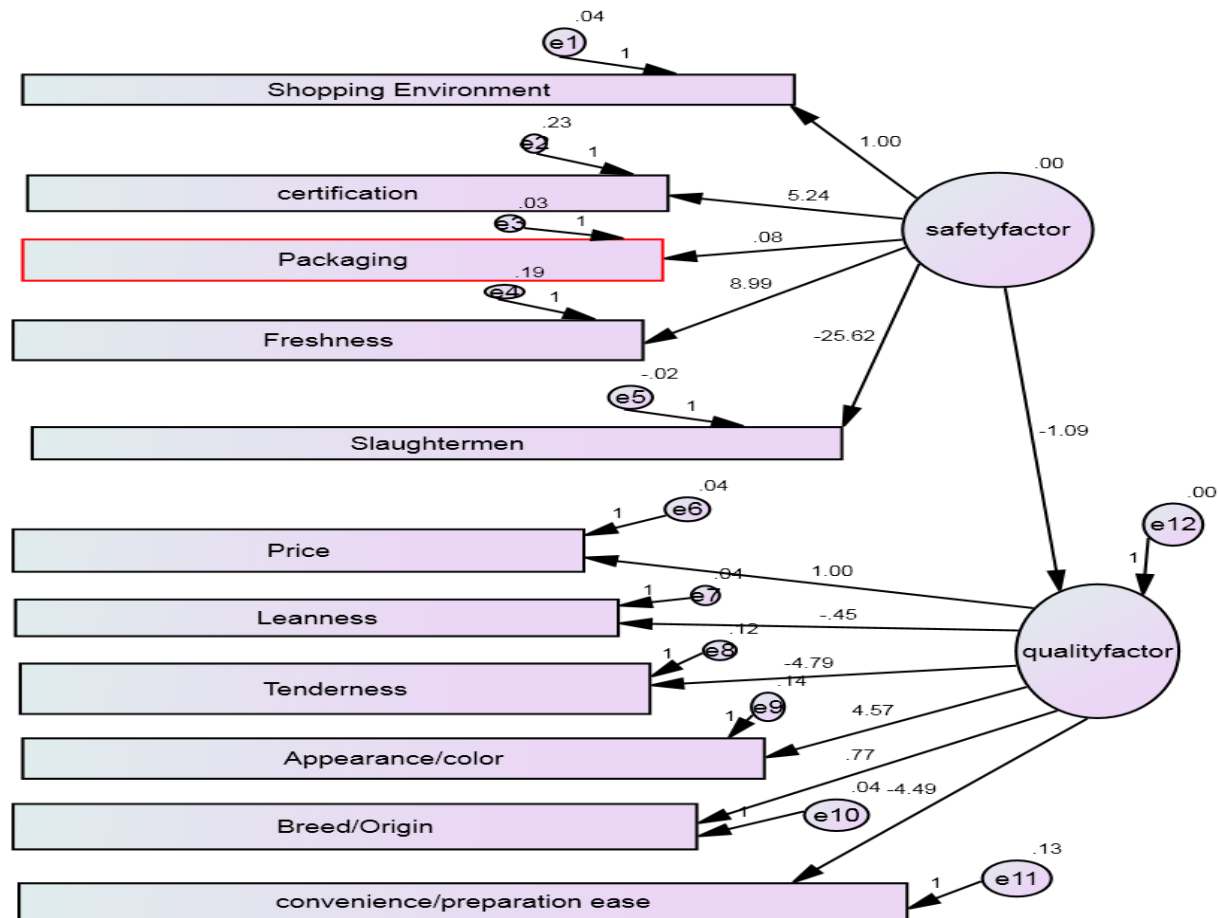
Figure 4.2 Confirmatory Factor Analyses for Beef Product Attributes

The assumptions of confirmatory factor analysis (CFA) were met after which the analyses were made. In accordance with the objective of factor analysis, thus to achieve parsimony (Byrne, 2010), a first–order, one-factor model was computed first. This model assessed whether the 11 attributes identified could all be combined into one factor. The Goodness-Fit-Indicators indicated that the model fit was not acceptable. Next, the first-order two-factor model was examined to assess whether Lapar et al. (2010), Goss et al. (2007), and Jabbar and Islam (2010) proposed

safety and quality attributes of beef was plausible and statistically significant and applicable to Ghanaian consumers (see Figure 4.2 and Table 4.2).

Table 4.2. Maximum likelihood estimates on indicators of beef quality and safety

Attribute		Factor	Parameter estimates	Z	P -value
Quality factor	<---	safety factor	-1.087*	-1.68	0.0930
Religion	<---	safety factor	-25.619	-1.55	0.1200
Shopping environment	<---	Safety factor	1.000***	2.32	0.7470
Inspection/certification	<---	Safety factor	5.244*	1.70	0.0890
Packaging	<---	Safety factor	0.082	0.19	0.8490
Freshness	<---	Safety factor	8.995*	1.81	0.0700
Tenderness	<---	Quality factor	-4.795***	-4.79	0.0000
Leanness	<---	Quality factor	-0.450***	-2.20	0.0300
Price	<---	Quality factor	1.000***	10.18	0.0000
Colour	<---	Quality factor	4.567***	4.748	0.0000
Origin	<---	Quality factor	0.773***	3.287	0.0010
Convenience	<---	Quality factor	-4.491***	-4.75	0.0000

(331.46, p<0.00), GFI=0.89, CFI=0.95, TLI=0.93 and RMSEA=0.049
Source: Authors' calculations, 2013.

Results indicated good model fit: (331.46, p<0.00), GFI=0.89, CFI=0.95, TLI=0.93 and RMSEA=0.049. The results indicate that consumers in the study area significantly rely on freshness, shopping environment, inspection and certification of the beef products as safety indicators. They also rely on slaughter men (religion) and packaging but these variables were not statistically significant. This result confirms the findings of Lapar *et al*. (2010) and Goss *et al*. (2007) but contrary to the Liana *et al*. (2010) using confirmatory factor analysis, they found that proper packaging and labelling are perceived by consumers as meat safety factors.

On the other hand, consumers rely significantly on tenderness, leanness, colour, origin and convenience of cooking as quality indicators in beef purchasing. This result in in line with the findings of Makokha and Fadiga (2009), who also found that consumers rely on origin, colour, leanness and tenderness as important indicators for quality. Price according to the results is a significant indicator of quality. This is consistent with the findings of Kim and Boyd (2004) who said that consumers put a significant weight on price as a quality indicator but contrary to the

findings of Thilmany *et al*. (2007), who surveyed Colorado consumers using factor and cluster analysis and found that, consumers' perceptions of beef quality attributes is mainly related to production practices (e.g. use of antibiotics, hormones and environmentally friendly grazing).

The result of the factor analysis also confirms that safety of beef has a significantly negative relationship with quality of beef as shown from Figure 4.2. The negative relation is explained on the basis that consumers perceived the quality of beef as an attribute is totally different from the safety of beef. Thilmany *et al*. (2007) and Liana *et al*. (2010) explained that consumers' reliance on safety attributes does not depend on quality cues and that a beef product can be of higher quality and still not be safe due to external factors that consumers rely on for assessing food safety.

Maximum likelihood estimation was used to estimate model parameters. During this process, we used the following three goodness-of-fit indices: results of a Chi-squared test ($\chi 2$, p), CFI, and RMSEA. In this analysis safety and quality were not measured or observed (latent) but the attributes that consumers rely on for these factors were captured and the validity of these attributes is what is confirmed by the factor analysis using the Amos Graphics for the latent variables safety and quality, this was used because of its ability to measure, to what extent are the manifest or indicator variables a good indicators of safety and quality by testing for the significance of the variables using maximum likelihood estimation. The approach is also supported by the works of Mannion *et al*. (2000) and Neela (2009) who used factor analysis to determine perceived quality and safety factors of beef among Irish consumers.

4.4 Determinants of consumers' willingness to pay for beef product attributes

Two specifications of the RPL model were estimated for the WPT for beef product attributes. The first included only choice specific attributes namely the price, production method, certification, steak color and fat content.

Table 4.3 reports the estimates for the Ashanti and Brong-Ahafo region as well as the pooled sample without interaction variables. In the model estimated, all of the explanatory variables except price were specified to vary normally across consumers. The dependent variable was a binary or dichotomous, thus 1 if the consumer selects or chooses any of the alternative choice sets and 0 otherwise.

Table 4.3 Random parameter logit estimates with only choice-specific attributes

Attribute	Ashanti Region		Bong-Ahafo		Pooled sample	
	Coefficient Estimates	Std. Dev. Estimates	Coefficient Estimates	Std. Dev. Estimates	Coefficient Estimates	Std. Dev. Estimates
Pm	2.55***	6.78***	1.61***	8.16***	1.64***	8.05***
	(0.62)	(1.36)	(0.60)	(2.35)	(0.58)	(2.04)
Cert	3.81***	2.94***	5.31***	1.24**	5.44***	1.42***
	(0.57)	(0.73)	(1.39)	(0.57)	(1.21)	(0.53)
Fc	3.01***	1.01***	4.52***	0.37	4.64***	2.09**
	(0.4020)	(0.0910)	(1.1734)	(0.7412)	(0.98)	(0.85)
Sc	0.74***	1.16**	1.31***	1.74***	1.14***	1.74***
	(0.23)	(0.48)	(0.51)	(0.59)	(0.41)	(0.51)
Price	-0.29***		-0.70***		-0.71***	
	(0.07)		(0.23)		(0.21)	
Rsq-Adj	0.61		0.61		0.61	
Chi-squared	804.07***		1048.49***		1050.79***	
Log likelihood	-377.06		-503.00		-501.85	
Replications	500		500		500	

*** =significant at 1%,   ** =significant at 5%, * = significant at 10%
Presented model was estimated using NLOGIT 3.0, with Halton draws and 500 replications for simulated probability. Values in parentheses are standard errors.
Source: Authors' calculations, 2013

From Table 4.3, it is shown that all of the random parameter attributes estimated for the Ashanti region were statistically significant with significant standard deviation parameters in the model estimated. Price, production method (**Pm**), fat content (**Fc**), certification (**Cert**) and steak color (**Sc**) were all statistically significant at 1% with statistically significant standard deviation parameters which is evidence that preference heterogeneity exist among consumers in the Ashanti region in terms of production method (Pm), fat content (Fc), certification (Cert) and steak color (Sc) of beef.

From the Brong-Ahafo region, the estimates of the random parameter were all statistically significant at 1% level. Production method (***Pm***), steak color (***Sc***) and certification (***Cert***) had significant standard deviations at 1% and 5% level implying that consumers in the Brong-Ahafo region are also heterogeneous in their preference for production method, steak color and certification attributes of beef and homogeneous in the preference for fat content. This result is consistent with the findings of Goss *et al.* (2007).

In the pooled sample, all the random parameter attributes were statistically significant at 1% level. The standard deviation estimates for production method (***Pm***), certification (***Cert***) and steak color (***Sc***) were significant at 1% level whereas fat content is significant at 5% level; this implies that in totality preference heterogeneity exist for Ghanaian consumers. This finding is supported by the work of Loureiro and Umberger (2006) who found heterogeneity among US consumers. The significant standard deviations means that WTP estimates calculated cannot be interpreted as being representative of the entire sample.

Table 4.4 presents estimates of the random parameter model with the interaction terms. The inclusion of these interaction terms allowed us to account for the idea that people with different age, educational level, income level and gender may have different marginal utilities with respect to beef consumption (Nahuelhual *et al*., 2004). Table 4.4 shows that fourteen out of sixteen demographic variables were statistically significant in the Ashanti region model, thirteen out of the sixteen demographic variables were significant in the Brong-Ahafo region model and fifteen out of the twenty demographic variables in the pooled sample model were statistically significant.

In the Ashanti region model, the production method attribute, interaction between production method and age, production method and income, production method and gender were statistically significant at 1% level whereas production method and education was significant at 5% level. The significant standard deviation of interaction between production method and age, production method and income, production method and education implies that willingness to pay for this attribute varies beyond what could be explained by consumers' age, income and

educational level. This finding is consistent with the result of Tonsor *et al.* (2005) who found that demographic characteristics influence European consumers' preferences for beef steak.

Table 4.4 Random parameter logit estimates with choice-specific attributes and demographic interaction terms

Attribute	Ashanti Region		Bong-Ahafo		Pooled sample	
	Coefficient Estimates	Std. Dev. Estimates	Coefficient Estimates	Std. Dev. Estimates	Coefficient Estimates	Std. Dev. Estimates
Price	-0.49***		-0.61**		-0.62***	
	(0.15)		(0.27)		(0.17)	
Pm	2.69***	5.44***	1.47*	1.15	1.53***	7.29***
	(0.73)	(1.35)	(0.88)	(1.94)	(0.54)	(1.81)
Cert	3.67***	2.06***	4.08***	4.08***	4.89***	1.27**
	(0.75)	(0.28)	(1.27)	(1.27)	(1.0983)	(0.57)
Fc	3.06***	2.42***	6.30**	7.34**	4.26***	1.13*
	(0.64)	(0.73)	(3.00)	(3.14)	(0.96)	(0.61)
Sc	0.82***	0.01	1.06**	1.06**	1.19***	1.77***
	(0.29)	(0.34)	(0.52)	(0.52)	(0.42)	(0.62)
Pm*Age	0.09***	0.02***	3.57***	0.08*	0.21***	0.07***
	(0.03)	(0.01)	(1.29)	(0.04)	(0.06)	(0.03)
Pm*Edu	0.14**	0.04***	1.73*	0.33**	0.24**	0.00
	(0.07)	(0.02)	(0.89)	(0.14)	(0.12)	(0.07)
Pm*Gen	1.99***	0.40	-1.61	0.42	2.99***	0.65
	(0.69)	(0.84)	(1.27)	(1.70)	(1.03)	(2.21)
Pm*Inc	0.08***	0.06**	2.69***	0.01	0.02	-0.04
	(0.03)	(0.03)	(0.69)	(0.01)	(0.02)	(0.02)
Pm*Reg					5.09***	7.04***
					(1.24)	(1.66)
Fc*Age	1.00***	0.028	2.57**	1.06**	2.29*	0.01
	(0.25)	(0.01)	(1.23)	(0.52)	(1.24)	(0.01)
Fc*Edu	1.04*	0.00	1.47*	4.08***	0.76*	0.08
	(0.56)	(0.03)	(0.88)	(1.27)	(0.22)	(0.31)
Fc*Inc	1.78*	0.19	3.57***	0.02	0.03**	0.11
	(0.92)	(0.92)	(1.29)	(0.06)	(0.01)	(0.01)
Fc*Gen	-1.47***	0.08	-0.61**	4.18***	0.75	0.41
	(0.40)	(0.78)	(0.27)	(1.27)	(0.66)	(1.45)
Fc*Reg					1.98***	0.08
					(0.55)	(0.65)
Sc*Age	-0.01	1.01***	0.07*	0.01	-0.01	0.01
	(0.03)	(0.09)	(0.04)	(0.01)	(0.04)	(0.02)
Sc*Edu	0.62***	0.46***	3.513***	0.00	0.14	0.05
	(0.18)	(0.06)	(1.29)	(0.03)	(0.09)	(0.05)
Sc*Inc	0.29***	0.15	0.05	0.01	1.76**	0.2528***
	(0.17)	(0.96)	(0.09)	(0.11)	(0.79)	(0.05)

Table 4.4 Random parameter logit estimates with choice-specific attributes and demographic interaction terms (continued)

Attribute	Ashanti Region		Bong-Ahafo		Pooled sample	
	Coefficient Estimates	Std. Dev. Estimates	Coefficient Estimates	Std. Dev. Estimates	Coefficient Estimates	Std. Dev. Estimates
Sc*Gen	0.62***	-1.23***	-3.21**	0.14	2.63***	0.49
	(0.15)	(0.09)	(1.35)	(1.62)	(0.94)	(0.77)
Sc*Reg					0.23*	0.25
					(0.12)	(0.96)
Cert*Age	-0.61***	(0.78**	-2.55***	0.00	-0.14*	0.04*
	(0.18)	(0.31)	(0.74)	(0.01)	(0.08)	(0.02)
Cert*Edu	0.65***	1.20**	0.59**	0.0014	0.29**	0.01
	(0.15)	(0.52)	(0.24)	(0.0416)	(0.13)	(0.06)
Cert*Inc	0.30*	2.92***	2.94***	0.49***	0.15***	0.07***
	(0.17)	(0.92)	(1.36)	(0.05)	(0.05)	(0.03)
Cert*Gen	-0.94	0.06	0.45	0.09	-1.79***	1.46**
	(0.57)	(0.52)	(1.01)	(0.81)	(0.59)	(0.59)
Cert*Reg					0.53	0.04
					(0.36)	(0.33)
Rsq-Adj	0.53		0.43		0.51	
Chi-squared	827.26***		242.26***		1054.53***	
Log likelihood	-362.69		-149.20		-499.98	
Replications	500		500		500	

*** =significant at 1%, ** =significant at 5%, * = significant at 10%
Presented model was estimated using NLOGIT 3.0, with Halton draws and 500 replications for simulated probability. Values in parentheses are standard errors.
Source: Authors' calculations, 2013

In the Brong-Ahafo region model, production method attribute was statistically significant at 10% level with an insignificant standard deviation estimate. The interaction between production method and age, production method and income were statistically significant at 1% level whiles the interaction between production method and education was significant at 10% level. The statistically significant standard deviation estimates of the interaction between production method and age, production method and education suggests that the WTP for production method attribute varies beyond what can be explained by age and education.

In the pooled sample, interaction between production method and age, production method and education, production method and gender, production method and region of resident were statistically significant at 1% and 5% respectively. This means that WTP for this attribute is influenced by these factors but on the other hand the statistically significant standard deviation

estimates of interaction between production method and age as well as production method and region of resident indicates that WTP for this attribute varies beyond what is explained by age and region of resident. This result is consistent with the result of Conner and Oppenheim (2008).

The fat content attribute in the Ashanti region model is statistically significant at 1% level with a significant standard deviation estimate at 1% level implying that preference indeed varied in the population for this attribute, the interaction between fat content and age, fat content and gender were statistically significant at 1% level whereas the interaction between fat content and education, fat content and income were significant at 10% level. This means that age, education and income positively influence consumers' preferences and WTP for fat content attributes whiles gender had a negative influence on fat content attributes. Thus, females on the average prefer some level of fat in beef compared to males, a finding supported by the results of Koistinen (2010) in Finland who found that, females have preferences for some level of fat content.

In the Brong-Ahafo region model, the fat content attribute was statistically significant at 1% level with a significant standard deviation estimate at 1% level implying that preference indeed varied in the population for this attribute, the interaction between fat content and age, fat content and gender were statistically significant at 5% level, the interaction between fat content and education was significant at 10% level whiles fat content and income were significant at 1% level. The significant standard deviation estimates of the interaction between fat content and education, fat content and age, fat content and gender suggest that the WTP for fat content attribute varies beyond what is explained by education, gender and age. The result is supported by the finding of Tonsor *et al*. (2005) who also found demographic factors like age, education, gender among others influence consumers' WTP for beef products in Europe.

In the pooled sample model, it was realized that age, education, income and region of respondent have a positive influence on consumers' preferences and WTP for fat content attribute. The certification attribute in the Ashanti region model is positively significant at 1% level with a positive significant standard deviation estimate at 1% level. Thus, the preference for this attribute indeed varied in the population. The interaction between certification and age is significant with

a negative sign for all the three models. Certification and education were statistically significant at 1% level with significant standard deviations estimates whiles the interaction between certification and income is significant at 10% level with significant standard deviation estimate. This means that the WTP for certification attribute varies beyond what is explained by age, education, and income level of consumers. The finding is supported by the results of Lapar *et al*. (2010) who revealed that, socioeconomic factors influence consumers' preference and WTP for meat products.

In the Brong-Ahafo region model similar results were obtained, the certification attributes is statistically significant at 1% level with a significant standard deviation estimate at 1% level suggesting that preference for this attribute indeed varied in the population. The interaction between certification and age certification and income were statistically significant at 1% level whiles the interaction between certification and education is significant at 5% level. The significant standard deviation estimate of the interaction between certification and income implies that WTP for certification varies beyond what is explained by income. Age had a negative influence on certification meaning that as age increases the preference and WTP for this attribute tend to decrease. In the pooled sample model, age and gender were found to negatively influence preference and WTP for this attribute with significant standard deviation estimates suggesting that variation in this attributes can be explained beyond age and gender. Income and education significantly influence WTP for certification attribute.

The steak colour attribute was found to have a significantly positive coefficient estimate at 1% in the Ashanti region model with insignificant standard deviation estimate implying that there is no preference heterogeneity in the consumers after the interaction variables were added to the model. On the other hand, the attribute is significant in both parameter estimates and standard deviation estimates for both Brong-Ahafo and the pooled sample models, suggesting presence of heterogeneity in preference in the model with interaction variables. Interaction between steak colour and gender, steak colour and education, steak colour and income were significant with a positive sign at 1% level in the Ashanti region which means that gender, education and income influences WTP for steak colour attribute in Ashanti. The significant standard deviation estimates of interaction between steak colour and gender, steak colour and education implies that

the WTP for steak colour varies beyond just gender and education. Similar result were obtained for the Brong Ahafo region model, thus interaction between steak colour and gender, steak colour and education, steak colour and age were significant at 5%, 1% and 10% level respectively with gender having a negative sign. Mare *et al*. (2013) too found that consumer characteristics influence their preferences for fat colour in South Africa.

Adding to the evidence of preference heterogeneity and the effect of demographic variables on preference for beef steak/cut attributes. A negative relationship exists between the prices of each steak or cut and the utility consumers obtain from consuming that beef cut as expected.

4.5 Willingness to pay for beef product attributes

Table 4.5 presents the average WTP for beef attributes in the random parameter logit model with interaction terms. Average consumer WTP for beef cut/steak attributes were estimated as described previously by utilizing the ratios of the coefficient on the beef attribute and the price coefficient.

The estimated mean WTP price premiums for 1Kg ordinary boneless beef from estimated from the random parameter model with interaction variable revealed that, pasture-raised animal is GH¢2.4688 ($1.6909) pasture-raised, consumers on the average were willing to pay GH¢7.9057 ($5.4149) for assured certification label, GH¢1.9245 ($1.3182) for whitish steak colour, and GH¢ 6.8689 ($4.7047) five percent (5%) fat level for the pooled sample.

Table 4.5 WTP estimates for the RPL model with interaction term

Attribute	Ashanti Region	Brong-Ahafo Region	Pooled Sample
Pm	GH¢5.5131($3.7761)	GH¢2.3976($1.6422)	GH¢2.4688 ($1.6909)
Cert	GH¢7.4971 ($5.1350)	GH¢6.6320($4.5425)	GH¢7.9057 ($5.4149)
Fc	GH¢6.2431($4.2761)	GH¢10.2533($7.0228)	GH¢6.8689 ($4.7047)
Sc	GH¢1.6456 ($1.1271)	GH¢1.7264($1.1825)	GH¢1.9245 ($1.3182)

Average exchange rate: 1 US Dollar (US$) =1.4600 Ghana Cedi (GH¢)
Source: Authors' calculations, 2013

In the Ashanti region, consumers were willing to pay GH¢5.5131($3.7761) for pasture-raised beef, GH¢7.4971 ($5.1350) for assured certification label, GH¢6.2431($4.2761) for five percent

fat level and GH¢1.6456 ($1.1271) for whitish steak whereas in the Brong-Ahafo region, consumers on the average were willing to pay GH¢2.3976($1.6422) for pasture-raised beef, GH¢6.6320($4.5425) for assured certification, GH¢10.2533($7.0228) for five percent fat level and GH¢1.7264($1.1825) for whitish steak color.

Table 4.6 shows WTP estimates for beef product in the random parameter without interaction terms. WTP estimates were also calculated for the random parameter model without interaction term in order to see the difference in the two estimations.

Table 4.6 WTP estimates for the RPL model without interaction term

Attribute	Ashanti Region	Brong-Ahafo Region	Pooled Sample
Pm	GH¢8.8706 ($6.0756)	GH¢2.2820 ($ 1.5630)	GH¢ 2.3116 ($1.5833)
Cert	GH¢13.3703($ 9.1577)	GH¢7.5571 ($ 5.1761)	GH¢7.6475($5.2380)
Fc	GH¢10.5712 ($7.2405)	GH¢6.4289 ($4.4034)	GH¢ 6.5217($4.4669)
Sc	GH¢2.5936 ($ 1.7764)	GH¢1.8573($1.2721)	GH¢ 1.5988(1.0951)

Average exchange rate: 1 US Dollar (US$) =1.4600 Ghana Cedi (GH¢)
Source: Authors' calculations, 2013

Consumers on the average were willing to pay GH¢8.8706 ($6.0756), GH¢13.3703 ($ 9.1577), GH¢10.5712 ($7.2405) and GH¢2.5936 ($ 1.7764) for pasture-raised beef, assured certification label, five percent level of fat and whitish steak colour respectively in the Ashanti region whereas in the Brong –Ahafo region, consumers on the average were willing to pay GH¢2.2820 ($ 1.5630), GH¢7.5571 ($ 5.1761), GH¢6.4289 ($4.4034) and GH¢1.8573($1.2721) for pasture-raised beef, assured certification label, five percent level of fat and whitish steak colour respectively. For the pooled sample, average WTP were as follows; GH¢ 2.3116 ($1.5833), GH¢7.6475($5.2380), GH¢ 6.5217($4.4669) and GH¢ 1.5988(1.0951) for pasture-raised beef, assured certification label, five percent level of fat and whitish steak colour respectively. In the pool sample it was observed that the WTP estimates were lower for the random parameter models without interaction term compared to the model with interaction variables. The estimates varied within the two regions across the individual attributes.

CHAPTER FIVE

Summary, conclusions and policy implications

5.1 Summary and conclusions

There is a significant potential market for global livestock exporters, local farmers and other stakeholders in the beef industry. In order to better understand Ghanaian consumers' preferences for beef products. This research examines Ghanaian consumers' preferences and willingness to pay for beef products attributes which significantly determine Ghana's international and local demand with regards to beef products. The research surveyed 400 Ghanaian consumers who shopped at meat retail shops and meat stalls in Kumasi Metropolis and Sunyani Municipality.

The results of the study as obtained; the first specific objective was to identify the attributes' of beef consumers prefer and use in the purchasing decision. The ranking of shopping environment, packaging, certification and leanness attributes as extremely important attributes of beef products considered in beef purchases in the Ashanti region suggests that all players along the beef value chain should pay particular attention to these attributes to as a marketing strategy while taking into consideration price, tenderness and freshness of the beef products. In the Brong-Ahafo region, the results suggests that it's appropriate for all players along the value chain such as farmers, producers as well as exporters to consider hygienic shopping environment, steak colour, packaging and tenderness attributes of beef products since these are extremely important attributes consider by consumers in the region. The rating of freshness, certification and leanness as important attributes of beef products considered when purchasing beef also implies that key players along the value chain should not ignore these attributes since they contribute to consumers purchasing decision. It is concluded that, Ghanaian consumers rely mostly on external beef product image such as shopping environment, certification, packaging, cooking convenience and steak colour. This imply that traditional marketing strategies which focus solely on price and quality competition may no longer be successful in today's Ghanaian beef and livestock markets. It is further concluded that preference for beef products is not necessarily

based on external attributes that is associated with food safety. Quality is a function of various intrinsic and extrinsic factors.

The second sub objective was to determine factors influencing consumers' preferences for beef product attributes. The ordered probit model was used to estimate factors that influence consumers' preferences. The results show that, young Ghanaian consumers are more concerned with origin and certification of beef products while middle-aged Ghanaian consumers are more concerned with product price and origin. Consumers with less formal education place higher importance on product certification, shopping environment and tenderness whiles consumers with college and polytechnic education are more concerned about product tenderness, leanness, certification and shopping environment and places less importance on product colour, slaughter men, packaging and origin.

Consumers who have attained university education places high importance ratings to packaging, freshness and shopping environment attributes. This evidence suggests that the Ghanaian beef industry could also use selective demographic targeting to maintain or build its own market share among competing beef products.

Larger Ghanaian households place less importance on product leanness, slaughter men, certification and packaging. Low income consumers place less importance ratings to product price, certification, packaging and shopping environment attributes whiles middle-income consumers are less likely to give high importance ratings for shopping environment attribute but are more concerned about beef product origin attribute. This suggests that as income increase, Ghanaian consumers place greater importance on shopping environment and less importance on the origin of the products. Female Ghanaian consumers place high importance on product leanness, origin, certification and freshness attributes compared to male consumers. Consumers in the Ashanti region are more concerned about product tenderness and colour of steak. Ashanti and Brong-Ahafo consumers have similar preferences for product origin, freshness, certification and leanness. Hence there is a need for segmentation of markets based on gender, age, income, education level, and regional targeting based on the attributes of preferences. This result in the conclusions that consumers preferences for beef product attributes is not only influenced by

demographic factors but also perception of consumers about the product and attributes of associated with the product itself.

The third sub objective was to determine the indicators of beef safety and quality from the identified beef product attributes. The confirmatory factor analysis was used for the identification of the attributes consumers' rely on for safety and quality using IBM SPSS AMOS GRAPHICS VERSION 20 for the latent variables safety and quality, this was used because of its ability to measure, to what extent are the manifest or indicator variables a good indicators of safety and quality by testing for the significance of the variables using maximum likelihood estimation. The results indicate that consumers in the study area significantly rely on freshness, shopping environment, inspection and certification of the beef products as safety indicators. They also rely on halal method slaughter and packaging but these variables were not significant. On the other hand, consumers rely significantly on tenderness, leanness, colour, origin and convenience of cooking as quality indicators in beef purchasing. It is therefore concluded that, designing attractive packaging with suitable size, making products easy to cook, provision of certification label, specification of production method as well as creating a comfortable and hygienic shopping environment will be a vital marketing strategies to consider in Ghana by international beef exporting countries like the US, Europe and other exporting countries in Africa including all players along the value chain.

The fourth sub objective of the study was to determine consumers' WTP and factors influencing consumers' WTP for beef product attributes. The random parameter model was estimated, this approach was justified because recent literature and research suggest consumers possess heterogeneous preferences. Therefore, it is appropriate to employing a model that allows heterogeneous preferences. The empirical findings revealed that Ghanaian consumers have heterogeneous preferences for beef production method, certification assurance, steak colour and fat content. In addition, consumer characteristics including age, income, gender, region and education influence steak/cut selection. The empirical results further revealed that Ghanaian consumers' on the average have higher WTP for certification and low fat content attributes follow by pasture-raised beef and least WTP for steak colour. This suggests that farmers and beef

producers provide certification labels, provision of less fatten animal, differential beef products by method of production as a strategy for gaining higher price premiums for their beef products. A negative relationship existed between the prices of each steak attribute and the utility consumers obtain from consuming that beef as expected. This suggests that price is key factors that influence the consumers' WTP for beef products. It is therefore concluded that heterogeneity among consumers is not only limited to European consumers as various researches have shown but also exits in Africa. Therefore, key players along the value chain of beef such as beef producers and exporters should not treat all consumers as homogeneous.

5.2 Recommendations

It is recommended that beef and other livestock distributors should focus on Ghanaian consumers with particular attention to shopping environment, packaging, leanness, inspection and certification, tenderness, colour and freshness attributes of beef products. Local beef producers and exporters should create an excellent external beef product image rather than concentrating on only intrinsic attributes of beef.

Marketing strategies to be considered by beef product investors should include display of certification stamp, origin and fat content of beef products through labeling, designing attractive packaging with suitable size, making products easy to cook, and creating a comfortable and hygienic shopping environment should be considered as marketing strategies.

It is recommended that the Ghanaian beef industry could also use selective demographic targeting to maintain or build its own market share among competing beef products from exporting countries.

Policy makers and investors in the beef industry should use selective demographic targeting to maintain or build strong food safety and quality assurance since these factors influences individual consumers' preferences and choice of safety and quality attributes. Policies on food safety and quality should factor females as key contributors.

Similar studies should be conducted in other regions in order to compare the preference and WTP behaviour of beef consumers in the different regions. This will contribute to yielding reliable results on the overall preferences and WTP for beef products in Ghana.

Future research on consumer preferences for livestock products should adopt methods that account for preference heterogeneity among consumers and WTP methods should consider the different classed of consumer groups either using latent class or other appropriate methods.

Future research should include WTP for other attributes of beef such as animal welfare, environmental and health concerns since these attributes were found to have a significant influence consumers purchasing decision.

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APPENDIX I

DEPARTMENT OF AGRICULTURAL ECONOMICS

UNIVERSITY OF THE FREE STATE

DEPARTMENT OF AGRICULTURAL ECONOMICS, AGRIBUSINESS AND EXTENSION, KNUST

QUESTIONNAIRES FOR BEEF CONSUMERS

"Consumer Preference and Willingness to Pay for Beef Cut Attributes"

Name of the interviewer…………………………… Date of interview……………………

Name of the respondent…………………………. Region………...............................

Questionnaire Number……………. ……………. Market……………………………..

Respondent Contact Number……………………

Section A: Personal and Household Characteristics

1. Age ………………………
2. Gender: Male [   ] Female [   ]
3. Level of formal education: Primary [   ] JSS/JHS [   ] SSS/SHS[   ] Training College [   ]
   University[   ]
4. Household size………………………………………….
5. Religion: Christianity [   ] Muslim [   ] Traditional [   ]
6. Ethnicity ………………………………
7. Marital status: single [ ] Married [   ]
8. Household income (GH₵)…………………………………

Section B: Consumers Awareness and Perceptions of Beef Cut
1. 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 [   ]

2. How frequently do you typically purchase beef?
   a. Once per month
   b. 2-3 times per month
   c. 4 or more times per month
   d. Once per week
   e. 2-3 times per week

f. 4 or more times per week

3. How much (in GH₵) do you spend on beef each week? ………………………….
4. Which of the following breeds of cattle do you prefer?
    a. Local
    b. Foreign
5. Which of the following appearance of beef do you prefer?
    a. Fresh with some fat
    b. Fresh with some water
    c. Dry without fat /water

6. Are you aware of the following beef cuts?

Beef Cuts	Yes	No
Fillet		
Loin Boneless		
Ordinary Boneless		
Shoulder		
Brisket		
Shank		
Kidney		
Bone-in		
Offal (intestines)		
Head		
Liver		
Tail		
Leg		

7. How much more are you willing to pay for beef with assured inspection and certification label for health, quality and safety?
    a. Not willing to pay
    b. 5% more
    c. 15% more
    d. 20% more
    e. 25% more
8. How much more are you willing to pay for pasture raised or natural beef (no added hormones, no antibiotics, all feed tested to be free of chemical residues, clean water, natural feed and environmental practices are followed to respect land)
    a. Not willing to pay
    b. 5% more
    c. 15% more
    d. 20% more
    e. 25% more

9.   Please check the **seven** product traits of those listed below that you consider most

important when you purchase a beef product

Product Trait/Attribute	Check the **seven** most important to you
Price	
Product Leanness (Less fat)	
Product Tenderness	
Product Color/Appearance	
Product Freshness/condition	
Product inspection (certification by public health/municipal authority)	
Product Preparation Ease or convenience	
Shopping Environment	
Breed (Local or Foreign)	
The Slaughter men (religion)	
Product Quality	

10.   Please rate the selected attributes in order of importance (**1–not important at all, 2–not**

very important, 3–somewhat important, 4–important, 5–extremely important)

Product Attribute	Please rate the attributes in order of importance
Price	
Fat Content	
Product Tenderness	
Product Color/Appearance	
Product Inspection	
Product Freshness/condition	
Shopping Environment	
Product Quality	
The Slaughter men (religion)	
Breed (Local or Foreign)	

11. When you make a purchase decision to buy a particular beef product, you may take several
things into consideration such as the trust you place in the store where you are shopping,
your past experience with the product, or information contained on the package label. Now
think about these factors and please check sources that you use to determine that likely eating
experience.

Product Trait/Attribute	Rely upon for assessing trait (check all that apply for each trait)				
THE 7 traits checked from the previous question should only show up here	Past experience With Product	Retailer or Butcher Help	Store where Purchased	Visual Inspection of product	Product Label Information

Assessment of Beef Industry

12. Whether you have ever knowingly purchased beef produced in another country or not, what is your perception of the level of food safety of beef in Ghanaian market. (Your Perceived Level of Food Safety)
    1) Very low
    2) Low
    3) Moderate
    4) High
    5) Very high

13. Which aspect of food safety is more important to you?
    a. Microbial safety (bacterial infections, careless display location , presence of blood)
    b. Physical safety (presence of foreign material in the product)
    c. Chemical safety (use of car tyres in singeing, improper washing of the offal etc.)

14. When you purchase beef how much do you rely on each of the following for assessing food safety information/assurance?

Product Attribute	Level Relied on for Food Safety Assurance					
	Not at all reliant	Not very reliant	Somewhat reliant	Very reliant	Extremely reliant	No Opinion
	1	2	3	4	5	
Price Level						
Product brand						
Product color/ Appearance						
Product odour						
Government inspection						
Origin						
Shopping Environment						

15. Please assess the food safety level of the following Beef Cut types.

Beef Cuts	Level of Food Safety					
	Very Low	Low	Moderate	High	Very High	
	1	2	3	4	5	No Opinion
Fillet						
Loin Boneless						
Ordinary Boneless						
Shoulder						
Brisket						
Shank						
Kidney						
Bone-in						
Offal(intestines)						
Head						
Liver						
Tail						
Leg						
Skin						

16. A). Over the past two years, have you lowered your beef consumption because of food safety concerns?   i. No   ii yes

B). Yes, If yes, reduced by what percentage (please give your best estimate) _____

17. These statements are about your trust in individuals and institutions with respect to the safety of beef products. I have distinguished between the government, farmers and retailers of beef products. Please indicate to what extent you agree with each statement

Government	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The government has the competence to control the safety of beef products					
The government has sufficient knowledge to guarantee the safety of beef products					
The government is honest about the safety of beef products					
The government is sufficiently open about the safety of beef products					
The government takes good care of the safety of beef products					
The government gives special attention to the safety of beef products					
Farmers					

Farmers have the competence to control the safety of beef products					
Farmers have sufficient knowledge to guarantee the safety of animals for slaughter.					
Farmers are honest about the safety of animals sold for slaughter					
Farmers are sufficiently open about the safety of animals sold for slaughter					
Farmers take good care of the safety of animals for slaughter					
Farmers' gives special attention to the safety of animals to be sold for slaughter.					
Butchers/Retailers					
Butchers/ Retailers have the competence to control the safety of beef products					
Butchers /Retailers have sufficient knowledge to guarantee the safety of beef products					
Butchers /Retailers are honest about the safety of beef products					
Retailers are sufficiently open about the safety of beef products					
Butchers /Retailers takes good care of the safety of our beef products					
Butchers /Retailers gives special attention to the safety of beef products					

18. Perception about Pasture Raised or Naturally beef. Please indicate to what extent you agree with each statement

Pasture Raised Animals/Beef	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Raising animals on pasture is good for the animals' welfare.					
Raising animals' on pastures can decrease animals' health problems, stress levels, and anti-social behaviours.					
Raising animals on pasture is good for the environment					
Pasture raised animals' cause's problems and destruction to peoples farms if the animals are not controlled.					
Beef from animals raised on pasture is of higher quality compared to beef from animals raised in confinements.					
Beef from animals raised on pasture is					

very lean compared to beef from animals raised in confinements					
Beef from animals raised on pasture is very expensive.					
I will be willing to pay more for beef from pasture raised animals if it is labeled					
Beef products from pasture raised animals are very safe.					
I prefer beef from pasture raised animals to conventionally or confine animals beef					

SECTION C: Choice Selection of Various Beef 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

Attribute	Option A	Option B	Option C
Feeding method	Naturally fed	Conventional	Conventional
Percentage of fat	Maximum of 5%	Maximum of 5%	Maximum of 5%
Color of Beef	whitish	whitish	Red
Certification	Uncertain	Assured	Uncertain
Price	GH₵ 10	GH₵ 5	GH₵ 5
I would buy	▭	▭	▭
I would not buy any of the above	▭		

Choice set 2

Attribute	Option A	Option B	Option C
Feeding method	Naturally fed	Conventional	Conventional
Percentage of fat	Maximum of 5%	Maximum of 20%	Maximum of 20%
Color of Beef	Red	Red	Whitish
Certification	Assured	Uncertain	Assured
Price	GH₵ 5	GH₵ 10	GH₵ 12
I would buy	▭	▭	▭
I would not buy any of the above	▭		

Choice set 3

Attribute	Option A	Option B	Option C
Feeding method	Conventional	Conventional	Naturally fed
Percentage of fat	Maximum of 5%	Maximum of 20%	Maximum of 10%
Color of Beef	Whitish	Whitish	Whitish
Certification	Uncertain	Uncertain	Uncertain
Price	GH₵ 12	GH₵10	GH₵12
I would buy	▭	▭	▭
I would not buy any of the above	▭		

Choice set 4

Attribute	Option A	Option B	Option C
Feeding method	Conventional	Conventional	Naturally fed
Percentage of fat	Maximum of 10%	Maximum of 5%	Maximum of 10%
Color of Beef	Red	Red	Whitish
Certification	Uncertain	Assured	Assured
Price	GH₵ 12	GH₵12	GH₵5
I would buy	▭	▭	▭
I would not buy any of the above	▭		

Choice set 5

Attribute	Option A	Option B	Option C
Feeding method	Naturally fed	Conventional	Naturally fed
Percentage of fat	Maximum of 5%	Maximum of 10%	Maximum of 20%
Color of Beef	Whitish	Red	Red
Certification	Assured	Assured	Assured
Price	GH₵ 12	GH₵10	GH₵12
I would buy	▭	▭	▭
I would not buy any of the above	▭		