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APPLYING EXPERIMENTAL ECONOMICS TO DETERMINE CONSUMERS' WILLINGNESS TO PAY FOR FOOD ATTRIBUTES

by

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DECLARATION

I declare that the dissertation, which I hereby submit for the degree M.Com Agricultural Economics at the University of Pretoria, is my own work and has not been submitted for a degree at any other tertiary institution.

SIGNITUTARE: …….. DATE: June 2011

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I dedicate this study to my father, Dr. Koos van Zyl.

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ABSTRACT

APPLYING EXPERIMENTAL ECONOMICS TO DETERMINE CONSUMERS' WILLINGNESS TO PAY FOR FOOD ATTRIBUTES

by

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Degree: M.Com
Department: Agricultural Economics
Supervisor: Prof. J.F. Kirsten
Co-supervisor: Mrs. H. Vermeulen
Key Concepts: Willingness to pay, random *n*th price auction, Karoo Lamb.

Changes in the features of food demand and consumption have moved from the mass consumption model towards an increasing qualitative differentiation of products and demand. This movement towards addressing consumers' demand for food products with more advanced quality attributes has led to increasingly complex food qualification processes and a proliferation of standards. Accompanying these changes in the agro-food system is a growing consumer concern for food safety and quality.

Even though these trends are also permeating South Africa, little research has been done on the local quality dynamics of this emerging country. There is therefore the need to investigate consumers' food choice behaviour in a developing country context, such as South Africa.

Consumers' quality perception and decision making process regarding food products is quantified through measuring consumers' willingness to pay (WTP)

for a given attribute in a food product. Willingness to pay refers to the maximum monetary amount that a consumer is willing to pay for a specific product representing a bundle of product attributes.

The general objective of this study is to test the application of experimental auctions as one of the available methods to measure consumers' willingness to pay, in order to determine the applicability of experimental auctions to specific research scenarios – for example the case of food products with advanced quality attributes in a developing country context.

Sample selection for the experiment was done through a combination of random and convenience sampling. The total sample amounted to 31 participants. The target population was high income, established South African consumers, who are regular consumers of red meat and also the main buyers of groceries in the household.

A pre-auction survey was done to determine the exact demographic composition of the sample as well as gaining insight into the sample's buying behaviour and attitudes towards red meat, specifically Karoo lamb.

A random *n*th price auction was conducted to obtain willingness to pay estimates for a premium on certified Karoo lamb. Various demographic and behavioural variables were linked to participants' individual bids in order to determine the possible influence of these variables on participants' bidding behaviour.

This research study tested the application of an experimental auction mechanism in the food marketing context of a developing country. To the knowledge of the researcher, it is the first study of its kind done in South Africa. It was worthwhile to investigate this method as an alternative to stated preference methods in the field of food choice behaviour, because the auction conducted during this

research project succeeded in giving meaningful insights into the possibilities of the certification of meat of origin in a developing country like South Africa.

From the auction results, a general positive willingness to pay for certified Karoo lamb was observed, with an average premium recorded of R10.90/500g of loin chops. The impact of additional information was clearly visible as bids increased substantially after information treatments about the product were introduced.

It was found that female respondents and respondents from the older age group generally bid higher premiums for Karoo lamb. Respondents buying red meat and sheep meat (i.e. referring to mutton and lamb products) from Woolworths and Spar also indicated a higher positive willingness to pay a premium for certified Karoo lamb.

With specific reference to the case study product, a positive willingness to pay for certified Karoo lamb was determined in this study. The concerns raised by participants about the lack of availability and authenticity of Karoo lamb, serves as an indication of the need for a formal certification process of food products in South Africa.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of variance
BDM	Becker-DeGroot-Marschak
LSM	Living Standard Measure
RPM	Revealed preference methods
SAARF	South African Advertising Research Foundation
SPM	Stated preference methods
WTA	Willingness to accept
WTP	Willingness to pay

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The agro-food system, referring to trade, the economic structure and the handling of food from the production of the commodity to the processing of the final consumer (Padberg, Ritson & Albisu, 1997), has evolved worldwide in the last few decades. This evolution is based on the industrialization of the agricultural and food system. The result is an increased offering of standardized products. With this increase, marketing and quality control has shifted from product control to process control, thereby shifting competition in the agro food system (Ponte & Gibbon, 2005).

Concurrently there have been important changes in the features of food demand and consumption moving away from the mass consumption model towards an increasing qualitative differentiation of products and demand (Allaire, 2003). This goes along with the fact that other factors, in addition to price, are gaining more importance in transmitting knowledge about product quality to consumers. Padilla, Villalobos, Spiller & Henry (2007) explain that consumer preferences for food are defined by changes in demographic and socio-cultural variables, consumer attitudes and the development of new lifestyles. These factors are also impacting on competition among actors in the supply chains. This movement towards addressing consumers' demand for food products with more advanced alternative quality attributes (Ponte & Gibbon, 2005; Krystallis & Ness, 2005) has led to increasingly complex food qualification processes and a proliferation of standards.

Accompanying these changes in the agro-food system is a growing consumer concern for food safety and quality. This has lead to a new market in

differentiated, high value food products (Rodriguez, Lupin & Lacaze, 2006). The demand for these products stimulated a need for change in food technology and distribution. Even though these trends are also permeating the South African landscape, little research has been done on the local quality dynamics in this emerging country with such clear dualistic characteristics.

The importance placed on quality has become one of the most significant factors in the agro-food chain over the past few years (Sepúlveda, Maza & Pardos, 2011). While food comes in infinite variety, and food choices are a major component of purchasing decisions of the modern-day consumer (Grunert, 1997), quality has become a key concept for both consumers and producers. In their research, Oude Ophuis & Van Trijp (1995) explain that the perceived quality approach considers quality dependent on the consumer's judgement. Perceived quality is further defined by Aaker (1991) in Oude Ophuis & Van Trijp (1995) as the perception of the consumer of the overall quality or superiority of a product or service with respect to its intended purpose when compared to alternatives. In this study the discussion of quality will be limited to the quality of food products.

Quality is a multifaceted concept, which cannot be evaluated as a whole by consumers; therefore consumers use indicators of quality to make a judgement about the product quality (Oude Ophuis & Van Trijp, 1995). Food choices address a wide range of quality attributes – conventional as well as more advanced quality attributes. When consumers are faced with a buying desicion, they have an idea of the specific product attributes they desire. Product attributes are a quality or feature of a product. Melton, Huffman, Shogren & Fox (1996) states that consumers will value similar products differently based on slight differences in product attributes.

Quality attributes that consumers seek in a given product fall into three information categories: search, experience and credence attributes. Search attributes can be identified immediately and can be used by consumers to

identifying a product before purchase (Cunningham, 2003). Search attributes may include packaging and product colour. Experience attributes can be identified during consumption and may include tenderness, taste and product convenience. Credence attributes cannot be evaluated before, during or after consuming the product (Northen, 2000). Credence attributes may include hormone-free or nutritional claims, which are generally certified by a reputable third party, in order to be considered as credible by consumers (Cunningham, 2003). In Table 1.1 possible quality attributes relating to fresh meat are presented.

Table 1.1: Quality attributes for fresh meat products

Subsets of Quality Attributes				
Food Safety Attributes	**Nutritional Attributes**	**Sensory Attributes**	**Value/Function Attributes**	**Process Attributes**
Food borne pathogens	Calories/Fat	Taste	Size & style	Animal welfare
Hormone residues	Sodium	Colour	Composition	Traceability
Food additives	Carbohydrates	Appearance	Convenience	Environmental impact
Spoilage	Protein	Freshness	Package material	Place of Origin
Physical hazards	Vitamins & minerals	Aroma	Shelf-life	Heritage product

Adapted from: Caswell, Noelke and Mojduszka (2002) in Cunningham (2003).

Consumers' opinion of quality before purchase is inferred by means of quality cues (Oude Ophuis & Van Trijp, 1995). Quality cues are used to form expectations about product quality attributes that cannot be experienced directly, such as naturalness or ethical aspects, and also to form expectations about attributes that are experienced before or during consumption such as sensory properties or price (Napolitan, Braghieri, Piasentier,. Favotto, Naspetti & Zanoki, 2010).

Cunningham (2003) explains the relationship between product attributes and quality cues such that every product has a range of intrinsic quality attributes

(search, experience and credence) which exists in a buyer's information framework. In addition to these intrinsic product attributes, products have extrinsic quality cues or indicators to facilitate the purchase decision. Extrinsic cues will influence the expected quality of a product and are especially important when it comes to credence attributes, seeing as they can only be verified by extrinsic cues from a reputable resource. The relationship between quality cues and quality attributes is simplified by Oude Ophuis & Van Trijp (1995) in that quality cues can be ascertained by the senses prior to consumption whereas quality attributes are benefit-generating product aspects and cannot be observed prior to consumption.

Quality cues or search attributes can be further distinguished into intrinsic and extrinsic cues. Intrinsic quality cues are defined as characteristics that are part of the physical product, which cannot be changed without also changing the physical product itself while extrinsic quality cues are defined as related product characteristics but they are not part of the product (Olsen & Jacoby (1972) in Oude Ophuis & Van Trijp (1995). Table 1.2 gives a list of possible quality cues for fresh meat products.

Table 1.2: Quality cues for fresh meat products

Intrinsic cues	Extrinsic cues
Appearance	Price
Colour	Brand name
Size	Place of purchase
Marbling	Country of origin
Cut	Nutritional information
Juiciness	Production information

Adapted from: Oude Ophuis & Van Trijp (1995)

Food of origin can be seen as an extrinsic quality cue (Table 1.2). It is an extrinsic cue because the origin of the product will be indicated externally to the

product, for example on the product label. Even though place of origin serves as an extrinsic quality indicator; the origin itself is an intrinsic credence attribute to the product. Food of origin is defined as credence attribute because it cannot be evaluated prior or during consumption of the product; it can only be evaluated if the specific information is given on the product label or in some other way.

Presented below in Figure 1.1 is the Food Quality Framework model (Steenkamp, 1989; In: Oude Ophuis & Van Trijp, 1995) which portrays the quality perception process for consumers. This model offers a useful framework where the effects of cues and quality attributes on perceived quality and on each other are portrayed.

From Figure 1.1 we see that in a decision making process, quality cues from the environment are categorized and interpreted, serving as an indication of the possible quality attributes of the product. When all cues and attributes are considered, the consumer will form a perception of the quality of a given product in order to help facilitate the buying decision.

A conceptual model of the quality perception process

(Steenkamp, 1989; In: Oude Ophuis & Van Trijp, 1995)

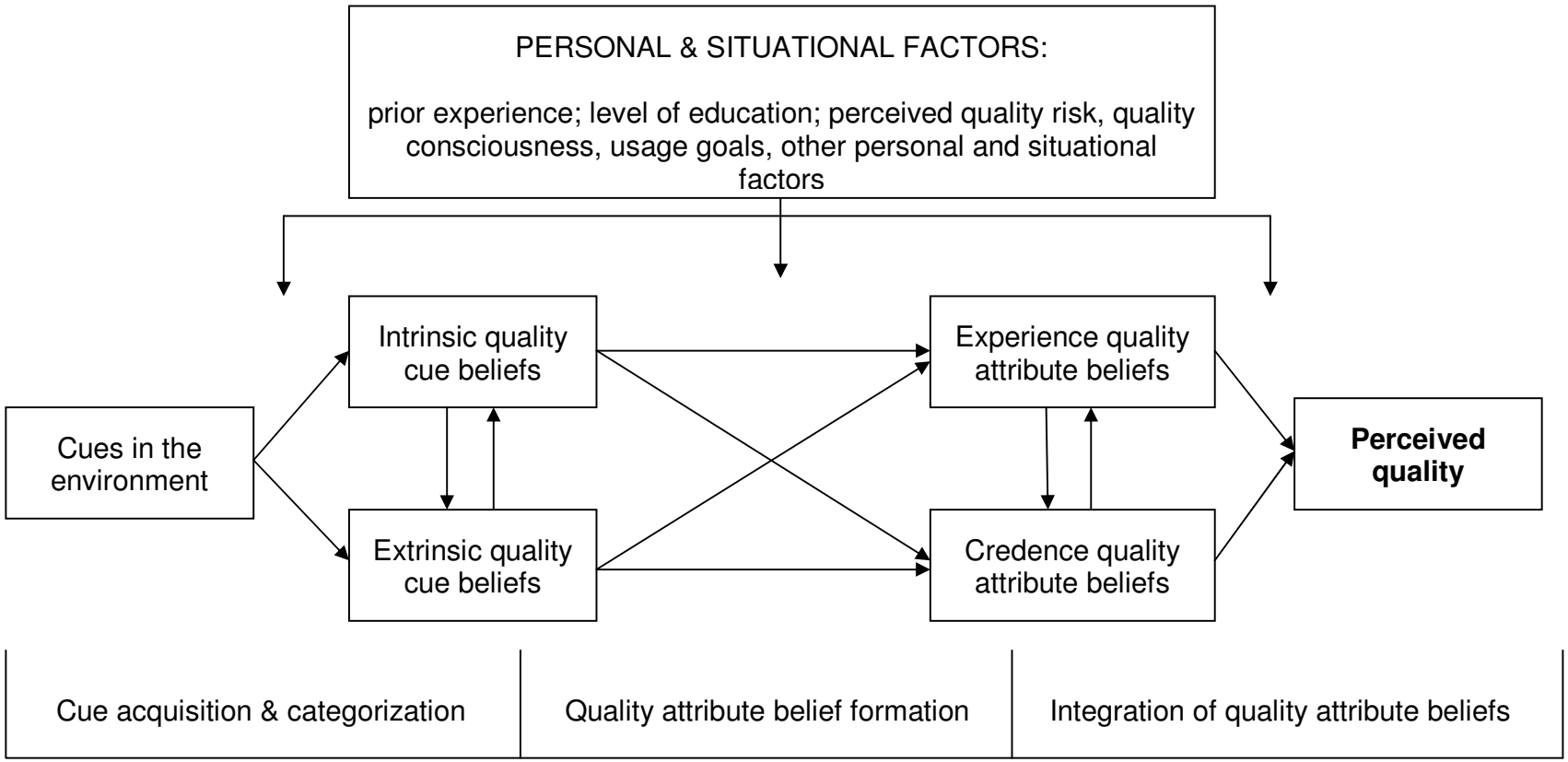

Figure 1.1: Conceptual model of the quality perception process

Food of origin is briefly discussed as a quality attribute because it is the focus attribute in this project. With the signing of the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), member countries of the World Trade Organization (WTO) acknowledged geographical indications as an independent intellectual property right. Geographical indications stand to protect products that are intrinsically linked to a region based on either their quality, reputation or some other characteristic. With a long history of traditional production, European countries have for centuries recognized and fiercely protected the inherent value captured in the link between a product and its region of origin. European nations have protected names such as Parmesan, Roquefort, Champagne, Port and Sherry through a system of Geographical Indications to ensure that only people and firms within a specific geographical region benefit from the commercial exploitation of their heritage or their specific resources (Kirsten, 2010).

Now that the basis for the quality perception process has been laid, it is important to know the actual value consumers place on a quality attribute of a given product, i.e. to capture their perceptions and valuations for a product that possess different quality attributes. To quantify how consumers value a given attribute, willingness to pay (WTP) estimates for a given attribute or product is elicited. Consumers' willingness to pay is a measure of consumer surplus – the potential benefit to consumers (Giamalva, Bailey & Redfern, 1997). The basic definition for willingness to pay as explained by Lee, Repkine, Hwang & Kim (2004) is expanded to define willingness to pay as the maximum monetary amount that a consumer is willing to pay for a specific product representing a bundle of product attributes or different product attributes (or groups of attributes) embedded in a given product.

The success of a product depends on consumer acceptance, thus developers are interested in knowing the acceptance of their product by consumers beforehand (Kimenju, De Groote & Morawetz, 2006). The demand for new products should thus be studied before they are developed and marketed. It is therefore important to have accurate estimates of consumers' willingness to pay, since these estimates provide basic information used in pricing decisions

and adoption forecasts (Lusk & Hudson, 2004; Silva, Nayga, Campbell, & Park, 2007). Estimating consumers' willingness to pay for quality attributes in goods is also of importance to producers, since they need to know which quality attributes of their products are valued most by consumers (Lee, Repkine, Hwang & Kim, 2004).

1.2 PROBLEM STATEMENT

1.2.1 General problem statement

In order to develop a more comprehensive understanding of consumer behaviour, it is critical to understand the different methods used to analyse consumer behaviour and food choice (BFAP, Baseline 2009).

A large body of scientific literature describes numerous methods to measure consumers' WTP for specific food products / product quality attributes. Two prominent methodology categories in this regard include revealed preference methods and stated preference methods (widely applied and in use for many years).

Using revealed preference techniques, researchers can measure WTP for existing goods by gathering market data on quantity demanded at different prices and use the data to estimate price elasticities (Cunningham, 2003), but this method can only be applied to existing products where actual market data exists.

Alternatively, stated preference methods are used to elicit willingness to pay estimates, where consumers explicitly state their willingness to pay for a given product attribute or product. When using stated methods, the researcher can create a hypothetical market for a novel good where consumer choices can be analysed (Lusk & Shogren, 2007). A drawback of stated preference methods is that it might not correspond closely to consumers' actual preference (Wardman, 1988) because there is no economic commitment

required from the participant's side, thus no incentive to state their true value for the attribute in question (Voelckner, 2006).

An alternative group of methods, experimental economics, are used to study the economics of consumers' food choice behaviour. From this group, experimental auctions originated, offering a method that combines the advantages of traditional revealed and stated preference methods. It is argued that experimental auctions as a method to establish willingness to pay estimates could be more reliable than other stated preference methods.

The general movement towards addressing consumers' demand for food products with more advanced quality attributes is also a trend permeating South Africa. Although many WTP studies have been conducted in South Africa, no local study has before attempted to estimate the willingness to pay for specific food attributes by applying experimental economics, specifically experimental auctions. Studies where experimental auctions were applied to measure WTP have been done in developed countries, especially the US and Europe. The expected differences between WTP studies done in a developed country versus a developing country could be significant, seeing as consumers and their buying behaviour differ notably between developing and developed countries.

1.2.2 Specific problem statement

In the context of the general problem as presented above, the specific need was established to identify an appropriate experimental auction mechanism and to implement this mechanism in a developing country, such as South Africa.

Windmills and sheep, farm homesteads, endless vistas, home baked bread, and hospitable nights... These are images much engrained in the minds of every South African when they think of the Karoo region. Because of these images and the tranquillity and honesty of the Karoo way of life the 'Karoo'

concept has become synonymous with quality, tradition and wholesomeness. As a result of these images, people not even remotely linked to the geography or the values and images of the region; exploit the word Karoo to make profit. Furthermore, Karoo lamb/mutton has become associated with a unique and desirable flavour, being described as much sought after (Kirsten, 2010).

South African lamb is currently marketed generically without making any reference to specific regional identity, despite the well known identity of sheep produced under the free range conditions of the Karoo region. Karoo lamb is thus already established as a meat of origin in South Africa, although not necessarily as a formal Geographical Indication. In order to protect the geographical name of the Karoo, as well as the indigenous resources associated with Karoo lamb/mutton, the potential exists for the establishment of a geographical indication based on the reputation of quality and flavour in combination with the nostalgia generated by the perception of the Karoo region.

The need has arisen to investigate the opportunity to establish a formal certification label for Karoo meat of origin. It is necessary to first establish if there is economic merit in this process by investigating whether consumers are willing to pay a premium for certified sheep meat from the Karoo region in South Africa.

With fresh meat being a product with a high degree of credence character (Verbeke & Roosen, 2009) and the potential to certify Karoo lamb as meat of origin in a developing country, an ideal opportunity was presented to investigate the possibility of certifying Karoo lamb as a case study in this experiment.

1.3 RESEARCH OBJECTIVES

1.3.1 General objective

The objective of this study is to identify a desirable experimental auction mechanism and to implement this mechanism by conducting an experimental auction. The aim of the experimental auction is to elicit WTP estimates for a food product with advanced quality attributes in a developing country context.

1.3.2. Specific objective

Specifically the purpose of this study is to test the applicability of experimental auctions and to establish consumers' willingness to pay for meat originating from the Karoo.

In light of the above discussion, the study will aim to:

- Test the design and implementation of an random *n*th price experimental auction on a food product with advanced quality attributes.
- Determine if consumers are willing to pay a premium for certified Karoo lamb as meat of origin.
- Test the impact of additional information on consumers' bidding behaviour for certified Karoo lamb.
- Analyse the possible links between demographic variables, consumer attitudes towards Karoo lamb and consumer bidding behaviour for Karoo lamb.

1.4 METHODOLOGY

Firstly, an in depth literature review will be conducted where different methods used in the elicitation process are discussed with regards to the general application and strengths and weaknesses of each method. Examples of

previous studies are discussed where these methods were applied in analysing consumer food choices, with specific reference to studies about red meat quality attributes.

A short written pre-auction survey was conducted on the day of the experiment. The information is used to gain a better understanding of participants' demographic composition and their knowledge and attitude towards meat in general and specifically Karoo lamb.

A random *n*th price auction was identified as the preferred auction mechanism to be applied in the case study. A brief explanation of the mechanism is given, with an in-depth discussion to follow in Chapter 2.

The auction consists of several bidding rounds, where additional information about the auctioned product is provided after every second bidding round. Participants are endowed with a generic product (500g lamb loin chops), where after they are asked to write down the maximum monetary amount they are willing to pay to upgrade their endowed product to the novel product (500g certified Karoo lamb loin chops). After each round, bids are sorted and a random number is drawn. This number gives an indication of the cut-off position for 'winners' in the auction round. All participants with bids higher than the specific bid at the cut-off position are then winners of the round. Finally after all rounds are conducted, a binding round is drawn where auction winners now upgrade their endowed product to the novel product at a price equal to the bid at the randomly drawn position.

Average bids obtained from the auction were linked to demographical variables obtained from the written survey in order to evaluate any possible links.

1.5 ORGANISATION

The remainder of this study is organised into five chapters. Chapter Two is a literature review, discussing methods used to measure consumers'

willingness to pay for quality attributes. This chapter also serves as an introduction into experimental auctions. In Chapter Three, the design and application of the specific experimental auction, a random *n*th price auction mechanism, is discussed in detail. Chapter Four is dedicated to exploring the socio-economic profile of the chosen sample, also capturing their meat purchasing behaviour. Chapter Five discusses the detailed analysis of the experimental auction results and Chapter Six serves as a concluding chapter to this dissertation, discussing what was found in this thesis, possible problems or shortcomings in this study and recommendations for future research.

CHAPTER 2

METHODS TO MEASURE WILLINGNESS TO PAY

2.1 INTRODUCTION

This chapter focuses on methods applied in economic scientific literature to measure consumers' willingness to pay (WTP) for products or services, focusing on specifically food and then meat products. According to Kalish & Nelson (1991), WTP refers to the maximum amount of money a consumer would pay for a given quantity of a product, given a specific set or bundle of attributes present in the product.

A large body of scientific literature describes numerous methods to measure consumers' willingness to pay for specific food products or product quality attributes. Two prominent methods are stated preference- and revealed preference methods (Lusk & Shogren, 2007).

Stated preference methods rely on the statements of individuals with regards to their preferences in a set of options in order to estimate their utility function (Kroes & Sheldon, 1988). Loureiro, McCluskey & Mittelhammer (2003) define stated preference methods as simply asking respondents questions with the intention of eliciting their preferences for a specific good, without requiring that the participant acts accordingly. These methods will be discussed with relevant meat related examples (Table 2.1).

On the other hand, revealed preference methods use actual consumer decisions to model a consumer's preference, thereby using actual purchasing behavioural information of the consumer to reveal preferences (Loureiro, McCluskey & Mittelhammer, 2003). From the literature reviewed for this study, it was clear that originally revealed preference methods was not traditionally used in food choice behaviour but rather in estimating preferences for different transport options (Kroes & Sheldon, 1988; Wardman, 1988) or for

estimation of consumers' preferences for different environmental impacts (Shammin, 1999). However, revealed preference methods, in particular experimental auctions, are quickly gaining momentum in terms of food preference research. Experimental economics has become a fixture within the economics discipline (List, 2003). Corrigan, Depositario, Nayga, Wu & Laude (2009) further notes that experimental auctions is one of the most common experimental valuation methods in agricultural economics today. This statement is enforced by the literature reviewed for this research, where the experimental auction method was used to estimate food choice by Alfnes & Rickertsen (2003); Bernard & Bernard (2009); Evans, Brown, Collins, D'Souza, Rayburn & Sperow (2008) and Feldkamp, Schroeder & Lusk (2004), to mention but a few. (Refer to Table 2.3 later in this chapter for beef related experimental studies where experimental auctions were used as the method of choice). It is still worth taking a brief look at traditional revealed preference methods in order to understand the alternative methods available and lead us to the discussion on *experimental auctions* – the main focus of this thesis.

2.2 STATED PREFERENCE METHODS (SPM)

As mentioned above, when applying stated preference methods, respondents are asked to state the monetary value that they attach to a particular good or service (directly or indirectly) (Lusk & Shogren, 2007). The review of the literature presented in this chapter reveals that stated preference methods make use of survey questions asking individuals to state choices, describe their behaviour and state what they are willing to pay for a specific product or attribute. The survey consists of hypothetical questions designed to reveal specific information about preferences and how much the participant would pay for that attribute in a given product. Researchers often conduct focus group interviews aiming to select the most relevant product attributes in the design of the experiment, as suggested by Alpizar, Carlsson & Marinsson (2001) and Umberger & Calkins (2008). In short, stated preference methods can be defined as a family of techniques which use individual participants' statements about their preferences of a specific good or service to elicit

willingness to pay values for the given product or service (Kroes & Sheldon, 1988).

The three most widely used stated preference methods applied to general analysis of consumers' choices and WTP for products or services, are conjoint analysis, choice experiments and the contingent valuation method. These methods are introduced below, followed by a summary of prominent applications in food literature, with specific focus on studies that investigated consumers' WTP for meat products and related attributes, in light of the meat focus of this thesis.

2.2.1 Conjoint Analysis

As defined by Green & Srinivasan (1978), conjoint analysis is a method that estimates the structure of a consumer's preference given his/her overall evaluation of a set of alternative products with pre-specified levels of different attributes. Using conjoint analysis, one can make inferences about the consumer's attitude and preferences towards a specific product attribute.

A conjoint experiment includes the conjoint design and the administration thereof (Halbrendt, Wirth & Vaughn, 1991). The design specifications include choosing the attributes with their associated levels. For example: if milk was the product, with milk fat percentage an attribute and the actual level of fat (full cream, 2% fat or fat free) would be the levels of the specific attribute. The conjoint design also requires the researcher to combine these chosen attributes and levels into product concepts in order to develop choice sets. Halbrendt, Wirth & Vaughn (1991) further states that these attributes and associated attribute levels should be carefully selected as they constitute the characteristics of the hypothetical product and should therefore include the most relevant aspects to potential buyers.

Secondly, the conjoint experiment needs to be administrated. Consumers taking part in the experiment would typically be presented with alternative

product concepts (choice sets) described in terms of a set of attribute levels (from the conjoint design). The researcher can use various techniques to present these choice sets to the consumers, such as verbal description, visual presentation, physical, graphical or photographic presentation (Padberg, Ritson & Albisu, 1997). Participants are asked to evaluate all choice sets and then rate them on a scale to indicate their preference for different choice sets with a rating, for example 1 to 10, with 1 being 'would definitely buy', and 10 being 'not willing to buy' (Haddad, Haddad, Olabi, Shuayto, Haddad & Troufeili, 2007).

Lastly, the researcher would analyse the data from respondents' evaluations of the product profiles to draw inferences about the preferences of attributes and evaluate scenarios of interest (Darby, Batte, Ernst & Roe, 2008).

2.2.2 Choice Experiments

A choice experiment, in its simplest terms, can be defined as a setting where respondents are asked to choose between different products with pre-specified attributes, with the goal of eliciting consumers' stated preferences for the given attributes represented in the choice sets (Mørkbak, Chirstensen & Gyrd-Hansen, 2008). Choice experiments are often used in the application of agricultural economics and is a popular method when evaluating non-market goods (Enneking, 2004).

The design of a choice experiment allows the participant the opportunity to choose between two or more products options, each option with a set of attributes at different levels. Each product option would typically be referred to as a choice set, with the various attributes defining the choice set (Alpizae, Carlsson & Martinsson, 2001). A non-choice option is usually included amongst alternative choice sets, as illustrated in the study by Loureiro & Umberger (2007). A non-choice option would create a more realistic purchase situation as consumers could defer from purchasing the good or choose a different purchase outlet (Enneking, 2004).

Participants in the choice experiment would be asked to choose the most preferred product option available to them (Corrigan, Depositario, Nayga, Wu, & Laude, 2009). A choice experiment can be done through presentation of choice sets to participants. Various presentation methods are possible such as verbal description, visual presentation, physical, graphical or photographic presentation. With this systematic trade-off between pairs of products, the researcher would be able to estimate the utility and willingness to pay for separate attributes (Moskowitz & Silcher, 2006).

Choice experiments are very similar to conjoint analysis in the design of the choice sets. In both research methods, participants are presented with a hypothetical setting of different product options defined by a given number of attributes and associated attribute levels. These two methods also have similar ways in which to portray the various choice sets. The main difference between conjoint analysis and a choice experiment is that in conjoint analysis participants are usually asked to rank the choice sets on a scale system, whereas participants faced with a choice situation would choose the preferred option or choice set from the various alternatives.

2.2.3 Contingent Valuation Method

Contingent valuation is a stated preference method whereby WTP values are directly obtained with regards to a specific product. The researcher will typically create a hypothetical market where subjects then operate and results are directly recorded. The contingent valuation method has been the most commonly used approach under the umbrella of stated preference methods in most applications (Alpizae, Carlsson & Martinsson, 2001). Contingent valuation is typically used to elicit willingness to pay values for a non-market or novel good where respondents are requested to state their willingness to pay for the good (De Groote & Kimenju 2008).

The basic design of contingent valuation consists of a set of questions that asks the participant if he or she is willing to pay a premium for a given good

with pre-specified attributes. The answer to the first question would typically lead to a second question, where the specific willingness to pay for the given attribute or novel good would be addressed. The methods, in which the experiment is conducted, can be through face-to–face interviews, mail surveys or telephone based interviews.

When designing the contingent valuation experiment, there are different ways to construct the questions regarding willingness to pay, leading to different designs within the contingent valuation approach. To mention a few examples from the literature reviewed for this study (which will not be discussed in detail): Aldanondo-Ochoa & Almansa-Sáez (2009) used an open-ended question format, where participants are asked to explicitly state their willingness to pay for the various products. McClusky, Grimsrud, Ouchi & Wahl (2005) used the dichotomous choice contingent valuation methodology where each participant in the study were asked if he/she would be willing to pay a specific price for the given good in a hypothetical setting, allowing the participant to answer only with a yes or no. In the study done by Moon, Balasubramanian & Rimal (2006) the payment card approach was used to elicit willingness to pay values. Each respondent was presented with a range of values and asked to indicate the highest amount they would be willing to pay for the product at stake. Each contingent valuation technique used to elicit willingness to pay values has its advantages and disadvantages, depending on the specific study.

The stated monetary amount in the questionnaires is contingent upon the nature of the hypothetical market and good in the survey scenario (Rahim, 2008). Stated differently, valuation of the hypothetical good is contingent upon the stimulated market presented to the participants (Rahmatian, 2005).

The contingent valuation approach, like the other stated preference methods, is used to estimate the value people place on non-market goods (Mergenthaler, Weinberger & Qaim, 2009). Although there are similarities between the three methods discussed, contingent valuation also differs from conjoint analysis and contingent valuation in an important aspect. When using

a conjoint or choice valuation approach, the price of the good up for discussion is pre-specified. The participants are asked to rank product alternatives (conjoint analysis) or indicate their most preferred option (choice experiment). With the contingent valuation approach, participants are asked to state their willingness to pay for a good with pre-specified attributes and a given quantity.

2.2.4 The application of stated preference methods

Now that the theory of stated preference methods has been discussed, the focus in this section shifts to the application of this group of methods, to ensure that a comprehensive outline is presented. Firstly, an overview of the most important strengths and weaknesses of stated preference methods are discussed. Following, in Table 2.1, is a summary of meat-related studies where stated preference methods were applied.

2.2.4.1 Strengths and weaknesses of stated preference methods

The main strength of the family of stated preference methods is that the researcher can create a hypothetical market where goods are bought or sold, implying that consumer choices about hypothetical product can be analysed (Lusk & Shogren, 2007). According to Kimenju, Morawetz & De Groote (2005) preference methods are relatively easy to control and not as costly as revealed preference methods with the reason being that only hypothetical situations and products are presented. For developing countries with only a limited budget for research, stated preference methods makes for an attractive alternative. Stated preference methods are also more flexible in being able to deal with a wide variety of variables within a particular experimental design (Kroes &Sheldon, 1988).

Stated preference methods also have some weaknesses. The participant's stated preference might not correspond closely to his actual preference (Wardman, 1988). This is due to the hypothetical nature of the questions and

the fact that no actual behaviour is observed (Loureiro, McCluskey & Mittelhammer, 2003). As participants are not required to make any real economic commitment, WTP values stated could be higher than what the participant is actually willing to pay for a given product (Voelckner, 2006). Furthermore, respondents might be unfamiliar with the good and not have an adequate basis for evaluating and stating their true value (Rahim, 2008). The good represented in the stated preference situation could be hypothetical (novel good not yet on the market) or unknown to the *participant* – consequently the respondent will not have any idea of what value to attach to such a product seeing as there is no point of reference. This could lead to over- or understating their WTP values for the product, whereas if the product was presented to them they could have a clearer understanding of it and state their WTP more accurately. Stated preference methods have also been criticized for not being incentive compatible. Stated differently, the respondents do not have any incentive to state their true willingness to pay, as there is no commitment or consequences for their stated value (Kimenju, Morawetz & De Groote 2005).

2.2.4.2 Summary of meat-related studies applying stated preference methods

Table 2.1 presents a summary of prominent studies where stated preference methods were applied to elicit consumers' willingness to pay for meat products and associated attributes. Application deals specifically with preferences regarding meat attributes such as traceability, meat origin, animal treatment practices and food safety.

In all studies summarised below, a positive willingness to pay a premium for the tested attribute was observed, some to a lesser extent than others. This is a positive indication showing that consumers are aware of the attributes of meat when considering their options, and are actually willing to pay for preferred attributes. Furthermore, in all the studies that tested consumers' willingness to pay for an attribute serving as an indication of the country of origin, or a specific safety and/or quality assurance label related to a country,

participants in the studies were found to prefer their own country's meat and/or assurance indicators above the alternative, regardless of whether they were Korean, American or German consumers.

Most of the studies used a monetary amount that served as an indication of the premium consumers are willing to pay for the tested attribute, while some of the studies only gave a percentage, due to the market value that consumers used as a reference point not being known. Other studies only suggested that a positive willingness to pay was observed, but no indication of an amount or percentage was discussed.

Table 2.1: Recent applications of stated preference methods in the context of red meat consumer research

Authors	Focus	Methods applied/ Data used	Main Results
Enneking (2004)	Investigating German consumers' WTP for meat quality assurance, in particular meat with a 'quality and safety' label. The product used in this study was 125g packaged liver sausages.	Choice experiment.	Quality labelling has a considerable effect on consumer choice behaviour and WTP estimates vary significantly across brands. WTP for quality & safety (Q&S) label on a German brand is €0.34 (R3.30) and WTP a premium for Q&S label on a less well known brand is €0.11 (R1.07).
McCluskey, Grimsrud, Ouchi & Wahl (2005)	The study analyses the factors affecting Japanese consumers' WTP a premium for BSE-tested beef and estimates the mean WTP for BSE-tested beef in Japan.	A single-bounded dichotomous choice contingent valuation method and consumer surveys were used.	65.9% of participants (n=381) were willing to pay a premium of 50% or greater for BSE-tested beef (no monetary amount given, would depend on consumers' market value of beef).
Loureiro & Umberger (2006)	Analysing US consumers' relative preference for food safety and quality; specifically food of origin, food safety and traceability. The product used in the study was beef ribeye steak.	Choice experiment model for beef.	Consumers attached a higher value to the USDA food safety inspection certification than any other set of attributes, including country of origin labelling and traceability. WTP a premium for: 1) country of origin = R39.63/kg 2) food safety USDA = R124.51/kg 3) traceability = R29.31/kg 4) tenderness = R14.71/kg

Authors	Focus	Methods applied/ Data used	Main Results
Lichtenberg, Heidecke and Becker (2008)	Determining German meat consumers' WTP for traceability of meat (pork & turkey fillets).	Conjoint analysis additive model.	German consumers differ in association of traceability; this has an impact on their WTP for traceable meat. The indication from results is that German consumers would pay a premium for a label clearly indicating the traceability of the meat product, although no monetary amount is stipulated.
Mørkbak, Christensen & Gyrd-Hansen (2008)	Eliciting if Danish consumers would be willing to pay for reducing the risk of Salmonella infections and the specific risk reduction method. The product used in the choice experiment was packets of 500g minced pork meat.	Choice experiment with consumers answering questions over the internet.	Consumers are willing to pay for safer meat, but only up to a certain point. They are also concerned about the risk reduction method and prefer it to take place at farm level. Danish consumers would pay R20.85/500g to reduce the risk of Salmonella from 1% to 0.1% and would pay a premium of R36.49/500g for minced pork if the risk of Salmonella was completely eliminated.
Umberger & Calkins (2008)	Determining South Korean meat consumers' WTP for Australian, US and domestic beef, with specific focus on credence attributes. (WTP for country of origin)	Survey, choice experiment and focus groups.	South Korean consumers indicated a higher positive perception of Australian beef than US beef, but still prefer Korean beef. For 100g of Australian beef participants would pay $2.44 (R17.00) less than for Korean beef and $4.84 (R33.73) less for US beef. If the beef is of Korean origin, participants are willing to pay a premium for: 1) environmentally friendly: $1.66 (R11.57) 2) highly marbled: $1.14 (R7.95)

Authors	Focus	Methods applied/ Data used	Main Results
Chung, Boyer and Han (2009)	Determining the WTP of Korean consumers for local vs. imported beef in Korea. (WTP for country of origin).	Conjoint analysis.	Korean consumers value imported beef approximately $14/lb (R215/kg) less than beef of Korean origin. Valuation of beef quality differs over demographic groups.
Schnettler, Vidal, Silva, Vallejos & Sepúlveda (2009)	Determining WTP of beef consumers in Chile for the attribute of information regarding 1) animal practices before slaughter, 2) country of origin and 3) price.	Conjoint analysis & cluster analysis.	Origin and information regarding animal practices were more important than price, but WTP values were very marginal. Market price for beef is $4.24/kg (R29.55/kg) and WTP (total price, not a premium price) for additional information $4.242/kg (R29.57/kg).
Verbeke, W. & Roosen, J. (2009)	The study focuses on the extent (if any) in which origin, quality and traceability labelling serves as an appropriate tool to differentiate food products – specifically on fresh meat and fish.	Primary data collection through consumer surveys over a 5 year period (2000 – 2005).	Quality information cues are most appealing, followed by origin labelling and then traceability. The product's healthiness appeal yields more differentiation potential for origin and traceability labelling. (No monetary values used in this study)

2.3 REVEALED PREFERENCE METHODS (RPM)

The revealed preference technique is a method that uses actual consumer decisions in order to elicit willingness to pay values by modelling consumer preferences and exploiting the fact that consumer decisions reveal their true preferences (Loureiro, McCluskey & Mittelhammer, 2003). Traditionally and according to the literature reviewed, the most widely used methods under the family of revealed preference methods are hedonic pricing and the travel cost method. Both these methods are typically used for estimation in environmental studies, but also in the construction/housing industry and to determine travelling preferences. The hedonic pricing method is also used in the food industry, as discussed below.

2.3.1 Hedonic Pricing

Historically *hedonic pricing* was often used in the property- and environmental market (Tyrväinen, 1996; Waltert & Schläpfer, 2010; Sue & Wong, 2010 and Jim & Chen, 2009). The willingness to pay for a specific attribute (an extra bathroom in a house, for example) was measured by comparing the market value of two similar properties which only differ in respect to that specific attribute (an additional bathroom in this example). The implicit price for the attribute was assessed by comparing the price a buyer is willing to pay for a house with an extra bathroom as compared to one without (Lusk & Shogren, 2007). Hedonic pricing has also been used as a value elicitation method in the agricultural- and food sector (Lenz, Mittelhammer & Hillers, 1991 and Langyintuo, Ntoukam, Murdock, Lowenberg-DeBoer & Miller, 2004) with specific reference to the wine industry. Noev (2005) used a hedonic pricing model to estimate the effect of wine quality and regional and varietal reputation on wine prices in Bulgaria. Combris, Lecocq & Visser (1997) used a hedonic price technique to show that the market price of Bordeaux wine is determined by objective characteristics, meaning the label on the bottle, but also the sensory characteristics of the wine. The hedonic pricing model is thus

widely applied to durable goods, but can also be used in the estimation of willingness to pay for specific food attributes.

2.3.2 Travel Cost Method

The *travel cost method* is typically used in transport and environmental studies (Fleming & Cook, 2008; Hesseln, Loomis, González-Cabán & Alexander, 2003 and Starbuck, Alexander, Berrens & Bohara, 2004). A simplified example explains the method: from observing travellers patterns (train ticket buyers); a comparison of chosen alternatives with rejected alternatives reveals the preference of travellers.

2.3.3 The application of revealed preference methods

In this section, a brief summary is given on the important strengths and weaknesses of revealed preference methods. It is important to understand the strengths and weaknesses of this group of methods, as it is part of the fundamental theory on which experimental auctions (Section 2.5) are based.

2.3.3.1 Strengths and weaknesses of revealed preference methods

The main strength of revealed preference methods is that real choices are examined and the data obtained is therefore very accurate (Lusk & Shogren, 2007). Hedonic pricing and the travel cost method depends on observable data from *actual* behaviour of individuals (Rahim, 2008).

Some of the weaknesses of this family of methods are that the revealed preference method cannot be used when a novel product is being developed, because no direct observation of consumer behaviour is possible (Kroes & Sheldon, 1988). A further disadvantage of revealed preference methods, as pointed out by Caldas & Black (1997), is that the results and choices made against the actual set of options depends only on the respondent's market perception. Thus, the researcher cannot control the boundaries of the

experiment, meaning that boundaries were pre-specified (any external influence that could affect the respondent's market perception) in the actual market situation where data was observed and the researcher has no control over the external influences affecting the consumers choices.

2.4 THE VALUE OF STATED PREFERENCE AND REVEALED PREFERENCE METHODS: SUMMARY

The previous discussion of methods revealed that both these families have prominent advantages, but are also lacking in certain aspects. The main shortcoming of stated preference methods is that it is not an incentive compatible mechanism. Subjects facing a hypothetical setup tend to behave differently from a real life situation (Silva, Nayga, Campbell & Park, 2007.) Participants would typically overstate their willingness to pay seeing that there are no actual consequences to their actions.

The main weakness of revealed preference methods is that only an existing good or service could be valued. No new good could be valued because the method is based on observing existing patterns.

Subsequently a need was identified to establish an approach to overcome some of these shortcomings and offer a combination of the advantages of both methods (Lusk & Shogren, 2007). This point of argument leads us to the discussion on experimental auctions.

2.5 EXPERIMENTAL AUCTIONS

An experimental auction is a quantitative research method for applied economics. It was originally developed as a mechanism to obtain information about people's values regarding monetary lotteries. After several decades, researchers realised experimental auctions could be a powerful tool, resulting in the implementation of induced value experiments to obtain people's values about goods in a real-world situation (Lusk & Shogren, 2007).

Laboratory experimental methods have become increasingly popular in economic analysis because of the control the method offers over variables and accurate measurement of variables. (Menkhaus, Borden, Whipple, Hoffman & Field, 1992). Experimental methods, especially experimental auctions, are now used for obtaining data, such as benchmarks to price new products.

The most important advantage of conducting an experimental auction is that the researcher can create a hypothetical market situation where some elements can be controlled, but still offer the respondents an incentive to state their true willingness to pay through their actions. In an auction, real products and real money are exchanged within the experimental setting. This gives participants more of an incentive to reveal their true value for the product than in a setting where values are simply stated (Lusk, Feldkamp & Schroeder, 2004). In theory, the experimental auction method combines the best of both worlds by combining the advantages of stated- and revealed preference methods (Lusk & Shogren, 2007).

An experimental auction is a hypothetical setting where the researcher can control the chosen variables and create a market place for the hypothetical product. Obvious advantages of such a setting would be the relative ease of the experiment, control of variables and the ability to measure a hypothetical product. Furthermore, the mechanism in most auction mechanisms is theoretically incentive compatible, meaning participants should have a reason or motivation to reveal their true preference for the good that is up for auction or, stated differently, that an individual's dominant strategy would be to reveal their true value for the product through their bidding behaviour (Lusk, Feldkamp & Schroeder, 2004). Lusk & Shogren (2007), derived the implicit assumption that people perceive no gain or loss from simply stating preferences. To some extent consumers believe that their answers to hypothetical questions are inconsequential. Experimental auctions created an incentive for people to bid or reveal their preference for the product truthfully. Bids are real, paid with actual money and participants receive the goods they bid on. In other words, for people participating in an experimental auction,

there are real consequences. If they win a specific bid / auction, they will have to pay their bid and receive the actual good they bid on, thereby taking ownership of the bidding process, similar to a buying situation in the marketplace. Assuming a demand revealing auction, the auction bids provide a direct measure of the consumer's willingness to pay for the given attribute. The difference between bids submitted for the conventional good and the novel good (with the additional attribute) is therefore a direct estimation of the willingness to pay for a given measured attribute (Corrigan, Depositario, Nayga, Wu, & Laude, 2009). This fact eases the interpretation of the results when auction data is analysed.

An experimental auction also has its limitations. Firstly, only products (hypothetical or existing) with *existing attributes* can be included in the auction. Secondly, because of the setting of the experiment, the sample of respondents taking part in the auction is limited (Alfnes & Rickertsen, 2007). As Corrigan, Depositario, Nayga, Wu, & Laude (2009) pointed out, there is an advantage in the relatively simple interpretation of auction results (the bidding value can be interpreted as the WTP premium if participants are only bidding on a specific attribute), but there is also a disadvantage to the same argument. As mentioned in their study, while ease of interpretation is evident, it could create a confusing scenario for the participant. In a market situation, a consumer is faced with a variety of choices at a pre-specified price. In an experimental auction, the situation is reversed, with the participant being presented with a given quantity of a good and then has to bid on a price which he/she is willing to pay for this good. It is therefore essential that the auction mechanism be explained thoroughly to ensure that participants understand the process.

Three types of classic demand revealing auction mechanisms will now be discussed: Vickrey's second-price sealed bid auction, Becker-DeGroot-Marschak (BDM) mechanism and the random *n*th-price auction.

2.5.1 Vickrey's second-price sealed-bid auction

In 1961 William Vickrey published his pioneering paper on auction theory. He introduced the second price auction, arguing that bidders will be best off when bidding truthfully (Vickrey, 1961).

Vickrey's second price sealed bid auction has been widely used and is traditionally the most popular auction mechanism. The mechanism is known for being demand revealing, relatively simple to explain and has an endogenous market-clearing (payment) price (Shogren, Margolis, Koo & List, 2001*b*). The payment price refers to the actual price that the winner of the auction would end up paying. The fact that it is endogenously determined means that the payment price would be equal to one of the bids submitted, thus *endogenously* determined by the auction mechanism through the bids of participants. All these attributes leads to the mechanism being very popular (Cunningham, 2003).

The standard mechanism of the Vickrey auction works as follows: Participants submit their sealed bid to the monitor. Bids are then sorted from the highest to the lowest bid. After each round of the auction, the payment price (being the second highest price) is revealed. The price is endogenously determined, but not randomly. As explained above, the endogenous price in the Vickrey second price auction would always be the second highest bid for this specific auction mechanism, hence the name of the mechanism. Thus, the price is determined endogenously through the design of the mechanism, but not randomly, because it will always be the second highest bid submitted, and never just any randomly drawn bid. An auction can also consist of any number of bidding rounds. The number of rounds in the auction depends on the conductor. If the auction is repeated several times, the payment price will be announced after each round. Finally one round will be randomly drawn as the binding round. Whoever won the binding round, will win the auction. The winner of the auction would be the highest bidder and he would pay the second highest bid price (referred to as the 'payment price') for the good.

The incentive for truthful bidding is a simple concept. A person cannot be better off by bidding insincerely. A participant's weakly dominant strategy is to bid his true value (Lusk & Shogren, 2007). No player in the auction can determine the price that he will pay. The highest bidder would have to pay the price of the second highest bidder and can thus not control the payment price. Bidding more than your true value for the product could lead to winning the auction but paying more than what the good is worth to the winner (Vickrey, 1961). On the other hand, bidding less than your true value could lead to losing out on the chance of buying the good which would have increased the utility of the bidder.

The main shortcoming of the Vickrey auction is at individual level (Shogren, Maroglis, Koo & List, 2001*b*). The mechanism does not include off-margin bidders. The term 'off-margin' bidders refer to participants who value the good far above or below the market-clearing (payment) price. The problem with the Vickrey auction occurs with bidders who typically under-value the good compared to the payment price (Shogren, Cho, Koo, List, Park, Polo & Wilhelmi, 2001*a*). The auction fails to engage bidders who bid far below the market price, because the payment price would always be relatively high compared to other bids, as it is by nature of the auction mechanism the second highest bid in the round. This leads to the demand curve of off-margin bidders not being revealed accurately.

Secondly, participants tend to bid above their true value in the Vickrey auction, even though truthful bidding is a weakly dominant strategy in this auction (Aseff, 2004). Aseff explains that over-bidders will only experience a loss if the object is secured and the second highest price is above the winner's valuation. The participant would then be paying more for the good than what it is actually worth to him/her.

2.5.2 Becker-DeGroot-Marschak auction mechanism (BDM)

The BDM auction is an incentive compatible mechanism (Lusk & Shogren, 2007). The mechanism was first used in 1961 to evaluate maximum buyer prices and minimum seller prices (Cunningham, 2003).

The BDM auction mechanism is a relatively simple to explain to participants, so repeated practice rounds are not always necessary. Also, this type of auction has less opportunity costs for participants because the auction is usually conducted in the field as opposed to in a laboratory setting (Froehlich & Carlberg, 2007).

In the BDM auction, individuals do not bid against one another, but against a random price generator (Lusk, Alexander & Rousu, 2004). A simple format of the BDM procedure could be where each subject submits a sealed bid for the good up for auction. A random price is then drawn from a predetermined distribution of prices. If the individual's bid is greater than the randomly drawn price he will purchase the good at the randomly drawn price (Lusk & Shogren, 2007).

As with the Vickrey auction, the BDM auction mechanism is an incentive compatible auction mechanism where participants' weakly dominant strategy is to bid their true willingness to pay for the good up for auction. When measuring willingness to pay, underbidding will increase the chance of losing out on a profitable purchase while overbidding increases the likelihood that the participant will make an unprofitable purchase (Shogren *et al*., 2001*a*).

It is important not to reveal upper and lower boundaries of the possible payment price spread to participants, as it has been found that it could contaminate the demand revealing feature of this auction (Cunningham, 2003).

The random *n*th-price auction discussed next is a combination of second-price (Vickrey) auction and BDM auction.

2.5.3 Random *n*th-Price Auction

The random *n*th-price auction was formally introduced by Shogren *et al.* (2001*b*) and combines the features of the Vickrey second-price auction, which encourages competition amongst bidders, and the BDM mechanism, which gives all bidders a chance to win the auction (Lusk & Shogren, 2007).

The key element of the random *n*th-price auction is a *random* and *endogenous* market-clearing price. The randomness of the price ensures that all bidders are engaged, while the endogenous price guarantees that the payment (market-clearing) price is in line with the value that the consumer attaches to the product (private value) of the bidders (Shogren *et al*. 2001*b*).

The standard random *n*th-price auction works as follows: Each participant would offer a sealed bid for the auctioned product. The monitor collects the bids and sorts them from the highest to the lowest bid. The monitor now randomly draws a number (*n*) which will be from the distribution 2 to *k* (with *k* being the number of participants). The monitor will sell one unit of the good to each of the (*n*-1) highest bidders at the randomly drawn *n*th-price (Shogren *et al*., 2001*b*). These participants are referred to as the winners of the round or auction, because they get to trade in the auction i.e. exchange their original good for the novel good at the payment price (Akaichi & Gil, 2009). The reason for the distribution starting at 2 to *k* and not 1 to *k*, is because if the distribution was from 1 to *k*, and the monitor draws $n = 1$, then there would be no winners in the auction, seeing as the winners of the auction would be the equal to $n - 1$. It is further important to note that the random number *n* being drawn is a position being drawn and not the actual payment price. A numerical example would help to illustrate the theory explained above:

A random nth price auction is held with ten participants, k = 10. The participants submit their bids and the bids are sorted from the lowest to the

highest bid. The monitor draws a random number from the distribution between 2 and k (thus 2 to 10). The number that was drawn is n = 4. The n – 1 highest bidders in the auction are declared winners. The monitor sells each winner (the three highest bidders) one unit of the auctioned good at the nth price, thus the fourth highest bid.

With:

k	=	*the number of participants in the auction*
n	=	*the nth highest bid in the auction*
n – 1	=	*number of winners of the auction*

Shogren *et al.* (2001*b*) set out to investigate if the random *n*th-price auction could engage all bidders to bid truthfully. It was found that each bidder should bid sincerely because they cannot depend on the random market-clearing price as a marker or price indicator. Everyone has an equal chance of winning the auction and purchasing the good because the market-clearing price is determined *endogenously* – it is drawn from the bids submitted in the auction round and could be any price within the range of bids. The random *n*th-price auction is further demand revealing because of its natural ability to engage all bidders, even if they believe that they are in the lower tail of the value distribution (List, 2003). The mechanism reengages bidders who have low preferences for a good and believe they cannot win the auction profitably (Shogren *et al*. 2001*b*). In the next chapter the specific research design for the purpose of this study will be discussed.

Table 2.2 offers a summary of the three auctions discussed in this section. It is evident that all three auctions have demand revealing properties, offering participants an incentive to reveal their true value. While the Vickrey second price auction might not include off-margin bidders in the lower tail of bids, the BDM auction mechanism offers a solution by drawing a random payment price, but the price is drawn from a predetermined distribution of prices. The price drawn in the BDM auction is thus not endogenously determined. The random *n*th price auction offers a combination of the two classic demand

revealing auctions by having a payment price which is both endogenously determined and randomly drawn.

Table 2.2: Summary of incentive compatible auctions

Attributes of the auction	Vickrey second price auction	BDM auction	Random *n*th price auction
Participant Procedure	Simultaneously submit sealed bids	Simultaneously submit sealed bids	Simultaneously submit sealed bids
Winning bidder	Participant with highest bid	All participants with a bid greater than the randomly drawn price	All participants with a bid greater than the randomly drawn *n*th bid
Number of winners	1	0 to all participants	*n*-1
Market price	Second highest bid	Randomly drawn price	*n*th highest bid
References	Shogren *et al*, 2001b	Cunningham, 2003	Shogren *et al*, 2001b

Adapted from: Lusk, Feldkamp & Schroeder, 2004.

2.5.4 Application of Experimental Auctions

In this section, the application of experimental auctions is discussed through examples of previous studies, as summarised in Table 2.3. The studies mainly illustrate how experimental auctions were used to elicit consumer preferences with regards to red meat. The summary will show the relevance of experimental auctions in the food industry worldwide, especially in the meat sector. An interesting observation was that the studies reviewed for this research project, made use of mostly Vickrey and BDM auction mechanisms when analysing consumer preferences for red meat. Only two studies in Table 2.3 made use of the random *n*th price auction when eliciting estimates for consumer's willingness to pay for a red meat product.

Table 2.3: Applications of experimental auction methods in the context of red meat consumer research

Authors	Focus	Methods applied / Data used	Main Results
Melton, Huffman, Shogren & Fox (1996)	The study illustrates the use of an experimental auction by testing American consumers' willingness to pay for fresh pork chops with given visual attributes and taste attributes.	Incentive compatible second-price auction.	It was found that the presentation format of visual attributes matters. There was a poorer correlation with attributes showed in photographs with information than that of viewing the fresh product. There are also discrepancies between taste tests and that of visual appearance. There was only a $0.05/pound (R0.77/kg) difference in increments between poor and good quality chops.
Giamalva, Bailey & Redfern (1997)	The study elicited WTP estimates of sixty adults from Arkansas in order to determine if they would pay a premium for an irradiated meat sandwich versus a typical meat sandwich in order to eliminate the risk of foodborne bacteria.	A demand revealing second-price auction.	Almost 70% of the participants were willing to pay a positive premium for an irradiated meat sandwich. The average WTP for an irradiated meat sandwich was $0.71 (R4.95).

Authors	Focus	Methods applied / Data used	Main Results
Alfnes & Rickertsen (2003)	The study tested European consumers WTP for beef from U.S. origin. The study came about because of the ban in 1989 of U.S. beef from Europe due to the use of growth hormones in the production of American beef. The products used in the study were Irish, Norwegian, U.S. hormone-free and U.S. hormone treated beef.	A modified second-price auction.	Participants were endowed with 250g of rib-eye beef steak. Up for auction were 500g of rib-eye beef steak from the Irish, Norwegian, U.S. hormone-free and U.S. hormone treated origin. The typical market price to upgrade a 250g Norwegian rib-eye steak to 500g Norwegian rib-eye steak would be NOK 40.10 (R47.06). The average premiums bid to upgrade the endowed 250g steak to one of the following 500g steaks of origin were as follows: 1) Domestic hormone free = R47.06 2) Irish hormone free = R44.80 3) U.S. hormone free = R40.28 4) U.S. hormone treated = R29.53

Authors	Focus	Methods applied / Data used	Main Results
Cunningham (2003)	The study aimed to test the impact of information treatments on consumers' willingness to pay for Bison products. The participants involved in this study were recruited from Guelph, Ontario. The three information treatments that were tested were: (1) information about the nutritional aspects of the product, (2) the taste and (3) if it was natural (free of growth hormones and antibiotics).	A random *n*th price auction was conducted to elicit willingness to pay values after each information treatment was introduced.	The main hypothesis of the study, that nutritional information had the greatest impact on willingness to pay values, was rejected, as this variable proved to be insignificant. Differences in average bids between rounds were as follows (the quantity of product unclear): Nutritional information: R1.54 Taste information: R1.46 Natural aspects: R1.29

Authors	Focus	Methods applied / Data used	Main Results
Feldkamp, Schroeder & Lusk (2004)	The study was done to elicit the maximum amount that Kansas consumers are willing to pay to exchange a generic rib-eye steak for a natural; guaranteed tender; USDA choice or Certified Angus Beef (CAB) steaks or how much they would bid for one of the five steaks without exchange. Two sessions were held, one for the 'exchange treatment' and one for the 'no exchange treatment'. All steaks were approximately 350g.	Becker-DeGroot-Marschak (BDM) auction mechanism.	50% of participants were willing to pay the following premiums to exchange their endowed 350g generic rib-eye steak: 1) Natural = R0/350g 2) Guaranteed Tender = R6.97/350g 3) Choice = R6.97/350g 4) CAB = R11.36/350g 50% of participants were willing to pay the following premiums for a 350g rib-eye steak with the following attributes relative to a generic 350g rib-eye steak: No-exchange results: 1) Natural = R0/350g 2) Guaranteed Tender = R6.97/350g 3) Choice = R13.94/350g 4) CAB = R 13.94/350g

Authors	Focus	Methods applied / Data used	Main Results
Kukowski, Maddock, Wulf, Fausti & Taylor (2005)	The aim of the study was to evaluate the acceptability and the willingness to pay of consumers for different beef chuck muscles. Consumers were from households in South Dakota, USA.	An in-home evaluation was done by giving consumers two steaks to evaluate on uncooked appearance and cooked palatability (how the steak tasted). Consumers then participated in a random *n*th price auction, consisting of five different rounds.	Four different muscle groups were tested against LM steaks. The market value for some beef cuts were given to determine a reference point. There was a strong correlation between the appearance trait, palatability trait and average pricing bids. Two of the muscle groups were found to be at acceptable to consumers as steaks, but at lower prices than the LM steaks. The negative willingness to pay values for the acceptable muscle groups were R4.95/450g and R5.51/450g less for triceps brachii and infraspinatus respectively when compared to R/450g for LM steaks.

Authors	Focus	Methods applied / Data used	Main Results
Evans, Brown, Collins, D'Souza, Rayburn & Sperow (2008)	The study is done to determine American (Appalachian region) consumers' willingness to pay for Appalachian (origin) grass-fed beef, thereby assessing consumers' attitude towards *local* grass-fed beef.	Becker-DeGroot–Marschak (BDM) experimental auction mechanism in conjunction with a stated preference survey. In store observations were recorded where participants were randomly assigned to evaluate either a ground beef sample or a steak sample.	Stated Preference Results: 73.9% and 81.8% of the sample of steak and ground beef respectively, preferred grass-fed beef to grain-fed beef. BDM Auction Results: (steak and ground beef samples' results were similar, so only the steak results are presented in this summary) 73% of the sample of in the steak group submitted non-zero bids to upgrade their product to the preferred, indicating a willingness to pay for a preferred product. An average bid to upgrade to grass-fed steaks (no weight specified) was $2.28 (R15.89) and to upgrade to a grain-fed steak $1.57 (R10.94). Percentage of the total sample population willing to pay a premium for grass-fed beef at a specific premium price: 1) At R15.36/kg → 53% 2) At R30.73/kg → 40% 3) At R61.46/kg → 20% would still purchase the grass-fed beef opposed to at the given premium.

Authors	Focus	Methods applied / Data used	Main Results
Xue, Mainville, You & Nayga (2010)	The aim of this study was to elicit American consumers' WTP for grass-fed beef strips vs. conventional beef strips, all other variables held constant. Secondly, as a contribution to literature, consumers' nutritional knowledge on the product was tested.	Becker-DeGroot-Marschak (BDM) auction mechanism with in-store observations in conjunction with a written survey. Only participants who preferred grass-fed beef participated in the auction.	This study found that according to visual responses, most of the sample prefers grass-fed beef to conventional beef, but mainstream responses (taste and overall evaluation) are in favour of conventional beef. The auction further revealed that participants were willing to pay $2/lb (R30.73/kg) more for grass-fed beef. Furthermore it was found that participants' knowledge about the nutritional aspects of the product could have an impact on their WTP.

Note that an exchange rate (ZAR/$) of R6.97/$ was used in conversions.

2.6 SUMMARY

The first part of this chapter was dedicated to a discussion on the prominent methods used to elicit willingness to pay estimates for food quality attributes. Past research studies on the subject were summarised and discussed, specifically the application of stated and revealed preference methods applied to red meat research.

The second part of Chapter Two covered the fundamental aspects of experimental auctions, followed by an in depth discussion and comparison of three of the classic demand revealing auction mechanisms: Vickrey second price auction, Becker-DeGroot-Marschak auction mechanism and the random *n*th price auction. It was found that the random *n*th price auction is a mechanism that engages all bidders to bid sincerely, combining the main advantages of the Vickrey second price auction and the Becker-DeGroot-Marschak auction mechanism. Finally, a summary of willingness to pay studies, specific to red meat quality attributes, with an experimental auction as elicitation method, was presented and discussed.

Following the literature overview, the next chapter will present the application of a random *n*th-price auction in conjunction with a pre-auction survey. The objective of the case study is to elicit willingness to pay values for an upgraded novel sheep meat product and to test the effect of information on bidding behaviour.

CHAPTER 3

EXPERIMENTAL DESIGN

3.1 INTRODUCTION

In the previous chapter, three auction mechanisms were explored. It was concluded that the random *n*th price auction is a mechanism that engages all bidders to bid sincerely. The mechanism is designed to give participants an incentive to bid their true values for a given product by creating a market where real products and real money are exchanged (Lusk, Feldkamp & Schroeder, 2004). Furthermore, the random *n*th price auction mechanism differs from the Vickrey second price auction in that it entices low value bidders to bid truthfully due to the payment price being randomly determined. This auction mechanism is also popular due to the element of an endogenous market-clearing price, opposed to a BDM auction mechanism. Thus, the payment price (or market clearing price) is guaranteed to retain some relation to the bidders' private value of the good up for auction (Shogren *et al.*, 2001*b*). The random *n*th price auction combines two of the most attractive elements from the Vickrey second price auction (an endogenous market clearing price) and the BDM auction mechanism (a random market clearing price).

In view of the advantages of the random *n*th-price auction, it was decided to use this particular auction mechanism to test consumers' willingness to pay for a novel sheep meat product with specific attributes related to the origin of the sheep meat. The auction was applied in conjunction with a pre-auction survey where consumers' demographic characteristics, purchasing patterns and perceptions regarding the product to be auctioned were captured. Before the pre-auction survey no additional information on the product up for auction was provided to participants because the aim of the survey was to capture participants' private values for the good without any external influences.

The specific product investigated in the case study is Karoo lamb and it was introduced into the auction as a novel product through improved and alternative labelling and a certification process that verifies the origin of the product. South African lamb and mutton is currently marketed generically without making any reference to specific regional identity, despite the well-known regional identity carried by lamb and mutton produced under free range conditions the Karoo region and the fact that a substantial share of lamb and mutton sold in the South African market originates from the Karoo. There is however specific brand marketing based on certification of naturalness and free range such as Checkers' "*certified natural lamb*" and Woolworths' "*free range*" lamb, but no regional connection is made. Lamb and mutton originating from the Karoo is thus not identifiable through labelling or certification nor is it marketed separately or put forward as a specific niche with a specific premium.

For the auction to establish the hypothesised premium attached to Karoo lamb, participants each received an initial endowment, a packet of 500g generic lamb loin chops, and were asked to bid the maximum amount that they were willing to pay for an additional attribute; (all other product attribute variables kept constant) a Karoo lamb certification label. Participants in the auction thus bid to upgrade their traditional endowed product to a novel product with the additional attribute of it being certified as from the Karoo region.

Furthermore, the impact of additional information on bidding behaviour was tested with two information treatments about Karoo lamb introduced at consecutive stages of the auction procedure. The first treatment was an information handout with an explanation of what certified Karoo lamb entails. The second treatment was a detailed oral presentation from a knowledgeable scientist who is familiar with the Karoo lamb case, Prof. Hettie Schönfeldt. She spoke about the sensory attributes of Karoo lamb and possible differences between Karoo lamb and lamb originating from other regions in South Africa.

Participants' willingness to pay a premium for lamb from the Karoo is measured throughout the entire experiment. Furthermore, willingness to pay values elicited after information treatments would make it possible to measure the potential impact of information treatments on bidding behaviour. It is a difficult task to measure an additional premium on sheep meat in South Africa, due to generic lamb and mutton already being rather expensive. To prove this point, retail prices from four local Gauteng retailers and two butcheries in Pretoria were observed and recorded. This area was chosen for price observation because it is in the same geographical area as the target population. The retailers were chosen because they were indicated as the main retail place of purchase for sheep meat (from the pre-auction survey data) and the two butcheries are well-known, upmarket butcheries in Pretoria, in line with the lifestyle of the target population. These prices were observed in July/August 2010. Table 3.1 indicates that the average price of lamb loin chops ranges from approximately R90/kg to R118/kg, confirming the expensive nature of sheep meat.

Table 3.1: Observed prices for lamb loin chops

Retailer / Butcher	Price of loin chops (R/kg)
Pick 'n Pay	R89,95/kg
Spar	R90,99/kg
Checkers	R92,99/kg
Mondanette Butchery	R94,90/kg
Kings' Meat Deli	R98,90/kg
Woolworths	R118,16/kg

Prices observed in July/August, 2010.

The remainder of this chapter focuses on explaining the experimental organization, design and procedure of the specific auction.

3.2 EXPERIMENTAL ORGANISATION

In this section, the discussion focuses mainly on the target population, how the sample size was determined and what the sample demographics entailed.

The study was conducted in November 2009 in Pretoria, Gauteng. The study was approved by the Board of Ethics, University of Pretoria. Both the pre-survey and the experimental auction experiment were conducted at an auditorium on the campus of the University of Pretoria.

3.2.1 Target Population

Participants for this study had to be regular consumers of red meat, be the main buyers of groceries in the household and be from the wealthier consumer segments as measured by the Living Standard Measure (LSM) market segmentation classification developed by the South African Advertising Research Foundation (SAARF) (www.saarf.co.za). Participants for this study had to form part of the consumers in LSM groups 8 – 10 being affluent enough to potentially afford sheep meat with it being an expensive red meat option. Furthermore, when asking people to bid on an additional credence attribute, it is likely that only the wealthier consumers would be willing or able to pay a premium on an already expensive, luxurious product.

The target group was selected from the Eastern suburbs of Pretoria. The group had to be from a high LSM group (as discussed above) and from the Eastern suburbs of Pretoria which is traditionally attributed as a wealthy upper class area. Furthermore, limited funds for selection of participants were available, and this area being well known to the researcher therefore eased the selection process. Even though this selection would result in a sample that is not representative of the entire South African population, it does not pose a problem because firstly, the product is targeted at a niche group of consumers and secondly, the focus of this thesis is not necessarily on a representative group of consumers, but rather to test the application of the auction

mechanism. The main consideration when selecting participants was that they fitted the criteria of the target population. It was found that the sample group from the Eastern suburbs of Pretoria were a good fit when considering the specific product and the associated lifestyles of the group.

3.2.2 Sample Size

The typical sample size of an auction depends on various factors, including financial constraints and the main objectives of the study. The objectives of this type of study can be either to identify differences in valuations between treatments or to provide an estimate of the mean WTP / willingness to accept (WTA) for the good. A larger sample would be preferred if the impact of information treatments were measured (Lusk & Shrogen, 2007).

When previous studies were consulted, it is clear that there are a variety of sample sizes to be used when conducting an experimental auction. Cunningham (2003) used a total sample size of 57 participants. Participants were split into five groups of 10 and one group of 7. The study tested the impact of information treatments on the willingness to pay for Bison products, using an experimental auction. In the study of Feldkamp, Schroeder, & Lusk (2004), two experimental groups were used with 28 and 27 participants respectively. The objective of this study was to use an incentive compatible method where consumers would reveal their true value for a ‘generic’ steak versus a steak with specific attributes, thus only participants’ willingness to pay was tested.

The sample size for the experimental procedure in this study consisted of 31 participants. Approximately 60 participants were randomly invited to take part in the auction with 31 of them accepting the invitation and attending the auction. Even though this is a small sample for an experimental auction, various constraints prevented the inclusion of more consumers – specifically strict financial constraints. If the sample was split into groups like in the study of Cunningham (2003) a bigger sample would have been more efficient, but in

this study, all the respondents within the group were exposed to the same experimental treatments simultaneously.

Splitting the group and doing multiple rounds was not practical due to the financial and time constraints on the project. With a sample of *n=31* it would in any case be unpractical to split the group into sub-samples. Also, the goal of the experiment was testing the method, compared to the commonly used stated preference methods and testing if information adding would have an impact on bidding behaviour of the participants. The sample is usually split if the sequence of information is tested – different groups will receive information in a different sequence (as in Cunningham, 2003). Thus, it was sufficient to use only one group because the sequence of information was not being tested in this exercise.

For the main objective of the auction (estimating consumers' WTP for Karoo lamb) and the way in which data was used for analysis, the sample proved sufficient when considering that the overall objective of the study was to evaluate different value elicitation methods and finally the implementation of an experimental auction. Although the main objective of conducting an experimental auction with relatively limited resources, a larger sample would be preferred for follow-up studies, as some of the results discussed later in this thesis would have been more significant had the sample been bigger.

3.2.5 Sample demographics

From an ethnic perspective, the sample consisted of 31 white consumers, with 80% of the sample being female. According to the South African Advertising Research Foundation (SAARF) LSM segments profiling SA consumers, established consumers (LSM 7-10) have a higher average household income than lower LSM groups (SAARF, 2010a). If it is further analysed, white consumers make up 43% of LSM 9 consumers and 66.1% of LSM 10 consumers (SAARF, 2010).

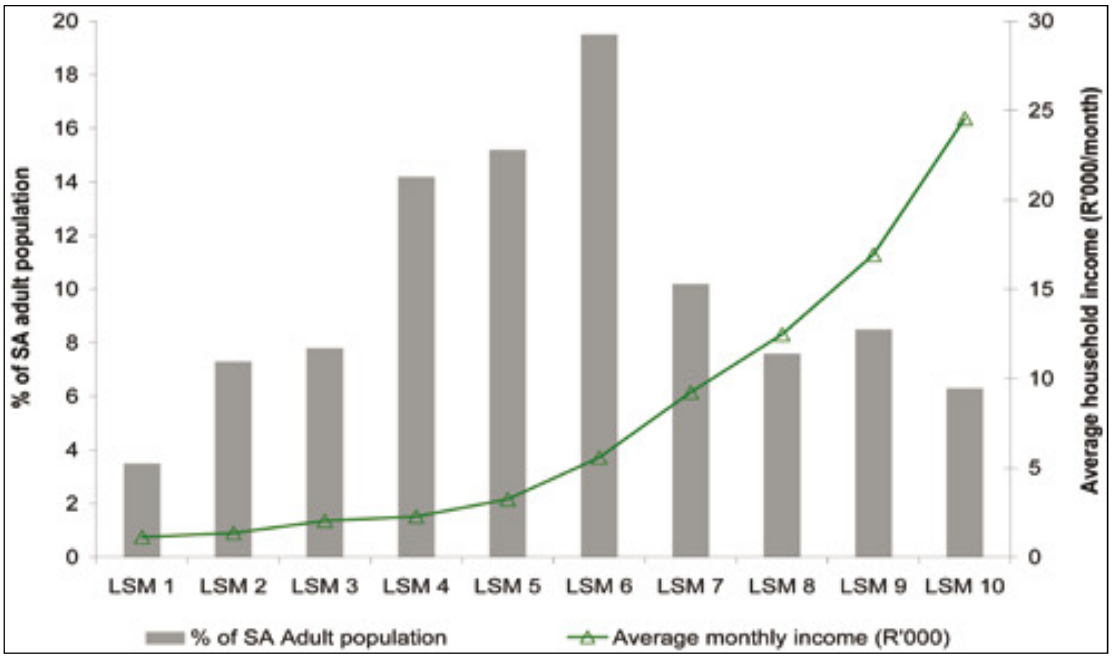

Figure 3.1: The SAARF LSM Segments: Proportion of SA adult population and average monthly household income in 2009

Adapted from: BFAP Baseline 2010 (SAARF, 2010a)

It was thus concluded that consumers in the LSM 9 – 10 groups consist dominantly of white consumers. Furthermore, based on the 2008 BFAP Baseline, calculated from data from the Bureau of Market Research (BMR) about 55% of meat expenditure on mutton/lamb is done by established consumers of the population (LSM 7 – 10) (Martins, 2006). One can thus argue that white consumers are the majority group when considering mutton/lamb purchase behaviour.

3.3 EXPERIMENTAL PROCEDURE AND DESIGN

The experimental procedure consisted of a one-day pre-survey and experimental auction. On arrival, subjects were asked to fill out a pre-auction survey. Once all the pre-surveys were collected, the random *n*th-price auction began. Subjects were treated as one group, with all participants receiving the same information treatments simultaneously.

There were two practice rounds and six experimental rounds in the auction. In the practice round, additional information was given after the first round of bidding and winners' bids and the payment price was revealed after each round. In the bidding rounds for Karoo lamb, additional information was given after every two bidding rounds, while winners' bids and the payment price were revealed after every round.

The auction procedure can be broken down into twelve distinct steps, as summarised in Table 3.2. These steps outline the entire auction procedure and will be discussed in more detail, following Table 3.2. With the discussion of each step, the reason for the specific design will also be explained and supported by literature from previous experimental studies where relevant.

The way in which the consecutive steps of the auction are explained and designed, is based on the random *n*th price auction conducted by Cunningham (2003).

Table 3.2: Summarised steps of the specific auction design.

Steps	Description
Step 1	Participants sign consent form; receive auction hamper.
Step 2	Participants complete written survey.
Step 3	Verbal explanation of random *n*th-price auction with example.
Step 4	Practice round one with block of fudge; winners and payment price are revealed.
Step 5	Information about the block of fudge is given, bidding repeated in a second round with winners and the payment price being revealed.
Step 6	Binding round for the fudge auction is randomly drawn, winners are revealed.
Step 7	First bidding round for Karoo lamb; winners & payment price are revealed.
Step 8	Second bidding round for Karoo lamb; winners & payment price are revealed.
Step 9	Information about Karoo lamb is given, third bidding round for Karoo lamb, winners and payment price are revealed.
Step 10	Fourth bidding round for Karoo lamb; winners and payment price are revealed.
Step 11	Information about Karoo lamb is given, fifth bidding round for Karoo lamb, winners and payment price are revealed.
Step 12	Sixth bidding round for Karoo lamb; winners and payment price are revealed.
Step 13	Binding round is randomly drawn for the Karoo lamb auction, winners are revealed. Exchange for fudge & Karoo lamb.

Step 1: At arrival

As participants arrived at the venue of the experiment, they were asked to read and sign a consent form giving their consent to participate in the auction and complete a written survey form. Participants then received an auction hamper containing the following: a block of fudge, booklet with bidding slips, R200 cash, a random ID number and written auction instructions (Appendix A). Real money was given to participants as part of an attempt to create a more realistic experiment, as supported by Horowitz & McConnell (2002).

The block of fudge served as the base product for the practice auction while the base product (lamb loin chops) for the real auction were kept in a fridge due to the perishable nature of the product. The participants used the bidding booklet to write down each round's bid which was then collected. An ID number was used to keep the entire auction anonymous. The reason for the R200 cash in the auction hamper is two folded. Firstly, the money would serve as compensation for the person to actually take part in the auction and secondly, it would serve as the cash to use to take part in the auction. The amount had to be sufficient to avoid placing any constraint on the bidding amount. The market value for the base product was approximately R50. This market value was used to calculate an approximate amount for compensation and bidding. Two hundred rand was a sufficient amount for participants to use to bid for a realistic premium on the base product and still have enough money left for compensation for taking part in the auction.

Step 2: Survey

On arrival, participants were requested to complete a pre-auction survey (Appendix B). The survey was designed to evaluate participants' general buying patterns and lifestyle and also to collect demographic information such as age, gender, income level, occupation, education level and household size. A further purpose of the pre-auction survey was to get a basic understanding of participants' buying behaviour, starting out with specific reference to red meat, and then focusing specifically on sheep meat. Further information about

perceptions of the novel product, Karoo lamb, was then tested. It was important to elicit this information before the auction in order to get participants' *homegrown values* for Karoo lamb, stated differently, look at knowledge and perceptions of participants before any additional information given during the experimental auction could distort the subject's original view. Lusk & Shogren (2007) explain *homegrown values* as the values that participants bring to the experiment from their learning experience of actual real world goods. Lastly, the survey was used to test the knowledge and attitudes of participants towards Karoo lamb.

Step 3: Explanation of random *n*th-price auction

Instructions about the auction were given by a moderator. The auction mechanism was verbally explained in addition to the written auction instructions provided in the auction hamper. Practical examples were given to ensure that participants understood the mechanism of the random *n*th-price auction. Participants were also told that their best strategy was to bid truthfully and that the mechanism would 'punish' untruthful bidding. Again, this was explained using a practical example. Furthermore, participants were told that two practice rounds using a block of fudge would follow to get everyone comfortable with the auction mechanism where after the real auction with lamb chops would follow. Participants were told that the payment and exchange of both auctions would only take place after the final round of the second auction (lamb chops).

Step 4: First bidding round of practice auction

As mentioned, a practice auction was held before the actual auction for Karoo lamb was conducted. The reason for conducting a practice auction is for participants get some practice using the mechanism and to get comfortable with the procedure. Lusk & Shogren (2007) explains that the reason for training and practice is so that participants realise that the best strategy in an incentive compatible auction is not to bid as they would in other markets to make a profit, but to bid their personal true value for the product. A trial

auction using candy bars was also done by Melton, Huffman, Shogren & Fox (1996); Cunningham (2003) and Giamalva, Bailey & Redrern (1997) in order to get participants familiar with the mechanism.

Participants were asked to critically look at the block of fudge (unmarked) received in the auction hamper. A second block, labelled as "*fat free fudge",* was then sent around for inspection (see figure 3.2).

Figure 3.2 Fat free label

Participants were asked to bid the maximum premium that they were willing to pay to exchange their first block of fudge for the second block. Bidding slips were collected and sorted from the highest bid to the lowest. A random number was drawn by the moderator to indicate the cut-off position, thus determining the cut-off price. The cut-off position and price was revealed, as well as the winners' ID numbers (all bids above the cut-off price qualify as winners of the auction round). The idea behind revealing prices is to show that the mechanism of the random *n*th-price auction will reward truthful bidding and punish insincere bidding and also that participants can evaluate their position relative to the cut-off price. Participants were also warned not to use the price revelation to compare their bids with other bidders' prices, as it is an auction where the optimum strategy is to truthfully bid *your* willingness to pay.

Step 5: Information & second bidding round of practice auction

An information sheet was handed out with the same label that appears on the second block of fudge and an explanation of what the label represents.

The above label is an indication of products that are ***trans fatty acid*** and ***saturated fat*** free.

Trans fatty acids are commonly known as ***trans fat*** and are made by heating liquid vegetable oils in the presence of hydrogen gas. Side effects of ***trans fat*** consumption include increases in cholesterol levels, increase in inflammation and an over activity of the immune system, that is implicated in chronic illnesses such as heart disorders and diabetes. ***Trans fats*** are more stable than other fats, which makes it an attractive option for manufacturers to use, since products are less likely to spoil.

Saturated fats are typically fats that are found in animal products such as cheese, red meat and butter. Over consumption of ***saturated fats*** can lead to undesirable cholesterol levels which, in turn, can cause cardiovascular disease. Low ***saturated fat*** content is sometimes undesirable since it is a perception under consumers that taste is compensated when saturated fat levels are reduced.

Source: Harvard Public School of Health
http://www.hsph.harvard.edu/nutritionsource/what-should-you-eat/fats-full-story/index.html

Figure 3.3 Fat free information sheet

Participants were asked to take revealed prices and information into consideration and then bid for a second time. Bidding slips were collected and sorted. Again a random cut-off price was determined by the monitor drawing a random number *n* from the sample distribution to indicate the cut-off position.

Step 6: Winners of fudge auction determined

A binding round was then randomly drawn by the flip of the coin. Winners were revealed with payment and exchange to take place after the entire auction procedure.

Step 7: First bidding round of Karoo lamb auction

Participants were informed that the second auction for lamb chops was to commence. The facilitator explained that the auction would consist of six bidding rounds and that only one of these rounds would be randomly drawn to determine the binding round. It was further explained that the binding round would be determined after the sixth round by the role of the dice. Once again it was mentioned that because the binding round is randomly determined, it is in the bidders' best interest to bid sincerely in every round. The participants were asked to bid in R1 increments in order to simplify the exchange process.

An unmarked packet of approximately 500g of lamb loin chops (base product) was sent around the auction audience. The chops were packed in a cellophane tray with clear wrap to make the product completely visible to the audience. Participants were told that they each already had a similar packet of chops to take home, but that it was stored in the kitchen fridge at the facility due to the perishable nature of the product. A second similar 500g packet of lamb loin chops was sent around, the only difference in the product being that the second packet of chops were marked with a label "Karoo lamb" (below). The label below is also the actual label being developed in South Africa for the certification of Karoo lamb. It was decided to use the actual label to add authenticity to the experiment, thereby creating even more of a real-market climate.

Figure 3.4 Certification mark for Karoo meat of origin

Participants were then asked to place a bid to upgrade the base product to the product certified as Karoo lamb. There was no limit as to what they could bid, i.e. no monetary constraint was placed on bidders. One can argue that there are some monetary constraints, but with the product having a market value of approximately R50 and participants being endowed with R200 as compensation for attending the auction and bidding money, any participant could easily bid four times the market value of the base product as a premium on the base product, however, this would be a highly unlikely scenario. If participants wished to bid more than R200 as the premium, they would have the option to pay the difference from their own pocket (as would be the realistic market situation). No verbal or written constraints on bids were placed during the auction.

It is important to note that participants were only bidding their willingness to pay a premium above current retail prices for 'generic' South African lamb. The study thus aims to assess the value of clearly identifying and market a meat product of origin for the consumer, similar to studies done by Alfnes & Rickertsen (2003) and Evans, Brown, Collins, D'Souza, Rayburn & Sperow (2008) where consumers' willingness to pay for meat of origin was tested using an experimental auction. There are two options when considering the procedure to elicit the demand for a novel product. Subjects can either be

endowed with a good and asked how much they are willing to pay to upgrade the original good to a novel good with similar but somewhat different attributes; or they can simply bid on the full value of the novel good (Lusk, Feldkamp & Schroeder, 2004).

The reason, in this specific experiment, for not bidding on the entire product is to simplify data analysis. As explained in the study by Corrigan, Depositario, Nayga, Wu, & Laude (2009), if participants only bid on the product, the bidding value can be taken as the premium a participant is willing to pay for the additional attribute. Where participants bid on the entire product and their market value for the base product is not known, it would be complicated to extract the WTP estimate for the additional product attribute. A further reason is that the specific product in this auction is only an 'upgraded' version of an existing product which is well known to participants. The value that participants attach to the base product is not known, because market prices for the base product were not given to participants; the researcher cannot state the exact reference price used by participants in this experiment. It thus simplifies the procedure to simply bid on a premium amount for the upgraded product.

All the bids were collected and sorted from the highest to the lowest bid. A random number (*n*) was drawn to determine the cut-off position indicating the market clearing price. A random *n* is drawn from the distribution between 2 and the number of participants (k), as explained in Chapter 2. This random number allocates the position which will in turn determine the cut-off price (also referred to as the payment- or market clearing price). To explain, if the random number *n* is 19, the price of the nineteenth position is taken as the cut-off price. Every bid above the cut-off price won the auction. If there are bids in positions above random number 19 with the same price as position 19, they would be grouped together with the random number position and would not win the auction.

The reason for a position being drawn and not a random price is as follows: If a price is drawn, then there would be limitations on what could be the winning

price. The monitor would have to decide on a band for the prices that could be possible cut-off prices. On the other hand, if a position is drawn, bidding prices are not influenced by the monitor at all and are completely random and original.

The winning participants ID numbers are revealed as well as the random number (position) and the payment price. This information can be used to monitor the mechanism to prove that truthful bidding is the best strategy.

Step 8: Second bidding round of Karoo lamb auction

Participants were asked to take the revealed bidding information and market-clearing price of the previous round into account. Once again they had to write their maximum willingness to pay to exchange the generic lamb loin chops for the certified Karoo lamb loin chops.

The auction is repeated for several rounds with a specific information treatment being introduced after a given round. When Lusk & Shogren (2007) explain how to conduct an experimental auction, he suggests that the auction should be repeated for several rounds. The reason for repeated rounds is that participants only realize that it is the best strategy to bid truthfully after a few rounds of bidding (Melton, Huffman, Shogren, Fox, 1996). Repeated rounds were done is most of the experimental literature analysed for this study (Melton, Huffman, Shogren, & Fox, 1996; Giamalva, Bailey & Redfern, 1997; Cunningham, 2003; Noussair, Robin & Ruffieux, 2004).

All the bids were collected and sorted from the highest to the lowest bid. A random number (*n*) was drawn to determine the cut-off position indicating the market clearing price. The winners of the round and the payment price were revealed.

Step 9: Third bidding round of Karoo lamb auction, where the first information treatment about Karoo Lamb is introduced

In the second round of bidding for Karoo lamb, additional information about the label was given to participants in the form of an information sheet.

*The label above is a **guarantee** that the meat is from the **Karoo region**.*

Where is the *Karoo?*
Traditionally the Karoo is the great semi-arid area stretching North-eastwards from the Cape.

Some requirements to conform to in order to be labelled as *Karoo meat*:
Only animals originating from the Karoo or animals that remained in the area of the Karoo at least 12 months before slaughter and which is free of scheduled diseases can be labelled as Karoo meat.

Animals should have free access to sufficient amounts of cold, fresh, clean water meeting the requirements of drinking animals. The animals should also have free access to natural veldt grazing. Supplementary feeding is permitted in times of drought.

Karoo Lamb as a brand:
"Windmills, sheep, farm homesteads, endless vistas, home-baked bread…"
The 'Karoo' concept has become synonymous with quality, tradition and wholesomeness. A South African treasure: flocks of sheep, grazing freely amongst scattered shrubs. "Their meat is spiced on the hoof and described as *mouth-watering succulent*." No surprise, these sheep feed on a thousand different species of wild herbs – the most exquisite lamb, world-renowned as free-range Karoo Lamb.

Source: J.F. Kirsten, D. Troskie, H. Vermeulen, H. Schönfeldt and C. Bramley. The potential of Karoo Lamb as origin based meat and Geographical Indication – University of Pretoria, 2008

Figure 3.5 Karoo information sheet

Participants were given time to read through the handout on *Karoo Meat* before asked to bid the maximum amount they were willing to pay to exchange their originally endowed lamb loin chops for the certified Karoo lamb loin chops.

All the bids were collected and sorted from the highest to the lowest bid. A random number (*n*) was drawn to determine the cut-off position and the market clearing price.

The round's winners were revealed as well as the random, endogenous payment price.

Step 10: Fourth bidding round of Karoo lamb auction

Participants were asked to take a holistic view of the auction procedures thus far and take all relevant information into account before submitting their next bid. Once again they had to write their maximum willingness to pay to exchange the generic lamb chops for the certified Karoo lamb chops.

All the bids were collected and sorted from the highest to the lowest bid. A random number (*n*) was drawn to determine the cut-off position indicating the market clearing price. The winners of the round and the payment price were revealed.

Step 11: Fifth bidding round of Karoo lamb auction, where the second information treatment about Karoo Lamb is introduced

For the second time, participants were to receive additional information about Karoo lamb. In this step of the proceedings, participants were presented with a PowerPoint-supported presentation by Prof. Hettie Schönfeldt, a nutritionist and animal scientist who was actively involved in the sensory research on Karoo lamb preceding the experimental auction. The presentation covered research done on sensory differences between mutton produced in different regions in South Africa and Namibia, and further compared fatty acid profiles

of mutton from different regions with that of the Karoo region. It is important to note that all information given to participants were factual and not leading them in any favourable or non-favourable way to bid in a specific way.

After the presentation, participants were asked to take all given information (additional information on the product as well as the information from revealed bids and payment prices into account before bidding to exchange their generic lamb chops for certified Karoo lamb chops.

Bidding slips were collected and sorted. Again a random cut-off price was determined by the monitor drawing a random number *n* from the sample distribution to indicate the cut-off position.

Step 12: Sixth bidding round of Karoo lamb auction

This is the sixth and final round of the Karoo lamb auction. Participants were asked to take all information given during the past rounds into account and then bid the maximum amount that they were willing to pay to exchange the first packet of lamb chops for certified Karoo lamb chops.

All the bids were collected and sorted from the highest to the lowest bid. The random *n* cut-off price was drawn. Winners and the payment price were revealed.

Step 13: Auction winners are determined

Finally, the monitor used a six-sided dice to determine the binding round for the Karoo lamb auction. The final auction winners were revealed. The winners of the fudge- and the Karoo lamb auction were taken aside and the exchange for the novel product (Fat Free Fudge & Karoo lamb chops) was made where the winners then paid the payment prices for the two auctions respectively.

3.4 DATA ANALYSIS

For the first set of variables (socio-demographic variables, presented in Chapter Four) the data was analysed using the Pearson Chi-square test. This test was chosen to analyse the goodness of fit of a normal variable with more than two categories.

The data presented in Chapter Five was analysed using a one-way analysis of variance (ANOVA) test. In this section, the socio-demographic variables captured in the pre-auction survey were linked to the average bids recorded in the experimental auction. The one-way ANOVA test was chosen to analyse whether observed differences among means could be attributed to chance or if there was statistical merit in these differences.

3.5 CONCLUSION

This chapter presented a detailed discussion on the design and implementation of a random *n*th price auction applied to Karoo lamb.

The first part of the chapter was concerned with the experimental organization of the study, explaining the chosen target population, sample size and sample demographics. The second part of Chapter Three focused on the experimental design and implementation. The specific design and execution of the experimental auction was presented in thirteen steps. Motivations for the specific design choices were discussed from a practical viewpoint as well as past studies.

The results obtained from the pre-auction survey will be presented in the next chapter, giving a thorough overview of the socio-economic profiling of the sample as well as their attitudes and purchasing behaviour regarding red meat.

CHAPTER 4

SOCIO-ECONOMIC PROFILE AND MEAT PURCHASING BEHAVIOUR OF PARTICIPANTS

4.1 INTRODUCTION

In Chapter three, the experimental procedure for both the written survey and the experimental procedure were discussed. Chapter Four is dedicated to presenting the socio-economic profile of the sample through a discussion and presentation of the pre-auction survey results.

The discussion in this chapter follows the same sequence as that in the survey, by first discussing demographic variables, food preparation behaviour, meat purchasing and consumption behaviour, mutton and lamb purchasing factors, Karoo lamb awareness and purchasing and finally Karoo lamb purchasing behaviour.

4.2 STATISTICAL ANALYSIS

In analysing the results of the survey, a Pearson Chi-square test was applied. The Pearson Chi-square was chosen to tests the goodness of fit when dealing with a normal variable with two or more categories. An example of a typical normal variable would be gender group with male and female as the two categories.

All Chi-square analysis was done by means of the statistical package SPSS 12.0 for Windows. The test statistic, degrees of freedom and the p-value (indicting statistical significance) is reported.

4.3 SAMPLE DEMOGRAPHICS

The sample demographics were captured in the pre-auction survey. The potential links between respondents' demographic characteristics and their responses to stated preferences are explained through the survey results. The demographic characteristics of the sample are summarised in Table 4.1. The remaining part of this section explores the validity of the sample demographics.

Table 4.1: Sample demographics

Variable	Sample Characteristics (n=31)
Gender	
% Male	20.0%
% Female	80.0%
Age	
% up to 40 yrs	45.2%
% > 40 yrs.	54.8%
Education	
Up to Gr. 12	3.2%
Technicon diploma/degree	3.2%
University degree	80.6%
Other post-matric qualification	12.9%
Monthly *household* income	
< R10 000	0%
R10 000 – R14 999	12.9%
R15 000 – R19 999	6.5%
R20 000 – R24 999	12.9%
R25 000 +	67.7%
Average household size	
Average household size	3 people / household

In terms of gender, the sample consisted of 80% females. According to SAARF (2010a, 2010b)[1] established consumers (LSM 7 – 10) would have an

[1] The SAARF (2010a, 2010b) summary profile of the South African consumer market based on the SAARF LSM® segments can be found in Appendix C.

approximate split in gender of 50% female, implying an overrepresentation of females in the sample. However, this does not pose as a major concern because there is a disproportionate share of household shopping done by females (Evans *et al.,* 2008). A study by Katsaras, Wolfson, Kinsey & Senauer (2001) in Cunningham (2003) showed that 83% of females are the grocery shoppers for the household. Anecdotal evidence suggests that the same statement (females do most of the household's grocery shopping) holds for South African consumers and that the gender split of 80% female seems representative of the primary grocery shoppers.

The average age of the participants in this study was 42, with a maximum and minimum age of 70 and 24 years respectively. In the South African consumer market, the dominant age groups for established consumers are between 24-49 years of age with the balance of consumers being fifty or older, as summarised in Table 4.2 (SAARF, 2010a, 2010b).

Table 4.2: Age split of established South African consumers

LSM Group	Age split within group
7	35-49 years of age (28%) 25-34 years of age (26%)
8	35-49 years of age (29%) 50+ years of age (25%)
9	35-49 years of age (28%) 25-34 years of age (26%)
10	35-49 years of age (28%) 25-34 years of age (26%)

Adapted from: SAARF (2010a, 2010b) summary profile of the South African consumer market based on the SAARF LSM®

When the sample of participants is compared to the above statistics from SAARF, 36.6% of participants fall in the age group 24-34 years, 30% of participants are 35-49 years and 33.3% of participants are 50 years or older, which is comparable to the South African age demographic of established consumers.

The major split in age groups in the data used in this thesis was up to 40 years of age or older than 40 years of age. It was decided to split the sample into only two categories due to the sample being relatively small. With ages of participants ranging from 24 to 70 years old, and the sample consisting out of 31 participants, the age spread was simply too big for the given sample to look at individual age groups. The reason why the split was done at up to 40 years of age or older than 40 years was as follows: when age data was sorted, this specific split in age groups would yield two groups which would closely split the sample into two similar sized groups, leaving enough observations in each group to improve statistical analysis.

Concerning education level, the majority of the sample (80.6%) holds a university degree, while 96.7% have some or other post-matric qualification. The selected sample for this study is more educated than the general South African consumer in the LSM 7 – 10 group. An average of approximately 68% of consumers holding a high school diploma and approximately 30% of consumers holding a post-matric qualification in the LSM 7 – 10 (SAARF, 2010a, 2010b).

The sample's income demographic fell within these averages with the entire sample having a minimum household income of R10 000 per month and 67.7% of the sample earning more than R25 000 per month. According to SAARF (2010a, 2010b) an established South African consumers would typically have a monthly household income of between R9 238 (LSM 7) to R24 554 (LSM 10). Furthermore, given the expensive nature of sheep meat, a wealthier sample was appropriate for this study.

No direct correlation is made by SAARF summarizing the profile of the South African consumer market based on the SAARF LSM segments between LSM groups and household size. In the National South African Census (2001) the average South African household is recorded to consist of 3.8 people. When considering the geographical breakdown of LSM groups 7 – 10, it is observed that these higher LSM groups are situated mainly in Gauteng, Western Cape and KwaZulu-Natal (SAARF, 2010a, 2010b). According to the National

Census (Statistics SA, 2001), household sizes for Gauteng consists on average of 3.2 people, Western Cape of 3.6 people and KwaZulu-Natal of 4.2 people. Since the sample for this study was selected from Gauteng, the average household size of 3 people per household would be consistent with the national average household size in Gauteng.

According to the above discussion, the sample is largely comparable with established South African consumers in LSM 7 – 10.

4.4 FOOD PREPARATION BEHAVIOUR

Food preparation behaviour of the sample was analysed in order to explore the impact of evening meal preparation and duration on participants' bidding behaviour. Results are presented in Table 4.3.

Table 4.3: Food preparation behaviour

Variable	Frequency (n=31)	Significant Difference
Food prep. frequency		Yes, when comparing age groups
Daily	51.6%	[χ^2=7.874; df=2; p=0.02]
3 – 4 times per week	35.5%	Younger consumers (age ≤ 40) – less often (28.6% daily).
1 – 2 times per week	12.9%	Older consumers (age > 40) – more often (70.6% daily).
		None for:
		Gender: [χ^2=1.005; df=2; p>0.1]
		Household size: [χ^2=8.203; df=8; p>0.1]
Food prep. duration		None:
1 hour	25.8%	Gender: [χ^2=1.445; df=2; p>0.1]
30 min – 1 hour	67.7%	Age: [χ^2=4.081; df=2; p>0.1]
< 30 min	6.5%	Household size: [χ^2=7.879; df=8; p>0.1]

Frequent evening meal preparation was prominent in the sample, with approximately half of the sample (51.6%) preparing evening meals on a daily basis and 35.5% preparing meals 3 to 4 times per week. Furthermore, approximately 70% of the sample spends between 30 minutes to an hour for

preparation of an evening meal. These results are as expected, fitting the required target population.

The food preparation behaviour of demographic sub-groups in the sample was statistically compared with demographic variables of gender, age and household size. There are no statistically significant differences in terms of the food preparation behaviour and gender or household size sub groups.

When considering age comparisons, there was a statistical significant difference, (χ^2=7.874; df=2; p=0.02) between age groups and food preparation frequency. Participants who are older than 40 years would typically prepare evening meals more frequently than participants who are 40 years of age or younger. This can be explained by younger people following the trend of a faster lifestyle. Furthermore, it could possibly also be explained that people 40 years or older have families at home whom they cook for.

Generally the various demographic sub-groups thus engage in very similar behaviour in terms of evening meal preparation frequency and duration, with the exception of age.

4.5 MEAT PURCHASING AND CONSUMPTOIN BEHAVIOUR

Respondents' red meat and sheep meat preferences were analysed in terms of purchase outlets, consumption frequency and relevant purchasing factors. Meat purchasing and consumption behaviour was analysed to see if these behavioural trends related to bidding behaviour.

Table 4.4: Red meat purchasing and consumption behaviour

Variable	Red meat (n=31)	Sheep meat (n=31)
How often do you consume meat?		
Daily	9.7%	0%
3 – 4 times per week	61.3%	6.5%
1 – 2 times per week	29.0%	48.3%
Twice a month	0%	38.7%
Once a month	0%	6.5%
Where do you buy meat?		
Butchery	67.7%	61.2%
Spar	48.4%	32.3%
Woolworths	41.9%	41.9%
Checkers	19.4%	16.1%
Farmer	6.5%	9.7%
Farmers' Market	6.5%	0%
Pick 'n Pay	3.2%	35.5%

As evident from Table 4.4, the majority of the sample consumes red meat at least once a week, with most of the sample (61.3%) consuming red meat three to four times per week. This shows that the sample selected for this study meets the criterion that the participants in this study should be regular consumers of red meat.

Frequent sheep meat consumption was not prominent from the results. None of the sample consumes sheep meat on a daily basis and only 6.5% of the sample consuming sheep meat 3 - 4 times per week. The majority of the sample (48.3%) consumes sheep meat at least once or twice a week with 38.7% consuming it twice a month. This result is understandable because sheep meat is one of the more expensive meat types in South Africa.

It should be noted that when interpreting the data on where participants buy meat, they were allowed to choose multiple retail outlets (if applicable). Thus, the percentages allocated to the different meat outlets would not add up to a 100%.

More than 60% of the sample purchase red and sheep meat from a local butcher, followed by Spar (48.4%) and Woolworths (41.9%). The results are slightly different for sheep meat purchases. While the butchery is still the most preferred outlet for buying sheep meat, Woolworths is the second most popular retailer (41.9%) followed by Pick ‘n Pay and Spar who are visited by 35.5% and 32.3% of the respondents respectively for sheep meat purchases.

These results are interesting given the fact that sheep meat prices observed at Woolworths and butcheries were the most expensive (see Table 3.1 for details), suggesting that the sample was not price sensitive. Furthermore, it could be indicative of consumers' quality perceptions linked to retail outlets like Woolworths and butchers, overshadowing their price concerns.

4.6 SHEEP MEAT PURCHASING FACTORS

In this section of the survey participants were asked to select three of the factors from the given list (see Table 4.5 below) that would typically influence their purchase choice of sheep meat. Table 4.5 presents the share of the sample who selected a specific purchasing factor as well as statistically significant differences between variable levels.

Table 4.5: Factors considered by participants when purchasing sheep meat

Variable	Percentage of sample considering specific factor (n=31)	Significant Difference
Cut	90.3%	None: Gender: [χ^2=0.797; df=1; p>0.1] Age: [χ^2=0.188; df=1; p>0.1] Household income: [χ^2=1.582; df=3; p>0.1]
Price	83.9%	None: Gender: [χ^2=0.002; df=1; p>0.1] Age: [χ^2=0.530; df=1; p>0.1] Household income: [χ^2=1.519; df=3; p>0.1]
Fat content	51.6%	Yes, when comparing gender groups Yes; [χ^2=3.638; df=1; p=0.056] Male consumers – less important (16.7%) Female consumers – more important (60%). None for: Age: [χ^2=0.784; df=1; p>0.1] Household income: [χ^2=2.017; df=3; p>0.1]
Colour	41.9%	None: Gender: [χ^2=0.002; df=1; p>0.1] Age: [χ^2=0.682; df=1; p>0.1] Household income: [χ^2=2.301; df=3; p>0.1]
Expiry date	22.6%	None: Gender: [χ^2=0.199; df=1; p>0.1] Age: [χ^2=0.524; df=1; p>0.1] Household income: [χ^2=2.467; df=3; p>0.1]
Brand	19.4%	Yes, when household income level Yes; [χ^2=6.594; df=3; p=0.086] Income level R10 000-R14 999 and R20 000 – R24 999 – relatively import (50%). Income level R15 000 – R19 999 – not important. Income level R25 000+ - slightly important (9.5%). None for: Gender: [χ^2=1.786; df=1; p>0.1] Age: [χ^2=0.420; df=1; p>0.1]

Variable	Frequency (n=31) Positive Replies	Significant Difference
Packaging	19.4%	None: Gender: [χ^2=0.931; df=1; p>0.1] Age: [χ^2=1.389; df=1; p>0.1] Household income: [χ^2=1.712; df=3; p>0.1]
Organic	9.7%	Yes, when household income level Yes; [χ^2=10.979; df=3; p=0.012] Income level R10 000-R14 999 – relatively import (50%). Income level R15 000 – R19 999 and R25 000+ - not important Income level R20 000 – R24 999 - relatively important (25%). None for: Gender: [χ^2=0.416; df=1; p>0.1] Age: [χ^2=0.620; df=1; p>0.1]
Free range	3.2%	None: Gender: [χ^2=0.248; df=1; p>0.1] Age: [χ^2=1.255; df=1; p>0.1] Household income: [χ^2=0.492; df=3; p>0.1]

It should be noted that *meat of origin* as a purchasing factor was not included in the listed factors in the pre-auction survey. The reason for not including this factor, even though it is the focus attribute for the case study, is because only existing attributes/factors were included in the choice set. Meat of origin (with regards to sheep meat) is not formally marketed in South Africa yet, thus it was excluded from possible factors that could influence participants' purchasing decision with regards to sheep meat.

The most important factor (frequency of 90.3%) for participants when considering buying sheep meat is the specific cut of the meat. This observation could be viewed in light of the versatile nature of sheep meat allowing for preparation of a variety of dishes from different meet cuts.

The price of the meat is the second most important factor for respondents when buying sheep meat, with 83.9% of participants indicating that price is a factor. This is an interesting observation, seeing as in the previous section most of the selected sample bought sheep meat at the butchery or Woolworths, both relatively expensive outlets for buying meat. This trend indicated that consumers might be price inelastic, but contradicting the observation is the fact that most consumers still consider price as one of the important factors influencing their purchase behaviour.

The third most important factor is the fat content of the meat. As could be expected, there is a significant difference (χ^2=3.638; df=1; p=0.056) between fat content influencing purchase behaviour and gender groups. For male consumers it is a less important factor while 60% of females consider it an important factor when purchasing sheep meat. It is generally known that women are more focused on dieting, which could explain the fact that fat content is an important purchasing consideration by female participants. As mentioned in the study by Mooney, Farley & Strugnell (2009) thinness has become synonymous with beauty and status. They further state that predominately females have dissatisfaction with their body image and strive to achieve current ideals through dieting. It should be mentioned that these results could be slightly distorted, due to only 20% of the sample consisting of male participants.

Lanari, Schaefer & Scheller (1995) found that colour perception plays a key role in consumers' evaluation of red meat quality. It was thus an expected result when colour was the fourth most frequent listed factor when buying sheep meat with a frequency of 41.9%. Consumers usually relate the bright red colour in red meat to freshness, while discriminating against meat that has turned a browner colour (Hood & Riordan (1973) in O'Sullivan, Byrne, Martens, Gidskehaug, Andersen & Marten, 2003).

The expiry date of the meat was fifth most important factor with a frequency of 22.6%. One would expect the expiry date to be more important, but a possible

explanation could be that the participants trust their preferred retailer to sell fresh meat.

The branding of meat was chosen by 19.4% of participants as a determining factor when buying sheep meat. When the relationship between branding as a purchasing factor and demographic variables was tested, a significant difference between levels of household income was found (χ^2=6.594; df=3; p=0.086). However, the nature of this statistical significant difference was found to be potentially bias due to the disproportionate share of income levels in the sample. Packaging is also a determining purchasing factor for 19.4% of the sample, with no statistically significant difference between demographic sub-groups.

Approximately 10% of the sample indicated that meat being organic would influence their purchasing decision. When tested against demographic variables, a statistical significant difference was found in terms of household income level (χ^2=10.979; df=3; p=0.012). An interesting observation was that for the income levels of R15 000 – R19 000 and R25 000+ per month, organic meat was not important at all. These two income groups make up approximately 74% of the total sample. Thus, for this sample, sheep meat being organic would not have a major impact on the purchasing decision. Once again, these results could be bias due to the disproportionate share of income levels in the selected sample.

Only 3.2% of the sample indicated that the product being free range would influence their being decision. No statistical significance was found between demographic sub-groups.

From the above representation of results and the discussion a clear indication is given of what consumers deem important when purchasing sheep meat. The cut of the product and the price is by far the most considered factor for consumers in this sample. In Table 4.6, sheep meat purchasing factors were grouped together based on consumers' choice sets. The frequency in the table indicates the percentage of the sample that selected the specific group of factors as important when buying sheep meat.

Table 4.6: Combinations of mutton & lamb purchasing factors

Combination of Factors	Frequency of Combinations (n=31)
Price, fat, cut	29.0%
Price, cut, colour	9.7%
Price, cut, packaging	9.7%
Price, brand, cut	6.5%
Price, expiry, brand, fat, organic, cut, packaging, colour	6.5%
Price, expiry, cut	6.5%
Price, fat, colour	6.5%
Brand, cut, colour	3.2%
Expiry, brand, cut	3.2%
Fat, cut	3.2%
Fat, cut, colour	3.2%
Organic, cut, colour	3.2%
Price, expiry, cut, colour	3.2%
Price, expiry, fat, cut, colour	3.2%
Price, packaging, colour	3.2%

According to these results, the most popular factor choice set for sheep meat include three factor groups, with price and cut consistently present and combined with fat content (29%), packaging (9.7%) and colour (9.7%).

These results emphasise that the two factors consumers from this sample is most concerned with is the combination of the price and the cut.

4.7 KAROO LAMB AWARENESS AND PERCEPTION

After exploring respondents' red meat and sheep meat purchasing and consumption behaviour, the focus then shifted towards Karoo lamb specifically. Participants were questioned about their knowledge and attitude

towards Karoo lamb. The data gathered in this regard was critical in order to develop an understanding of respondents' 'baseline' Karoo lamb knowledge and behaviour before being exposed to the experimental procedures of the auction.

The sample had an excellent awareness of Karoo lamb, with 97% of the sample indicating that they have heard of the product before the auction day. Participants were then asked what image comes to mind when they consider the term 'Karoo lamb". Table 4.7 presents the results.

Table 4.7: Images related to Karoo lamb

Image of Karoo lamb	Frequency (n=31)
Karoo veld / shrubs	25.8%
Tasty	25.8%
No Image	19.4%
Quality	12.9%
Aroma	9.7%
South African Authentic	9.7%
Organic	9.7%
Wild taste	9.7%
Fresh	6.5%
Free range	6.5%
Natural	6.5%
Tender	6.5%
Christmas	3.2%
Wholesome	3.2%

Approximately, 19% of participants did not have any distinct opinion/idea about the term 'Karoo lamb'. All the other images can be interpreted as positive, except for approximately 10% of the sample who said that they think of a "wild taste" when considering the term 'Karoo lamb'. The dominant Karoo lamb images related to *Karoo veld / shrubs* (25.8%) and *tasty* (25.8%)

followed by *quality* (12.9%); *aromatic* (9.7%); *organic* (9.7%) and *SA authentic* (9.7%). Thus the sampled consumers' perceptions about Karoo lamb are generally positive.

In the second part of the question relating to consumers' perceptions and purchasing behaviour of Karoo lamb, participants were required to answer questions regarding their Karoo lamb purchases. The results are recorded in Table 4.8 and discussed below.

Approximately 65% of the participants have bought Karoo lamb before. A significant difference was found (χ^2=5.231; df=1; p=0.022) between age groups, with a significantly smaller share of consumers in the younger age group (age ≤ 40) who have bought Karoo lamb before as opposed to 82.4% of older participants (age >40) who have bought Karoo lamb before. Karoo lamb has become synonymous with the typical, almost nostalgic, old fashioned wholesomeness of South African cuisine, as explained in a culinary article by Odendaal (2010). This link between Karoo lamb and the olden day culture of South Africans could possibly explain why higher previous purchases of Karoo lamb were observed for the older group of participants.

Table 4.8: Karoo lamb knowledge and perception

Variables	Frequency	Significant Difference
Bought Karoo lamb before?	**(n=31)**	Yes, when comparing age groups
Yes	64.5%	[χ^2=5.231; df=1; p=0.022]
		Younger consumers (age ≤ 40) – less often (42.8%).
		Older consumers (age > 40) – more often (82.4%).
		None for:
		Gender: [χ^2=0.685; df=1; p>0.1]
		Household income: [χ^2=2.815; df=3; p>0.1]
If no, why not?	**(n=11)**	None:
Not available	81.8%	Gender: [χ^2=1.494; df=2; p>0.1]
Trust issues	18.2%	Age: [χ^2=5.966; df=2; p<0.1], but stats not reported as significant due to very small sub-sample distorting the results.
		Household income: [χ^2=9.968; df=6; p>0.1]
If yes, do you trust that it is authentic?	**(n=20)**	None:
		Gender: [χ^2=0.952; df=1; p>0.1]
Yes	70%	Age: [χ^2=0.848; df=1; p<0.1]
		Household income: [χ^2=2.967; df=3; p>0.1]
Willing to pay a premium for Karoo lamb?	**(n=31)**	Yes, when comparing age groups
		Yes; [χ^2=9.120; df=1; p=0.003]
Yes	58.1%	Younger consumers (age ≤ 40) – less often (28.6%).
		Older consumers (age > 40) – more often (82.5%).
		None for:
		Gender: [χ^2=1.869; df=1; p>0.1]
		Household income: [χ^2=3.719; df=3; p>0.1]

The rest of the sample, who have not bought Karoo lamb before, had two reasons for not buying the product. Firstly, most of the group (81.8%) replied that the product is not available at their local retailer or butcher. Secondly, 18.2% of the sample replied that they do not trust whether it is really authentic Karoo lamb that they would be buying. Availability as a reason for not buying the product is a possible consequence of the product not being available as a branded, certified product in leading retailers such as Woolworths, Checkers, Spar or Pick ‘n Pay.

When the group who had bought Karoo lamb before were asked if they trust that the product they buy is authentic, 70% replied that they do. They further indicated that they can trust the meat as authentically from the Karoo, because they trust the butcher they buy it from or they buy it directly from the Karoo and not through a local retailer. Some of the participants indicated that they are still careful not to buy meat that is marketed as Karoo lamb, because it might not be authentic. These concerns of the participants regarding the authenticity of Karoo lamb are a clear indication of the need for a trusted, third party certification label for Karoo lamb serving as meat of origin indication and guarantee.

Lastly, participants were asked if they are willing to pay a premium for Karoo Lamb. Despite there being obvious trust issues about the authenticity of Karoo Lamb, 58.1% of participants indicated that they are willing to pay a premium for Karoo lamb. A statistical significant difference was observed (χ^2=9.120; df=1; p=0.003) when participants' willingness to pay a premium for Karoo lamb was linked to the sample demographic of age. It was found that consumers older than 40 years (who also tend to buy Karoo lamb more often) were more likely to pay a premium for the product than consumers of 40 years and younger. This result could once again be explained by the older generation having nostalgic connections to the Karoo and images related to the Karoo, therefore being willing to pay a premium for certified Karoo lamb.

4.8 SUMMARY

In this chapter, various demographic variables as well as purchasing behaviour and participants' attitudes towards red meat and sheep meat were addressed. Demographic variables revealed the composition of the sample, which consisted of mainly females. Behavioural variables such as purchasing behaviour were discussed in detail.

More than 96% of participants were aware of Karoo lamb before the day of the auction, while approximately 65% of the sample has bought the product

before. Issues regarding the authenticity and the lack of availability of Karoo lamb were raised. Despite of the obvious concerns regarding Karoo lamb, approximately 58% of the sample indicated that they are willing to pay a premium for Karoo lamb.

In Chapter Five, the auction results will be discussed and mean bids from the auction will be linked to results from Chapter Four.

CHAPTER 5

RESULTS FROM THE EXPERIMENTAL AUCTION

5.1 INTRODUCTION

As discussed in Chapter 3 the experimental auction consisted of 6 bidding rounds, representing three treatments with two bidding rounds within each treatment group. The generic initially endowed product was a 500g packet of loin lamb chops (approximately six chops) and participants bid to upgrade their generic product to a similar 500g packet of six loin lamb chops which is certified as meat form the Karoo region. The average bids for the various treatments and bidding rounds are summarised in Table 5.1. Individual bids and cut-off positions drawn in the auction are presented in Appendix D. A photographic presentation of the experimental auction can be found in Appendix E.

The rest of the chapter is concerned with discussing the results from the experimental auction where the variables addressed in the pre-auction survey are linked to the auction bids to determine any possible influence the variables could have on bidding behaviour.

5.2 STATISTICAL ANALYSIS

A one-way analysis of variance (ANOVA) test was applied in this section of the study to investigate whether there were statistically significant differences between the mean values of the auction bids, and also between the mean values of sub-groups. The one-way ANOVA was chosen in order to see if the differences between means can be attributed to chance, or if there really is a statistical meaningful difference between means.

All ANOVA tests were performed with the statistical package of SPSS 12.0 for Windows. The test statistic (F), degrees of freedom (between groups) and the p-value are reported.

5.3 AUCTION RESULTS

In this section, the results from the random *n*th price auction will be presented and discussed in detail. The aim of the auction was to measure the maximum premium participants are willing to pay for the additional attribute; meat of origin from the Karoo.

Secondly, the impact of information treatments on bidding behaviour was tested. There were six bidding rounds in this auction, with information treatments being introduced after every second round. Thus, every round was repeated once before additional information was introduced. Using repeated rounds in experimental auctions is a common practice, the reason being that subjects usually require several rounds of bidding before realising that their optimum strategy is to bid truthfully (Lusk & Shogren, 2007; Melton, Huffman, Shogren & Fox, 1996). The early rounds in the auction are thus part of the learning process (Giamalva, Bailey & Redfern, 1997).

The next goal of the auction was to see if the information treatments had a specific impact on bidding behaviour. This was done by grouping bidding rounds before and after information treatments together, with the average bids of the two rounds being used in analysis.

First, a one-way ANOVA test was done on the grouped bids to see if there is any statistical significant difference between rounds one and two; rounds three and four and rounds five and six. No significant difference was found with a p-value > 0.1 in all three cases. The average bids from rounds one and two; rounds three and four and rounds five and six were then grouped together to form only three average bids for further statistical analysis. It is important to note that the sample size has not been increased, because then bids from the same participant would have been taken into account twice.

Table 5.1 presents a summary of the results of average bids of each of the six bidding rounds as well as grouped bids within each information treatment group. The

standard deviation of each average bid as well as any possible statistical significant difference between these bids are summarised in Table 5.1.

Table 5.1: Average bidding amounts during the experimental auction for a 500g packet of loin lamb chops certified as meat from the Karoo region

Bidding round:	Information Treatment	Individual bidding rounds:			Information treatments:		
		Average premium price bid:	Standard Deviation	Significant differences:	Average premium price bid:	Standard Deviation	Significant differences:
Round 1	Exposure to Karoo lamb label	R8.26	7.742	None, [F=0.7676, df=1; p>0.1]	R7.56(a)	5.266	Significant differences [F=9.199, df=2, p<0.000] Between a & b (p=0.004) a & c (p=0.000) No significant difference was found between groups b & c (p=0.219)
Round 2		R6.87	4.225				
Round 3	Exposure to Karoo lamb information sheet	R10.71	5.113	None, [F=1.832, df=1; p>0.1]	R11.69(b)	5.443	
Round 4		R12.68	6.274				
Round 5	Exposure to Karoo lamb Presentation	R13.29	5.878	None, [F=0.037, df=1; p>0.1]	R13.44(c)	5.879	
Round 6		R13.58	5.949				

A detailed discussion of the data presented in Table 5.1 will be grouped into three sub-sections, where the results from bidding rounds within each information treatment group will be discussed.

5.3.1 Bidding premiums following exposure to the Karoo lamb label

As explained in detail in Chapter 3, in the first two bidding rounds of the experimental auction, participants received a 500g packet of generic lamb loin chops to examine, and then a second packet of 500g lamb loin chops was presented. The second packet of lamb loin chops was marked with a label that guarantees that the product is certified meat from the Karoo region. Participants were then asked to bid the maximum premium they would be willing to pay to upgrade their endowed generic packet of lamb loin chops to the certified Karoo lamb loin chops. The first bidding round of the auction was followed by a second bidding round, without introducing new information treatments to participants.

The bids for a premium on Karoo lamb recorded in the first bidding round can be seen as naïve bids, because participants have not received any additional information on the product up for auction. Furthermore, participants could not use a given market price as a reference, seeing as no market price information for loin chops was given. Thus, the only value participants have as reference is their own value of the product. An average bid of R8.26 for a premium on Karoo lamb was recorded, indicating that participants would pay an average price of R8.26 to upgrade their 500g endowed generic lamb loin chops to a 500g packet of certified Karoo lamb loin chops. One factor that could possibly have an influence on these initial bids is previous experiences associated with the auctioned product. People learn from previous experiences, and this could involve change in current behaviour (Kotler & Keller, 2006). Therefore, perceptions about Karoo lamb recorded in the pre-auction survey will be linked to bids recorded later in this chapter.

When the auction was repeated for a second time (without any new information being introduced) the average bid decreased to a premium of R6.87 to exchange the endowed product to the Karoo lamb product.

From a technical viewpoint, a possible explanation for the decrease in bids can be the following: In the first round, the randomly drawn market clearing price was relatively low at R1.50, with a high position number of 16. Thus to refresh, position number 16 was drawn as the cut-off position and the corresponding price at position 16 was a premium price of R1.50, meaning that any participant who bid a premium above R1.50 would be able to exchange their endowed generic lamb chops for Karoo lamb chops at a premium payable of R1.50.

When the information of the first round (payment price of R1.50 and winning ID numbers) were revealed, participants could have interpreted the results from the first bidding round as that they could bid lower and still fall above the cut-off price – meaning that they could pay a lower premium and still exchange the original good for the novel product, in so doing not bidding their true value for the product, but bid lower and still be a winner in the auction round. This could have led to participants bidding slightly below their true value, possibly thinking that the mechanism would not punish insincere bidding. Participants were also not following bidding instructions carefully which is clear from the cut-off price of R1.50; as participants were specifically asked to bid in R1 increments. Also, one must remember that the auction mechanism was still relatively new to participants and they had not yet realised that the mechanism would punish untruthful bidding.

No statistical significant difference was found between round one and two of the auction [$F=0.7676$, $df=1$; $p>0.1$] so these two rounds were grouped together. An average premium of R7.56 is observed for the premium participants are willing to pay to exchange 500g generic lamb loin chops for 500g certified Karoo lamb loin chops, when only being exposed to the Karoo lamb label.

5.3.2 Bidding premiums following exposure to the Karoo lamb information sheet

In this treatment group, the first information treatment was introduced to participants. They each received an information sheet with information about the Karoo region and the certified label on the auctioned product. After having time to read through the

information, participants were once again asked to bid the maximum premium they are willing to pay to exchange their endowed generic lamb loin chops for a similar packet of certified Karoo lamb loin chops.

In the third bidding round, bids increased dramatically from the second bidding round to a mean bid of R10.71. There are a few possible explanations for this increase in bidding prices: Firstly, participants realised that their untruthful bidding from round two was punished as a higher payment price realised relating to a higher cut-off position. This could be an indication that participants were starting to understand the auction mechanism better than in the first two rounds. Secondly, the most likely reason for the increase in bids is that the information treatment introduced to participants before this round could have had a significant impact on their bidding behaviour, indicating a positive relationship between learning more about the product and participants willingness to pay a premium for Karoo lamb.

In the fourth round, participants were asked to take the information gathered from the auction results as well as all additional information that they received throughout the auction proceedings thus far into consideration, and then once again place a bid for their willingness to pay a premium to exchange their generic lamb for Karoo lamb. Bids increased again to an average premium bid for Karoo lamb of R12.78. The increase in bids can possibly be explained by participants becoming more comfortable with the mechanism and understanding that insincere bidding will automatically be punished by the auction mechanism.

When rounds three and four are grouped together, an average bid of R11.69 is recorded. It is clear to observe the increase in bids as the auction progressed. There is now also a clear distinction between bids before and after the first information treatment. From the exposure to the Karoo lamb label to the first information treatment (information sheet) the increase in the average bids is R4.13. This relatively big increase in bids could have a two-fold explanation. Firstly, the information handout was effective and related positively to participants' willingness to pay a premium for Karoo lamb. Secondly, after four rounds of bidding, participants were getting comfortable with the auction mechanism and proceedings, and bidding a premium closer to their true value of the product.

5.3.3 Bidding premiums following exposure to the Karoo lamb presentation

Before the fifth bidding round, the second information treatment was introduced. Prof. Hettie Schönfeldt, a nutritionist from the University of Pretoria, presented a study which related to specific findings on the nutritional composition and sensory attributes of Karoo lamb (see Chapter 3 for detailed discussion).

After participants listened to the presentation (accompanied by visual slides) they were asked to once again bid the maximum premium they were willing to pay to exchange their generic lamb chops for Karoo lamb chops.

In the fifth round, an increase in the average recorded bids was once again observed with a mean bid for round five of R13.29. The increase can be explained by the continuous learning the random *n*th-price mechanism offers by revealing winners' ID numbers and the payment price. Also, additional information on the novel product, Karoo lamb was given after round four. The impact of the second information treatment was not as significant as that of the first information treatment, but still increased bids by R0.51 per 500g packet of chops.

For the last time, participants were asked to place their bids, taking into consideration al bidding information revealed in the previous rounds, as well as the two information treatments that they were exposed to. In the sixth and last round of bidding, only a slight increase in average bids was observed, at an average premium bid of R13.58. This trend can be explained by participants being comfortable and understanding the auction mechanism. If one considers the last three bidding rounds' average bids, it can be concluded that bids were stabilising and that this trend would have continued had there be more auction rounds.

The average bids from bidding rounds five and six were grouped together. The increase between these average bids observed after the first information treatment (information handout) and the second information treatment (verbal presentation), is smaller than the observation between the bids after exposure to the Karoo lamb label and the first information treatment, but still significant at R1.75. The logical conclusion is that the first information treatment had a much bigger impact on

bidding behaviour than the second. If recalled from Chapter 3, the first information treatment presented basic information about the Karoo lamb product opposed to the second information treatment which was an in-depth explanation of the product and its nutritional composition. When comparing the naïve bids after exposure to the Karoo lamb label with the bids after participants were exposed to the verbal presentation, all the revealed information throughout the auction and participants were comfortable with the mechanism, there is a considerable difference in the mean bids. The mean bids increased by R5.88 between the first combined round (R7.56) and last combined round (R13.44).

5.4 BIDDING PREMIUMS IN RELATION TO OTHER SURVEY VARIABLES

In this section, the average bids of the respondents are linked to variables recorded in the pre-auction survey. In particular, variables related to demographic characteristics, food preparation behaviour, meat purchasing and consumption behaviour, mutton and lamb purchasing factors and Karoo lamb awareness and purchasing behaviour. The purpose of the results presented in this section is to explore the existence of potential sub-segments within the sample, based on the variables listed above.

5.4.1 Mean treatment bids of demographic sub-groups

In Table 5.2 to Table 5.4 the mean bids from the experimental auction are explored in terms of the demographic variables included in the survey. The purpose of this section is to explore the demographic backgrounds of participants and if it has an effect on the bidding behaviour observed in the experimental auction.

The data presented in the tables below generally illustrates the absence of significant differences, when considering the bidding behaviour of demographic sub-groups in the sample. Certain demographic sub-groups presented with higher average bids, but the majority of these differences were statistically insignificant. A possible explanation for this unusual absence of significant differences in terms of demographic variables could be related to the sample size (n=31) being relatively

small when considering statistical analysis. When the sample size increases there is actually more information to analyse (the values of more random variables). One can expect the sample mean to be closer to the population mean, the quantity intended to estimate. Thus, one would be able to have a more accurate analysis of means, being able to decide if the differences among sample means can be attributed to chance, or whether it is real differences between the means of the population sampled (Freud, 1992).

Table 5.2: Mean bids linked to gender

Variable	Experimental Treatment	Variable Levels	Percentage of Total Sample (n=31)	Mean Bid	Significant Difference
Gender Initial bid	Exposure to Karoo lamb label	Male Female	20.0% 80.0%	R5.67 R8.02	None: [F=0.965; df=1; p>0.1]
Bid after information sheet	Exposure to Karoo lamb information sheet	Male Female	20.0% 80.0%	R8.17 R12.54	Yes, when comparing gender groups Yes; [F=3.370; df=1; p=0.077] Male consumers – bid lower at R8.17 Female consumers – bid higher at R12.54
Bid after talk	Exposure to Karoo lamb presentation	Male Female	20.0% 80.0%	R11.08 R14.00	None: [F=1.199; df=1; p>0.1]

In general, female respondents presented higher bids than male respondents. For the auction bids after participants were exposed to the Karoo lamb information sheet, a statistical significant difference (F=3.370; df=1; p=0.077) was observed when comparing average bids to gender. A possible explanation could be that generally, females do more grocery shopping than men (Katsarus *et al.* 2001) and could indicate that female shoppers are more aware of current market prices and premiums on specific products. When taking the general romantic image of the Karoo into consideration, it is possible that female respondents are more emotional and nostalgic towards the idea of the Karoo, causing them to be willing to pay a higher premium for meat from this region. Lastly, from a statistical viewpoint, 80% of the participants in this sample were female, which could cause a distorted picture,

although generally most of the grocery shopping is done by females, as mentioned above.

When bids were split into age groups (Table 5.3), it was found that participants of up to 40 years of age were bidding lower premiums than older participants in the first two rounds. After the second information treatment (last bidding round) participants of up to 40 years of age were found to bid higher premiums than older participants. No statistical significant difference was found between auction bids and age groups, but the impact of information is clearly visible in the bidding tendency in age groups. Images related to the Karoo, such as farm homesteads, home baked bread, hospitable nights has become synonymous with quality, tradition and wholesomeness. This relation could awaken nostalgia of days gone by, especially for older participants, willing them to bid higher premiums for Karoo lamb than their younger counterparts.

Table 5.3: Mean bids linked to age

Variable	Experimental Treatment	Variable Levels	Percentage of Total Sample (n=31)	Mean Bid	Significant Difference
Age Initial bid	Exposure to Karoo lamb label	up to 40 years > 40 years	45.2% 54.8%	R5.96 R8.88	None: [F=2.473; df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	up to 40 years > 40 years	45.2% 54.8%	R10.11 R13.00	None: [F=2.260; df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	up to 40 years > 40 years	45.2% 54.8%	R14.14 R12.85	None [F=0.362; df=1; p>0.1]

When bids were ranked according to income level (Table 5.4), no statistical significant difference was found. The lowest income level bid the highest in the first two rounds, which does not make economic sense. Participants with an income level above R20 000, bid consistently. These results are highly distorted due to the uneven distribution of income levels within the sample. Most of the sample (93.5%) falls into the income group earning more than R20 000 monthly. This distribution fits

the profile of the target consumer for this study, but compromises statistical analysis in terms of the Chi-Square test, where the distribution is too distorted to make statistical sense. Again, the impact of information treatments is evident from bidding results.

Table 5.4: Mean bids linked to income level

Variable	Experimental Treatment	Variable Levels	Percentage of Total Sample (n=31)	Mean Bid	Significant Difference
Income Level Initial bid	Exposure to Karoo lamb label	R10 000 – R14 999 R15 000 – R19 9999 R20 000 – R24 999 R25 000	3.2% 3.2% 80.6% 12.9%	R10.50 R3.50 R7.50 R7.40	None: [F=0.802; df=3; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	R10 000 – R14 999 R15 000 – R19 9999 R20 000 – R24 999 R25 000	3.2% 3.2% 80.6% 12.9%	R12.38 R7.75 R11.50 R11.98	None: [F=0.367; df=3; p>0.1]
Bid after verbal presentation	Exposure to Karoo lamb presentation	R10 000 – R14 999 R15 000 – R19 9999 R20 000 – R24 999 R25 000	3.2% 3.2% 80.6% 12.9%	R9.63 R13.25 R13.50 R14.17	None: [F=0.646; df=3; p>0.1]

The same scenario holds for the distribution of education levels within the group. Again, with 80.6% of the sample having obtained a university degree, the distribution causes statistical analysis to become distorted.

Bids sorted according to household size did not produce any statistical significant difference either. These bids were random, yet consistent. No specific economic sense could be made from these bidding patterns.

The first observation made from this section, is that very few statistically significant differences are observed. The explanation could be mainly because of the small sample size (as explained before, Freud 1992) and secondly because of the distorted distribution of certain sub-groups within the demographic composition of the sample. By implication, due to the lack of statistical significant differences, it is not

possible to say for certain if the differences among means in bids observed in the sub-groups can be attributed to chance, or if it is actual differences based on the specific variable linked to the mean bid. Because of the difficulty in statistical analysis due to the small sample size, a strong focus is given to discussion of whether the data makes economic sense.

The most significant conclusions from the above analysis are that female participants generally bid higher than their male counterparts. Various reasons, as discussed above, could lead to this result. For example, females generally do the household's grocery shopping, 80% of the sample consisted of female participants and that females might be more enticed by the image of the Karoo and the nostalgia related to it. Furthermore it was observed that younger participants initially bid lower than older participants, but after all information treatments the younger group bid higher. This is a good example of the impact of information on younger participants, and that they might be more open to new information than the older participants in the sample.

5.4.2 Mean treatment bids linked to food preparation behaviour

In this section, bids observed in the experimental auction are compared based on participants' food preparation behaviour. Data presented in Table 5.4 and Table 5.5 generally illustrate the absence of significant differences when considering the bidding behaviour of sub-groups in the sample based on food preparation behaviour. Certain subgroups presented higher average bids, but all of these differences were statistically insignificant. This unusual absence of significant differences in the data could once again be attributed to the relatively small sample used in this study. Refer to the explanation of the impact of a small sample on statistically significant differences among mean values in Section 5.3.1 of this chapter. All results are summarized in Table 5.4 and Table 5.5.

Table 5.5: Mean bids linked to food preparation frequency

Variable	Experimental Treatment	Variable Levels	Percentage of Total Sample	Mean Bid	Significant Difference
Food preparation frequency Initial bid	Exposure to Karoo lamb label	Daily 3 – 4 times per week 1 – 2 times per week	51.6% 35.5% 12.9%	R8.09 R7.00 R7.00	None: [F=0.158; df=2; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	Daily 3 – 4 times per week 1 – 2 times per week	51.6% 35.5% 12.9%	R13.00 R10.09 R10.88	None: [F=0.982; df=2; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	Daily 3 – 4 times per week 1 – 2 times per week	51.6% 35.5% 12.9%	R14.00 R12.45 R13.88	None: [F=0.226; df=2; p>0.1]

Participants in this study who prepare an evening meal on a daily basis, indicated that they would be willing to pay a higher premium for Karoo lamb. This observation was expected and makes economic sense because sheep meat is usually prepared as an evening meal. Bids from the other two groups were closely related. Again, bids increased as additional information was introduced, proving the positive impact that information has on the bidding behaviour of this sample.

Table 5.6: Mean bids linked to food preparation duration

Variable	Experimental Treatment	Variable Levels	Percentage of Total Sample (n=31)	Mean Bid	Significant Difference
Food preparation duration Initial bid	Exposure to Karoo lamb label	Hour or more 30 min to 60 min Less than 30 min	25.8% 67.7% 6.5%	R8.69 R6.71 R12.00	None: [F=1.179; df=2; p>0.1]
Bid after info	Exposure to Karoo lamb information sheet	Hour or more 30 min to 60 min Less than 30 min	25.8% 67.7% 6.5%	R11.69 R11.81 R10.50	None: [F=0.050; df=2; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	Hour or more 30 min to 60 min Less than 30 min	25.8% 67.7% 6.5%	R11.75 R14.00 R14.25	None: [F=0.428; df=2; p>0.1]

The bidding behaviour according to food preparation duration, did not give much insight into consumer behaviour. With the initial bid, it was expected that participants who spend the most time preparing a meal, would bid higher than those participants

who prefer a quick preparation time. Instead, the group who prepare meals in less than thirty minutes bid the highest. This observation could possibly be explained by a lack of knowledge about the product up for auction, because the bid came down after the first information treatment but then got higher after the second treatment, indicating the inconsistency of bids when grouped according to food preparation time.

5.4.3 Mean bids linked to meat purchasing and consumption behaviour

In Table 5.7 the auction bids are grouped according to the participants' consumption frequency. Both red meat and sheep meat are discussed and tested for statistical significant differences.

Table 5.7: Mean bids linked to consumption frequency

Variable	Experimental Treatment	Variable Levels	Red meat consumption frequency (n=31)	Mean Bid (Red Meat)	Sheep meat consumption frequency (n=31)	Mean Bid (Sheep meat)	Significant Difference (Red Meat)	Significant Difference (Sheep Meat)
Initial bid	Exposure to Karoo lamb label	Daily	9.7%	R7.50	0%	N/A	None: [F=0.008; df=2; p>0.1]	None: [F=0.436; df=3; p>0.1]
		3 – 4 times per week	61.3%	R7.66	6.5%	R8.75		
		1 – 2 times per week	29.0%	R7.39	48.3%	R8.27		
		Twice a month	0%	N/A	38.7%	R7.08		
		Once a month	0%	N/A	6.5%	R4.00		
Bid after info	Exposure to Karoo lamb information sheet	Daily	9.7%	R14.83	0%	N/A	None: [F=0.585; df=2; p>0.1]	None: [F=1.402; df=3; p>0.1]
		3 – 4 times per week	61.3%	R11.58	6.5%	R9.00		
		1 – 2 times per week	29.0%	R10.89	48.3%	R13.67		
		Twice a month	0%	N/A	38.7%	R10.21		
		Once a month	0%	N/A	6.5%	R8.50		
Bid after talk	Exposure to Karoo lamb presentation	Daily	9.7%	R12.17	0%	N/A	None: [F=0.083; df=2; p>0.1]	None: [F=0.698; df=3; p>0.1]
		3 – 4 times per week	61.3%	R13.68	6.5%	R8.75		
		1 – 2 times per week	29.0%	R13.33	48.3%	R14.70		
		Twice a month	0%	N/A	38.7%	R12.71		
		Once a month	0%	N/A	6.5%	R13.00		

5.4.3.1 Red Meat

The participants consume red meat at least once or twice a month. Bids in the first round are very similar. After the first information treatment (information sheet), all bids increase dramatically. In the last bidding round, participants who consume red meat daily bid slightly lower, but no significant difference between bids is observed.

5.4.3.2 Sheep meat

None of the participants consume sheep meat daily. Bids are consistent, with participants who consume sheep meat less frequently bidding slightly lower in the first two bidding rounds than in the third. Again, this observation could be explained by the positive impact that the information treatments have on bidding behaviour.

In Table 5.8, insight is gained into possible relations between average bids observed in the auction and participants chosen purchase outlet for red meat and sheep meat. An in-depth discussion of the results follows Table 5.8.

Table 5.8: Mean bids linked to place of purchase

Variable (Place of Purchase)	Experimental Treatment	Percentage of sample buying red meat at outlet (n=31)	Mean Bid (Red Meat)		Percentage of sample buying sheep meat at outlet (n=31)	Mean Bid (Sheep meat)		Significant Difference (Red Meat)	Significant Difference (Sheep Meat)
			Yes	No		Yes	N0		
Butchery Initial bid	Exposure to Karoo lamb label	67.7%	R8.55	R5.50	61.2%	R8.42	R6.21	None: [F=2.373, df=1; p>0.1]	None: [F=1.312, df=1; p>0.1]
Bid after info	Exposure to Karoo lamb information sheet	67.7%	R12.43	R10.15	61.2%	R12.24	R10.83	None: [F=1.195, df=1; p>0.1]	None: [F=0.481, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	67.7%	R13.00	R14.35	61.2%	R12.87	R14.33	None: [F=0.349, df=1; p>0.1]	None: [F=0.448, df=1; p>0.1]
Spar Initial bid	Exposure to Karoo lamb label	48.4%	R8.53	R6.66	32.3%	R7.65	R7.52	None: [F=0.983, df=1; p>0.1]	None: [F=0.004, df=1; p>0.1]
Bid after info	Exposure to Karoo lamb information sheet	48.4%	R14.13	R9.41	32.3%	R13.50	R10.83	Yes; [F=7.008, df=1; p=0.013] Participants buying red meat from Spar bid higher than those who do not buy from Spar.	None: [F=1.662, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	48.4%	R13.07	R13.78	32.3%	R12.40	R13.93	None: [F=0.111, df=1; p>0.1]	None: [F=0.450, df=1; p>0.1]

Variable (Place of Purchase)	Experimental Treatment	Percentage of sample buying red meat at outlet (n=31)	Mean Bid (Red Meat)		Percentage of sample buying sheep meat at outlet (n=31)	Mean Bid (Sheep meat)		Significant Difference (Red Meat)	Significant Difference (Sheep Meat)
			Yes	No		Yes	No		
Woolworths Initial bid	Exposure to Karoo lamb label	41.9%	R9.38	R6.25	41.9%	R9.38	R6.25	None: [F=2.839, df=1; p>0.1]	None: [F=2.839, df=1; p>0.1]
Bid after info	Exposure to Karoo lamb information sheet	41.9%	R15.12	R9.22	41.9%	R15.12	R9.22	Yes; [F=12.131, df=1; p=0.002] Participants buying red meat from Woolworths bid higher than those who do not buy from Woolworths	Yes; [F=12.131, df=1; p=0.002] Participants buying sheep meat from Woolworths bid higher than those who do not buy from Woolworths.
Bid after talk	Exposure to Karoo lamb presentation	41.9%	R14.50	R12.67	41.9%	R14.50	R12.67	None: [F=0.727, df=1; p>0.1]	None: [F=0.727, df=1; p>0.1]
Checkers Initial bid	Exposure to Karoo lamb label	19.4%	R9.25	R7.16	16.1%	R11.20	R6.87	None: [F=0.756, df=1; p>0.1]	Yes; [f=3.034, df=1; p=0.092] Participants buying sheep meat from Checkers bid higher than those who do not buy from Checkers.
Bid after info	Exposure to Karoo lamb information sheet	19.4%	R10.17	R12.06	16.1%	R12.90	R11.46	None: [F=0.577, df=1; p>0.1]	None: [F=0.286, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	19.4%	R11.58	R13.88	16.1%	R14.00	R13.33	None: [F=0.732, df=1; p>0.1]	None: [F=0.053, df=1; p>0.1]

Variable (Place of Purchase)	Experimental Treatment	Percentage of sample buying red meat at outlet (n=31)	Mean Bid (Red Meat)		Percentage of sample buying sheep meat at outlet (n=31)	Mean Bid (Sheep meat)		Significant Difference (Red Meat)	Significant Difference (Sheep Meat)
			Yes	No		Yes	No		
Directly from Farmer Initial bid	Exposure to Karoo lamb label	6.5%	R0.75	R8.03	9.7%	R4.17	R7.93	Yes; [F=3.930, df=1; p=0.057] Participants buying red meat from a farmer bid lower than those who do not buy directly from a farmer.	None: [F=1.401, df=1; p>0.1]
Bid after info	Exposure to Karoo lamb information sheet	6.5%	R8.50	R11.91	9.7%	R10.00	R11.88	None: [F=0.729, df=1; p>0.1]	None: [F=0.314, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	6.5%	R18.00	R13.12	9.7%	R16.67	R13.44	None: [F=1.302, df=1; p>0.1]	None: [F=1.003, df=1; p>0.1]
Farmers Market Initial bid	Exposure to Karoo lamb label	6.5%	R8.00	R7.53	0%	N/A	R7.65	None: [F=0.014, df=1; p>0.1]	None: [F=0.239, df=1; p>0.1]
Bid after info	Exposure to Karoo lamb information sheet	6.5%	R10.50	R11.78	0%	N/A	R11.92	None: [F=0.100, df=1; p>0.1]	None: [F=1.594, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	6.5%	R12.50	R13.50	0%	N/A	R13.72	None: [F=0.052, df=1; p>0.1]	None: [F=2.213, df=1; p>0.1]

Variable (Place of Purchase)	Experimental Treatment	Percentage of sample buying red meat at outlet (n=31)	Mean Bid (Red Meat)		Percentage of sample buying sheep meat at outlet (n=31)	Mean Bid (Sheep meat)		Significant Difference (Red Meat)	Significant Difference (Sheep Meat)
			Yes	No		Yes	No		
Pick 'n Pay Initial bid	Exposure to Karoo lamb label	3.2%	R7.18	R7.78	35.5%	R7.05	R7.85	None: [F=0.087, df=1; p>0.1]	None: [F=0.161, df=1; p>0.1]
Bid after info	Exposure to Karoo lamb information sheet	3.2%	R11.82	R11.63	35.5%	R11.14	R12.00	None: [F=0.009, df=1; p>0.1]	None: [F=0.174, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	3.2%	R13.95	R13.15	35.5%	R13.09	R13.63	None: [F=0.129, df=1; p>0.1]	None: [F=0.057, df=1; p>0.1]

It should be noted that 'no' bids are also reported in Table 5.8. These bids are reported because it is necessary to compare bids form participants who buy at a specific outlet versus participants who do not buy form that specific outlet in order to see if there is a correlation between purchase outlets and participants' bidding behaviour. Furthermore, participants were not limited to choosing only one retail outlet for meat purchases, as this would be an unrealistic scenario that is not likely to occur in a real market situation.

Participants, who buy red meat and sheep meat at a butchery, bid higher in the first two rounds than participants who do not use the butchery as a purchase outlet. Although no statistical significant difference was found for this group, the higher bids are as expected, with butcheries being one of the more expensive outlets for meat purchases (refer to Table 3.1) and consumers buying from butcheries are thus not that price sensitive.

Bids were initially higher for participants who buy meat from Spar. In the third bidding round, bids were relatively similar for both people buying from Spar and those who do not. A statistical significant difference was observed ($F=7.008$, $df=1$; $p=0.013$) in the second bidding round, indicating at a 95% level of significance that participants who buy red meat from Spar bid higher for a premium on Karoo lamb than participants who do not buy red meat at Spar.

For participants buying meat from Woolworths, a significant difference for both red meat ($F=12.131$, $df=1$; $p=0.002$) and sheep meat ($F=12.131$, $df=1$; $p=0.002$) was found in the second bidding round, indicating that people buying meat from Woolworths would be willing to pay a higher premium for certified Karoo lamb. This observation is consistent throughout all three bidding rounds. This result was expected, seeing as Woolworths is the most expensive retailer from the observed panel of possible outlets (Table 3.1) with regards to sheep meat. Consumers buying from Woolworths are not considered to be price sensitive. Furthermore, Woolworths also offers the option to customers to buy 'free range' meat (www.woolworths.co.za).

When comparing bids from participants who buy sheep meat from Checkers, a statistical significant difference ($F=3.034$, $df=1$; $p=0.092$) was found at a 90% level of

significance. What is interesting about this observation is that respondents buying from Checkers showed their willingness to bid higher premiums on Karoo lamb than participants not buying from Checkers in the *initial bidding round*. In other words, these participants did not need any additional information before making the higher bids on the auctioned product. This could be an indication of a trust relationship with the retailer. Checkers are somewhat less expensive (Table 3.1) when compared to other outlets observed for this study, yet they offer their customers '*certified natural lamb*' (www.checkers.co.za). This branding strategy could be the reason for the possible trust relationship with their customers. Participants buying meat from Checkers bid consistently higher for both meat types throughout the bidding rounds.

Participants buying red meat directly from a farmer, bid significantly lower at a 90% level of significance ($F=3.930$, $df=1$; $p=0.057$) than participants who do not buy from farmers. This observation also makes economic sense, seeing as participants who buy from farmers would most likely buy the product for a less expensive price, by cutting out the middleman in the wholesaler and retailer. The bids for the remaining two rounds are random but an increase in bidding amounts throughout the three bidding rounds are observed, again an indication of the impact of the information treatments.

The portion of the sample buying red meat from a farmer's market is very small for this sample. No participants buy sheep meat from a farmer. No statistical significant difference was found and the only observation from this group is the increased bidding from round one through to round three - again the effect of information treatments is evident.

Participants buying meat from Pick 'n Pay as opposed to participants who do not use Pick 'n Pay as an outlet, bid very similar. Throughout the three rounds, all participants' bids increased similarly. No significant difference was found between the two groups. This is a very interesting observation, the only retailer that participants bid almost identical for. A possible explanation could be that Pick 'n Pay does not have specific branding for their meat products with regards to credence attributes (as opposed to Woolworths and Checkers). Participants are most likely to

see it as a generic brand and thus follow the same bidding pattern as participants who do not buy meat from Pick ‘n Pay.

From this analysis, it was evident that of retailers who branded their meat products specifically with regards to credence attributes, customers bid relatively higher than participants who do not buy from these outlets. It should be noted that only Woolworths, Spar, Checkers, Pick ‘n Pay and the butchery were listed as options in the survey questionnaire with the additional option of providing an alternative retailer or outlet should the participant purchase meat elsewhere.

5.4.4 Mean bids linked to sheep meat purchasing factors

In the following section, bids from the experimental auction were linked to sheep meat purchasing factors captured in the survey questionnaire. Bids are grouped according to each purchasing factor and then tested for statistical significant differences to see if the specific purchasing factor, if considered, will have an impact on the average bids recorded in the experimental auction. Only the five most frequently recorded factors are reported, seeing as there was no significant difference observed for less frequently recorded factors and the percentage of participants who selected these factors were less than 20% (less than 6 people) of the sample. Results are summarized in Table 5.9 below.

Table 5.9: Mean bids linked to mutton & lamb purchasing factors

Variable (Purchasing Factor)	Experimental Treatment	Percentage of sample positively replying to purchasing factor (n=31)	Mean Bid		Significant Difference
			Yes	No	
Cut Initial bid	Exposure to Karoo lamb label	90.3%	R7.57	R7.50	None: [F=0.000, df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	90.3%	R11.57	R12.83	None: [F=0.141, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	90.3%	R13.32	R14.50	None: [F=0.106, df=1; p>0.1]
Price Initial bid	Exposure to Karoo lamb label	83.9%	R7.87	R6.00	None: [F=0.518, df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	83.9%	R11.19	R14.30	None: [F=1.384, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	83.9%	R12.62	R17.70	Yes; [F=3.386, df=1; p=0.076] Participants, who do not consider price as a purchasing factor when buying sheep meat, bid higher than participants consider price as a purchasing factor for sheep meat.
Fat Content Initial bid	Exposure to Karoo lamb label	51.6%	R7.09	R8.07	None: [F=0.258, df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	51.6%	R12.03	R11.33	None: [F=0.124, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	51.6%	R14.72	R12.07	None: [F=1.607, df=1; p>0.1]

Variable (Purchasing Factor)	Experimental Treatment	Percentage of sample positively replying to purchasing factor (n=31)	Mean Bid		Significant Difference
			Yes	No	
Colour Initial bid	Exposure to Karoo lamb label	41.9%	R7.50	R7.61	None: [F=0.003, df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	41.9%	R12.85	R10.86	None: [F=1.004, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	41.9%	R13.04	R13.72	None: [F=0.099, df=1; p>0.1]
Expiry Date Initial bid	Exposure to Karoo lamb label	22.6%	R7.07	R7.71	None: [F=0.77, df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	22.6%	R12.29	R11.52	None: [F=0.104, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	22.6%	R12.57	R13.69	None: [F=0.190, df=1; p>0.1]

Once again, there is an unusual absence of significant differences between mean bids related to specific variables. This absence can be attributed to the relatively small sample size, as explained earlier in this chapter.

Participants who consider price as a purchasing factor when buying sheep meat, bid significantly lower than people who do not consider the price of the meat they buy. This result was as expected, because when price is one of the factors participants consider when buying a product, it can serve as an indication of price sensitivity, explaining why this specific group would bid lower. The observation is also supported by a statistical significant difference (F=3.386, df=1; p=0.076) with a 90% level of significance.

For the following purchasing factors: expiry date, fat content and cut, bids were very similar between the group of participants who consider these factors and the group who do not consider these as important factors when buying sheep meat. Some

economic sense could be made from this observation, for example, similar bids when considering expiry date as a purchasing factor, could be an indication that participants trust their retailer to provide fresh meat, and thus do not consider expiry date as a purchasing factor, even though it is still most likely important to these consumers to buy a fresh product.

From all purchasing factors considered, the only statistical significant difference in bids was found when price was considered. When looking at other factors, bids were relatively similar.

5.4.5 Mean bids linked to Karoo lamb purchasing behaviour

In the last section of this discussion, average bids obtained in the experimental auction were compared to Karoo lamb purchasing behavioural factors captured in the survey questionnaire. The survey questions were structured to capture past experiences regarding the product as well as participants' attitude towards the authenticity of Karoo lamb as a product. The results are captured in Table 5.10 to Table 5.11.

Firstly, bids are sorted according to participants' awareness of Karoo lamb as a product. Although no statistical significant difference was found between groups who were aware of Karoo lamb as a product and those who were not, it is suggested by the bids recorded that participants who were aware of the product, bid consistently lower than the alternative group. A possible explanation for this observation could be that people who are not aware of the product bid higher because they assumed it would be a product with additional benefits or were simply not making informed bidding decisions.

Table 5.10: Mean bids linked to Karoo lamb awareness and images

Variable	Experimental Treatment	Percentage of sample positively replying to Karoo lamb awareness and/or image (n=31)	Mean bids according to answers		Significant Difference
			Yes	No	
Have you ever heard of Karoo lamb before? Initial bid	Exposure to Karoo lamb label	96.7%	R7.45	R11.00	None: [F=0.431, df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	96.7%	R11.55	R16.00	None: [F=0.639, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	96.7%	R13.30	R17.50	None: [F=0.485, df=1; p>0.1]
Do you have a specific image relating to Karoo lamb? Initial bid	Exposure to Karoo lamb label	81.0%	R8.06	R7.39	None: [F=0.094, df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	81.0%	R8.94	R12.65	Yes; [F=2.943, df=1; p=0.097] Participants who have a specific image of Karoo Lamb bid lower than participants who do not.
Bid after talk	Exposure to Karoo lamb presentation	81.0%	R10.75	R14.37	None: [F=2.351, df=1; p>0.1]

Participants, who have a specific image relating to the term Karoo lamb bid lower than participants who have no image linked to the term. A statistical significant difference was found (F=2.943, df=1; p=0.097) in the second round of bidding after participants were exposed to the Karoo lamb information sheet, supporting the above statement. As mentioned in the previous paragraph, it could be possible that participants who do not have a specific image in mind when considering the term Karoo lamb, assumed that it would be a superior product with additional benefits, and thus showed a willingness to pay a higher premium for lamb chops certified as being from the region of the Karoo.

Table 5.11: Mean bids linked to Karoo lamb purchasing behaviour

Variable	Experimental Treatment	Sample Frequency (n=31)	Mean Bid		Significant Difference
			Yes	No	
Bought Karoo lamb before Initial bid	Exposure to Karoo lamb label	64.5%	R8.73	R5.45	Yes; [F=2.912, df=1; p=0.099] Participants who have bought Karoo Lamb before bid higher than those who have not bought it before.
Bid after info sheet	Exposure to Karoo lamb information sheet	64.5%	R13.45	R8.50	Yes; [F=7.053, df=1; p=0.013] Participants who have bought Karoo Lamb before bid higher than those who have not bought it before.
Bid after talk	Exposure to Karoo lamb presentation	64.5%	R14.48	R11.55	None: [F=1.810, df=1; p>0.1]
No, why not? Initial bid	Exposure to Karoo lamb label	Availability: 81.8% Trust: 18.2%	**Availability**	**Trust Issues**	None: [F=1.853, df=2; p>0.1]
			R6.11	R2.50	
Bid after info sheet	Exposure to Karoo lamb information sheet	Availability: 81.8% Trust: 18.2%	R9.28	R5.00	Yes; [F=4.166, df=2; p=0.026] Participants who have a trust issue with whether a product is authentic Karoo Lamb, bid lower than people whose reason for not buying the product is lack of availability
Bid after talk	Exposure to Karoo lamb presentation	Availability: 81.8% Trust: 18.2%	R11.33	R12.50	None: [F=0.908, df=2; p>0.1]
Yes, trust that it is authentic? Initial bid	Exposure to Karoo lamb label	70.0%	**Yes**	**No**	None: [F=0.407, df=1; p>0.1]
			R9.36	R7.58	
Bid after info sheet	Exposure to Karoo lamb information sheet	70.0%	R13.32	R12.58	None: [F=0.078, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	70.0%	R15.07	R13.00	None: [F=0.441, df=1; p>0.1]

Upon analysing the bidding results linked to whether or not participants have bought Karoo lamb before, it was found that participants who have bought the product

before, bid higher than participants who haven't bought Karoo lamb before. This positive impact of previous purchases on bidding behaviour is supported by a statistically significant difference found after the first bidding round (F=2.912, df=1; p=0.099) with a 90% level of significance and also after the second round of bidding (F=7.053, df=1; p=0.013) with a 95% level of significance. This result could be interpreted as an indication of a general positive experience from previous purchases of Karoo lamb, leading to an increased willingness to pay a premium for the certification of Karoo lamb.

In the previous section where Karoo lamb awareness and images related to the product was discussed, it was observed that participants with no awareness or image of the product bid higher than participants who were aware of the product or related a specific image to Karoo lamb. In the next section, it was found that participants who have bought Karoo lamb before bid higher than participants who have not purchased the product before. These two results mentioned above might seem conflicting with one another, but one could argue that participants who have actually bought the product before (and most likely consumed it) opposed to participants who are simply aware of the product or could relate a specific image to the product, might value Karoo lamb differently. Thus, people who had bought the product before were willing to pay an even bigger premium than participants who were simply aware of the product, relating a specific image to Karoo lamb or participants who might merely be hoping to upgrade to a supposedly superior product, even if that product is unknown to them.

Participants who indicated that they have not bought Karoo lamb before were asked to state the reasons for not buying Karoo lamb. The main two reasons that came to light from the analysis was that it was either unavailable or that the participant did not trust the authenticity of the product sold as Karoo lamb.

In this section of the study, these reasons were linked to bidding behaviour. An important observation was made: Participants who have trust issues regarding the product's authenticity, bid lower than participants who did not buy the product due to a lack of availability. A statistical significant difference was found (F=4.166, df=2; p=0.026) after the first information treatment supporting this statement at a 95% level

of significance. From this observation, it is clear to see that participants are reluctant to buy the product due to the lack of certification guaranteeing the products' authenticity as Karoo lamb. It was found that in the third bidding round (after both information treatments) participants with trust issues regarding product authenticity, bid slightly higher than participants not buying the product due to the lack of availability. This serves as an indication of the positive impact of the certification and information regarding the proposed Karoo lamb label. Furthermore, a major marketing opportunity was identified from this analysis relating to the certification and proper distribution of the product; with the need being identified from this analysis.

Next, participants who have bought Karoo lamb before were asked if they believed that the product was authentic. Participants' answers were assessed and compared to their average bids as recorded in the experimental auction. It was found that participants who believe that the Karoo lamb they bought were authentic, bid higher than participants who were unsure of the product's authenticity. This result was expected, although no statistical significance was found to support it. Participants who bid higher were sure that they were getting the actual product they were paying a given premium for opposed to participants who were not sure if the product was genuine. The uncertainty and a lack of trust for this group, thus lead to a lower willingness to pay a premium for the given product.

Table 5.12: Mean binds linked to participants' willingness to pay a premium for Karoo lamb

Variable	Experimental Treatment	Sample Frequency (n=31)	Mean Bid		Significant Difference
			Yes	No	
Willing to pay a premium? Initial bid	Exposure to Karoo lamb label	58.1%	R7.97	R7.00	None: [F=0.251, df=1; p>0.1]
Bid after info sheet	Exposure to Karoo lamb information sheet	58.1%	R12.78	R10.19	None: [F=1.745, df=1; p>0.1]
Bid after talk	Exposure to Karoo lamb presentation	58.1%	R13.69	R0813.	None: [F=0.081, df=1; p>0.1]

Lastly, participants were asked if they were willing to pay a premium for Karoo lamb. Note that their answers were recorded before the experimental auction. Results for both the groups were similar. One would expect that the group who answered that they were willing to pay a premium for Karoo lamb would bid higher in the actual auction. Even though there was not a significant difference found between the mean bids of the two groups, both groups still bid a premium in the auction. Participants, who stated that they were not willing to pay a premium for Karoo lamb in the survey most likely bid an initial premium because they interpreted the auction mechanism wrongly and in later rounds their bids increased, reflecting the impact of the information treatments and the learning experience from the initial bidding rounds.

5.5 SUMMARY

In this chapter the results from the random *n*th-price auction was investigated, where after the average premium bids for Karoo lamb were linked to the variables obtained in the pre-auction survey. An important number of observations were revealed in this chapter.

Bids from the random *n*th-price auction were grouped into only three rounds (initial round, after information sheet, after talk with PowerPoint slide-show) in order to have a clearer indication of the possible impact of information on bidding behaviour. After each information treatment, the mean WTP bids for the Karoo lamb chops increased. The bids increased from R7.56 to R11.69 to R13.44. There are two important observations to take note of. Throughout the entire auction, most of the participants submitted a non-zero bid, indicating their willingness to pay a premium for certified Karoo lamb. Secondly, it is important to note the dramatic increase in bids from round one to round two, and then the more marginal increase from round two to round three. Thus, from this observation, one can conclude that basic information about Karoo lamb has a more significant impact on consumers' willingness to pay for certified Karoo lamb as meat of origin. This basic pattern was observed throughout most of the auction results.

When the average bids obtained from the auction were linked to variables, it was found that females generally bid higher than male participants in the auction, while observations regarding the place of purchase indicated that there is a significant difference in bidding patterns for participants who buy meat from specific retailers such as Woolworths and Spar.

Price was seen as an important purchasing factor. Participants who consider price when purchasing meat, bid significantly lower than participants who do not consider price as an important purchasing factor.

Participants, who have not bought Karoo lamb before, indicated that the reason is because the product is simply not available or that they did not trust that the product was authentic. This is a very important observation, giving a clear indication of the possibilities for certified Karoo lamb as meat of origin.

An unexpected result was observed when participants who stated in the survey that they would not pay a premium for Karoo lamb, bid very similar premiums to participants who stated that they would pay a premium for the product. This could be an indication that the problem is not that participants had misleading information about the product, they simply did not have any information about Karoo lamb. This may be the reason for bids following the same pattern for both these groups, because participants received the same information treatments throughout the auction.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 INTRODUCTION

The changing food choice environment faced by consumers on a daily basis, served as the motivation for the main objective of this study: to develop a thorough understanding of the prominent methods used to measure consumer's willingness to pay for food quality attributes in a developing country context.

In order to address the objective, Chapter Two provided a thorough literature review of the prominent methods used in willingness to pay studies. Stated- and revealed preference methods were discussed and compared, before shifting the focus to a newer field of research methods: experimental auctions. Experimental auctions were introduced as a research tool used to elicit willingness to pay estimates in food choice behaviour. Three classic auction methods were discussed and compared. The review of auction mechanisms was used as a basis to identify the random *n*th price auction as the method of choice, leading one to the specific objectives of this study.

The specific objective of this study was to conduct an experimental auction, using the mechanism as a tool to elicit willingness to pay estimates for a specific food product attribute. With the specific mechanism identified, an opportunity for a case study in the sheep meat sector of South Africa presented itself. The specific objective of the study was applied to testing South African consumers' willingness to pay a premium for certified Karoo lamb as a meat of origin product. Furthermore, the impact of additional information treatments on bidding behaviour was tested throughout the experimental auction. Lastly, bidding behaviour observed in the experimental auction was linked to socio-economic characteristics of the sample, testing if there were any possible links between specific groups and willingness to pay a premium for Karoo lamb.

6.2 SUMMARY OF FINDINGS

The main findings of the study are discussed in line with the objectives stated at the beginning of the study:

The specific objectives of the study were addressed through the execution of a random *n*th price auction, applied to a case study on the possible certification of Karoo lamb as a meat product of origin. Good estimates of willingness to pay are needed for novel products in order to assess consumers' valuation of the product, optimum pricing strategies and to test product adaptation (Silva *et al*, 2007), with the certification of Karoo lamb meat lending itself to an appropriate case study.

A pre-auction survey was conducted in order to gain insight into participants' demographic composition and red meat purchasing behaviour, as presented in Chapter Four. Apart from unpacking the demographic composition of the sample and discussing participants' red meat purchasing behaviour, the main finding of this chapter will briefly be revisited.

The majority (96%) of participants were aware of Karoo lamb before the day of the auction, while approximately 65% of the sample had bought the product before, indicating a high level of awareness of the product in the sample group. The general lack of availability of Karoo lamb was pointed out, with approximately 82% (n=11) of participants who indicated that they had not bought Karoo lamb before due to the product not being readily available. Another serious concern that was brought to light for the survey results, was that 18.2% (n=11) of participants who indicated that they had not bought Karoo lamb before was because they did not trust the authenticity of the product. Despite the obvious concerns regarding Karoo lamb, approximately 58% of the sample indicated that they are willing to pay a premium for Karoo lamb.

The results from the experiment were presented in detail in Chapter Five. Only the main results from the random *n*th price auction are summarized:

- Firstly, a general lack of statistical significant differences among variables was observed. As alluded to in Chapter Five, the limited sample size (n=31) could influence the ability of the results to yield statistically significant differences.

- Participants indicated a strong willingness to pay a premium for certified Karoo lamb throughout the auction, with the average premium for the entire auction (all three information treatment groups) being R10.90.

- The impact of information treatments was clearly illustrated through bidding rounds with the average bid of each round increasing as participants received information treatments.

- Female respondents presented higher bids than male respondents, possibly because females feel more nostalgic towards the Karoo concept. This result could also be slightly skewed, due to the sample consisting of 80% females.

- Older consumers bid generally higher than their younger counterparts. The Karoo concept could awaken nostalgia of days gone by, willing older participants to bid higher premiums for Karoo lamb.

- Significant difference in bidding patterns for participants who buy meat from specific retailers such as Woolworths and Spar were observed.

- Participants who consider price when purchasing meat, bid significantly lower than participants who do not consider price as an important purchasing factor.

- Participants who stated in the survey that they would not pay a premium for Karoo lamb, bid very similar premiums to participants who stated that they would pay a premium for the product. This result could be a general reflection of the lack of available information on Karoo lamb as a certified product.

From a marketing perspective, a clear opportunity and case for intellectual property protection exists when considering the Karoo lamb case. The results from the experimental auction suggested that participants are willing to pay a premium for certified Karoo lamb, with an average bid of R10.90 observed from the auction.

In the experimental auction participants bid on a 500g packet of lamb chops. The average bids recorded are thus in R/500g. When the average bidding amounts for the main three rounds are converted to R/kg, the average bids could be interpreted compared to retail prices for lamb loin chops observed at the time of the experiment. After each information treatment, the mean WTP bids for the Karoo lamb chops increased. The bids for Karoo lamb loin chops went from R15.12/kg to R23.38/kg to R26.88/kg, with an average bid for the entire auction of R21.80/kg. When the retail prices for lamb loin chops was recorded at the time of the experiment (Table 3.1), prices from six different retailers and butcheries ranged from R89.95/kg to R118.16/kg, with an average retail price for lamb loin chops of R97.65/kg. If the average premium bid for Karoo lamb chops is expressed as a percentage of the average retail price for lamb loin chops, the average bid for a premium on Karoo lamb is 22% of the market price of loin lamb chops. Clearly this result serves as a further indication of the possibilities and economic merit for Karoo lamb as a Geographical Indication and the need for certification of the product.

Furthermore, information treatments had a significant effect on bidding behaviour. After the fist information treatment (information sheet on Karoo lamb) average bids increased from R7.56 to R11.69, thus an increase of R4.13 or 55% in average bids. After the second information treatment (detailed verbal information on the composition of sheep meat form different regions) a smaller increase of R1.75 or 15% was observed. When considering different marketing opportunities, one should consider the significant increase in average bids following the information sheet as opposed to the smaller increase in bids after the detailed verbal presentation. This observation serves as an indication that marketing techniques such as a leaflet at supermarkets or a poster containing basic information on Karoo lamb would be sufficient to introduce certified Karoo lamb to consumers. Form the observed results, it might not be economically viable at this stage to introduce an in-depth information campaign about the product, as the additional premium consumers might be willing to pay could be insignificant compared to the additional marketing costs.

Lastly, the concerns raised by participants about the lack of availability and authenticity of Karoo lamb indicate the need for the certification of Karoo lamb as a product of origin.

The above arguments serve as a clear motivation for marketers to pursue the certification of Karoo lamb as a product of origin.

6.3 RECOMMENDATIONS

As in all experimental research there were limitations to this thesis. Having limited resources to conduct research resulted in a sample size of only 31 participants which in turn resulted in a limited quantity of data available for analysis. Limited data did not allow for broad statements to be made and an obvious lack of statistically significant differences were observed throughout the study. It is suggested that for future research, a larger sample size should be used, as it would yield valuable results when there is a clear statistical distinction of differences between variables.

The basic requirements for participants were that they are the main buyers of food for the household, are consumers of sheep meat and are from a relatively high income group. Thus, the nature of the product in the case study did not warrant for lower income groups to be included in the analysis. In future research, a more basic product could be used to include a wider range of income groups.

Further, the scope of application of this study focused on a niche market, not yielding a representative sample of South African consumers, but rather a specific target population. The geographical focus of the sampling procedure only included the Pretoria area within Gauteng Province of South Africa. It would be interesting to extend the research study to other provinces within the country. It is also suggested that representative ethnic groups be included in future research.

When Lusk & Shogren (2007) explains how to conduct an experimental auction, he suggests that the auction should be repeated for several rounds. The reason for repeated rounds is that participants only realize that it is the best strategy to bid truthfully after a few rounds of bidding. The possibility should be considered that even more rounds are conducted, to ensure participants understand the mechanism.

Although the impact of information treatments was observed in this research study, the impact of the *sequence* of information treatments could be tested in future research by dividing the sample into more than one sub-group and shuffling the sequence of information treatments.

Another potential research area would be to investigate the experimental auction mechanism. The research conducted for this thesis could be replicated by utilizing a different experimental auction mechanism, such as the BDM mechanism or the Vickery second price auction, to examine how the results differ.

Lastly, it is recommended that an in-store experiment where the results from this study are implemented be done, thereby creating a true market scenario. Not only will it serve as a test for the results of this study, but could also yield interesting observations to be used by marketers.

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APPENDICES

Appendix A: Auction Instruction Handout

GENERAL INFORMATION

Dear Participant,

Thank you for taking the time to participate in this research study. Please open the 'goodie bag' that you received.

Inside your bag:

- one block of fudge (do not open or eat yet)
- booklet with bidding slips
- bank-bag with R200 (R10 notes and R1 coins)
- random ID number

The R200 is your compensation for participating in the research study. You will also use your R200 as bidding money in the auction. Whatever you did not use, is yours to take home.

BIDDING INSTRUCTIONS

Please follow the instruction sheet as the auction moves along, DO NOT look ahead, you will be told when to turn over.

Please follow all instructions carefully.

Do not talk to other participants for the entire duration of the auction.

Two products will be used in the bidding exercise:

- first a block of fudge
- then a meat product

Explanation of Bidding Exercise:

The auction can be seen as a bidding exercise. Shortly you will be asked to write down your bid on a bidding slip. Your bid is private information, meaning you cannot show your bid to any other participant.

Bidding steps:

1. You will receive a product (fudge) which is a generic (original) product. This now belongs to you.

2. A second product will be shown to you. The new product will have one additional attribute, but otherwise it is exactly the same as the first (original) product.

3. You will now place a bid (write down how much you are willing to pay) to exchange your original product for the new product.
4. Once all the bids have been collected, they will be sorted from the highest to the lowest bid. A random one of these bids will be drawn to determine the payment price of the round.

5. Everyone who bid higher than the payment price will have to pay the payment price and get to exchange their original product for the new product. Everyone who bid lower than the payment price will not get to exchange their original product and will not pay anything.

6. The ID numbers of all the winners as well as the payment price will be revealed.

7. A second round of bidding will follow, but now you have an idea of where your bid lies in comparison to the rest of the participants' bids.

We will first do an example of the bidding process.

NOTE:

- It is important to understand that you only bid to exchange your product. In other words, you only bid what you are willing to pay for the additional attribute.
- You must picture yourself in a marketplace, for example your favourite supermarket and then decide if you are willing to pay an additional amount for the second product. If you are, the value that you are willing to pay should be written on your bidding slip.
- It is in your best interest to bid truthfully. This means that the amount your write on your bidding slip should be the true value that the new product (or additional attribute) is worth to you. Consider the following: If you bid more than what you are really willing to pay for the product, you might end up paying more for the product than you wanted to. Likewise, if you bid less than what the product is worth to you, you may not be able to purchase a product that you really wanted.
- You are allowed to bid zero / R0 if you are not interested in exchanging your original product.

- Every round of bidding is completely independent, in other words what you did in a previous round should have no influence on how you bid in the next round.

Any questions?

Practice Auction (fudge):

Explanation:

The practice auction will have two rounds of bidding. Only one of the two practice rounds will be binding, in other words, only one round will count where people will actually pay money and exchange products. The binding round will only be determined at the end of the two rounds by a coin toss. Because you do not know which round will count, it is best to bid your true value in both rounds. Bids must be placed in increments of R1.

Steps for the Practice Auction:

1. Take a look at the fudge (product 1) from your 'goodie bag'.
2. Take a look at the alternative product (product 2) being shown around.
3. Place your bid for exchanging product 1 with product 2. Use the first bidding slip in your bidding booklet and also fill in your ID number.
4. Bids will be collected and sorted.
5. Payment price will be determined by a random draw.
6. Payment price and winners' ID numbers will be revealed.

DO NOT TURN OVER

Read the information sheet that is being handed out.

You will now bid on the fudge for a second time:

1. Place your bid for exchanging product 1 for product 2. Use the second bidding slip in your bidding booklet and also fill in your ID number.

2. Bids will be collected and sorted.

3. Payment price will be determined by a random draw.

4. The binding round (the round that counts) will be determined by tossing a coin → tails for round one; heads for round two.

5. Everyone who bid higher than the payment price will pay the payment price and exchange their original fudge for fat free fudge.

DO NOT TURN OVER

Experimental Auction (lamb chops):

Explanation:

The lamb chops auction will have six rounds of bidding. Only one of the six rounds will be binding, in other words, only one round will count where people will actually pay money and exchange products. The binding round will only be determined at the end of the sixth round by rolling a dice. Because you do not know which round will count, it is best to bid your true value in all the rounds. Bids must be placed in increments of R1.

Steps for the Experimental Auction:

1. Take a look at the lamb chops (product 1) being shown around. Each of you already own a packet of exactly similar chops, they are in the kitchenette in a fridge to keep them cool.

2. Take a look at the alternative product (product 2) being shown around.

3. Place your bid for exchanging product 1 with product 2. Remember you only bid to exchange your product, so only what you are willing to pay extra. Use the third bidding slip in your bidding booklet and also fill in your ID number.

4. Bids will be collected and sorted.

5. Payment price will be determined by a random draw.

6. Payment price and winners' ID numbers will be revealed.

DO NOT TURN OVER

Take a few minutes and consider the information given by the revealed payment price and the bids that lies above the price. This information is given to you so that you can get comfortable with the auction mechanism. Use the information, but it is important to remember that it is still in your best interest to bid your **true value** for the product. The only way you can benefit from the auction is by bidding YOUR true value.

The auction will now be re-conducted.

1. Place your bid for exchanging product 1 for product 2. Use the fourth bidding slip in your bidding booklet and also fill in your ID number.

2. Bids will be collected and sorted.

3. Payment price will be determined by a random draw.

4. Payment price and winners' ID numbers will be revealed.

DO NOT TURN OVER

Read the information sheet that is being handed out.

You will now bid on the lamb chops for the third time:

1. Place your bid for exchanging product 1 for product 2. Use the fifth bidding slip in your bidding booklet and also fill in your ID number.

2. Bids will be collected and sorted.

3. Payment price will be determined by a random draw.

4. Payment price and winners' ID numbers will be revealed.

DO NOT TURN OVER

Again use the revealed price and winner information, but it is important to remember that it is still in your best interest to bid your **true value** for the product.

The auction will now be re-conducted.

1. Place your bid for exchanging product 1 for product 2. Use the sixth bidding slip in your bidding booklet and also fill in your ID number.

2. Bids will be collected and sorted.

3. Payment price will be determined by a random draw.

4. Payment price and winners' ID numbers will be revealed.

DO NOT TURN OVER

Welcome to Prof. Hettie Schönfeldt. She is a professor at the University of Pretoria, Department Consumer Science. Her field of speciality is food composition. She will now give a short presentation on Karoo Lamb.

Consider the information that you have heard.

The auction will now be re-conducted.

1. Place your bid for exchanging product 1 for product 2. Use the seventh bidding slip in your bidding booklet and also fill in your ID number.

2. Bids will be collected and sorted.

3. Payment price will be determined by a random draw.

4. Payment price and winners' ID numbers will be revealed.

DO NOT TURN OVER

Again use the revealed price and winner information, but it is important to remember that it is still in your best interest to bid your **true value** for the product.

The auction will now be re-conducted.

1. Place your bid for exchanging product 1 for product 2. Use the last bidding slip in your bidding booklet and also fill in your ID number.

2. Bids will be collected and sorted.

3. Payment price will be determined by a random draw.

4. Payment price and winners' ID numbers will be revealed.

5. The binding round (the one that counts) of all six rounds will be determined by the roll of a six-side dice.

6. All winners will pay the payment price and exchange their original lamb chops for Karoo lamb chops.

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Appendix B: Pre-Auction Survey

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Faculty of Natural and Agricultural Sciences
Department of Agricultural Economics, Extension and Rural Development

Consumer Survey

- **Please answer all questions below**
- **Information is strictly confidential**
- **You cannot be identified based on your answers given in this survey**

Please mark (x) the appropriate box / boxes:

SECTION 1: *RED MEAT:*

1. How often do you consume *red meat*?

	every day
	3-4 times per week
	1-2 times per week
	twice a month
	once a month

2. How many times a week do you prepare an evening meal?

	every day
	3-4 times per week
	1-2 times per week
	less than once a week

3. How long does it usually take you to prepare an evening meal?

	1 hour or more
	30 min. to 1 hour
	less than 30 min.

4. Where do you usually buy *red meat*?

	Woolworhts
	Spar
	Checkers
	Pick'nPay
	Butchery

If other; please specify:

SECTION 2: *SHEEP MEAT:*

5. How often do you consume *lamb* or *mutton*?

	every day
	3-4 times per week
	1-2 times per week
	twice a month
	once a month

6. Where do you usually buy *lamb* or *mutton*?

	Woolworhts
	Spar
	Checkers
	Pick'nPay
	Butchery

If other; please specify:

7. What factors do you consider when purchasing *lamb* or *mutton*?
(mark three options; 1; 2 and 3 with 1 – most important; 2 – second most important and 3 – third most important)

	price
	expiry date
	brand
	fat content
	organic
	specific cut
	packaging
	colour

SECTION 3: *KAROO LAMB:*

8. Have you ever heard of Karoo Lamb before participating today?

	yes
	no

9. What image comes to mind when you hear the term 'Karoo Lamb'?

10. Have you ever bought Karoo Lamb before?

	yes
	no

If **no**, why not?

If **yes**, do you trust that it was really Karoo Lamb?

11. Are you willing to pay a premium for Karoo Lamb?

	yes
	no

12. Do you have any other comments about Karoo Lamb?

SECTION 4: *DEMOGRAPHICS:*

Please tell us more about yourself (*all personal information will be treated with strict confidentiality*):

13. Gender:

	male
	female

14. Age:

15. Highest level of education completed:

	Grade 7 or lower
	Grade 8
	Grade 9
	Grade 10
	Grade 11
	Grade 12 /
	Technicon diploma / degree
	University degree
	Other post-matric qualification

16. Monthly ***household*** income:

	< R10 000
	R10 000 - R14 999
	R15 000 - R19 999
	R20 000 - R24 999
	R25 000 +

17. Occupation:

18. Household size:

19. Do you have any additional comments?

Thank you for your time.

Appendix C: Summarised SAARF Demographics

A summary profile of the South African consumer market based on the SAARF LSM® segments

Descriptor:		Marginalised consumers: *(18.6% of population)* ***SAARF LSM® segments:***			Emerging consumers: *(48.9% of population)* ***SAARF LSM® segments:***			Established consumers: *(32.6% of population)* ***SAARF LSM® segments:***			
		1	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Average monthly household income *(SAARF 2010a)*		R1142	R1367	R2043	R2288	R3250	R5588	R9238	R12474	R16941	R24554
Gender: % Male / % Female *(SAARF 2010a)*		41.6% / 58.4%	40.9% / 59.1%	51.9% / 48.1%	49.9% / 50.1%	50.5% / 49.5%	49.1% / 50.9%	51.7% / 48.3%	50.9% / 49.1%	54.5% / 49.1%	52.4% / 47.6%
Dominant age groups *(SAARF 2010a)*		50+: 32% 16-24: 28%	50+: 30% 16-24: 30%	16-24: 28% 35-49: 27%	16-24: 28% 25-34: 27%	16-24: 29% 25-34: 27%	16-24: 28% 35-49: 28%	35-49: 28% 25-34: 26%	35-49: 29% 50+: 25%	35-49: 32% 50+: 26%	35-49: 30% 50+: 29%
Perceived unemployment *(SAARF 2010a)*		45%	44%	42%	39%	40%	30%	22%	14%	10%	5%
Rural share *(SAARF 2010b)*		100%	91.8%	88.1%	66.7%	42.4%	19.8%	12.1%	6.5%	6.9%	7.5%
Provincial location *(SAARF 2010a)*		E Cape, KZN, Limpopo			KZN, Limpopo, Gauteng			Gauteng, W Cape, KZN			
Formal education *(SAARF 2010b)*	None	22.0%	16.6%	9.5%	8.0%	3.0%	1.4%	0.7%	0.4%	0.0%	0%
	Primary	32.1%	30.1%	27.2%	22.2%	16.5%	9.9%	5.2%	2.2%	1.5%	0.4%
	High	45.6%	52.8%	60.9%	67.4%	77.3%	80.3%	78.6%	75.0%	65.9%	51.0%
	Post-matric	0.4%	0.6%	2.4%	2.2%	3.1%	8.5%	15.5%	22.6%	32.5%	48.7%
Electricity in home *(SAARF 2010b)*		35.4%	51.3%	76.3%	92.4%	98.7%	99.4%	99.7%	99.5%	99.6%	99.8%
Refrigerator in home *(SAARF 2010b)*		0%	12.1%	39.5%	65.9%	88.4%	94.7%	97.2%	98.8%	99.3%	99.7%
Microwave oven in home *(SAARF 2010b)*		0%	0.1%	1.6%	12.3%	36.9%	75.3%	93.2%	97.0%	98.5%	99.2%
Shopping frequency: Share mainly engaging in monthly bulk shopping *(SAARF 2010a)*		73%	64%	63%	62%	58%	54%	52%	49%	48%	44%
Products bought for household *(SAARF 2010b)*	Maize meal	72.0%	81.3%	81.2%	82.1%	82.4%	76.1%	63.1%	58.1%	53.2%	47.5%
	Rice	57.2%	64.1%	71.3%	73.6%	76.5%	79.8%	77.4%	78.4%	74.7%	75.7%
	Long life milk	32.6%	40.2%	46.2%	53.6%	57.1%	59.0%	59.9%	56.0%	57.0%	55.1%
	Vegetables (frozen)	10.4%	11.6%	16.4%	23.3%	28.0%	44.6%	57.1%	59.9%	62.3%	67.0%

Appendix D: Auction Bids

Fudge Auction

Round 1

n=16 1

ID	Bid	Pos.
17	7	1
2	6	2
14	5	3
23	5	4
1	3	5
31	3	6
7	2	7
12	2	8
20	2	9
30	2	10
28	1.5	11
6	1	12
8	1	13
13	1	14
16	1	15
24	1	16
26	1	17
21	0.5	18
3	0	19
4	0	20
5	0	21
9	0	22
10	0	23
11	0	24
15	0	25
18	0	26
19	0	27
22	0	28
25	0	29
27	0	30
29	0	31

Round 2

Winning fudge round

n=19 1

ID	Bid	Pos.
17	5	1
2	4	2
12	3	3
14	3	4
31	3	5
7	2	6
11	2	7
13	2	8
16	2	9
19	2	10
20	2	11
23	2	12
27	2	13
28	2	14
30	2	15
1	1	16
5	1	17
6	1	18
8	1	19
15	1	20
21	1	21
24	1	22
29	1	23
3	0	24
4	0	25
9	0	26
10	0	27
18	0	28
22	0	29
25	0	30
26	0	31

Karoo lamb Auction

Round 1 n=26 2

ID	Bid	Pos.
2	30	1
19	30	2
29	20	3
31	20	4
8	15	5
3	10	6
6	10	7
12	10	8
13	10	9
15	10	10
18	10	11
24	10	12
25	10	13
10	7	14
9	5	15
14	5	16
16	5	17
20	5	18
22	5	19
26	5	20
27	5	21
28	5	22
11	4	23
7	3	24
1	2	25
4	2	26
21	2	27
23	1	28
5	0	29
17	0	30
30	0	31

Round 2 n=9 10

ID	Bid	Pos.
31	20	1
12	12	2
15	12	3
3	10	4
6	10	5
8	10	6
13	10	7
14	10	8
17	10	9
18	10	10
24	10	11
29	10	12
2	8	13
10	7	14
28	6	15
9	5	16
11	5	17
16	5	18
19	5	19
20	5	20
22	5	21
25	5	22
26	5	23
27	5	24
1	4	25
7	3	26
4	2	27
21	2	28
23	2	29
5	0	30
30	0	31

Note Round 1: *n*=26, thus the random position is position 26 (third column) with the corresponding price at R2. Thus all participants who bid a price higher than R2 will win the auction (form position 24, marked in yellow) and pay R2 to upgrade their generic lamb chops to certified Karoo lamb chops.

Round 3

Sheep winning round

n=9 15

ID	Bid	Pos.
24	20	1
29	20	2
31	20	3
18	16	4
3	15	5
6	15	6
8	15	7
13	15	8
15	15	9
17	15	10
12	13	11
2	12	12
14	12	13
20	12	14
28	12	15
1	10	16
5	10	17
11	10	18
25	10	19
7	8	20
16	8	21
10	7	22
19	7	23
9	5	24
22	5	25
23	5	26
26	5	27
27	5	28
30	5	29
21	3	30
4	2	31

Round 4

n=16 13

ID	Bid	Pos.
3	25	1
13	25	2
2	20	3
24	20	4
28	20	5
29	20	6
31	20	7
15	17	8
18	16	9
6	15	10
8	15	11
14	15	12
17	15	13
1	14	14
10	14	15
12	13	16
7	10	17
11	10	18
19	10	19
23	10	20
25	10	21
26	10	22
5	9	23
16	8	24
20	7	25
9	5	26
22	5	27
27	5	28
30	5	29
21	3	30
4	2	31

Note Round 3: *n*=9, thus the random position is position 9 (third column) with the corresponding price at R15. Thus all participants who bid a price higher than R15 will win the auction (form position 4, marked in yellow) and pay R15 to upgrade their generic lamb chops to certified Karoo lamb chops.

Round 5

n=14 15

ID	Bid	Pos.
23	30	1
24	20	2
29	20	3
31	20	4
13	18	5
15	17	6
18	16	7
1	15	8
3	15	9
7	15	10
8	15	11
9	15	12
10	15	13
12	15	14
14	15	15
17	15	16
25	15	17
26	15	18
2	13	19
20	13	20
28	12	21
11	10	22
16	10	23
19	10	24
27	10	25
30	10	26
5	6	27
22	5	28
4	4	29
21	3	30
6	0	31

Round 6

n=21 12

ID	Bid	Pos.
23	30	1
24	20	2
29	20	3
31	20	4
10	18	5
13	18	6
15	18	7
1	16	8
8	16	9
14	16	10
18	16	11
3	15	12
7	15	13
9	15	14
17	15	15
25	15	16
26	15	17
2	14	18
12	13	19
19	13	20
11	12	21
16	12	22
28	12	23
27	10	24
30	10	25
20	9	26
5	6	27
22	5	28
4	4	29
21	3	30
6	0	31

Appendix E: Auction Photographs

Participants completing pre-auction survey.

Facilitator explaining the auction instructions to participants.

Participant examining fudge from practice auction.

Helpers collecting and sorting auction bids.

Generic lamb loin chops.

Certified Karoo lamb loin chops.

Payment price and bidding round's winners revealed.

Presentation by Prof. Schönfeldt.