

**CONSUMERS' PERCEPTION, PREFERENCES AND WILLINGNESS TO PAY FOR
SAFETY AND QUALITY ATTRIBUTES OF BEEF IN SOME SELECTED FORMAL
MEAT MARKETS IN THE KUMASI METROPOLIS AND SUNYANI MUNICIPALITY
OF GHANA**

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DECLARATION

I hereby declare that this submission is my own work towards my MPhil degree and that, to the best of my knowledge, it contains no material published by another person or material which has been accepted in any other University for any degree except where due acknowledgement has been made in the text.

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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 choice experimental data collected from 400 beef consumers in the Kumasi Metropolis and Sunyani Municipality of Ghana, this study examines consumers' perception, preference and willingness to pay for safety and quality attributes of beef product in Ghana. Key attributes include hygienic condition of the shopping environment, excellent and attractive packaging that minimizes contamination, leanness and certification of beef products for safety and quality. Therefore, guaranteed food safety information and attributes should emerge as a new index and basis for future trade in the beef industry. Preference heterogeneity exists among consumers in Kumasi Metropolis and Sunyani Municipality for verified animal health status, food safety inspection and certification and nutritional label. Hence, it is important for beef investors, government and NGO's to segment consumers into different classes when designing strategies to mitigate unsafe beef production, marketing and consumption. Consumers were willing to pay high premium for verified animal health stamp in both Kumasi and Sunyani compared to assured nutritional label, food and drugs board food safety certification license. Consumers in Kumasi were willing to pay more for assured nutritional label, food and drugs board food safety certification license compared to Sunyani. Consumer preferences for food safety inspection and certification, and nutritional label are explained by age, income and education in Sunyani Municipality whereas preferences for verified animal health status, food safety inspection and certification, and nutritional label are influenced by age, income, education and gender in Kumasi Metropolis.

Albeit the impact of gender and age are negative for verified animal health status and food safety certification license in both locations. Therefore, the use of selective demographic targeting to

maintain or build strong food safety and quality measures should be seen as a reality by policy makers and investors in the beef industry. Minimizing microbial, chemical and physical food contamination and incidents of unsafe food in Kumasi and Sunyani requires adoption of strict certification and inspections starting from the health status of animals to be slaughtered to the final product with proper labeling information for consumers, combined with strict sanitary inspections at the shopping or selling place. Also, sensitization of women on food safety practices, handling and violation of food safety is very essential in Kumasi and Sunyani. The study reveals that, consumers'' associate pasture-raised products with attributes important to purchase decisions and all the consumers express their willingness to pay premiums, most of the consumers were willing to pay 15% more for 1 kilogram pasture-raised beef products. The empirical results indicate that apart from socioeconomic characteristics, consumer perceptions and product attributes tend to influence consumers'' willingness to pay a premium for pastureraised beef products. Pasture-raised product differentiation is recommend as a feasible marketing strategy and recommend premium pricing strategies and promotion based on verifiable health and animal welfare benefits through labelling of products. The results suggest that Ghanaian consumers'' in general ranked hygienic condition of shopping environment, attractive packaging, leanness, assured inspection/certification, tenderness, whitish steak colour and freshness attributes as the seven most important attributes considered in purchasing beef products respectively.

TABLE OF CONTENT

Title Page	II
Declaration	III
Dedication	IV
Acknowledgement	V
Abstract	IX
List of Tables	X
List of Figures	XI
List of Acronyms	
CHAPTER ONE	1
INTRODUCTION	1
1.1 BACKGROUND	1
1.2 PROBLEM STATEMENT	2
1.3 OBJECTIVES OF THE STUDY	6
1.4 RELEVANCE AND JUSTIFICATION THE STUDY TO GHANA	7
1.5 ORGANIZATION OF THE STUDY	9
CHAPTER TWO	11
LITERATURE REVIEW	11
2.1 LIVESTOCK PRODUCTION AND LIVESTOCK PRODUCTS IN GHANA	11
2.2 APPROACHES TO MEASURING CONSUMER PREFERENCES AND WILLINGNESS TO PAY	13
2.3 CONSUMER PREFERENCE FOR BEEF PRODUCT ATTRIBUTES	17
2.3.1 CONSUMER PREFERENCE FOR BEEF PRODUCT ATTRIBUTES IN GENERAL	17
2.3.2 EMPIRICAL LITERATURE ON FACTORS INFLUENCING CONSUMERS' PREFERENCE FOR BEEF ATTRIBUTES	20
2.4 CONSUMER PREFERENCES FOR BEEF PRODUCTS IN GHANA	22
2.5 EMPIRICAL LITERATURE ON FACTORS INFLUENCING CONSUMER WTP FOR BEEF ATTRIBUTES	26
2.6 LITERATURE REVIEW ON MEASUREMENT OF VARIABLES	28
2.7 CONCLUSION	30
CHAPTER THREE	32
METHODOLOGY OF THE STUDY	32

3.1 THE STUDY LOCATIONS	32
3.1.1 DEMOGRAPHIC CHARACTERISTICS OF KUMASI METROPOLIS	32
3.1.2 DEMOGRAPHIC CHARACTERISTICS OF SUNYANI MUNICIPALITY	35
3.2 SAMPLE, SAMPLING PROCEDURE AND DATA COLLECTION	37
3.2.1 SAMPLE	37
3.2.2 SAMPLING METHOD	39
3.3 THEORETICAL DISCUSSIONS ON CONSUMER PREFERENCES	40
3.4 THEORETICAL DISCUSSIONS ON CONSUMER WTP FOR BEEF CUTS	43
3.5 CONCEPTUAL FRAMEWORK	45
3.6 THE CONFIRMATORY FACTOR ANALYSIS	46
3.7 THEORETICAL DISCUSSION ON CHOICE EXPERIMENTS	47
3.8 EMPIRICAL SPECIFICATION	52
3.9 VARIABLE DESCRIPTION AND MEASUREMENT	53
3.10 STATEMENT OF HYPOTHESIS	58
3.11 DATA ANALYSIS	59
CHAPTER FOUR	61
RESULTS AND DISCUSSIONS	61
4.1 DESCRIPTIVE ANALYSES	61
4.1.1 CONSUMER AND HOUSEHOLD CHARACTERISTICS	61
4.1.2 CONSUMER RATINGS FOR BEEF ATTRIBUTES	63
4.1.3 CONSUMERS PERCEPTION ON THE SAFETY OF BEEF PRODUCTS AND ASPECTS OF FOOD SAFETY THAT IS OF MOST CONCERNS TO CONSUMER	66
4.1.4 BEEF ATTRIBUTES THAT CONSUMERS RELY ON FOR ASSESSING FOOD SAFETY	68
4.1.5 CONSUMERS PERCEPTION AND WILLINGNESS TO PAY FOR PASTURE-RAISED BEEF PRODUCTS	70
4.2 DISCUSSION OF EMPIRICAL RESULTS	72
4.2.1 BEEF SAFETY AND QUALITY INDICATORS	72
4.2.2 DETERMINANTS OF WILLINGNESS TO PAY PRICE PREMIUMS FOR PASTURE RAISED (NATURALLY FED) BEEF	75
4.2.3 WILLINGNESS TO PAY FOR HEALTH INSPECTION AND CERTIFICATION LABEL	81
4.2.4 RANDOM PARAMETER LOGIT ESTIMATES OF CONSUMERS' WILLINGNESS TO PAY FOR SAFETY AND QUALITY ATTRIBUTES OF BEEF IN THE CHOICE EXPERIMENT	88

CHAPTER FIVE	94
SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS	94
5.1 SUMMARY AND CONCLUSIONS	94
5.2 RECOMMENDATIONS	98
REFERENCES	101

LIST OF TABLES

Table 2.1 Live Production of Cattle in Ghana from 2001 to 2010	12
Table 2.2 Beef Production (tons) in Ghana from 2001 to 2010	13
Table 2.3 Ghanaian Consumer Criteria for Meat Purchases	24
Table 3.1 Beef Product Attributes and Attribute Level in the Choice Experiment	50
Table 3.2 Sample of Choice Set	51
Table 3.3 Descriptive of Variables in the Models	57
Table 4.1 Consumer and Household Characteristics	62
Table 4.2 Beef Product Attribute Ratings by Consumers	65
Table 4.3 Amount of Reliance on Product Attributes in Assessing Food Safety	69
Table 4.4 Consumer Perception on Pasture-Raised Production and Products	71
Table 4.5 Distribution of WTP Premiums for Pasture Raised/Naturally Fed Beef and Certification Label	72
Table 4.6 Maximum Likelihood Estimates on Indicators of Beef Quality and Safety	73
Table 4.7 Ordered Probit Estimates of Consumer WTP Premiums for Pasture-Raised Beef	76
Table 4.8 Predicted Probabilities and Marginal Effects for WTP for Pasture Raised Beef Products	81
Table 4.9 Ordered Probit Estimates on Consumer WTP Price Premiums for Health Inspection and Certification Label	82
Table 4.10 Predicted Probabilities and Marginal Effects for WTP for Health Inspection and Certification Label	87
Table 4.11 Random Parameter Logit Estimates with only Choice-Specific Attributes	89
Table 4.12 Random Parameter Logit Estimates with Choice-Specific Attributes and Demographic Interaction Terms	91
Table 4.13 Statistics for Determining Model Fitness	92

LIST OF FIGURES

Figure 2.1 The Family of Stated Preference Methods	14
Figure 2.2 Framework Reflecting Consumer Behaviour towards Food Products	28
Figure 3.1 Map of Kumasi Metropolis	34
Figure 3.2 Map of Sunyani Municipality	36
Figure 3.3 Conceptual framework for consumer preferences and willingness to pay	45
Figure 4.1 Perceived Level of Beef Safety	67
Figure 4.2 Important Aspect of Beef Safety	67
Figure 4.3 Confirmatory Factor Analyses for Beef Product Attributes	74
Figure 4.4 Distribution of WTP from RPL without interaction	93

LIST OF ABBREVIATIONS

CV	Contingent Valuation
FAO	Food and Agricultural Organization
FDB	Food and Drugs Board
GDP	Gross Domestic Product
GSS	Ghana Statistical Service
GLSS	Ghana Living Standards Survey
SRID	Statistics, Research and Information Directorate
MOFA	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

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CHAPTER ONE

INTRODUCTION

1.1 Background

The Ghanaian food sector is modeled by society's development. It is generally known that reasonably good economic growth during the past few years has also created an expanding middle and high-income population, especially in the urban areas, where beef consumption patterns have been changing swiftly toward higher levels of consumption of high-value beef products (Annan-Peprah *et al.*, 2012; Opoku and Akorli, 2009). The change in consumption pattern emanates from consumers' perception of beef product attributes which influences their preferences and willingness to pay for beef product traits or attributes.

As Ghana makes its transition from a developing economy toward a developed one, a percentage of its population is becoming wealthier, demanding more goods, and eating more high-quality food (MOFA, 2010). 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. 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 recent food-safety crises have put strong emphasis on quality and safety of beef production such incidents include the use of car tyres in singeing cut parts such as leg piece, skin and head (Dabuo, 2011) and microbial and chemical food contamination (Saba & Gonzalez-Zorn), 2012.

As Ghanaian consumers' expectations become more and more demanding, safety and quality become keywords for producers as well as consumers. Growing concern over environmental influences and other credence characteristics of beef products have resulted in increasing interest

in the production methods, healthiness and other attributes of beef products which shape consumers purchasing decisions (Adzitey, 2013; Dabuo, 2011).

Beef production and marketing has a number of opportunities and challenges in Ghana. In the first instance, Ghana imports live animals (especially ruminants) from neighbouring countries and meat from either Europe or America (Adzitey, 2013). Beef products are mainly imported from Europe and America partly because the local meat supply is less than the demand; therefore livestock farmers can increase their production levels to fill the excess demand. One of the main challenges is the poor marketing performance (FAO, 2010). The absence of knowledge on consumer preferences and willingness to pay for beef attributes inhibit the effective design of products for the market affecting demand.

1.2 Problem Statement

Ideally, the flow of market information on consumers perception, attributes of beef that consumers prefer and prices they are willing to pay should be available to help beef producers in producing beef products that meet the requirements of consumers. Unfortunately, this flow of information on perception of consumers, attributes of beef that consumers prefer and are willing to pay upstream towards key players along the beef value-chain like beef producers is lacking.

Factors that influence Ghanaian consumer's preferences and willingness to pay for safety and quality attributes of beef are very essential in designing marketing strategies. However, these factors are not known on the Ghanaian beef industry because of absence of empirical literature or research on consumer preferences and willingness to pay for beef attributes. This has resulted in poor marketing and consumption of beef in Ghana (FAO, 2010).

Minimizing contaminations of beef products is one of the key objectives of many developing countries. However, microbiological, chemical and physical food contamination of beef products in Ghana is alarming in the beef industry (Saba and Gonzalez-Zorn, 2012). The production and marketing environment in which smallholder beef producers and sellers operate is primarily comprised of informal distribution channels where safety and quality standards are either lacking or inadequately defined (FAO, 2009). Some of which have been in the headlines of public discussion in Ghana, especially food safety as for instance some 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.

Reliable food safety and quality information on animal husbandry and geographic origin have long been recognized as value-adding differentiation mechanisms in the developed world. Unfortunately, little or no reliable food safety and quality information on animal husbandry and geographic origin exist for beef production, marketing and consumption in Ghana (SRID, 2010). This has resulted in many food-borne diseases arising from unsafe meat production and lack of information on food safety practices (Saba and Gonzalez-Zorn, 2012).

Consumers are progressively more sensitive to beef 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 quality attributes of those food products. Consumer assurance in the information available on beef products that offers them with the highest utility and their safety

as long as they can accurately determine the attributes regarding beef production and marketing 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).

The Ghana Food and Drugs Authority have defined standards for quality and safety of most fresh beef cuts produced and marketed in the country (FDB, 2004). Specifically, they provide guidelines 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 such as steak colour, hygienic condition of shopping environment etc. to differentiate quality and safety attributes of such products, and market actors and producers respond based on those attributes and consumer preferences yet these criteria and indicators are not known to beef producers.

Differentiation of pasture-raised beef products as different from those produced conventionally is a key product differentiation strategy for sustaining livestock production in many developed and developing countries; example of such differentiation strategies include product labelling and leanness of steak etc. However, the majority of the cattle produced in Ghana are naturally fed or pasture-raised since the key production structure is basically based on comprehensive grazing or free range (Adzitey, 2013). “Pasture-raised” (PR) has no universally accepted definition, nor is there a clear distinction between pasture-raised and conventionally or confinement-raised livestock and products. The most important distinctions are: (a) the animals spend their lives outdoors, on pastures (barring birthing, inclement weather, and other limited circumstances), and

(b) in the case of ruminants, the animals forage for significant portions of their diets from pasture (USDA, 2007). Many pasture-based farmers forego the use of added hormones and subtherapeutic antibiotics, adhering to more “natural” production methods (Conner *et al.*, 2008).

Fresh beef cuts, sausages, meat loaf and other products from cattle raised under this production system are termed pasture-raised beef products. Although Ghanaian livestock farmers have raised animals on pasture for ages, it is unfortunate that the promotion of pasture-raised products as different from those produced with the more common confinement method is relatively new and not existing in the Ghanaian beef industry. As a result, the proportion of pasture-raised beef supplied to the market is not known. Therefore, there is the need to pay attention to the promotion of pasture-raised product differentiation and creation of niche market since producers of fresh beef cuts and processed beef products buy animals that are produced naturally or pasture-raised at higher prices compared to conventionally produced ones which are mostly from neighbouring countries. The high prices of pasture-raised cattle are as a result of quality claims associated with its products as indicated by Conner *et al.* (2008) who posited that pasture-raised beef products have high levels of the fat-soluble vitamins A and E and of omega-3 polyunsaturated fats. Pasture-raised beef is leaner overall with up to three times more omega-3 than conventional beef. Pasture-fed beef also has a much better ratio of omega-3 to omegas-6, a balance critical to human health, providing anti-inflammatory and neuroprotective effects (Conner *et al.*, 2008). However, on the beef retail market in Ghana these beef products are sold undifferentiated and as such the expected premiums are not attained by sellers of fresh beef cuts and processed beef products.

Consumers’ perceptions, preferences and willingness to pay for safety and quality of beef attributes are outstanding issues that have to be understood by the producers and the government

in order to meet the product and food safety requirements of consumers. The study, therefore, seeks to address these knowledge gaps by finding answers to the following research questions. 1.

What safety and quality attributes of beef do consumers prefer and use in their purchasing decision? 2. How do consumers rely on the identified attributes in assessing food safety assurance?

3. How do consumers perceive the safety of beef products on the market? 4. How do consumers perceive pasture raised beef products and production? 5. What factors influence consumers' preferences and willingness to pay for safety and quality attributes of beef?

1.3 Objectives of the Study

The main objective of the study is to examine consumers' perception, preferences and willingness to pay for safety and quality attributes of beef in Ghana. The specific objectives are as follows:

1. To identify and examine the safety and quality attributes of beef consumers prefer and use in their purchases.
2. To assess the level of reliance on the identified attributes for food safety assurance in the beef industry.
3. To determine consumers' perception of the safety of beef products on the market.
4. To determine consumers perception and determinants of willingness to pay premiums for pasture-raised beef products.
5. To determine factors that influence consumers' preferences and willingness to pay for safety and quality attributes or traits of beef.

1.4 Relevance and Justification the Study to Ghana

Recently several studies on preferences and willingness to pay for meat attributes and other livestock products have been conducted in developed countries (Gracia and De-magistris, 2013;

Grebitus *et al.*, 2013; Lim, 2012). Most of these rigorous consumer studies on preferences and willingness to pay for meat products have not given much consideration to Sub-Saharan Africa, including Ghana resulting in scanty market information available on livestock products and attributes consumers prefer and willing to pay for in Ghana. Meanwhile there are fundamental indications that demand for improved food quality and safety has also been increasing (FAO, 2003). 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“ (Jabbar and Islam, 2010). An understanding of these criteria and indicators is essential for sellers for sellers of fresh beef cuts and processed beef products to respond to them for enhancement of marketing performance and profitability.

Pasture-raised production method was purposively selected because Ghanaian livestock farmers have raised animals on pasture for ages yet promotion of pasture-raised products as different from those produced with the more common confinement method is relatively new and not existing in the Ghanaian beef industry. In terms of quality and safety, pasture-raised beef products have been found to contain essential vitamins such as fat-soluble vitamins A and E and of omega-3 polyunsaturated fats with leaner beef compared to conventional beef. These ingredients are very essential to human health (Conner *et al.*, 2008). Pasture-raised beef products safe from chemical residues due to reduce use of antibiotics and sub-therapeutic hormones. There is therefore the need for studies that will help create a niche market for pasture-raised beef products since no such study has been conducted in the study area to the best of the author's knowledge.

In particular, issues concerning consumer willingness to pay a premium for pasture-raised livestock products in Ghana have not been rigorously addressed. Findings on willingness to pay premiums for pasture-raised beef products can ultimately offer an opportunity for niche marketing and product differentiation, and there are indications that expanding this production system would enhance the sustainability of livestock production which improve the livelihood of small and medium holder farmers especially in the Northern part of Ghana (MOFA, 2010).

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 has the potential to improve the incomes and livelihoods of small holders and other market participants and to be an avenue for the overall development of the livestock sector (FAO, 2009). Thus, if sellers of fresh beef cuts and processed beef products are able to supply consumers with their requirements, the demand for the product will increase thereby increasing the demand for cattle from farmers all things being equal. 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 (FAO, 2009). Increased livestock production will increase farmers' income, which will in turn contribute to reduction of poverty. Finally, the study will provide inputs into the formulation of local livestock management plans and programs, particularly on product attributes and preferences for the product and other breeding programs.

1.5 Organization of the Study

The study is organized as follows: Chapter One has presented the introduction of the study which is comprised of the background, the problem that the research seeks to address, the main and specific objectives of the study and finally the relevance and justification of the study. Chapter Two gives an overview of livestock production and livestock products in Ghana, methods of eliciting consumers' preferences and willingness to pay are discussed in details followed by detailed review of consumers' preferences for beef product attributes in general and in Ghana specifically. Also reviewed under this chapter is the detailed review of empirical literature on factors influencing consumers' preferences and willingness to pay for beef attributes. Chapter Three discusses the study location which comprise of demographic characteristics of Kumasi metropolis and Sunyani municipality. Theoretical discussion on consumer preferences and willingness to pay for beef attributes are discussed followed by a detail discussion of the factor analysis. Additionally, the choice experiments are discussed in details followed by the empirical specifications of models with the statement of hypothesis. Finally, sampling procedure and data collection approaches are discussed and the analytical methods for the data are also presented under this chapter. The results of the study are presented and discussed in Chapter Four. This comprises of the descriptive and empirical results. Summary, conclusions and policy recommendations based on the study's findings are provided in Chapter Five.

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CHAPTER TWO

LITERATURE REVIEW

This chapter consists of six sections. The first section covers an overview of livestock production and products in Ghana, while section two presents the methodological review, which discusses the available methods for estimating consumers' preferences and willingness to pay, their strength and weaknesses. In the third section, consumers' preferences for beef product attributes in general and in Ghana were reviewed respectively. The fourth section reviews empirical literature on consumer preference for beef product attributes whereas empirical literature on factors influencing consumer willingness to pay for beef product attributes were reviewed in section five. The final section presents conclusions on the literature reviewed.

2.1 Livestock Production and Livestock Products in Ghana

Animals produced in Ghana are solely for local consumption. As a by-product, bullocks are sometimes used as draught power for crop production. Animal faeces are also sometimes used as

manure to fertilize crops. 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 (Adzitey, 2013).

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). In this system, settled farmers whose main occupation is crops cultivation own livestock. 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 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). Cattle population is concentrated in the Guinea and Sudan Savannah vegetation zones of the three northern regions, which combined account for about 75% of the cattle population in Ghana (MOFA, 2010). The remaining transitional and humid forest zones are sparsely populated with cattle because of the prevalence of tsetse flies, which transmit a killer disease, trypanosomiasis. Cattle production 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 (MOFA, 2010). Table 2.1 presents cattle production from 2001 to 2010. The table shows that cattle production increased from 2001 to 2005. In 2006, there was a

decline in production. However, in 2007 the 2005 quantity was regained and production started increasing up to 2010 where 1,438,000 live cattle were produced.

Table 2.1 Live production of cattle in Ghana from 2001 to 2010

Year	Cattle
2001	1,315,000
2002	1,330,000
2003	1,344,000
2004	1,359,000
2005	1,373,000
2006	1,359,000
2007	1,373,000
2008	1,392,000
2009	1,438,000
2010	1,438,000

Source: FAOSTAT (2012)

Table 2.2 shows beef production in Ghana from 2001 to 2010. The table below shows that beef production increased from 2001 to 2003 but in 2004 there was a decline from 24,375 tons to 23,070 tons. In 2005, there was an increase from 23,070 tons to 25,393 tons after which a decline was observed in 2006. However, from 2006 upwards there was an increase in beef production up to 2010 where a total of 25,775 tons were produced.

Table 2.2 Beef production (tons) in Ghana from 2001 to 2010

Year	Beef(tons)
2001	24,000
2002	24,125
2003	24,375
2004	23,070
2005	25,393
2006	23,865
2007	23,419
2008	25,350
2009	25,538
2010	25,775

Source: FAOSTAT (2012)

2.2 Approaches to Measuring Consumer Preferences and Willingness to Pay

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 in stated preference 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 hold significant advantages when historical data do not suit the objective function or when data does not exist from history (CIE, 2001).

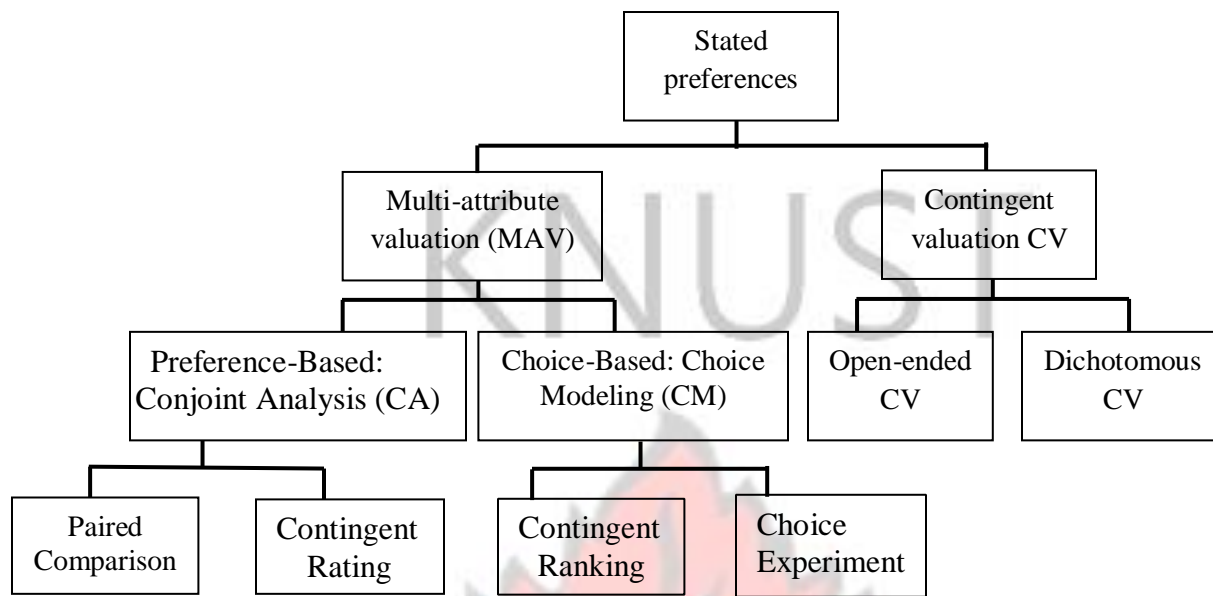


Figure 2.1 The Family of Stated Preference Methods

Source: Castello, 2003

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). 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 contingent valuation and multi-attribute valuation techniques; thus, between contingent valuation and both conjoint analysis and choice modeling approaches (CIE, 2001). Contingent valuation 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 (WTP) 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, contingent valuation 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 contingent valuation 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 contingent valuation 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 hypothetical scenario. A third potential weakness of contingent valuation 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 multi-attribute valuation methods, which include conjoint analysis and choice modeling (Hall *et al.*, 2002). The core difference between contingent valuation and multi-attribute valuation 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 Consumer Preference for Beef Product Attributes

2.3.1 Consumer Preference for Beef Product Attributes 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 of Oklahoma influences their preferences and that they purchase beef products perceived to be of higher quality and safe for consumption. For instance, consumers considered tenderness to be the most important palatability and quality 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 in most developing countries.

Lusk *et al.* (2003) iterated that, decline in beef consumption in France, Germany, United Kingdom and United States may be due to consumers' inability to differentiate between the qualities of beef products available for purchase. Lapar *et al.* (2010) however, 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 the consumers across a range of livestock products and these influences consumer preferences for beef products in Northern Vietnam. Furthermore, consumers prefer packaged beef with a government inspection stamp as a preferred safety attributes. This implies that the source of beef certification and inspection is crucial to consumers' preferences for meat products.

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 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 (Jabbar and Islam, 2010). Bosmans *et al.* (2005) found additional attributes that relates with appearance, nutritional information and food safety contrary to the findings of Bernues *et al.* (2003) who found that 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.

The creation of new market and promotion of highly differentiated beef products is mainly through a series of methods (search, experience, and credibility) and quality indicators (intrinsic and extrinsic) associated with beef and the productive processes together with 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; Becker, 2000; Northen, 2000). 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). It has been determined that, in particular cases however, information about product quality through labelling laws, certifications and nutritional information 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 such as steak colour for quality and safety.

Pouta *et al.* (2010) linked the impact of stating particular product information on a label and in a written form, finding that well-known brand name 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. A well-known brand name was, nevertheless, valued higher than the nutritional attributes.

2.3.2 Empirical Literature on Factors Influencing Consumers' Preference for Beef Attributes

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).

Psychographic factors like attitude of consumers concerning animal welfare, pasture raised production, lifestyle, 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.*, 2009; Goss *et al.*, 2007).

Food safety and quality concerns are important issues for most consumers and this 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). Therefore it is not surprising that in developing countries markets for animal products, consumers and producers differentiate products based on specific criteria representing quality, safety and convenience which should be observable and measurable (Islam and Jabbar, 2010). 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 *et al.*, 2009; Renuka, 2008; Hoffmam, 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).

2.4 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 (MOFA, 2009). Religious considerations have been found to be one of the key factors influencing beef slaughter and preferences (AnnanPeprah *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 Salmonellosis, 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). The FDB regulations are as follows:

1. Any company/persons wishing to import or put livestock products onto the Ghanaian market for sale will be expected to register with the Food and Drugs Board. 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.

The percentage of consumers who are aware of these regulations are not known. 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 (Annan-Peprah *et al.*, 2012). These criteria used by consumers must be investigated to make sure the safety of consumers is assured.

Table 2.3 Ghanaian Consumer Criteria for Meat Purchases

Region	Criteria used to purchase meat						Total respondents by Region
	Cost	Hygiene of meat	Cost & Hygiene	Religion	Hygiene & religion	Cost & religion	
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)

Table 2.3 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.

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.

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 products 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 products have been found to influence consumer preferences for beef products in Ghana.

Annan-Pepurah *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 time of the study, texture and tenderness were 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. This however, makes it not clear which attributes Ghanaians prefer.

2.5 Empirical Literature on Factors Influencing Consumer WTP for Beef Attributes

Willingness to pay is a measure for signifying the maximum monetary contribution an individual is willing to make in order to account 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). Willingness to pay for beef products has received some attention in the consumer choice studies. Consumers' willingness to pay 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 affect 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 influence consumers' willingness to pay for

beef attributes (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 willingness to pay for beef products. Among them include consumers' perception about 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, 2002; 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 individuals attitude or intension which is influenced by socioeconomic factors such as age, sex education, income and the available information. The socioeconomic factors directly influence willingness to pay. Individuals' knowledge of a product is influenced by available information through advertising, labelling, packaging and certification. The knowledge obtained influences the consumers' perception on food product quality or the attributes that makes up the product which indirectly influences willingness to pay. However, individuals' willingness to buy is influenced by his or her intension and it is directly related to willingness to pay. When the willingness to pay is known, then we can predict the purchase behaviour of the individual for a specific product market.

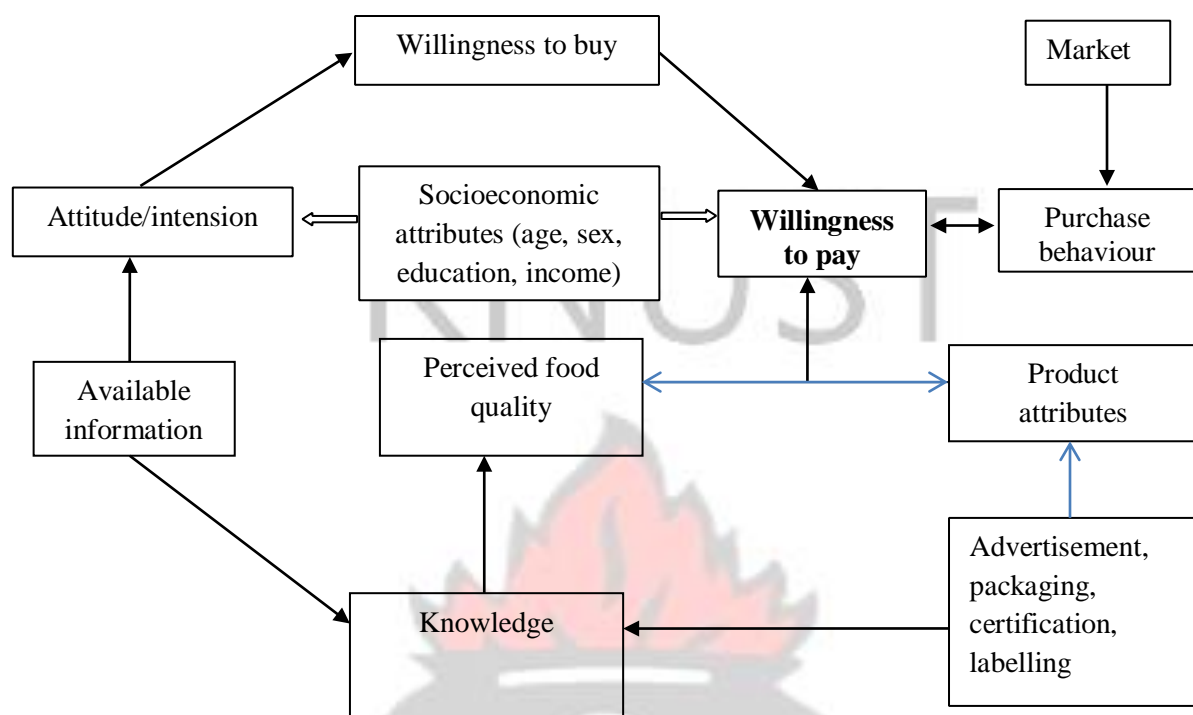


Figure 2.2: Framework reflecting consumer behaviour towards food products (adopted from Millock (2002) and Bonti-Ankomah and Yiridoe (2006))

2.6 Literature Review on Measurement of Variables

Various researchers have measured exogenous factors like processing, packaging, certification, product price, labeling, product brand and consumers' knowledge and awareness in different ways. External attributes such as processing, packaging, certification, product price, labeling, and product brand among other product attributes are mostly measured categorically where respondents are asked to choose or select the attributes they prefer (Fields *et al.*, 2006; Carlberg *et al.*, 2007). However, the problem that arises from this measurement is that, some respondents select more than one option and it becomes difficult to identify the most important attribute. Based on this limitation, multi-attribute ratings will be adopted such that each attribute will be rated by consumers in order of importance. Price of the variable is usually measured as continuous and in choice designs the prices are selected to be consistent with the prevailing market price and currency.

Consumers' knowledge and awareness have been measured as dummy variables (Kamal *et al.*, 2009) where respondents are directly asked whether they know about a particular product or whether they are aware of particular product. If yes, then a code of 1 is given and 0 otherwise.

Socioeconomic factors such as age, education, household size, household income, gender, and marital status. Age of respondents is mostly measured as a continuous variable in years (Millock, 2002). Some researchers measure it by creating age categories after which dummy variables are created for each category. This allows the researcher to identify the age category that is making the significant influence on the issue of study. Similarly, education has been measured as continuous variable in years of formal education by various authors (Millock, 2002; Carlberg *et al.*, 2007).

Some authors measure it by using the highest level attained after which dummy variables are created for each level (Chang *et al.*, 2012). This allows the researcher to identify the level of education that is making the significant influence on the issue of study. Household income has been measured as continuous variable in the currency pertaining to the study area (Schnettler *et al.*, 2009). However, income classes can be generated after which dummy variables are created and included in estimations to see which income class is significant. Household size has been measured as continuous variable in number of individuals in a household while some researchers prefer using number of dependents in a household depending on the study objectives. Gender and marital status are measured as dummy variables. The issue that comes out is which category should be labelled as 1 or 0 but the choice depends on the researcher based on the study objectives.

Consumers' attitude and perception variables are mostly measured on likert scale but the number of points is mostly decided by the researcher based on what literature says (Koistinen, 2010; Renuka, 2008). The responses from the respondents are used in estimating mean scores or perception index

depending on the research objectives. Also the categories from the likert scales can be recoded into dummy variables for further empirical estimations. The mean scores and perception index was used in this study.

2.7 Conclusion

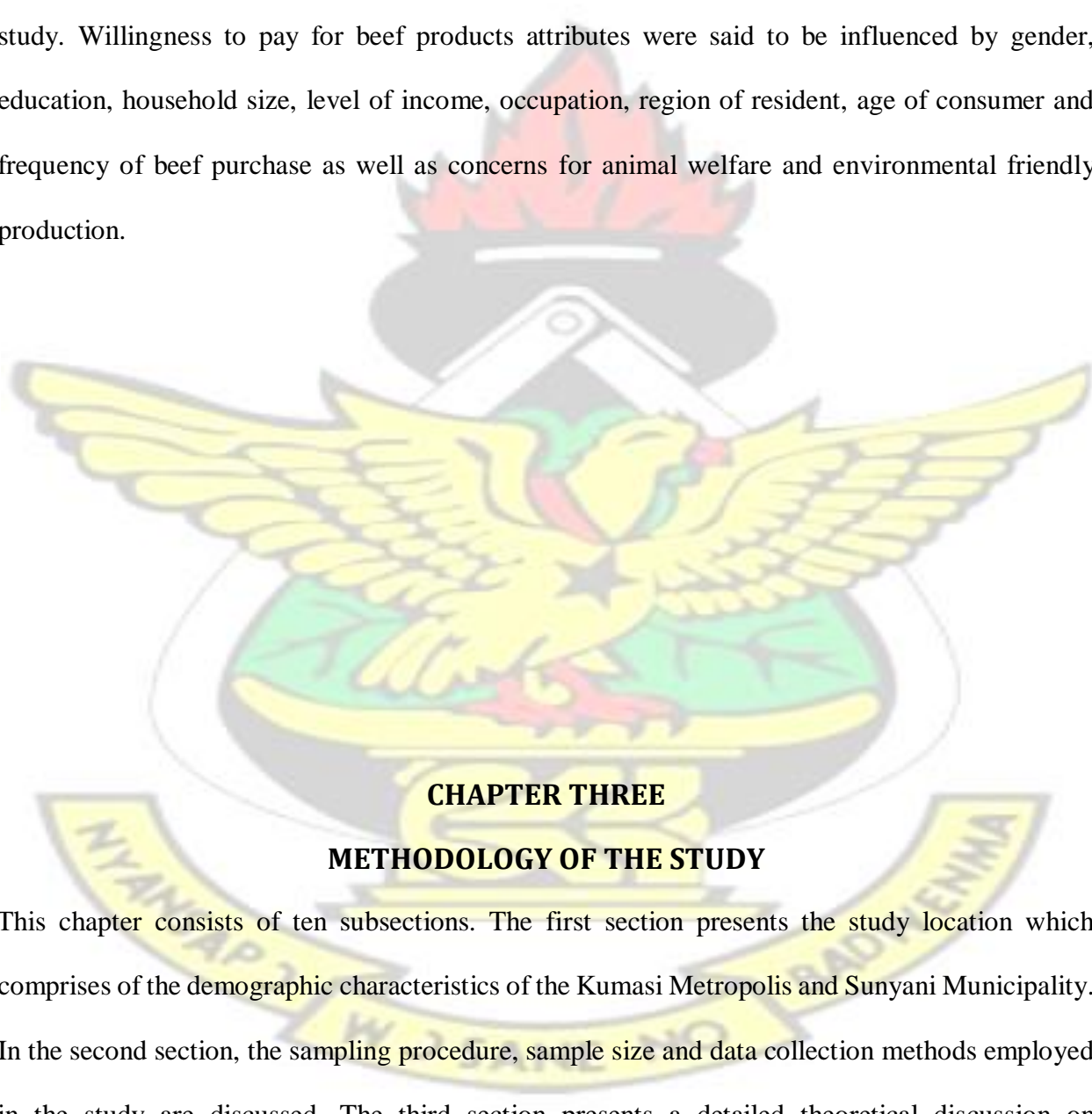
From the discussion on livestock production and products in Ghana, it was realized that beef production plays a major role in the socio-cultural life of farmers, farming communities, butchers and contributes to the overall economic growth of Ghana. Beef was revealed to be one of the primary meat and 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 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 product attributes 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 colour, certification, shopping environment, trust

and reputation of sellers as well as convenience of cooking were found to be important factors in consumers purchasing decisions.

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



CHAPTER THREE

METHODOLOGY OF THE STUDY

This chapter consists of ten subsections. The first section presents the study location which comprises of the demographic characteristics of the Kumasi Metropolis and Sunyani Municipality. In the second section, the sampling procedure, sample size and data collection methods employed in the study are discussed. The third section presents a detailed theoretical discussion on consumers' preferences followed by detailed discussions on the theory of willingness to pay for

beef cuts. The concept of the confirmatory factor analysis is also presented in section five. In section six, detailed discussions on the choice experiment is presented with sample choice set and the attributes considered in the choice experiment employed for the study. The empirical models appropriate for the empirical analysis together with the variable description and measurements are presented in section seven and eight. The hypotheses that were tested in the study are stated in section nine. Finally, the methods of data analyses employed for each of the specific objectives are presented in section ten.

3.1 The Study Locations

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 $6.35^{\circ} - 6.40^{\circ}$ and longitude $1.30^{\circ} - 1.35^{\circ}$, 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 (Ghana Living Standard Survey and Population Household Census, 2010). The Kumasi Metropolis is the most populous district in the Ashanti Region. During the 2010 Population Census, the estimated population was 2,035,064 (Ghana Living Standard Survey and Population Household Census, 2010). Kumasi has attracted such a large population partly because it is the regional capital, and also the most commercialised centre in the region (Ghana Living Standard Survey and Population Household Census, 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 (Ghana Living Standard Survey and Population Household Census, 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 since during day time people travel to Kumasi to do business and return to their various residents outside Kumasi. Based on the census report, the estimated population growth rate of the region is 5.47 per cent (Ghana Living Standard Survey, 2000: 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 (Ghana Living Standard Survey, 2000: 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

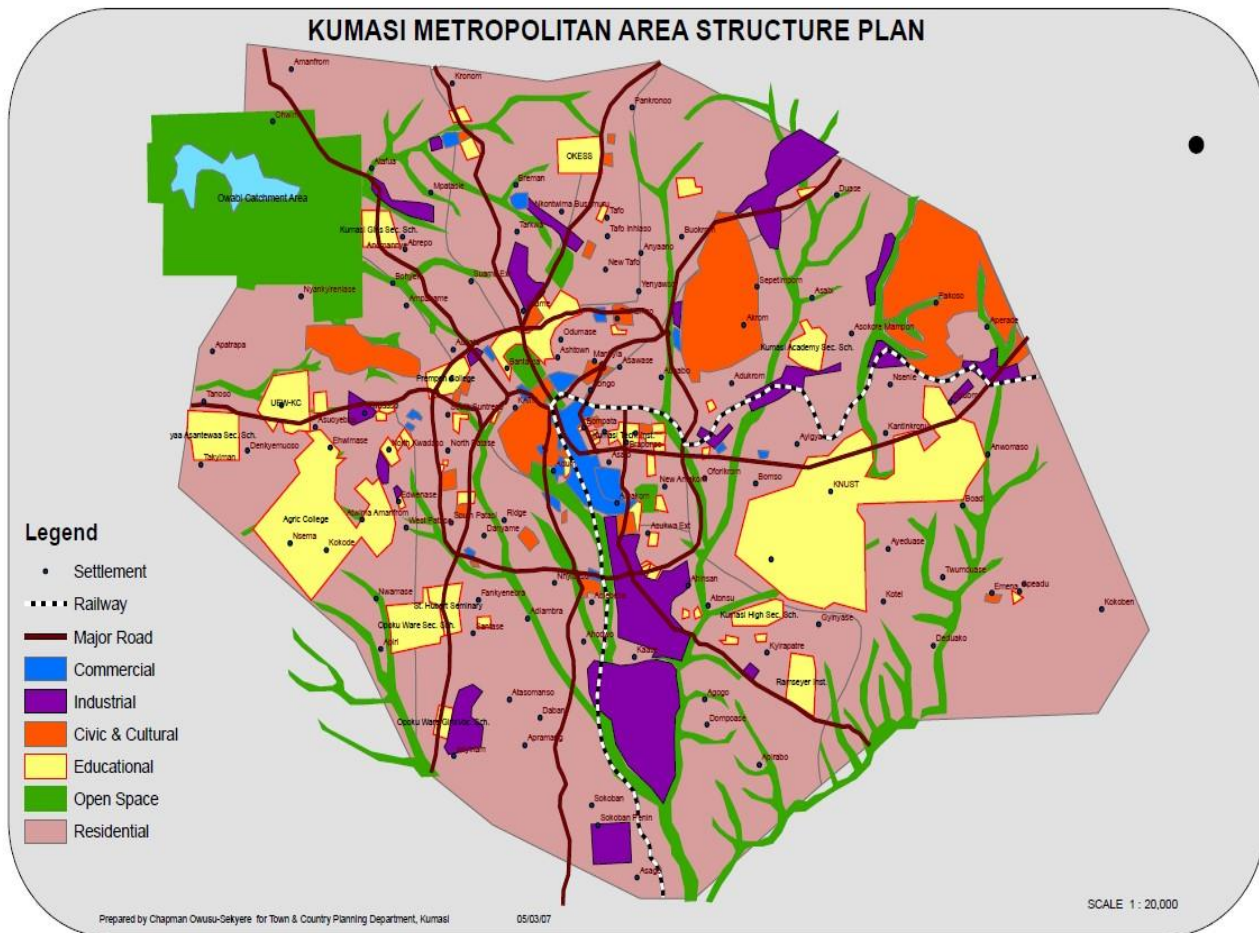


Figure 3.1 Map of Kumasi Metropolis
Source: Kumasi Metropolitan Assembly, 2013

Metropolis (5,530) (Municipal Planning Coordinating Unit, 2010). Figure 3.1 shows the map indicating the structural development of the Kumasi metropolis. The structural plan as can be seen in the map indicates the urbanization through settlement, educational facilities, industrial, commercial and residential areas. These are said to affect the demand and consumption pattern of consumers in the metropolis (Renuka, 2008).

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 $7^{\circ} 20'N$ and $7^{\circ} 05' N$ and Longitudes $20^{\circ} 30' W$ and $20^{\circ} 10' W$ 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 Computation, 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 Computation, 2010).

In 2000, the population of Sunyani Municipality was 101,145. Currently, with a growth rate of 3.8 percent, the estimated population is 147,301. Figure 3.2 shows the map of the Sunyani Municipality. The settlement areas as shown in the map tells how urbanization is increasing and this increase in urbanization among other factors account for increasing demand for improved food products. The population in the region is generally concentrated in the three largest localities (Sunyani, Abesim and New Dormaa) which hold about 74.3 percent of the population, with only 25.7 percent distributed among the other settlements. Sunyani, the regional capital, accommodates about 60% of the total population. The current concentration of 74.3 percent in the urban areas has accounted for the high urban growth and its associated problems of congestion and creation of slum.

The male-female ratio shows a ratio of 50.4 females to 49.6 males, thus the sex ratio of the municipality is 1 Male: 1.01 Females. The situation in the municipality does not deviate so much

from what the national figure depicts. The computation of male-female ratio is done for the economically dependent and age dependent groups. The age dependency ratio refers to the ratio of persons in the ages of 0-14 and 65+ to persons in the economically active group (15-64) whiles economic dependency ratio refers to the ratio of persons who are actively working (employed) to those who are not (unemployed).

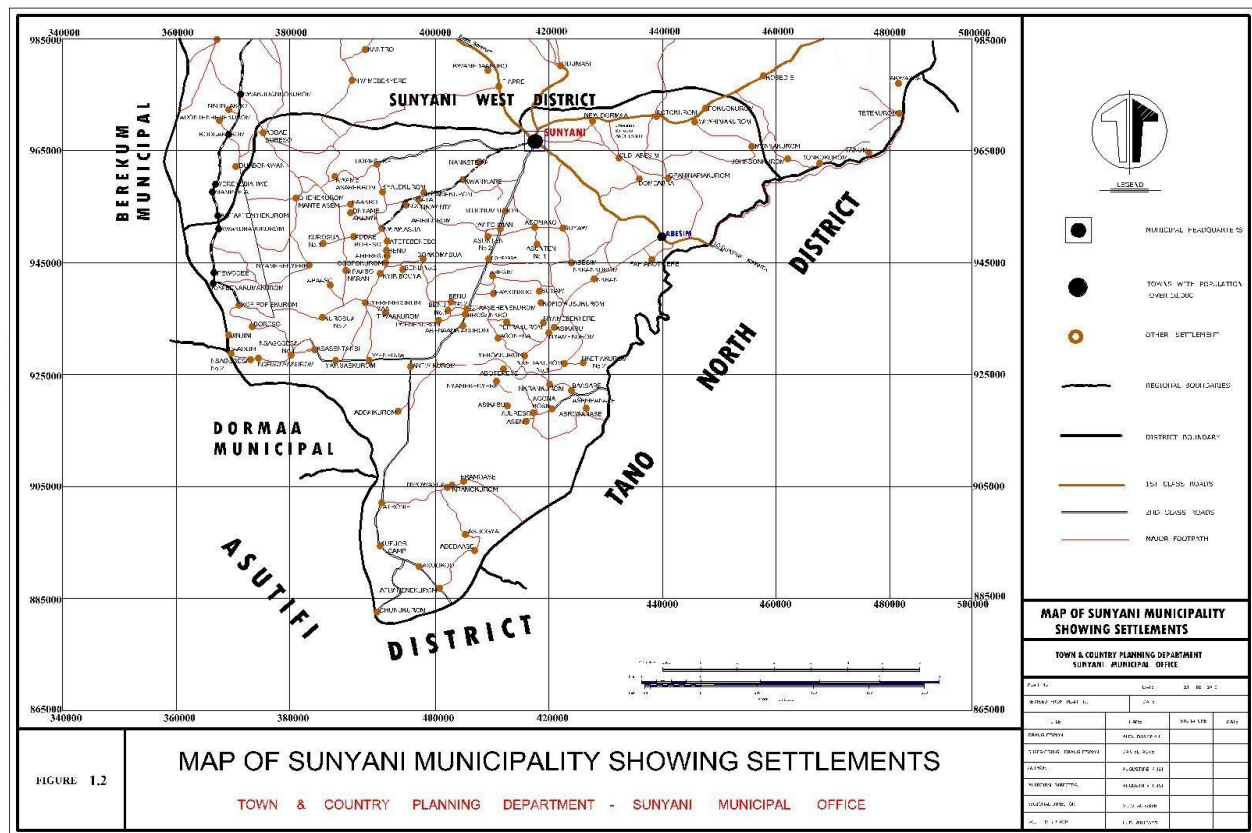


Figure 3.2 Map of Sunyani Municipality
Source: Sunyani Municipal Assembly, 2013

The age dependency ratio of the municipality stands at 73.3 percent (MPCU Computation, 2010). The ratio is lower than the national and regional figures of 87.1 and 90.5 respectively. This means that each person in the productive age has less than one person to support. On the other hand, the economic dependency ratio stands at 1:0.08. This means that less than one unemployed

person is supported by an employed individual. An age and economic dependency ratio of 73.3 percent and 1:0.08 depicts a positive economic situation of the municipality. The survey showed that about 26 percent of households in the municipality have 1-3 persons making up a household, 45.3 percent have 4-6 persons, and 22.7 percent 7-9. Moreover, the least composition has 4 percent and 2 percent for 10-12 and 13-15 respectively. The municipality has a mean household size of 4. Comparing the municipality's mean household size of 4 to the national average household size of 5.1, the average household size of the municipality is low. This means that there is low dependency as far as the number of persons per household is concerned. This may also suggest that, the extended family system is not dominant in the municipality as 71.3 percent of the households in the municipality are composed of 1-6 persons.

3.2 Sample, Sampling Procedure and Data Collection

3.2.1 Sample

Data used in this study was obtained from four hundred (400) beef consumers in the Kumasi Metropolis and Sunyani Municipality of Ghana in December, 2012 and January 2013. Primary 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. Thus, a focus group discussion and key informant interview were conducted among 10 urban consumers at residences, restaurants or market places and butchers in Kumasi and 5 consumers in Sunyani to understand their preferences and choice of beef attributes to differentiate quality and safety of beef products.

Secondly, data collection survey was conducted in KNUST meat and livestock unit, Kumasi abattoir meat market, Nhyiaso K-Appiah meat retail market, Asuoeyboa livestock products market

and Sunyani abattoir retail market where beef is sold in cut parts to fathom general consumption patterns. The population of the study included all beef consumers in Kumasi Metropolis and Sunyani Municipality. The data collection surveyed focused on beef cuts and consumer preference for different beef products traits based on a number of safety and quality attributes. These attributes were identified during the preliminary survey. Finally, the data collection was conducted on 400 beef consumers to address 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. The questionnaire used in the interviews comprised of a combination of open ended and closed ended questions, Likert type scales and options where the consumer rate his/her choices in level of importance of the attributes presented. 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) Origin (9) Slaughter men (religious purpose). These attributes were identified in the preliminary pilot survey and key informant interviews. About 14 cuts were available in the formal shops. These include fillet, loin boneless, ordinary boneless, shoulder, brisket, shank, kidney, bone-in, offal (intestines), head, liver, ox-tail, leg pieces and skin.

3.2.2 Sampling method

Multistage sampling was used. Pasture-raised production method was purposively selected because it is assumed that almost all cattle produced under the Sub-Saharan Africa region particularly Ghana are pasture raised. The second 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 and the frequent reports of unsafe meat production and marketing environment (Annan-Peprah *et al.*, 2012). Thirdly, four meat retail shops were selected from the three suburbs of the Kumasi metropolis purposively because these are the shops where beef products are sold formally in cut parts unlike the ordinary retail markets where beef are sold undifferentiated. The selected formal markets include the KNUST meat and livestock unit, Kumasi abattoir meat and livestock products retail market, Nhyiaso K-Appiah meat retail market and Asuoyeboa livestock products market. Only Sunyani abattoir retail market was selected from the Sunyani Municipal because of it is the major retail market where most consumers in the municipality buy their beef products from especially during market days.

Finally, a simple random sampling approach where all respondents on the list of customers had the chance to be selected was used in selecting the respondents from the selected beef retail shops. These markets have records/list of customer from which respondents were selected from during the survey. One hundred and fifty (150) consumers were simple 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 (50) consumers were sampled, as well as fifty (50) consumers each from Nhyiaso K-Appiah meat retail shop and Asuoyeboa meat retail shop respectively making a subtotal of three hundred (300) beef consumers in the Kumasi Metropolis. From the Sunyani Municipality, Hundred (100) beef consumers were conveniently selected from the Sunyani abattoir meat retail market such that any consumer who comes to the market on the data collection period and was willing to answer the

questions was considered. This was done because there was no list of customers from which a sample could be taken from. The different sample size from the individual markets was selected based on convenience and availability of respondents (Kothari, 2004). Also, 300 respondents were selected from Kumasi and 100 from Sunyani because the population of Kumasi is higher than that of Sunyani. Meat and livestock unit of KNUST was purposefully selected because of availability of expert knowledge on food safety and quality. In all a total sample size of four hundred (400) beef consumers were selected.

3.3 Theoretical Discussions on Consumer Preferences

Based on the discussion on the method of eliciting consumers' preferences and WTP, it is important to discuss the theory of consumers' preferences and WTP for products. The analysis of consumer preference for products stems from microeconomic theory and Lancaster's characteristics methodology where consumption utility is derived directly from a well-defined set of characteristics or attributes of the product and indirectly from consumed goods (Lancaster, 1991; Nicholson, 2001).

The economic foundations of attribute-based and choice experiment models are in Lancasterian consumer theory and random utility theory (Jaffry *et al.*, 2004). Lancasterian 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:

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

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 ϵ_{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, V_{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 capture 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 $V(i) > V(j)$ is fulfilled, ϵ is the error term and β are parameter estimates. From the viewpoint of the researcher, the conditional probability (P_i) that beef consumer n prefers beef cut i attributes over j in a different choice set is:

$$P_n(i) = P\left(\epsilon_{ni} > \epsilon_{nj} \mid V_{ni}, V_{nj}\right) = \frac{\exp(V_{ni})}{\exp(V_{ni}) + \exp(V_{nj})} \quad (2)$$

3.4 Theoretical Discussions on Consumer WTP for Beef Cuts

In general, consumers face two-fold choice decisions. These comprise which product cut to choose and how much to consume of the chosen product. Consumer WTP a premium for a particular product is considered as a choice problem within the framework of consumer stated preference. A rational consumer I will shift from the consumption of conventionally produced beef cut (\square^0) to the consumption of pasture-raised beef cut (\square^1) only if the utility obtained from the conventionally produced cut is lower than that of the pasture-raised beef cut. If the utility does not change then a rational consumer will not be willing to pay more. Thus, the consumer is willing to pay a premium for a given pasture-raised beef cut if the expected utility of consuming the pasture-raised beef cut $E[(\square^1)]$ is positive and exceeds the expected utility of consuming the conventionally produced beef cut $E[(\square^0)]_i$.

The individual consumer WTP a premium for a product is a function of the change in utility arising from the consumption choice. Specifically, beef consumers' WTP is assumed to be a function of the change in utility: $WTP = k \square \square[(\square^1)]$ where $\square \square(\square)$ is the change in utility and $k \geq 0$. Since the choice of one beef product over another is a discrete one, it is appropriate to look at consumers' choice problem in a random utility setting. Random utility models have been used widely in the valuation literature in the analysis of consumer food safety assessment and valuation of consumer response to new (or different) products. Based on the random utility framework proposed by Cranfield and Magnusson (2003), it is assumed that a consumer faces a choice between buying either the conventionally raised or pasture-raised beef cut. In the random utility model, the utility function is expressed as

$$U = X_{ii}\beta + \varepsilon_i \quad (3)$$

where U_i is the utility arising from the choice of the i th alternative, $X_i\beta$ is the deterministic component of the utility function. X_i is a vector of observable alternative specific factors that influence utility, β is a parameter vector and ε_i is the random component. The beef consumer notably chooses the pasture-raised beef cut (β^1) over the conventionally produced beef cut (β^0)

if the change in utility is positive $[\beta^1 - \beta^0] \beta > 0$ for all $\beta^1 > \beta^0$. The utility of the consumer is however not observable. What is observed is whether or not the consumer chooses to pay a premium for the pasture-raised beef cut. The study employs an ordered-probit model to quantify the effects of determinants on WTP. The dependent variable takes the form of a multiple response variable that has intrinsic order in many empirical analyses and as a result, an ordered qualitative response model is recommended (Cranfield and Magnusson, 2003). In this case, the WTP model can be written using a latent variable as follows:

$$WTP^* = X\beta + \varepsilon \quad (4)$$

Where WTP^* is the consumers' latent WTP, X is a vector of variables thought to influence WTP, β is a vector of parameters reflecting the relationship between WTP and the variables. ε is an independently and identically distributed error term with zero mean and a constant variance. Consumer characteristics could be included in the matrix X since WTP is likely to vary among consumers. Given that ε is unobservable and stochastic; the consumer's choice is not deterministic and can be predicted exactly. The probability that the consumer will purchase the pasture-raised beef product is given by:

$$p_i = \text{prob}_i \left[\varepsilon_i - \varepsilon_i < (X_i\beta) - (X_{ci}\beta) \right] \quad (5)$$

Where ci is conventional beef product and zi is pasture-raised beef product.

3.5 Conceptual Framework

Figure 3.3 shows the conceptual framework for consumers' willingness to pay for beef products.

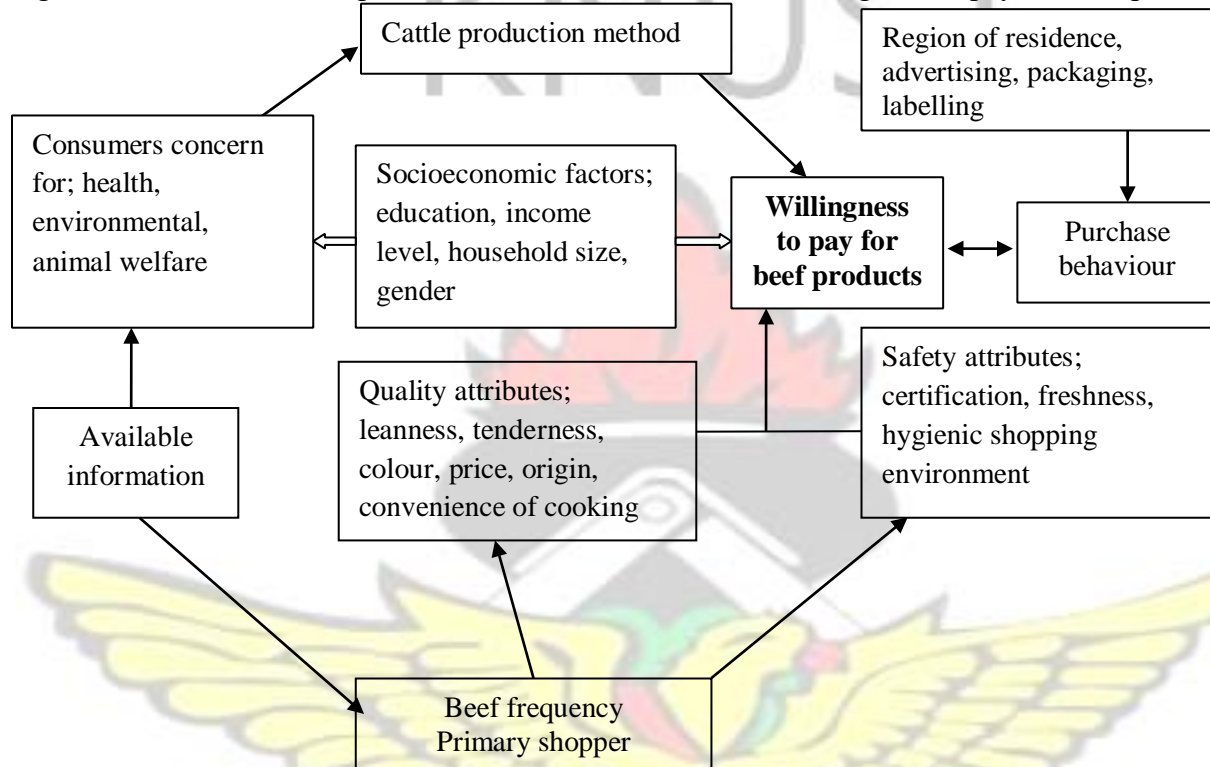


Figure 3.3 Conceptual frameworks for consumers' preference and willingness to pay for beef products.

The framework shows the various factors that account for consumers' willingness to pay for beef products and the purchasing behaviour of consumers. Among these factors are socioeconomic, safety and quality attributes of the beef product and production method, consumers' concerns and available information on the beef products as well as marketing strategies such as advertising, packaging etc. These factors link up to shape the behaviour of consumers in a particular geographical location or region of resident.

3.6 The Confirmatory Factor Analysis

Theoretically, the factor analysis assumes that observed variables $Y = (y_1, y_2, \dots, y_n)^T$ are related to a set of unobserved latent variables $X = (x_1, x_2, \dots, x_m)^T$ called “factors”. The association between vectors Y and X is stochastic and may be stated by a conditional probability function $\pi(Y|X)$. 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. Thus, the observed variables (Y) are explained in terms of a smaller number of unobserved latent factors (Z) (Peng *et al.*, 2005). Maximum likelihood estimation is used in testing the model parameters for significance. During this process, some goodness-of-fit indices such as a Chi-squared test (χ^2 , p), comparative fit index (CFI), and root mean square error of approximation (RMSEA) are employed in checking the model fitness.

In this analysis, safety and quality are not measured or observed (latent). However, the attributes that consumers rely on for these factors are captured and the validity of these attributes is confirmed by the factor analysis using the Amos Graphics for the latent variables safety and quality, this approach is usually 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 (Neela, 2009). In accordance with the objective of factor analysis, thus to achieve parsimony (Byrne, 2010), a first-order, onefactor model must be computed first. This model assessed whether the attributes identified could all be combined into one factor. The Goodness-Fit-Indicators indicated that the model fit was not acceptable. The first-order two-factor model examines whether the proposed safety and quality attributes of beef was plausible and statistically significant and applicable to Ghanaian consumers (Lapar *et al.*, 2010; Goss *et al.*, 2007; Jabbar and Islam, 2010).

3.7 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 for 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 contingent valuation 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 provide 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 Lancaster's 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 contingent valuation method thus hypothetical bias in 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.

The choice experiment, in particular, is employed for this study because of the multiple attributes and levels that is considered in the survey. The study incorporates estimated consumer willingness to pay for four different attributes of beef cuts. The consumer is then probed to choose one of the alternative beef options (A, B or C) or a possible no-choice option (See Table 3.2). The choice experiment incorporated three aspect of food safety and quality indicators from the farm level indicator of the health status of the animals slaughtered followed by the beef producers food safety inspection and certification license and finally the nutritional label of the final beef product. These include: (1) Animal health certification stamp from the veterinary officers in charge of animal health. (2) Food safety inspection and certification label from the food and drugs board department at the producer level. (3) Nutritional label of the beef products from the producers. (4) Price of the products was also incorporated. The study incorporates estimated consumer willingness to pay for the three different attributes. Table 3.1 summarizes the attributes and attribute levels evaluated in the choice experiments for 1Kg ordinary boneless beef cuts.

Table 3.1 Beef Product Attributes and Attribute Level in the Choice Experiment

Product Attribute	Attribute Level
1. Animal health	Verified veterinary stamp No veterinary stamp

2. Food safety certification	Food and drugs board license (FDB) ¹ Private producer license No license
3. Nutritional label	Assured Not assured
4. Price (GH¢)/kg	GH¢15 GH¢12 GH¢10 ²

Note: These attributes are not presently displayed on the Ghanaian market. However, the study seeks to find out the preferences of consumers and their willingness to pay supposing these measures are put in place to ensure food safety and quality by policy makers and key players along the beef value chain.

The consumer was then probed to choose one of the alternative beef options (A, B or C) or a possible no-choice option in the choice set (see Table 3.2). Consumer chooses from beef with veterinary stamp present and no stamp, beef product with food safety inspection and certification label from food and drugs board, private food safety certification label or no food safety certification label and finally beef product with nutritional label and no nutritional label. In addition to the above attributes consumers were presented with three different price levels for boneless beef cuts offered at 12GH¢/kg, 10GH¢/kg and 15GH¢/kg. The experimental design of the choice sets, or the combination of the attribute levels into different choice scenarios was determined using an experimental design to create choice sets. A full factorial design which includes all possible combinations of the attributes would yield large number of choice sets. Since it is not practically feasible to work with such a large number of choice sets, an orthogonal main effects design combined with a blocking strategy was generated, which

¹ Food and Drugs Board(FDB) is the food safety licensing body in Ghana

² 1 US Dollar (US\$) =1.460 Ghana Cedi (GH¢); December 2012 - January 2013
resulted in five choice sets. Information on the 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 and also because these product attributes are not presently existing on the Ghanaian market (Lusk *et al.*, 2003).

Table 3.2 Sample of Choice Sets

Attribute	Option A	Option B	Option C
Animal health	Verified veterinary stamp	No veterinary stamp	No veterinary stamp
Food safety	FDB	FDB	No license
Nutritional	Assured	Not assured	Assured label
Price	GH¢10	GH¢ 15	GH¢12
I would buy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I would not buy any of the above		<input type="checkbox"/>	

Recent literature and research on consumers' preferences and willingness to pay for livestock products suggest consumers possess heterogeneous preferences. Therefore, it is appropriate to employ a model that allows heterogeneous preferences (Lusk *et al.*, 2003). As a result the random parameter logit model (Mixed logit) is proposed to be the best model for estimating consumers' preferences and willingness to pay when preference heterogeneity is assumed (Tonsor *et al.*, 2005, Olynk *et al.*, 2010). The random parameter logit model 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 Lusk *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.

$$U_{ijt} = v_{ijt} + u_{ij} \quad (6)$$

3.8 Empirical Specification

Based on the theoretical discussion on willingness to pay for pasture-raised beef products, the ordered probit model for consumers' WTP for pasture-raised or naturally fed beef is specified as in equation 7. The ordered probit model is chosen because of the intrinsic order of the dependent variable. The intrinsic order calls for models that accounts for the ordering of the dependent variable (Peng *et al.*, 2005).

$$\begin{aligned}
 WTP = & \beta_1 \text{Age} + \beta_2 \text{Edu} + \beta_3 \text{Hsize} + \beta_4 \text{Pfreq} + \beta_5 \text{Aware} + \beta_6 \text{Msta} + \beta_7 \text{Lincome} + \beta_8 \text{Mincome} \\
 & + \beta_9 \text{Dist} + \beta_{10} \text{fedum} + \beta_{11} \text{Shopper} + \beta_{12} \text{Price} + \beta_{13} \text{leanness} + \beta_{14} \text{Inspection} + \beta_{15} \text{reshness} + \beta_{16} \text{Origin} \\
 & + \beta_{17} \text{Tenderness} + \beta_{18} \text{Colour} + \beta_{19} \text{Hea-conc} + \beta_{20} \text{Envi-con} + \beta_{21} \text{Wel_con} + \mu_{21}
 \end{aligned} \quad (7)$$

Two specifications of the random parameter logit (RPL) models were estimated based on the theoretical discussion of the choice experiment. The first included only choice specific attributes namely the price, animal health status, food safety certification and nutritional label.

$$V_j = \beta_1 \text{Anh} + \beta_2 \text{Fsaf} + \beta_3 \text{Nutl} + \beta_4 \text{price} \quad (8)$$

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

$$\begin{aligned}
 V_j = & \beta_1 \text{Anh} + \beta_2 \text{Fsaf} + \beta_3 \text{Nutl} + \beta_4 \text{price} + \beta_5 \text{Anhage} + \beta_6 \text{Anhedu} \\
 & + \beta_7 \text{Anh gen} + \beta_8 \text{Anh inc} + \beta_9 \text{Fsaf age} + \beta_{10} \text{Fsaf edu} + \beta_{11} \text{Fsaf gen} \\
 & + \beta_{12} \text{Fsaf inc} + \beta_{13} \text{Nutl age} + \beta_{14} \text{Nutl edu} + \beta_{15} \text{Nutl gen} + \beta_{16} \text{Nutl inc}
 \end{aligned} \quad (9)$$

The value the consumer places on the various attributes considered in the choice experiment can be determined using the random parameter model estimates. For a given beef 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 ($-\alpha_j/\beta$). 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).

3.9 Variable Description and Measurement

WTP is the dependent variable of the Ordered-Probit model specified in equation 7, it is measured on an ordinal scale of 0 to 4 where WTP=0 if respondents are not willing to pay premium for pasture-raised beef products, WTP=1 if respondents are willing to pay 5 % premium for pasture-raised beef products, WTP=2 if respondents are willing to pay 15 % premium for pasture-raised beef products, WTP=3 if respondents are willing to pay 20 % premium for pasture-raised beef products, WTP= 4 if respondents are willing to pay 25% more premium for pasture-raised beef products. **V_j** is the dependent variable for the random parameter logit model specified in equations 8 and 9. Is a binary variable denoting 1 if an alternative scenario is chosen from the choice sets, zero if no alternative scenario is chosen from a choice sets. **Age** of respondents was measured as continuous variable. Age is expected to have a positive influence on WTP for pasture-raised beef and certification label because literature reveals that old individuals are concerned about their health and eat diets with less fat (Peng *et al.*, 2005). **Edu** refers to years of formal education and

was measured as continuous variable. Education is expected to have a positive influence on WTP for pasture-raised beef and certification label because 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** refers to number of dependants in a household and was measured as a continuous variable. Household size is expected to have positive influence on WTP for pasture-raised beef and certification label 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 (Lusk *et al.*, 2003). However, Owusu and Anifori (2013) argued that households with large sizes are financially constrained by the large expenditure on the household and as such their purchasing power is reduced. **Inc** refers to monthly income of respondents which was measured in two ways. In the random parameter logit models 8 and 9, income was measured as a continuous variable in Ghana cedis per month whereas in the Ordered-Probit model income was measured as categorical variables after which dummy variables were created for each category:

Lincome is a dummy variable, 1 if monthly income less or equal 500 GH¢, zero otherwise, **Mincome** is a dummy variable, 1 if monthly income is between 501-1000 GH¢, zero otherwise and the reference category was **Hincome** denoting 1 if income is above GH¢ 1000, zero otherwise. The categorization was done because the income variable was not normally distributed but skewed, so there was the need to categorize them into different groups to see the effects of belonging to a particular group. **Lincome** variable is expected to have a negative effect on preferences and WTP for pasture-raised beef and certification label attributes. This is because all things being equal low income consumers“ will have a lower purchasing power which influences their preferences negatively. **Mincome** and **Hincome** variables are hypothesized to have positive influence on

preferences and WTP for pasture-raised beef and certification label because consumers“ in this category have the purchasing power to purchase the beef products with the improved product attributes (Lapar *et al.*, 2010).

Gen was a dummy variable denoting 1 if female, zero if male. **Gen** 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.

Mstatus refers to marital status measured as dummy variable 1 indicating married otherwise zero.

Dist refers to regional dummy variable denoting 1 if respondent resides in Kumasi Metropolis otherwise zero if respondent resides in Sunyani Municipality. **Shopper** variable was a dummy indicating 1 if respondent is the household primary shopper, zero otherwise. **Rel** is a dummy variable indicating 1 if Muslim, otherwise zero. **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 (Jabbar and Islam, 2010). **Rel** 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 (Makokha and Fadiga, 2009).

Pfreq refers to beef purchase frequency per month and it“s expected to have a positive influence on WTP for pasture-raised beef and negative effect on certification label because findings by Liana *et al.* (2010) and Makokha and Fadiga (2009) revealed that the higher the frequency of purchase the more experience the consumer becomes in terms of identifying safety attributes and such

respondents become used to personal indicators of quality which are considered experienced attributes such as taste, steak colour etc. It was measured as a continuous variable.

Aware refers to a dummy variable denoting 1, if respondent is aware of the qualities of pasture raised beef products compared to conventionally raised beef products, otherwise zero. Awareness is expected to have positive influence. **Hea_con** is a dummy variable referring to consumers' concern for health of animals slaughtered. Health concern is expected to have a positive influence on WTP for pasture-raised products and certification label because pasture-raised production is regarded as a quality attribute while the certification label provides assurance to consumers regarding their safety (Maria, 2006). It is defined as 1 if respondent is concerned about health of animals slaughtered, zero otherwise. **Envi-conc** is a dummy variable denoting 1 if respondent agrees that raising animals on pasture causes environmental problem, zero otherwise. Maria (2006) further argued that consumers who are more concerned about the environment and welfare of animals on the pasture will have a negative attitude towards pasture-raised products, hence environmental concern is hypothesized to have a negative influence. **Wel-con** is a dummy variable denoting 1 if respondent agrees that raising animals on pasture is good for the animals' welfare, zero otherwise. Animal welfare concern is expected to have a positive influence (Maria, 2006).

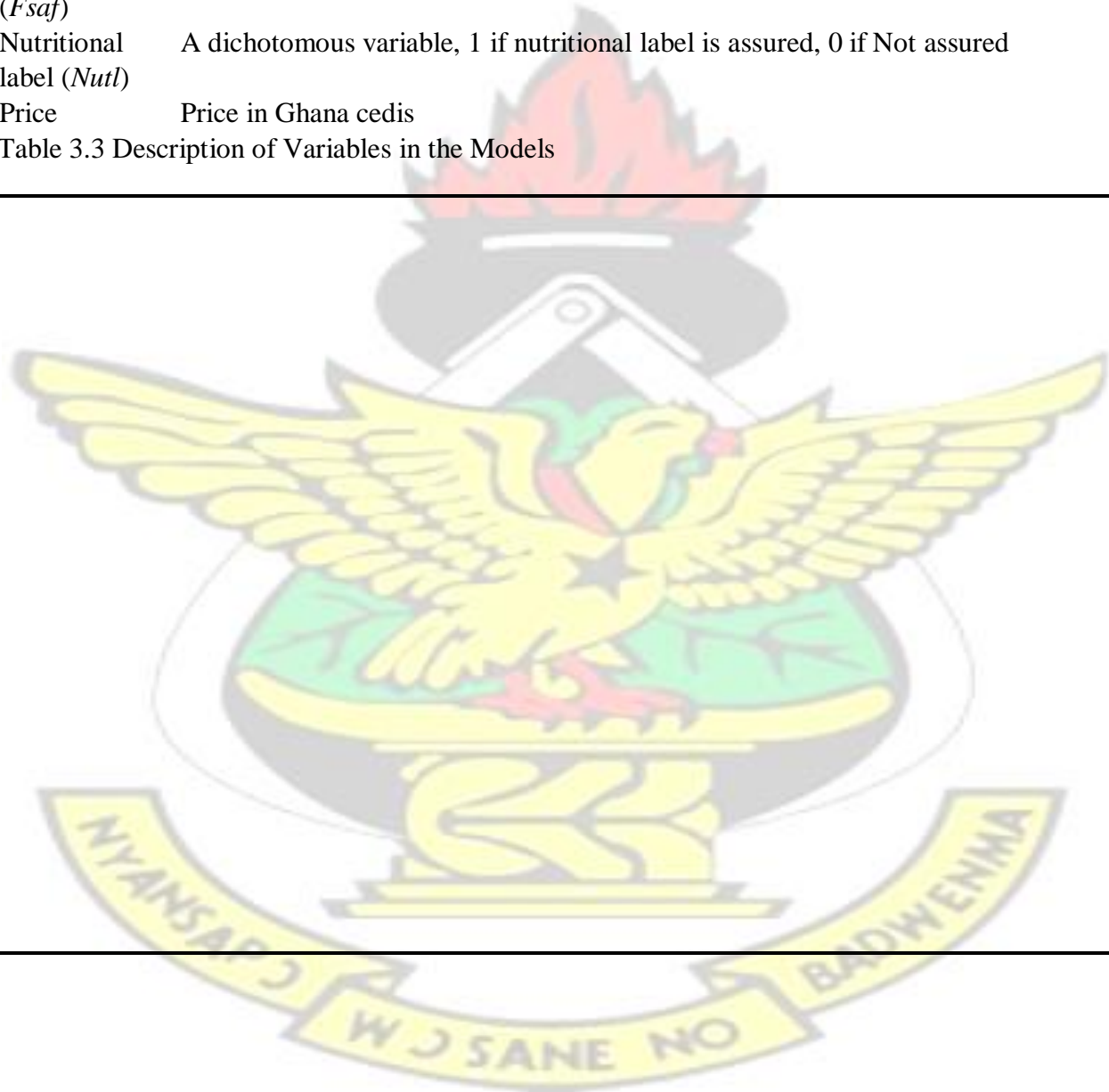
Price was measured as a dummy variable indicating 1 if respondent perceives prices as high, zero if low in the ordered probit model and measured as continuous in the random parameter logit model. Price is expected to have a negative influence according to economic theory (Lusk and Norwood, 2005). **Leanness** of beef was measured as a dummy denoting 1 if respondent perceives beef as lean, zero if fatty. **Inspection** of beef products was measured as a dummy variable indicating 1 if respondent perceives inspection as strict, zero otherwise. **Freshness** of beef products was measured as dummy variable indicating 1 if respondent perceives freshness as positive, zero negative. **Tenderness** of beef was measured as a dummy variable denoting 1 if respondent

perceives beef as tender, zero otherwise. **Origin** of the beef was likewise measured as a dummy variable indicating 1 if respondent prefers local beef (produced in Ghana), zero otherwise. Product attributes such as leanness, inspection, freshness, tenderness, appearance, cooking convenience and origin are expected to have a positive influence.

Variable	Variable Description
WTP	WTP=0 if not willing to pay, WTP=1 if 5 % more, WTP=2 if 15 % more, WTP= 3 if 20 % more, WTP= 4 if 25% more
V _j	1 if the alternative is chosen, 0 otherwise
Age	Years
Edu	Years of formal education
Hsize	Number of dependants in the household
Lincome	1 If monthly income less or equal 500 GH¢, 0 otherwise
Inc	Monthly income in Ghana Cedis
Mincome	1 If monthly income is between 501-1000 GH¢, 0 otherwise
Gen	1 if female, 0 otherwise
Mstatus	1 if married, 0 otherwise
Dist	1 if respondent resides in Kumasi Metropolis , 0 if Sunyani Municipality
Shopper	1 if respondent is the household primary shopper, 0 otherwise
Religion	1 if Muslim, 0 otherwise
Pfreq	Frequency of beef purchase (Number of times beef is purchased in a month)
Aware	1 If respondent is aware of quality of pasture raised cattle, 0 otherwise
Hea_con	1 If respondent is concerned about health of animals slaughtered, 0 otherwise
Envi-conc	1 if respondent agrees that raising animals on pasture causes environmental problem, 0 otherwise
Wel-con	1 if respondent agrees that raising animals on pasture is good for the animals" welfare, 0 otherwise
Price	1 If respondents perceive price as high, 0 if low
Leanness	1 If respondents perceive beef as lean, 0 if fatty
Inspection	1 If respondents perceive inspection as strict, 0 otherwise

Freshness	1 If respondents perceive freshness as positive , 0 negative
Tenderness	1 If respondents perceive beef as tender, 0 otherwise
Origin	1 If respondents prefers local beef, 0 otherwise
Appearance	1 If respondents perceive appearance as hygienic, 0 otherwise
Colour	1 if respondent prefers the steak colour, 0 otherwise
Convenience	1if steak is easy to cook, 0 otherwise
Animal health(<i>Anh</i>)	A dichotomous variable 1 if verified veterinary stamp, 0 if no veterinary stamp
Food safety (<i>Fsaf</i>)	Effect coding;1 if FDB licensed, -1 if private licensed, 0 if No license
Nutritional label (<i>Nutl</i>)	A dichotomous variable, 1 if nutritional label is assured, 0 if Not assured
Price	Price in Ghana cedis

Table 3.3 Description of Variables in the Models



Appearance of the beef was measured as a dummy variable denoting 1 if respondent perceived appearance as hygienic, zero otherwise. **Colour** of the beef was measured as dummy variable with 1 if respondent prefers the beef colour, 0 otherwise and the **convenience** of cooking was also measured as dummy, 1 if steak is easy to cook, and 0 otherwise. Animal health (**Anh**) is a dichotomous variable denoting 1 if verifiable veterinary stamp is present, zero if no veterinary stamp. Food safety (**Fsaf**) was effect coded with 1 representing FDB inspection and license, -1 if private license, zero if no license. Nutritional label (**Nutl**) is a dichotomous variable denoting 1 if nutritional label is assured, zero otherwise.

3.10 Statement of Hypothesis

1. **H0:** Consumers' age, education and frequency of beef purchase will not have any significant influence WTP for pasture-raised beef.
Ha: Consumers' age, education and frequency of beef purchase will significantly influence WTP for pasture-raised beef positively.
2. **H0:** Price, household size and being in low income category will not have any significant influence WTP for pasture-raised beef.
Ha: Price, household size and being in low income category will significantly influence WTP for pasture-raised beef negatively.
3. **H0:** Consumers' perception on product attributes such as leanness, inspection, freshness and tenderness have no significant influence WTP for pasture-raised beef products.
Ha: Consumers' perception on product attributes such as leanness, inspection, freshness and tenderness will significantly influence WTP for pasture-raised beef products positively.
4. **H0:** Consumers concerns for animal health and welfare have no influence their WTP for pasture-raised beef products.

Ha: Consumers concern for animal health and welfare will influence their WTP for pastureraised beef products positively.

5. **H0:** Consumers concern for the environment has no influence WTP for pasture-raised beef products negatively.

Ha: Consumers concern for the environment will influence WTP for pasture-raised beef products negatively.

6. **H0:** Consumers' age, gender, level of education, income level has no significant influence on consumers' preference and willingness to pay for food safety assurance attributes. **Ha:** Consumers' age, gender, level of education, income level will have a significant influence on consumers' preference and willingness to pay for food safety assurance attributes.

7. **H0:** Beef consumers in Kumasi Metropolis and Sunyani Municipality are not heterogeneous in their preference for safety and quality attributes of beef.

Ha: Beef consumers in Kumasi Metropolis and Sunyani Municipality are heterogeneous in their preference for safety and quality attributes of beef.

3.11 Data Analysis

The descriptive and inferential statistics was employed in the study. The safety and quality attributes of beef consumers prefer and use in their purchases were analyzed using descriptive statistics such as frequencies, percentages, and confirmatory factor analysis. To determine consumers' perception of the safety of beef products and the aspect of food safety that is of most concern in the Ghanaian meat market descriptive statistics such as frequencies and percentages were employed. Consumers' perception and determinants of willingness to pay for pasture raised beef products were analyzed using perception indices, descriptive statistics and estimated Ordered-Probit Model. The association between factors influencing consumer preferences for beef products

was analyzed using chi-square. The determinants of consumers' preferences and willing to pay for safety and quality attributes of beef were estimated using a random parameter logit model (Mixed Logit). The parameters of the ordered-probit, factor analysis and random parameter logit model were estimated through the maximum likelihood approach.



CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter consists of two main sections. Section one presents a descriptive analysis on consumer, consumption and household characteristics of the beef consumers in the sample area. Also discussed under this section are information on the consumer awareness of different beef cuts,

consumers perception on the safety of beef in the Ghanaian meat market, product attributes relied on for assessing food safety and quality in the beef market. Section two presents discussions on the empirical results.

4.1 Descriptive Analyses

4.1.1 Consumer and Household Characteristics

Consumers' and household characteristics are presented in Table 4.1 Consumers who purchase beef cuts at the formal retail shops are mostly within the ages of 19-30 with a 33.7 percent in the Kumasi Metropolis while in the Sunyani Municipality, 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 Kumasi Metropolis, whereas in the Sunyani Municipality, 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 Assibey-Mensah as cited by Owusu and Anifori (2013).

Characteristic	Kumasi Metropolis		Sunyani Municipality		Pooled sample	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Age						
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						
Males	138	46	33	33	171	42.8
Females	162	54	67	67	229	57.3

<i>Ethnicity</i>						
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
<i>Religion</i>						
Christian	234	78	68	68	302	75.5
Muslim	66	22	32	32	98	24.5
<i>Marital Status</i>						
Married	206	68.7	88	88	294	73.5
Single	94	31.3	2	2	106	26.5
<i>Education</i>						
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
1 st Degree	86	28.7	44	44	130	32.5
2 nd 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
<i>Shopper</i>						
Yes	191	63.7	82	82	273	68.3
No	109	36.3	18	18	127	31.8
<i>Frequency Purchase</i>						
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
<i>Household size</i>						
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

Table 4.1 Consumer and Household Characteristics

Calculations from field data, 2013.

Seventy eight percent (78%) of the respondents in the Kumasi Metropolis are Christian's whiles in the Sunyani Municipality only 68% were Christians but in total Christians were the majority with 75.5%. About 51.3% of the samples were Ashanti's with Ga's being the least with 0.7 % in

the Kumasi Metropolis while 78% of the respondents in the Sunyani Municipality are Bono's. In total the Ashanti's were the modal class with 40.5%. In Kumasi Metropolis 68.7% of the respondents were married whereas in the Sunyani Municipality, 88% were married and in total 73.5% of the respondents are married.

The results further showed that most of the consumers who purchased beef from the formal shops have attained their first degree. In the Kumasi metropolis 28.7% of consumers had attained first degree whereas in the Sunyani municipality 44% had attained first degree. In the pooled sample about 33% had attained their first degree. This indicates that most of the consumers who purchase beef cut from the formal selected shops or markets have attained tertiary education. In both regions it can be seen that most of the sampled consumers were the primary shoppers for their household, with 63.7% in Kumasi Metropolis and 82% in the Sunyani Municipality.

It is observed that, 47% of the consumers in Kumasi Metropolis purchase beef 2-3 times per month while in the Sunyani Municipality, 63% of the consumers of beef purchase beef 2-3 times per month. With regards to household size it was observed that both Kumasi Metropolis and Sunyani Municipality had 1-5 as the modal class and the same class was observed for the pooled sample.

4.1.2 Consumer Ratings for Beef Attributes

Table 4.2 presents the ratings of beef product attributes in order of importance by respondents in Kumasi Metropolis and Sunyani Municipality. Respondents in the Kumasi Metropolis rated low price, tenderness of beef and assured veterinary inspection/certification as important attributes they consider when purchasing beef products whereas hygienic condition of the shopping environment and attractive packaging were considered as extremely important attributes of beef products. Leanness of the beef was rated as both important and extremely important. They are also of the view that, whitish steak colour and halal method of slaughter are somewhat important attributes

considered when purchasing beef and on the other hand origin of the animal was considered as not very important. This finding is contrary to the findings of Makokha and Fadiga

(2009) who said that origin is an important attribute that consumers rely on in their purchases in Kenya; this contradiction may be attributed to the fact that consumers in Ghana cannot trace the origin of the products at the retail shops since some products are not properly packaged and labelled. In ranking the attributes using the mean scores, consumers in the Kumasi Metropolis rated hygienic condition of shopping environment, attractive packaging, assured inspection or certification, leanness, tenderness, freshness and whitish colour of beef as 1st, 2nd, 3rd, 4th, 5th, 6th and 7th respectively.

In the Sunyani Municipality, most consumers rated low price and origin of beef as somewhat important attributes considered in purchasing, halal method of slaughter were also considered as not very important by most consumers; this might be due to the low percentage of Muslims in the Municipality. This result is consistent with the findings of Annan-Peprah *et al.* (2012). Attractive packaging, freshness, assured inspection/certification and leanness of beef according to the consumers are rated as important attributes considered when purchasing beef. Hygienic condition of shopping environment, whitish colour and tenderness were rated as extremely important attributes that consumer rely on in purchasing beef. This is in line with the findings of Peng *et al.* (2005).

Table 4.2. Beef Product Attribute Ratings by Consumers

Attribute	Not important at all (1)	Not Very Important (2)	Somewhat important (3)	Important (4)	Extremely important (5)	Mean Rank
<i>Kumasi Metropolis</i>						
Price	62(20.7)	79(26.3)	61(20.3)	89(29.7)	9(3)	2.68
Leanness	0(0)	0(0)	44(14.7)	128(42.7)	128(42.7)	4.28
Tenderness	0(0)	2(0.7)	29(9.7)	191(63.7)	78(26)	4.15

Steak colour	1(0.3)	1(0.3)	117(39)	103(34.3)	78(26)	3.85
Certification	0(0)	1(0.3)	25(8.3)	148(49.3)	126(42)	4.33
Freshness	0(0)	0(0)	55(18.3)	208(69.3)	37(12.3)	3.94
Shopping place	0(0)	1(0.3)	6(2)	59(19.7)	234(78)	4.75
Halal Slaughter	30(10)	40(13.3)	138(46.0)	23(7.7)	69(23)	3.20
Origin of beef	2(0.7)	116(38.7)	81(27)	86(28.7)	15(5)	2.99
Packaging	1(0.3)	0(0)	7(2.3)	133(44.3)	159(53)	4.50
<i>Sunyani Municipality</i>						
Price	31(31)	33(33)	35(35)	1(1)	0(0)	2.07
Leanness	0(0)	0(0)	3(3)	62(62)	35(35)	4.32
Tenderness	0(0)	2(2)	20(20)	29(29)	49(49)	4.25
Steak colour	0(0)	0(0)	2(2)	40(40)	58(58)	4.56
Certification	0(0)	0(0)	7(7)	78(78)	15(15)	4.08
Freshness	0(0)	0(0)	17(17)	58(58)	25(25)	4.08
Shopping place	0(0)	0(0)	0(0)	27(27)	73(73)	4.73
Halal Slaughter	8(8)	33(33)	23(23)	4(4)	32(32)	3.19
Origin of beef	2(2)	10(10)	54(54)	34(34)	0(0)	3.20
Packaging	0(0)	0(0)	3(3)	56(56)	41(41)	4.38
<i>Pooled Sample</i>						
Price	93(23.3)	112(28)	96(24)	90(22.5)	9(2.3)	2.53
Leanness	0(0)	0(0)	47(11.8)	190(47.5)	163(40.8)	4.29
Tenderness	0(0)	4(1)	49(12.3)	220(55)	127(31.8)	4.18
Steak colour	1(0.3)	1(0.3)	119(29.8)	143(35.8)	136(34)	4.03
Certification	0(0)	1(0.3)	32(8)	226(56.5)	141(35.3)	4.27
Freshness	0(0)	0(0)	72(18)	266(66.5)	62(15.5)	3.98
Shopping place	0(0)	1(0.3)	6(1.5)	86(21.5)	307(76.8)	4.75
Halal Slaughter	38(9.5)	73(18.3)	161(40.3)	27(6.8)	101(25.3)	3.20
Origin of beef	4(1)	126(31.5)	135(33.8)	120(30)	15(3.8)	3.04
Packaging	1(0.3)	0(0)	10(2.5)	189(47.3)	200(50)	4.47

Source: Calculations from field data, 2013

Values in parenthesis are percentages

In rating the attributes using the mean scores, consumers rated hygienic condition of shopping environment, whitish steak colour, attractive packaging, leanness, assured inspection or certification, freshness and tenderness of beef as 1st, 2nd, 3rd, 4th, 5th, 6th and 7th respectively. In the pooled sample, the sampled consumers rated the identified beef attributes: hygienic condition of shopping environment, attractive packaging, leanness, assured inspection or certification, tenderness, whitish steak colour, freshness, halal method of slaughter, origin and low price of beef

as 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and 10th respectively. The differences in rating of attributes in the two regions indicate some form of heterogeneity in preference among individual consumers” in the study areas.

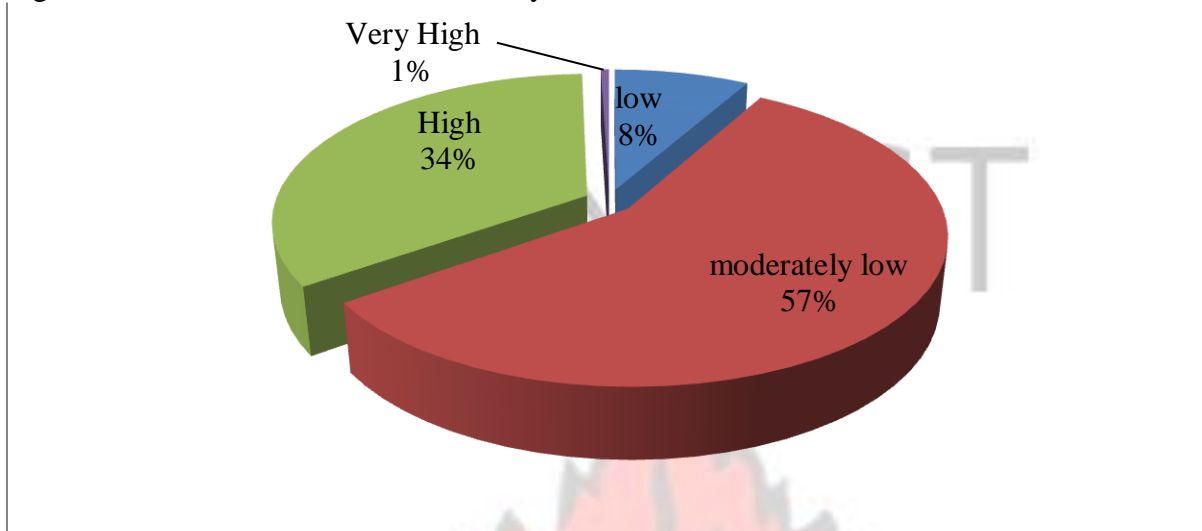
4.1.3 Consumers Perception on the Safety of Beef Products and Aspects of Food Safety that is of most Concerns to Consumer

Consumers’ perception on the safety of beef products on the Ghanaian market was assessed and presented in Figure 4.1. Most beef consumers in the study area perceived the safety of beef and beef products to be moderately low. Thus, 57% of the respondents considered the safety of beef and beef products to be moderately low, 34.25% perceived it to be high, 8.25% perceived it to be low and 0.50% considered it to be very high. Consumers were also asked to indicate the aspect of food safety that is of most concern to them and as can be seen in Figure 4.2, Fifty percent (50%) of the consumers were more particular about microbial and chemical safety. This aspect of food safety deals with bacterial infections, careless display locations and presence of blood which exposes beef to infection by microorganisms as well as the use of car tyres in singeing, improper washing of beef offal among other practices. This finding confirms the report by FAO (2010) and Dabuo (2011) which indicated that most beef markets in Africa are facing marketing challenges mainly related to consumer loss of confidence in the safety of beef products.

About twenty seven percent (27%) of the consumer reported that they are more concerned about microbial safety whereas 19% of the consumers were more concerned about chemical safety.

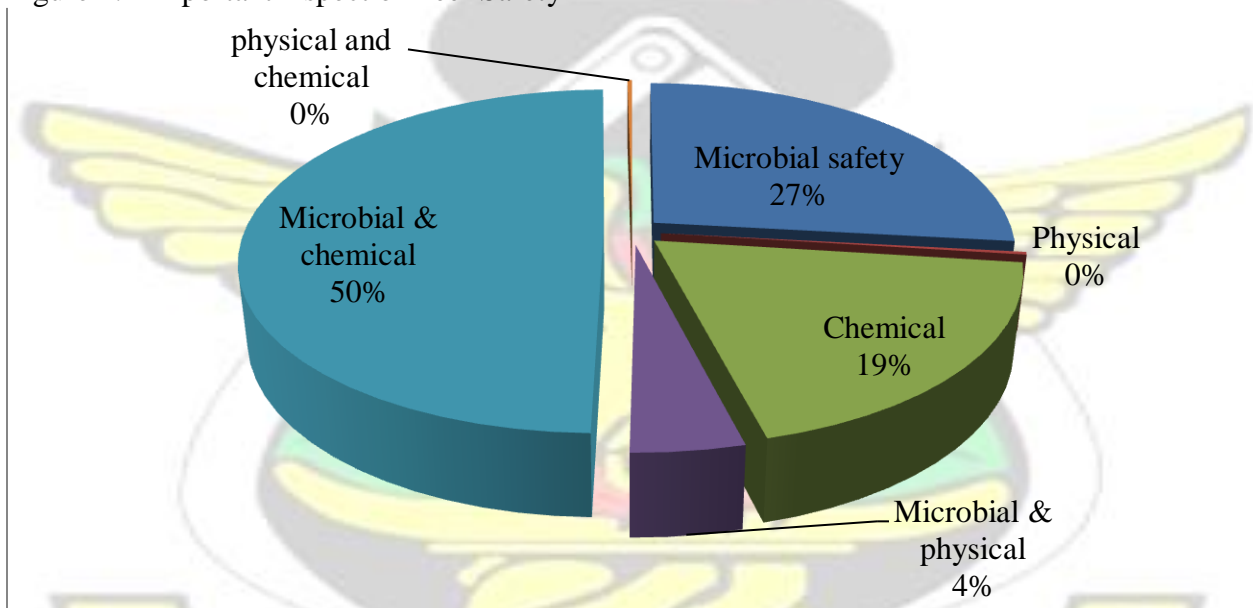
Only 0.25% of the consumers were concerned about physical and chemical safety of beef products.

Figure 4.1 Perceived Level of Beef Safety



Source: Calculations from field data, 2013

Figure 4.2 Important Aspect of Beef Safety



Source: Calculations from field data, 2013

4.1.4 Beef Attributes that Consumers Rely on for Assessing Food Safety

Part of the effort of managing beef food safety is developing an understanding of the signals consumers rely upon for food safety assurances and purchasing decision. Table 4.3 summarizes how much reliance in assessing food safety consumers place on a variety of beef product attributes. One of the noticeable things about these results is that few product attributes stand out as being

relied upon to the same extent by large numbers of respondents. Consumers in the Kumasi Metropolis are very reliant on product attributes like brand name, appearance/colour, product odour or smell, inspection and certification, origin and shopping place with 68.0%, 83.0%, 84.0%, 73.7%, 58.0%, and 51.7% respectively. This result is consistent with the findings of Schroeder *et al.* (2003) who also found that consumers use attributes like reputation of the store where the product was purchased; product freshness date; product color, smell, and texture; and government inspection as the most relied upon food safety indicators in Canada, Japan, Mexico and USA.

Furthermore in the Kumasi Metropolis and Sunyani Municipality, it was observed that packaging was extremely relied upon for assessing food safety. Consumers in the Sunyani Municipality on the other hand were very reliant on brand name, odour or smell and origin of the beef products with 84.0%, 91.0%, and 77.0% respectively whereas colour, inspection or certification, shopping place and packaging were extremely important attributes considered for assessing food safety with 63.0%, 61.0%, 76.0% and 76.0% respectively.

Table 4.3 Amount of Reliance on Product Attributes in Assessing Food Safety

<i>Product Attribute</i>	<i>Respondent Area</i>		
<i>1. Price</i>			
Not at all reliant	23.3%	41.0%	27.8%
Not very reliant	28.0%	38.0%	30.5%
Somewhat reliant	38.0%	14.0%	32.0%
Very reliant	10.0%	7.0%	9.3%
Extremely reliant	0.7%	0%	0.5%
No opinion	0%	0%	0%

2. Brand name

Not at all reliant	0%	1.0%	0.3%
Not very reliant	1.0%	2.0%	1.3%
Somewhat reliant	23.3%	10.0%	20.0%
Very reliant	68.0%	84.0%	72.0%
Extremely reliant	5.0%	3.0%	4.5%
No opinion	2.7%	0%	2.0%

3. Appearance/color

Not at all reliant	0%	0%	0%
Not very reliant	0.3%	1.0%	0.5%
Somewhat reliant	4.0%	2.0%	3.5%
Very reliant	83.0%	34.0%	70.8%
Extremely reliant	12.7%	63.0%	25.3%
No opinion	0%	0%	0%

4. Odour/smell

Not at all reliant	0%	0%	0%
Not very reliant	0.7%	1.0%	0.8%
Somewhat reliant	8.3%	3.0%	7.0%
Very reliant	84.0%	91.0%	85.8%
Extremely reliant	7.0%	5.0%	6.5%
No opinion	0%	0%	0%

5. Inspection

Not at all reliant	0%	0%	0%
Not very reliant	0.3%	1.0%	0.5%
Somewhat reliant	1.7%	2.0%	1.8%
Very reliant	73.7%	36.0%	64.3%
Extremely reliant	24.3%	61.0%	33.5%
No opinion	0%	0%	0%

6. Origin of beef

Not at all reliant	2.0%	0%	1.5%
Not very reliant	2.3%	2.0%	2.3%
Somewhat reliant	31.7%	19.0%	28.5%
Very reliant	58.0%	77.0%	62.8%
Extremely reliant	5.3%	2.0%	4.5%
No opinion	0.7%	0%	0.5%

Kumasi Metropolis Sunyani Municipality

Pooled Sample

<i>7. Shopping place</i>	0%	0%	0%
Not at all reliant	0.3%	1.0%	0.5%
Not very reliant	1.3%	0%	1.0%
Somewhat reliant	51.7%	23.0%	44.5%
Very reliant	42.0%	76.0%	50.5%
Extremely reliant	4.7%	0%	3.5%
No opinion			
<i>8. Packaging</i>			
Not at all reliant	0%	0%	0%
Not very reliant	0.3%	1.0%	0.5%
Somewhat reliant	1.3%	0%	1.0%
Very reliant	42.0%	23.0%	44.5%
Extremely reliant	51.7%	76.0%	50.5%
No opinion	4.7%	0%	3.5%

Source: Calculations from field data, 2013.

4.1.5 Consumers Perception and Willingness to Pay for Pasture-Raised Beef Products

Table 4.4 presents consumers' perception of pasture raised production and products. From the table it is evident that 58.8% of the consumers agree to the statement that pasture-raised production is good for animal welfare. Most of the respondents about 57.3% are of the perception that pasture-raised production decreases animal health problems, stress and antisocial behaviour. The study also shows that respondents disagreed with the statement that raising animal on pasture is good for the environment and they strongly agreed to the statement that raising animal on the pasture without strict restriction causes destruction to farms.

The respondents are of the perception that pasture raised beef products are of higher quality compared to conventionally raised products with a percentage of 76.5%. The respondents also perceive pasture-raised beef products to be expensive but are willing to pay for it if it is labelled as pasture-raised. The respondents also strongly agree that beef from pasture-raised animals are

very lean. Finally, 70.5% of the respondents perceive pasture-raised beef products to be very safe and that 72.5% of the respondent stated their preferences for pasture-raised products to conventionally produced or confined animals. Averaging the overall scores for the perception statements about the pasture-raised products and production led to a positive pasture-raised perception index (PRPI) = 0.53.

Table 4.4 Consumer Perception on Pasture-Raised Production and Products

	Perception Statements	Strongly Disagree	Disagree (-0.5)	Neutral (0)	Agree (0.5)	Strongly Agree	Mean Scores	
(1)								(-1)
86(21.5)	Raising animals on pasture is good for the animals" welfare.		26(6.5)	37(9.3)	235(58.8)		0.44	16 (4.0)
	Raising animals" on pastures can decrease animals" health problems, stress levels, and anti-social behaviours.	16(4.0)	42(10.5)	26(6.5)	229(57.3)	87(21.8)	0.41	
	Raising animals on pasture is good for the environment	16(4.0)	148(37.0)	59(14.8)	60(15.0)	117(29.3)	0.14	
	Pasture raised animals" cause"s problems and destruction to peoples farms if the animals are not controlled.	10(2.5)	15(3.8)	5(1.3)	70(17.5)	300(75)	0.79	
	Beef from animals raised on pasture is of higher quality compared to beef from animals raised in confinements.	7(1.8)	15(3.8)	4(1.0)	68(17.0)	306(76.5)	0.81	
	Beef from animals raised on pasture is very lean compared to beef from animals raised in confinements	9(2.25)	15(3.75)	2(0.5)	70(17.5)	304(76)	0.81	
	Beef from animals raised on pasture is very expensive.	7(1.8)	15(3.8)	4(1.0)	103(25.8)	271(67.8)	0.77	
	I will be willing to pay more for beef products from pasture raised animals if it is labeled	21(5.3)	31(7.8)	4(1.0)	292(73.0)	52(13.0)	0.40	
	Beef products from pasture raised animals are very safe.	26(6.5)	33(8.3)	4(1.0)	282(70.5)	55(13.8)	0.38	
	I prefer beef from pasture raised animals to confine animals	23(5.8)	33(8.3)	2(0.5)	290(72.5)	52(13.0)	0.39	
	Pasture- Raised Perception Index						0.53	

Source: Calculations from field data, 2013.

Table 4.5 summarises consumers' willingness to pay premiums for pasture raised or naturally fed beef and health certificate label. Consumers were first asked whether they will be willing to pay a premium with yes or no responses. All the respondents expressed willingness to pay and the distribution of their willingness to pay are presented in Table 4.5. It can be seen that 39.25% of the consumers were willing to pay 15% more per kg of ordinary boneless beef from naturally fed animal, while 25.8% were willing to pay 20% more, 17% were willing to pay 25% more and 18% of the consumers were willing to pay 5% more. With regards to inspection and health certification label of beef products, it was observed that 31.8% were willing to pay 5% more, 38% were willing to pay 15% more, 29% were willing to pay 20% more and 1.3% were willing to pay 25% for certification label for health, safety and quality.

Table 4.5 Distribution of WTP Premiums for Pasture Raised/Naturally Fed Beef and Certification Label

WTP Category	Pasture Raised/ Naturally Fed Beef	Certification Label
5 % more	18.0% (72)	31.8%(127)
15 % more	39.25%(157)	38.0%(152)
20 % more	25.8% (103)	29.0%(116)
25% more	17.0%(68)	1.3%(5)
Weight	1 Kg/ ordinary boneless	1Kg ordinary boneless

Note: Figures in parentheses are frequencies of respondents.

Source: Calculations from field data, 2013

4.2 Discussion of Empirical Results

The empirical results are presented in this section. Included in this section are the empirical indicators of safety and quality of beef, determinants of consumers' willingness to pay for pasture

raised beef products. Consumers' willingness to pay for safety and quality attributes of beef selected in the choice experiment.

4.2.1 Beef Safety and Quality Indicators

The results of attributes of beef that consumers use as indicators of beef safety and quality were estimated empirically using confirmatory factor analysis (see Figure 4.3). The maximum likelihood estimates of the analysis are presented in table 4.6. The unobserved latent factors are $e1$ to $e11$ in Figure 4.3. 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, hygienic condition of shopping environment, assured inspection and certification of the beef products as safety indicators. 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.

Table 4.6 Maximum Likelihood Estimates on Indicators of Beef Quality and Safety

Attribute		Factor	Parameter estimates	Z	p -value
Quality factor	<---	safety factor	-1.09*	-1.68	0.0930
Halal slaughter	<---	safety factor	-25.62	-1.55	0.1200
Shopping environment	<---	Safety factor	1.00***	2.32	0.7470
Inspection/certification	<---	Safety factor	5.24*	1.70	0.0890
Packaging	<---	Safety factor	0.08	0.19	0.8490
Freshness	<---	Safety factor	8.99*	1.81	0.0700
Tenderness	<---	Quality factor	-4.79***	-4.79	0.0000
Leanness	<---	Quality factor	-0.45***	-2.20	0.0300
Price	<---	Quality factor	1.00***	10.18	0.0000
Colour	<---	Quality factor	4.57***	4.75	0.0000
Origin	<---	Quality factor	0.77***	3.29	0.0010
Convenience	<---	Quality factor	-4.49***	-4.75	0.0000

(331.46, $p < 0.00$), GFI=0.89, CFI=0.95, TLI=0.93 and RMSEA=0.049 Source: Calculations from field data, 2013.

On the other hand, consumers rely significantly on tenderness, leanness, colour, origin and convenience of cooking as quality indicators in beef purchasing. This result is 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.



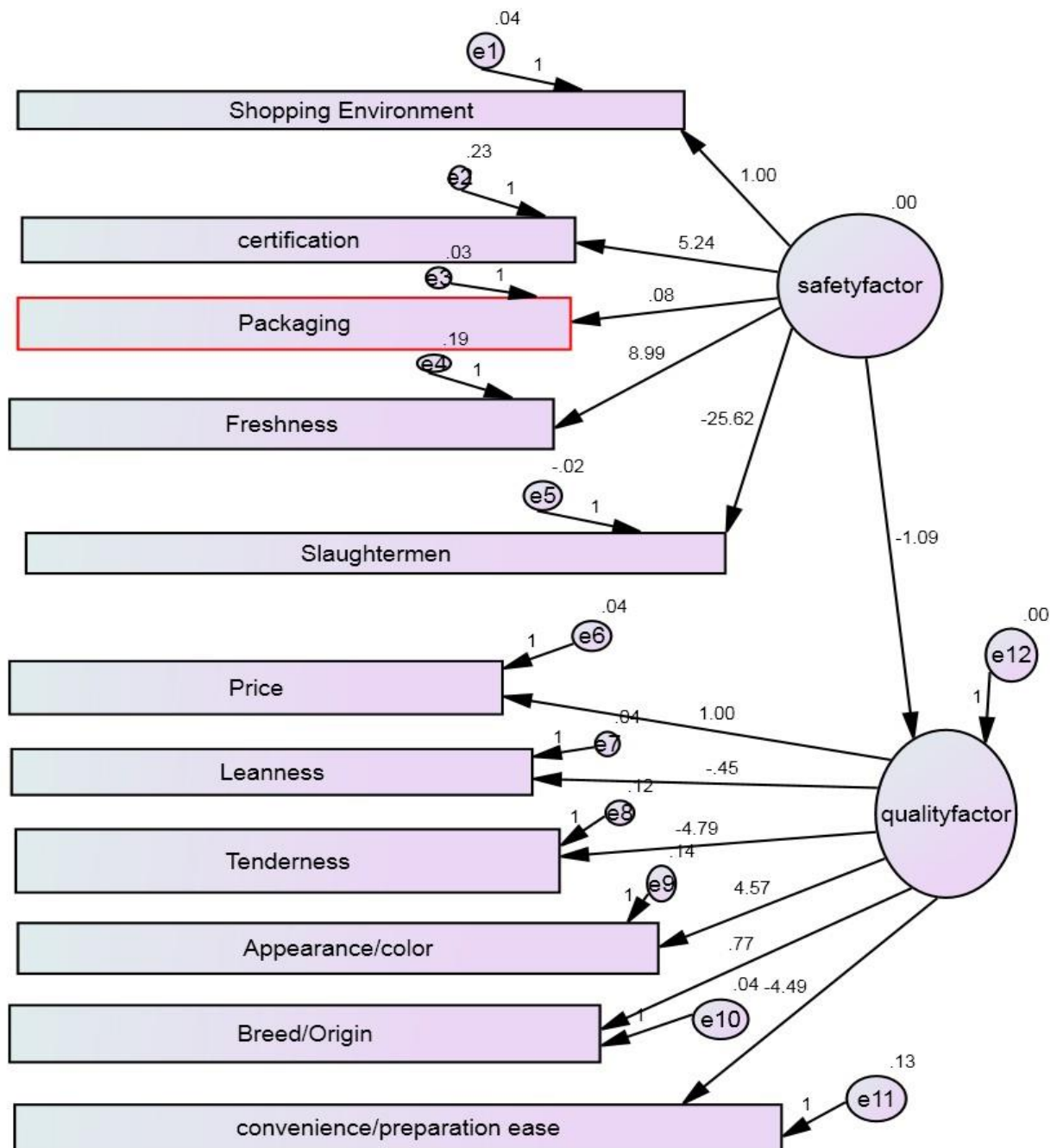


Figure 4.3 Confirmatory Factor Analyses for Beef Product Attributes

Price according to the results is a significant indicator of quality. This is consistent with the findings of Jabbar and Islam (2010) and Kim and Boyd (2004) who have reported 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.

4.2.2 Determinants of Willingness to Pay Price premiums for Pasture Raised (naturally fed) Beef

The ordered-probit models estimates of the factors influencing consumers' willingness to pay for pasture raised beef products are presented in Tables 4.7. The log-likelihood test was employed to assess the overall significance of the independent variables in explaining the variations in the consumers' willingness to pay premium for pasture raised beef products. 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 the sampled consumers' willingness to pay premium for pasture raised beef products. 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.

Table 4.7 Ordered Probit Estimates of Consumer WTP Premiums for Pasture-Raised Beef

Variables	Coefficient	Z-Value
------------------	--------------------	----------------

Socio-economic factors		
Age	-0.0108	-1.35
Education	0.0516 **	2.52
Hsize	0.0499 *	1.83
Lincome	0.0452	0.23
Mincome	-0.4987***	-3.18
Fedum	-0.5858***	-3.23
Mstatus	0.0805	0.54
Regdum	0.8102***	5.02
Shopper	-0.3497**	-1.96
Pfreq	0.1088**	2.18
Quality attributes		
Price	0.2593	0.85
Leanness	0.1542*	1.98
Origin	0.5915**	1.96
Color	-0.3095*	-1.68
Convenience	0.4521**	2.35
Tenderness	0.8005***	4.87
Safety attributes		
Appearance (Shop environment)	0.6342***	4.15
Inspection	0.5954***	4.07
Freshness	0.3153**	2.21
Awareness and Perception		
Knwl	0.1142	0.78
Health_concern	0.0370**	2.23
Enviro_Concern	-0.3816***	-3.55
Welfare_concern	0.1472**	1.90
Threshold parameter 1	1.0671	1.50
Threshold parameter 2	2.1478***	2.79
Threshold parameter 3	3.3432***	4.29
Observations	400	
LR(χ^2 statistic)	231.10***	
JB	2.9967 (0.2183)	
Pseudo R-square	0.2178	
Log-Likelihood	-414.98	

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

Source: Calculations from field data, 2013

The coefficients in Table 4.7 are ordered log-odds (or probit) coefficients and it is also noted that the models do not have an intercept because the intercepts are not identified independent of the

cut-points or threshold parameters. Since the ordered probit model is non-linear, the estimated coefficients are not marginal effects. As such, coefficient estimates and marginal effect are discussed separately.

The results from Table 4.7 shows that, out of the 21 estimated coefficients, 15 are statistically significant. The model results shows that consumers years of formal education (**Edu**) was statistically significant at 5% level indicating that a unit increase in the level of consumers education is associated with a 0.0516 increase in the ordered log-odds of being in a higher willingness to pay premium category, while holding all the other factors constant. The empirical result is consistent with the finding of Du Toit *et al.* (2003) for South African consumers.

The size of the respondents' household (**Hsize**) is statistically significant at 10% level. The middle income variable (**Mincome**) is statistically significant at 1% level implying that being in the middle income group is associated with 0.4987 reduction in the ordered log-odds of being in a higher willingness to pay premium category compared with the higher income group. Transforming to odds, we can say that the odds being willing to pay higher premium for pasture raised or naturally fed beef is reduced by 0.62 for consumers belonging to the middle income group compared to the higher income group consumers. This agrees with Lapar *et al.* (2010) and Asafo-Adjaye (2000), who posits that consumers in the middle and high income class have high purchasing power and are expected to have significant positive relationships with consumer WTP premium in order to agree with economic theory. The odd of females being willing to pay a higher premium is reduced by 0.59 compared to males and in terms of percentages the odds for females are 41% lower than the odds of males.

The dummy variable for Metropolis or Municipality (**Regdum**) is statistically significant at 1% level, transforming the ordered log-odds of 0.8102 to odd; we can say that the odds for consumers'

willingness to pay higher premiums are increased by 2.25 for consumers residing in the Kumasi Metropolis, holding other variables constant. In terms of percent change, we can say that the odd for Kumasi Metropolis consumers is 125% higher than the odds for Sunyani Municipality consumers. This result is consistent with the findings of Conner *et al.* (2008) who posit that willingness to pay for pasture-raised products is associated with the location of the consumer.

The variable for shopper (*Shopper*) is also statistically significant at 5% level with a negative coefficient, this means that being a shopper for the household is associated with 0.3497 reductions in the ordered log-odds of being in a higher willingness to pay category. The variable purchase frequency (*Pfreq*) was statistically significant at 5% level with a positive coefficient of 0.1088. This implies that a unit increase in the consumers purchase frequency is associated with 0.1088 increases in the ordered log-odds of being in a higher willingness to pay category. This is supported by the findings of Liana *et al.* (2010) and Makokha and Fadiga (2009) who revealed that the higher the frequency of purchase the more experience the consumer becomes in terms of identifying safety and quality attributes in markets where standards and grades are lacking. Such respondents have experience in using personal indicators to select the quality and safe products which in turn shape the consumers purchase behaviour (Wolf and Thulin, 2000; Conner and Christy, 2002).

Safety and quality attributes such as inspection, freshness, appearance, tenderness, colour, tenderness, leanness, convenience of cooking and origin considered in the WTP model also reveal quite interesting empirical results. Consumers were asked if they consider these food product attributes when purchasing beef products. Safety attributes such as inspection, freshness and appearance had significantly positive effects indicating that consumers place much premium on

these product attributes when purchasing pasture-raised beef products while quality attributes such as tenderness, leanness, convenience of cooking and origin have positive influence on willingness to pay premium for pasture-raised beef products. Albeit, steak colour has a significantly negative effect on the WTP premium for pasture-raised beef cuts. This result is consistent with the results of Conner and Oppenheim (2008) who pointed out that product attributes significantly affect WTP premiums for naturally fed beef products. The empirical results also indicate significant positive relationships between consumer perceptions on animal welfare and health concerns of pasture-raised animals and the WTP premium for the pasture-raised beef products whereas the perception of consumers on environmental improvement had a significantly negative effect on WTP premiums.

The predicted probabilities for the four WTP categories evaluated at the sample means of the data are presented in Table 4.8. These predicted probabilities demonstrate a strong likelihood that, the average consumer is willing-to-pay some premium for pasture raised beef products. Certainly earning as much as possible for products will be the aim of every producer since greater premiums are required by producers, then marketing strategies will have to focus on the fraction of consumers who are willing-to-pay higher premiums. The predicted probability for the fourth WTP category (i.e., WTP more than a 25 percent premium) is estimated to represent too small of a niche market, but there is the awareness that consumers in general are willing-to-pay some kind of premium for pasture raised beef products. There is therefore an assurance to producers who are concerned about the market potential for pasture raised beef products. However, the effect of a change in an explanatory variable on the predicted probabilities (i.e. marginal effects) is the most informative aspect. The marginal effects across the five WTP categories must sum to zero by definition for each explanatory variable. The interpretation of the marginal effects for continuous variables is

straightforward; all other things equal, a one unit change in the explanatory variable will result in an increase or decrease in the predicted probability equal to the size of the marginal effect whereas for binary variables the marginal effect is the change in predicted probability based on whether a respondent falls into that category or not.

The marginal effect for the education variable (*Edu*) is negative for consumers willing to pay 5% more and 15% more and positive for willingness to pay 20% and 25% more categories. This means that consumers with higher education were willing to pay higher premiums for naturally fed beef and this is in line with the expectation. The middle income (*Mincome*) group consumers have positive marginal effect for 15% WTP premium category and negative for the 5%, 20% and 25% category. This means that consumers in the medium income group are less willing to pay for the above categories and this group have a higher willingness to pay for the 15% category. Residing in Kumasi Metropolis increases the probability of being willing to pay a premium for all the WTP categories but stronger for the 20% more category.

Household size variable (*Hsize*) have a positive marginal effect for 20% and 25% more WTP premium category and negative for the 5% and 15% WTP category. This means that a unit increase in household size is associated with the probability of being willing to pay for 20% and 25% more WTP category. This is supported by the findings of Lusk *et al.* (2003) who posited 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. The shopper variable has a positive marginal effect for the 5% and 15% more WTP category and negative for the 20% and 25% more categories. This means that on the average consumers who are shoppers of their household have less probability of paying premium that are more than 20% and 25%.

Table 4.8 Predicted Probabilities and Marginal Effects for WTP for Pasture Raised Beef Products

	WTP =1	WTP =2	WTP =3	WTP=4
Predicted probabilities	0.0973	0.4876	0.3348	0.0803
Marginal effects				
Age	0.0018	0.0022	-0.0025	-0.0015
Education	-0.0084	-0.0107	0.0127	0.0073
Hsize	-0.0091	-0.0115	0.0118	0.0079
Lincome	0.0929	-0.0134	0.0144	0.0092
Mincome	-0.0102	0.0880	-0.0757	-0.0633
Fedum	-0.1868	-0.1148	-0.1347	-0.0805
Mstatus	-.0142	-0.0171	0.0196	0.0117
Regdum	0.1029	0.1122	0.2048	0.0969
Shopper	0.0524	0.0767	-0.1177	-0.0535
Pfreq	-0.0190	-0.0241	0.0267	0.0165
Knwl	-0.0137	-0.0166	0.0189	0.0114
Price	-0.0334	-0.0544	0.0498	0.0380
Leanness	-0.1597	-0.0548	0.1854	0.0401
Tenderness	-0.0699	-0.1197	0.0846	0.0940
Origin	0.0875	0.0610	-0.1023	-0.0462
Colour	-0.1069	0.0719	-0.0715	-0.0450
Convenience	-0.1023	-0.1023	0.0875	0.0610
Freshness	-0.0580	-0.0619	0.0767	0.0432
Inspection	0.0496	-0.1081	0.1369	0.0781
Appearance	0.0117	-0.1177	0.0767	0.0524
Health_concern	-0.0064	-0.0080	0.0090	0.0054
Enviro_Concern	0.0516	0.0995	-.0807	-0.0705
Welfare_concern	-0.0236	-0.0342	0.0348	0.0231

Source: Calculations from field data, 2013

4.2.3 Willingness to Pay for Health Inspection and Certification Label

The results of determinants of consumers' willingness to pay price premiums for health inspection and certification of live animals and beef products are presented in Table 4.9. In eliciting consumers' willingness to pay for certification label of beef for health, quality and safety of consumers in Kumasi Metropolis and Sunyani Municipality, it was revealed from the study that, out of the 20 coefficients, twelve of them were statistically significant (see Table 4.9).

Table 4.9 Consumer WTP Price Premiums for Health Certification Label

Variables	Coefficient	Z-value
Socio-economic factors		
Age	0.0169 **	2.06
Education	0.0492**	2.31
Hsize	0.0038	0.14
Lincome	-0.5782***	-2.80
Mincome	-0.6784***	-4.04
Fedum	-0.1568	-0.82
Mstatus	-0.0135	-0.08
Regdum	1.0044***	5.74
Shopper	-0.1369	-0.71
Pfreq	0.2575***	4.73
Quality attributes Price		
	-0.3143*	1.96
Leanness	-0.5004*	-1.88
Tenderness	0.6069***	3.50
Origin	-0.2227	-0.67
Colour	-0.3793*	-1.94
Convenience	0.5321	1.34
Safety attributes		
Freshness	0.2017	1.33
Inspection	0.5969***	3.77
Appearance	-0.3582***	3.54
Awareness	0.1422	0.90
Threshold parameter 1	1.9012**	2.50
Threshold parameter 2	3.5203***	4.57
Threshold parameter 3	6.0428***	7.36
Observations	400	
LR(χ^2 statistic)	276.65***	
JB	3.3917(0.2661)	
Pseudo R-square	0.3018	
Log-Likelihood	-319.95	

Source: Calculations from field data, 2013

The estimated coefficient of the age variable (*Age*) was statistically significant at 5% level with a positive coefficient of 0.0169. This means that a unit increase in the consumers' age is associated with 0.0169 increases in the ordered log-odd of being in a higher willingness to pay category. Transforming this to odds, we can say that, the odd of being in a higher willingness to pay category is increased by 1.02 for each unit increase in consumers' age, holding all other variables constant.

The education variable (**Edu**) is statistically significant at 5% level with a positive coefficient of 0.0492. Transforming this ordered log-odd to odds, we can say that the odd of a consumer being in a higher willingness to pay category is increased by 1.05 for every unit increase in the consumer's years of education, holding all the other variables at a fixed value. Holding all other variables constant, the low income variable (**Lincome**) is statistically significant at 1% level with a negative coefficient of -0.5782. Transforming this to odd, we can say that the odd of being willing to pay higher premium is reduced by 0.56 for consumers belonging to the low income category compared to the higher income groups. In percentage terms, the odd of consumers in the lower income group is 43.91% lower than consumers' in the higher income groups. The middle income variable (**Mincome**) is also significant at 1% level with a negative coefficient of 0.6784, transforming this ordered log-odd to odds; we can say that the odd of a consumer being in a higher willingness to pay category is reduced by 0.51 for consumers belonging to the middle income category compared to consumers in the higher income category, holding all other variables at a fixed value.

The location dummy variable (**Regdum**) is statistically significant at 1% level with a positive coefficient of 1.00, this means that residing in the Kumasi Metropolis is associated with 1.00 ordered log-odd of being in a higher willingness to pay premium category. Transforming this value to odds, we can say that the odds of being in a higher willingness to pay premium category is increased by 2.72 for consumers residing in the Kumasi Metropolis compared to consumers in the Sunyani Municipality.

The variable purchase frequency (**Pfreq**) was statistically significant at 1% level with a positive coefficient of 0.2575. This implies that a unit increase in the consumers purchase frequency is associated with 0.2575 increases in the ordered log-odds of being in a higher willingness to pay

category. Transforming to odds, we can say that the odds of being willing to pay higher premiums for naturally fed beef is increased 1.29 for each unit increase in the purchase frequency, holding all the other variables constant.

It is also realized that, safety attributes such as inspection and appearance are statistically significant at 1% level with coefficients of 0.5969 and -0.3582 respectively which implies that, perceiving that inspection of beef products is strict is associated with 0.5969 increases in the ordered log-odds of being in a higher willingness to pay category. Transforming to odds we can say that, the odds for being willing to pay higher premium is increased by 1.82 for consumers who rely on inspection and certification and in terms of percentages we can say that the odds for consumers who rely on this attribute is 81.65% higher than those who do not rely on this attributes, holding all other variables constant. However, perceiving that there hygienic appearance of the shopping is associated with 0.3582 reductions in the ordered log of being in a higher wiliness to pay premium category.

Quality attributes of beef such as tenderness was statistically significant at 1% level with a positive coefficient of 0.6069, transforming this value into odds indicates that, the odds of being in a higher willingness to pay category is increased by 1.83 for consumers relying on the product tenderness attribute in their purchases. In terms of percentages we can say that the odds for consumers who rely on this attribute is 83.47% more than the odds of consumers who do not rely on this attribute. However, price, leanness and colour were found to be significant at 10% level with negative coefficients 0.3143, 0.5004 and 0.3793. This implies those consumers who perceive the price of beef to be high, consumers who perceives beef to be lean and those who prefer the beef colour are less likely to pay higher premiums for inspection and certification labelling of beef products

holding the other variables fixed at a value. The estimated threshold levels defining the different WTP categories are all significant at the one percent level.

Table 4.10 shows the predicted probabilities for the four WTP premium categories evaluated at the sample means of the data for certification label. The marginal effects for age (*Age*) and education (*Edu*) are positive for the 15%, 20% and 25% more WTP category and negative for the 5% more WTP category. This means that a unit change in the age and education will result in an increase in the predicted probability equal to the size of the marginal effect.

The household size variable (*Hsize*) has a positive marginal effect for 15% and 20% more WTP categories and negative for 5% and 25% more WTP categories. The low and medium income groups have positive marginal effect for 5% more WTP category and negative marginal effect for the rest of the categories. this suggest that these consumer groups are less likely to pay higher premiums for certification labels and are likely to pay less premiums for certification label compared to consumers in the high income group.

The female dummy variable (*Fedum*) has a positive marginal effect for the 5 % more WTP premium category and negative for the rest of the categories. This implies that female respondents are less likely to pay higher premiums for the certification label compared to their male counterparts. Marital status (*Mstatus*) has a positive marginal effect for the 5% more WTP category and negative for the rest of the WTP categories which suggests that married respondents“ have a higher probability of not willing to pay higher premium for certification label.

The location dummy variable (*Regdum*) has a positive marginal effect for the 15%, 20% and 25% more WTP category and negative for the 5% more WTP category. The implication is that, residing in the Kumasi Metropolis is associated with a higher probability of paying higher premiums

of 15%, 20% and 25% more WTP categories. The marginal effect of the shopper variable (*Shopper*) is positive for the 5% and 15% more WTP premium category and negative for the 20% and 25% more WTP categories. This means that being a shopper of a household is associated with a higher probability of paying 5% and 15% more WTP category and less probability of paying higher premiums.

The marginal effect for the purchase frequency (*Pfreq*) is negative for 5% more WTP and positive for the rest of the categories. This means that a unit increase in the purchase frequency will increase the probability of paying 15%, 20% and 25% more WTP categories equal to the size of the marginal effects. Awareness of the certification and labeling has a positive marginal effect for the 15%, 20% and 25% more WTP categories and negative for 5% more WTP category. This means that consumers who are aware of certification and labels have a higher probability of paying 15%, 20% and 25% more WTP categories.

The marginal effect of the price dummy variable is positive for the 20% and 25% more WTP categories and negative for the 5% and 15% more WTP categories. This implies that consumers who rely on price attribute for purchases have a higher probability of paying higher premiums for certification and label and less probability of paying 5% and 15% more WTP categories compared to consumers who do not rely on price when making purchases. The marginal effects of the leanness dummy variable are positive for the 5% and 15% more WTP categories and negative for the 20% and 25% more category. This suggests that consumers who rely on leanness attribute have a higher probability of willing to pay 5% and 15% more WTP and less probability of paying higher premiums.

The marginal effects of the inspection, tenderness and freshness dummy variables are negative for the 5% more WTP category and positive for the rest of the categories implying that consumers

who rely on these attributes have higher probability of willing to pay 15%, 20% and 25% more WTP categories and less probability of paying 5% more premium. The marginal effect of the origin dummy variable is positive for 5% more WTP category and negative for the rest of the categories. Finally the marginal effect of the colour dummy variable is positive for the 5% and 15% more WTP categories and negative for the 20% and 25% more WTP categories.

Table 4.10 Predicted Probabilities and Marginal Effects for WTP for Health Inspection and Certification Label

	WTP =1	WTP =2	WTP =3	WTP=4
Predicted probabilities	0.2123	0.5818	0.2055	0.0004
Marginal effects				
Age	-0.0049	0.0008	0.0048	0.0001
Education	-0.0143	0.0003	0.0140	0.0000
Hsize	-0.0011	0.0000	0.0011	-0.0000
Lincome	0.1851	-0.0409	-0.1436	-0.0008
Mincome	0.2142	-0.0424	-0.1710	-0.0006
Fedum	0.0459	-0.0016	-0.0440	-0.0002
Mstatus	0.0039	-0.0000	-0.0038	-.0000
Regdum	-0.3337	0.1053	0.2274	0.0010
Shopper	0.0389	0.0009	-0.0396	-0.0002
Pfreq	-0.0747	0.0013	0.0730	0.0004
Awareness	-0.0422	0.0028	0.0393	0.0002
Price	-0.0805	-0.0190	0.0987	0.0008
Leanness	0.1177	0.0489	-0.1648	-0.0017
Inspection	-0.1814	0.0217	0.1588	0.0008
Freshness	-0.0601	0.0045	0.0554	0.0003
Tenderness	-0.1909	0.0359	0.1544	0.0007
Origin	0.0696	-0.0117	-0.0578	-0.0002
Appearance	0.1038	0.0099	-0.1130	-0.0008
Colour	0.0389	0.0009	-0.0396	-0.0002
Convenience	-0.0409	0.1851	-0.1436	-0.0008

Source: Calculations from field data, 2013

4.2.4 Random Parameter Logit Estimates of Consumers' Willingness to Pay for

Safety and Quality Attributes of Beef in the Choice Experiment

This section presents the empirical results on the random parameter logit and the willingness to pay estimates. Table 4.11 reports the estimates from the random parameter logit without interaction variables. All the explanatory variables except the price variable are assumed to be normally distributed across the consumers. The model was estimated separately for data from Kumasi Metropolis and Sunyani Municipality because a subsequent log-likelihood ratio test was used to determine if the data from the two sub-samples could be pooled (Gurajati, 2004; Olynk, Tonsor and Wolf, 2010; Wooldridge, 2002). The null hypothesis of pooling of data from Kumasi Metropolis and Sunyani Municipality was rejected. Hence, through the random parameter analysis, Kumasi Metropolis and Sunyani Municipality results are treated separately and estimates are presented separately. The coefficient estimates for verified animal health, food and drugs board food safety certification license and nutritional label are all statistically significant at 1% and 5% levels with significant derived standard deviations. Other statistics reported include the adjusted R^2 , Chi-square and log-likelihood statistics. The coefficients of price were negative in the two models.

The random parameter logit estimates with interaction terms are presented in Table 4.12. The coefficient estimates and standard deviations are all statistically significant at 1% and 5% levels for verified animal health, food and drugs board food safety certification license and nutritional label attributes when interacted with age, education, income and gender of consumers in both Kumasi Metropolis and Sunyani Municipality. All the demographic variables were statistically significant at the conventional levels in the Kumasi Metropolis model and 10 out of the twelve are statistically significant in the Sunyani Municipality model. A negative relationship exists between the prices of each attribute and the utility consumers obtain from consuming that beef product as expected and in accordance with the economic theory in the two models. The empirical results

reveal that both Kumasi and Sunyani consumers are heterogeneous in their preferences for verified animal health, food and drugs board food safety certification license and nutritional label.

Table 4.11 Random Parameter Logit Estimates with only Choice-Specific Attributes

Attribute	Kumasi Metropolis		Sunyani Municipal	
	Coefficient Estimates	Standard Deviation Estimates	Coefficient Estimates	Standard Deviation Estimates
<i>Anh</i>	4.529*** (1.111)	6.779*** (1.364)	8.162*** (2.346)	1.605*** (0.603)
<i>Fsaf</i>	3.015*** (0.402)	1.157** (0.478)	1.743*** (0.595)	1.306*** (0.505)
<i>Nutl</i>	3.739*** (1.161)	-2.937*** (0.733)	1.241** (0.571)	-4.519*** (1.173)
<i>Price</i>	-0.571*** (0.139)		-0.703*** (0.226)	
Rsq-Adj		0.71	Rsq-Adj	0.61
Chi-squared		804.07***	Chi-squared	1048.49***
Log-likelihood		-377.06	Log likelihood	-503.00
Replications		500	Replications	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 from field data, 2013

This is evidenced by the significant standard deviation estimates for the three food safety assurance attributes in the two models (see Table 4.11 and 4.12). This result is supported by the findings of Lusk and Norwood (2005), Loureiro and Umberger (2007), Conner and Oppenheim (2008) and Tonsor *et al.* (2005). The significant standard deviations means that WTP estimates calculated cannot be interpreted as being representative of the entire samples. The inclusion of the interaction terms in the random parameter model (see Table 4.12) accounted for the different marginal utilities for beef consumption and the effect of demographic factors on consumer preferences for food safety and quality information.

In Kumasi Metropolis, however, age has a negative impact on preferences for verified animal health and nutritional label but positive for food and drugs board food safety certification license.

Education and income have positive impacts on preferences for the three beef food safety assurance attributes. Gender was found to have a negative impact on preferences for verified animal health and positive impact on preferences for nutritional label and food and drugs board food safety certification license. The standard deviation estimates were significant for all the demographic interaction variables except interaction of food and drugs board food safety certification license with age. This indicates that preferences for food safety assurance attributes are influenced by consumers' age, education, income and gender but vary beyond just what could be explained by these demographic factors (Tonsor *et al.*, 2005; Schnettler *et al.*, 2009). It is observed that in Sunyani Municipality, age has a negative impact on preferences for verified animal health but positive for food and drugs board food safety certification license and nutritional label. Education and income likewise have positive impacts on preferences for the three beef food safety assurance attributes. Gender has a positive impact on preferences for nutritional label, albeit negative impacts on preferences for verified animal health and food and drugs board food safety certification license. The standard deviations were insignificant for the interaction of food and drugs board food safety certification license with age, education and income of respondents.

Also the interactions of nutritional label with age and education have insignificant coefficients. This suggests that preferences for food and drugs board food safety certification license and nutritional label could be explained by age, education and income of consumers in Sunyani but varies beyond what could be explained for interaction variables with significant standard deviations estimates (Conner and Oppenheim, 2008; Tonsor *et al.*, 2005; Olynk *et al.*, 2010).

Table 4.12 Random Parameter Logit Estimates with Choice-Specific Attributes and Demographic Interaction Terms

Attribute	Kumasi Metropolis		Sunyani Municipal	
	Coefficient Estimates	Standard Deviation Estimates	Coefficient Estimates	Standard Deviation Estimates

<i>Anh</i>	3.529*** (0.8654)	3.779*** (0.760)	3.671*** (0.754)	1.605*** (0.603)
<i>Fsaf</i>	2.015*** (0.2687)	1.157** (0.477)	3.057*** (0.640)	1.306*** (0.505)
<i>Nutl</i>	2.797*** (0.850)	-1.937*** (0.483)	1.997*** (0.695)	-4.5189*** (1.173)
<i>Price</i>	-0.670*** (0.163)		-0.489*** (0.150)	
<i>Anh*age</i>	-3.177** (1.264)	-1.118*** (0.259)	-1.271*** (0.097)	-0.521*** (0.182)
<i>Anh*edu</i>	2.922*** (0.435)	1.259*** (0.096)	0.189*** (0.067)	0.308* (0.172)
<i>Anh*inc</i>	0.743*** (0.232)	0.186*** (0.066)	1.058*** (0.094)	0.624*** (0.156)
<i>Anh*gen</i>	-1.043*** (0.093)	3.587*** (0.233)	-0.553*** (0.152)	5.437*** (1.346)
<i>Fsaf*age</i>	0.086*** (0.030)	0.047 (0.029)	0.611*** (0.124)	0.731 (0.424)
<i>Fsaf*edu</i>	0.142** (0.072)	5.657*** (1.239)	0.489*** (0.150)	0.006 (0.338)
<i>Fsaf*inc</i>	2.341*** (0.697)	0.024*** (0.006)	0.086*** (0.030)	0.059 (0.278)
<i>Fsaf*gen</i>	2.005*** (0.526)	0.045*** (0.015)	-0.142** (0.072)	0.024*** (0.006)
<i>Nutl*age</i>	-0.024*** (0.006)	0.611*** (0.124)	0.045*** (0.015)	0.018 (0.114)
<i>Nutl*edu</i>	0.045*** (0.015)	0.624*** (0.156)	0.008*** (0.003)	0.015 (0.162)
<i>Nutl*inc</i>	0.549*** (0.181)	0.617*** (0.155)	0.101*** (0.025)	0.404*** (0.041)
<i>Nutl*gen</i>	0.287* (0.171)	0.474*** (0.130)	0.006*** (0.002)	0.136** (0.056)
Rsq-Adj		0.72	Rsq-Adj	0.71
Chi-squared		638.13***	Chi-squared	844.58***
Log likelihood		-454.46	Log likelihood	-599.34
Replications		500	Replications	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: Source: Calculations from field data, 2013

Table 4.13 Statistics for Determining Model Fitness

Statistics	Kumasi Metropolis	Sunyani Municipal
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	Model without Interaction	Model with Interaction	Model without Interaction	Model with Interaction
Parameters (P)	4	16	4	16
Log-likelihood (LL)	-377.06	-454.46	-503.00	-599.34
AIC ³	762.12	940.92	990	1230.68
BIC ⁴	380.28	934.67	1012.44	1224.43
R ² -Adjusted	0.71	0.72	0.61	0.71

Source: Calculations from field data, 2013

Table 4.13 presents statistics for determining which of the two models fit the data as we estimated model for only choice specific attributes and with demographic interaction terms (see Table 4.11 and 4.12). We used the minimum Akaike Information Criterion (AIC) and the minimum Bayesian Information Criterion (BIC). Following Gurajati (2004), Wooldridge (2002), Kadane and Lazar (2004), models with lower AIC and BIC is preferred to higher AIC and BIC. Table 4.13 shows that in both Kumasi Metropolis and Sunyani Municipal models, the model without interaction terms best fit the data even though the R² estimates prove otherwise. However, Gurajati (2004) argues that R² will never decrease as more variables are added and as such should not be much relied on in comparing models with different parameters. Figure 4.4 presents the average WTP estimates for Kumasi Metropolis and Sunyani Municipality from the model without interaction variables. Average consumer willingness to pay for beef food safety assurance attributes were estimated as described previously by utilizing the ratios of the coefficient on the beef food safety attributes and the price coefficient. Consumers in the Kumasi Metropolis on the average were willing to pay GH¢6.55, GH¢5.28 and GH¢7.93 per 1Kg of

³ AIC (Akaike Information Criterion) = -2 (LL) + 2(P) or -2(LL - p)

⁴ BIC (Bayesian Information Criterion) = -2(LL - (p/2)ln(T))

T: number of choices

ordinary boneless beef with assured nutritional label, food and drugs board food safety certification license and verified animal health stamp respectively. Consumers in the Sunyani Municipal on the other hand were willing to pay GH¢1.77, GH¢2.48 and GH¢11.61 per 1Kg of beef with assured nutritional label, food and drugs board food safety certification license and verified animal health stamp respectively.

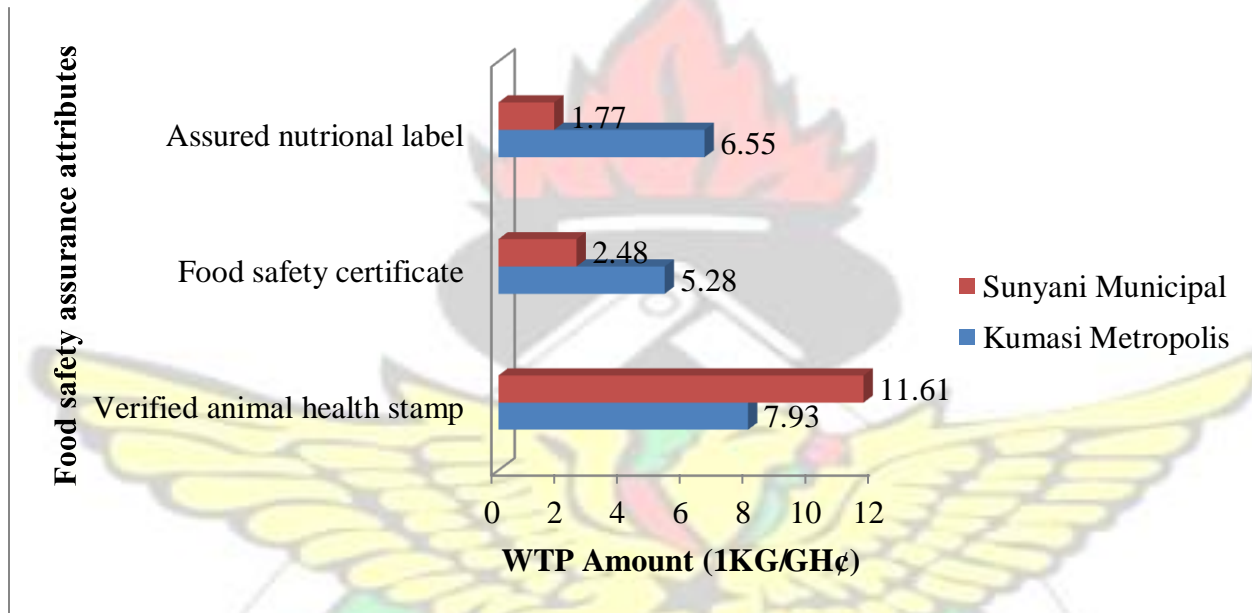


Figure 4.4 Distribution of WTP¹ from RPL² without interaction

The willingness to pay estimates shows that higher willingness to pay exists for verified animal health stamp in both Kumasi and Sunyani. Generally willingness to pay estimates in Kumasi were higher for assured nutritional label, food and drugs board food safety certification license compared to Sunyani. This may be as a result of the difference in standards of living in both areas. On the other hand, willingness to pay for verified animal health stamp in Sunyani is higher than in

¹ WTP means Willingness to Pay

² RPL means Random Parameter Logit

Kumasi. This probably may be as a result of the risk aversion attitude of consumers in Sunyani, all things being equal.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Summary and Conclusions

Ghana is an important livestock and meat products importing country in the world, which offers a significant potential market for global livestock exporters. In order to better understand consumers' perception, preferences and WTP for safety and quality attributes in Kumasi Metropolis and Sunyani Municipality. This research examined Ghanaian consumers' perception, preferences and willingness to pay for safety and quality attributes of beef. 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 and examine the safety and quality attributes beef consumers prefer and use in their purchases. They ranked shopping environment, packaging, certification and leanness attributes as extremely important attributes of beef products considered in beef purchases in the Kumasi Metropolis suggests that ranchers and beef producers should pay particular attention to these attributes in their marketing strategy while taking into consideration price, tenderness and freshness of the beef products. In the Sunyani Municipality, the results suggest that it's appropriate for ranchers and beef producers as well as exporters to consider shopping environment, steak colour, packaging, and tenderness attributes of beef products since these are extremely important attributes consider by consumers in the Municipality. The rating of freshness, certification and leanness as important attributes of beef products considered when purchasing beef also implies that ranchers and beef producers should

not ignore these attributes since they influence consumers purchasing decision. It is further concluded that preference for beef products is not necessarily based on only intrinsic attributes but also on external attributes associated with food safety.

The second sub objective was to assess the level of reliance on identified beef attributes for assessing food safety in the beef industry. Using descriptive statistics and confirmatory factor analysis for summing up and conceptualizing the attributes consumers relied on in assessing food safety and quality as well as purchase decision, it was realized from the study that few beef product attributes stand out as being relied upon to same extent by larger number of consumers in both districts selected for the study. Consumers in the Kumasi Metropolis are very reliant on product attributes like brand name (trust in particular shops), appearance/colour, product odour or smell, inspection and certification, origin and shopping place (hygiene) respectively whereas in the Sunyani Municipality consumers were very reliant on brand name, odour/smell and origin of the beef products respectively. Steak colour, inspection or certification, shopping place and packaging are extremely important attributes considered for assessing food safety respectively. Furthermore in the Kumasi Metropolis and Sunyani Municipality, it was observed that packaging was extremely relied upon for assessing food safety. The factor analysis results confirmed statistically that consumers consider freshness, shopping environment and certification as beef safety indicators, beef quality indicators were found to be price, tenderness, leanness, colour, origin and convenience of cooking. The estimates clearly indicate a negative correlation between beef safety and quality, suggesting that consumers perceive beef safety attribute to be totally different from beef quality attributes. It is therefore concluded that safety and quality attributes are two distinct latent factors.

The third sub objective was to determine consumers' perception of the safety of beef products and the aspect of food safety that is of most concern to the sampled consumers. The results of the study show that consumers perceive the safety of beef products to be moderately low. Microbial and chemical safety of beef products was found to be the key aspect of food safety that consumers are more concerned about. This aspect of food safety comprises of bacterial infections, careless display of beef products and exposure of beef products to disease causing organisms.

The fourth sub objective was to determine consumers' perception and determinants of willingness to pay for pasture-raised beef products. The results from the perception indices revealed that consumers perceive pasture-raised beef products as superior in quality to conventionally produced (confined) beef products in terms of health, quality, environmental and animal welfare benefits. Consumers have positive perception about pasture-raised beef products in terms of quality, animal welfare and health concerns of the animals raised on pasture and the environmental benefit. Consumers have overall strong positive perception index for quality of pasture-raised beef products and they express willingness to pay premiums for pasture-raised beef products. The study further revealed that consumers associate pasture-raised products with attributes important to purchase decisions and all the consumers express their willingness to pay price premiums, most of the consumers, about 82% were willing to pay 15% and more price premium for 1kilogram pasture-raised beef products. It is concluded that pasture-raised product differentiation will be a feasible marketing strategy. The empirical findings from the study provide understanding of the consumer choice of pasture-raised beef products in Ghana. It is concluded that apart from socioeconomic characteristics, consumer perceptions and product attributes tend to influence consumers' willingness to pay premiums for pasture-raised beef products in Ghana. It is concluded further that socioeconomic factors such as education, household size, frequency of beef purchase

and residing in Kumasi Metropolis have positive influence on WTP premiums for pasture-raised beef products. Consumers who are primary shopper of their household, belonging to the middle income category and being a female influence WTP premium for pasture-raised beef products negatively. Consumers concerns for animal health and welfare have positive influence on their WTP premiums for pasture-raised beef products. Consumers concern for the environment influence WTP premium for pastureraised beef products negatively. This means that meat production that negatively affects the environment reduces consumers' preferences and willingness to pay premium. Beside the socioeconomic characteristics, it is concluded that product attributes such as inspection/certification, freshness, origin and tenderness have positive effects on consumers' WTP premiums for pasture-raised beef products, whereas colour of steak/cut has a negative influence as expected.

The last sub objective was to determine Ghanaian consumers' willingness to pay for safety and quality attributes of beef products. The empirical findings revealed that consumers in Kumasi Metropolis and Sunyani Municipality are heterogeneous in their preferences for verified animal health status, food safety inspection and certification as well as nutritional label as indicated by the significant standard deviation estimates. This heterogeneous preferences means that the sampled consumers have different preferences and that willingness to pay estimates cannot be said to represent the entire sample. It is therefore concluded that the null hypothesis which stated that the consumers are homogeneous is rejected in favour of the alternative which stated that consumers are heterogeneous in their preferences for safety and quality attributes. Verified animal health stamp in both Kumasi and Sunyani promises to be an important tool for assuring consumers of the food safety of beef with a higher WTP premium. Assured nutritional label, food and drugs board food safety certification license and verified animal health stamp should be made available to

consumers at a premium. This will provide real-time information and confidence to consumers on the quality and safety status of beef products and also permit quick recalls when quality and safety standards are breached. Furthermore, it is concluded that females have negative preference attitude towards food safety attributes such as verified animal health stamp and food safety assurance labels. It is further concluded that age, education and income significantly influence willingness to pay for food safety assurance labels in Kumasi Metropolis and Sunyani Municipality.

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 cut and processed beef marketers should create an excellent external beef product image rather than concentrating on only intrinsic attributes of beef since consumers consider these attributes as extremely important. Marketing strategies to be considered by beef product investors in the future 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 in formal meat shops where some form of packaging is done for meat products. It is therefore recommended that prepackaging of beef with proper labelling before sales should be encouraged. Thus, traditional marketing strategies which focus mainly on price and quality competition may no longer be successful in Kumasi Metropolis and Sunyani Municipality beef industry of Ghana. Therefore, guaranteed food safety information and attributes should emerge as a new index and basis for future trade in the beef industry.

The use of selective demographic targeting to maintain or build strong food safety, and quality measures as well as market share among competing beef products has become a reality in Kumasi and Sunyani for policy makers and investors in the beef industry since demographic factors such as age, education and income significantly influence consumer preferences for beef attributes. It is recommended that the Ghanaian beef cut sellers, beef processors and marketers could also use selective demographic targeting to maintain or build its market share among competing beef products from exporting countries. This means that beef cuts can be sold in targeted areas depending on the demographic characteristics of the respondents for instance opening of meat shops in high income residential areas or targeting a specific educational class of consumers.

To minimize microbial, chemical and physical food contamination and incidents of food safety in Kumasi and Sunyani, strict certification and inspections starting from the health status of the animal to be slaughtered to the final product should be adopted with proper labeling information for consumers, combined with strict sanitary inspections at the shopping or selling place since consumers are willing to pay premium for these assurance attributes. The Hazard Analysis and Critical Control Point (HACCP) system should be enforced in the beef sector.

Premium pricing strategies and promotion based on verifiable health and animal welfare benefits through labeling of products by livestock investors, importers and exporters should be adopted since consumers have positive perception about these product attributes with the associated willingness to pay premium estimates. Educational campaign is needed for retailers especially those selling in traditional markets.

Similar studies should be conducted in other regions in order to compare the preference and willingness to pay behaviour of beef consumers in the different regions. This will contribute to producing reliable results on the overall preferences and willingness to pay premium for safety and

quality attributes of beef products in Ghana. Policy measures should include creating awareness on the benefits of consuming pasture-raised beef products through effective marketing strategies and educational campaigns since this will help sustain the livestock section in Ghana. Educating the consumer base about differences between pasture-raised and conventional production practices may therefore prove a critical facet of marketing efforts.

Fresh beef cut sellers, processors, wholesalers and retailers should pay particular attention to product freshness, inspection and certification, tenderness and origin of the products since they are crucial in consumers' willingness to pay price premiums for these products. Nongovernmental organizations and other stakeholders should formulate policies that would boost and promote the consumption and production of pasture-raised beef products by setting high set of standards that would offer a clear distinction for consumers to differentiate between pastured and confinement-raised products. Differentiating pasture-raised products from other livestock products may be best articulated by a label and accompanying set of standards. Future research on consumer preferences for livestock products should adopt methods that account for preference heterogeneity among consumers and willingness to pay methods should consider the different classes of consumer either using latent class or other appropriate methods.

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