

**Analysing consumers' perception and willingness to pay for rabbit meat: a
case study of Madiga Village, Polokwane Municipality, Limpopo Province,
South Africa**

By

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DECLARATION

I declare that the mini-dissertation hereby submitted to the University of Limpopo, for the degree master of science in agricultural economics has not previously been submitted by me for a degree at this or any other university; that it is my work by design and in execution, and that all material contained herein has been duly acknowledged.

MJ LEKOTA

03 May 2022

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Signature

Date

DEDICATION

This thesis is dedicated to the memory of my mother, Molobe Florah Lekota and my family at large, who always reminded me that there is nothing that beats hardwork and focus in achieving anything in this academic world. You are gone (mother), but your belief in me has made this journey possible. Finally, I would like to dedicate it to my supervisors, Professors Abenet Belete and Mmapatla Precious Senyolo.

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My utmost thanks go to my mother, pillar of strength, Molobe Florah Lekota, who painstakingly laid the foundation of my education by giving it all it takes. I would also like to acknowledge the love, patience, support and continued encouragement of my brothers, Brother Nelson Gwangwa, Brother Sebonani Bonny Gwangwa and most importantly, my uncle, Kgoogo Samuel Lekota, and aunt, Susan Lekota. I would like to also thank my Pastor, Phaladi Samuel Lediga and his wife, Tengiwe Lediga, for the support they have provided throughout this academic work. I can never ask God for a better family, thank you very much.

Finally, thanks to all enumerators involved in data collection for their committed efforts and to all consumers who took part in the survey for their important information to this research.

ABSTRACT

South Africa is characterised by low production which can be attributed to a lack of diversification and flexibility in agricultural production. There has been an explosive change in consumer-food relationships due to increased knowledge in the food industry. It is no longer just about supplying what you have, but about what you are selling as a producer that can meet the required need of consumers. Producers' primary objective in the food industry is to provide the product that consumers need. Rabbit meat is recognised in rural areas, however, most rural smallholder farmers do not take initiative in rabbit production. Madiga Village is one such area where rabbit production is not practised. Farmers at Madiga Village are focusing on livestock such as cattle, goat, sheep and pork; and none of them are focusing on rabbit production.

This study's main purpose was to understand consumers perception of and willingness to pay for rabbit meat and analysing this perception and willingness in relation to their socio-economic characteristics. Moreover, since rabbit meat competes with other types of meat, it was imperative for the scope of this study to compare rabbit meat with other types of meat. As such, rabbit meat was compared with chicken, beef, pork and mutton.

Information for this study on the perception of and willingness to pay was collected using a structured questionnaire that was administered through face-to-face interviews. The data that was collected was entered into a Microsoft Excel Spreadsheet and SPSS for analysis. This study used a sample size of 120 respondents at Madiga Village that were randomly selected. Analytical techniques used to analyse the data were Descriptive Statistics, Binomial Logit Model, Likert Scale and Chi-square Analysis.

Firstly, the socio-economic characteristics of the respondents were identified and described. From the 120 households sampled and interviewed at Madiga Village, the results revealed that 57% of the respondents were males as compared to 43% of females. The majority, constituting 58% of the respondents were unemployed, whereas 28% of the respondents in this study were full-time employed with only 14% being self-employed. The household size of the respondents was found to be on an average of 5 with a minimum of 1 and a maximum of 13 members.

From the Likert scale results using ten items, it was found that rabbit meat was perceived to be the easiest to cook and prepare relative to all the meat types it was compared with. Furthermore, it was perceived to be more nutritious, healthy and cheaper. However, it was found that respondents perceived it as being the difficult meat to find. Rabbit meat was also perceived as tasty compared to pork, chicken, beef and sheep (mutton) meats.

To understand socio-economic characteristics affecting perception and willingness to pay, the Binomial Logit Model and Chi-square Analysis were used, respectively. The Binomial Logit results indicated that males were more likely to pay for rabbit meat if it was sold on a farm. Moreover, The results indicated that as household size increases by one, respondents would be more likely to pay for rabbit meat. Furthermore, respondents who perceived rabbit meat as better than pork and sheep meats were likely to pay for rabbit meat. Therefore, the null hypotheses were rejected as there are socio-economic characteristics and consumer perceptions that affect their willingness to pay.

Rabbit farming is promising at Madiga village and farmers who would like to take an initiative in rabbit farming are encouraged to do so. The potential of this enterprise suits it to be incorporated into the livestock governmental financial budget as a new business initiatives.

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ABBREVIATIONS

BC – Before Christ

CIA – Central Intelligence Agency

EU – European Union

FAO – Food and Agriculture Organisation

R&D – Research and development

SSA – Sub-Saharan Africa

WTP -Willingness to pay

CHAPTER ONE: INTRODUCTION

1.1. Background

Recently, there has been an explosive change in consumer-food relationships due to increased knowledge in the food industry. It is no longer just about supplying what you have, but about what you are selling as a producer that can meet the required need of consumers. Producers' primary objective in the food industry is to provide the product that consumers need. Kohls and Uhl (1990) mentioned that this entails more than just equating total demand and supply, but also the process of equating the desired product at the right time and place to the buyer. Meeting the expectations of any consumer as a producer of any product or service requires understanding their purchasing behaviour. However, defining and identifying the forces that drive consumers' behaviour in buying meat involves complex and heterogeneous factors as buyers have distinct needs and characteristics (Buitrago-Vera *et al.*, 2016). Escriba-Perez *et al.* (2017) demonstrated that the consumption behaviour for one meat species cannot be generalised to other meats as consumers' behaviour may well differ. For this reason, it is within the scope of this study to assess consumers' perceptions of rabbit meat compared to other meat types.

Kohls and Uhl (1990) state that food consumption is influenced by physiological needs, tastes and preferences, habits, social relationships and economic factors. Williams and Stout (1964) and Djazayery *et al.* (1992) describe the other factors which affect food acceptance and consumption as size and age composition of the family, occupation, time (season), race and religion.

The estimated demand for protein is alarming because by 2050, the global population is likely to reach 10 billion and the food production/protein supply will need to increase by almost 70% (FAO, 2018). Live animal tissues converted to meat obtained from conventional slaughter-species in traditional agricultural-livestock productive systems such as cattle, sheep, pigs, and poultry, are currently the major marketed sources of animal protein. However, protein originating from meats and how they are produced have been broadly questioned in terms of food security scenarios of global population growth, protein availability, production efficiency (g protein/time/area of used land) and sustainability (FAO, 2017). Besides sustainability issues, consumer health concerns will result in changes in consumption and,

therefore, the types of foods demanded and their relative contributions to diets will also change.

Meats from less popular animal species, but coming from more environmentally friendly and efficient production systems, such as lagomorphs and rodents, have commercial market value and represent a valid opportunity to improve food security and sustainability, with high dietary/nutritional value for humans (Cullere and Dalle Zotte, 2018). Lagomorphs such as rabbits have attributes (desired by humans) that should theoretically render them, ideal meat producers.

Rabbits are promising in terms of zoo-technical productive performance, due to a short life cycle, rapid growth rate, short gestation period, and notable performance responses, including daily weight gain and feed conversion ratios (Nasr *et al.*, 2017). Moreover, rabbit meat is considered a healthy food, because it is found to be low-fat, balanced in terms of unsaturated fatty acids and cholesterol, source of highly available micronutrients, such as vitamins and minerals, rich in high-quality protein and has an appealing taste (Bosco *et al.*, 2001; Dalle Zotte and Szendrő, 2011).

However, rabbit meat is not prevalent worldwide, even in countries where it is considered a traditional meat species such as China and Mediterranean Europe. Most commercial rabbit meat is still sold as whole carcasses and little effort has been directed towards the research and development of rabbit meat products (Li *et al.*, 2018; Petracci *et al.*, 2018). Therefore, this study provides an analysis of some of the effects of the pre-mentioned factors on willingness to pay and attendant perception.

1.2. Problem Statement

Rabbit meat is one of the recognised meats in rural areas of South Africa. This is supported by Gittens (2000) who asserted that there was a potential market for rabbit meat in South Africa, particularly in rural areas. In the same vein, Billet (1992) reported that the rabbit meat industry was succeeding in Gauteng Province. Moreover, Billet as cited by Hoffman *et al.* (2004), mentioned that he was convinced that the meat market in Johannesburg was undersupplied. Although rabbit meat is recognised in rural areas, most rural smallholder farmers do not take initiative in rabbit production. Limpopo Province is 123 600 km² in area with a population of approximately 5.3 million people, of whom 89% live in non-urban areas and 40–50%

are unemployed and is arguably the poorest province in South Africa (McLeod *et al.*, 2008). Madiga Village is one such area where rabbit production is not practised. Farmers at Madiga Village are focusing on livestock such as cattle, goat, sheep and pork; and none of them are focusing on rabbit production. Therefore, given the potential of rabbit production, this study explored the potential of rabbit production at Madiga Village by analysing consumers' perception and willingness to pay for rabbit meat in the area.

Rabbit meat is one of the nutritious meats with attributes that fit it to be the most highly consumed meat than other meats. For instance, rabbit meat is found to be low in fat, cholesterol, and calories, and higher in protein, calcium, and phosphorus than beef, chicken, turkey, or pork (Nistor *et al.*, 2013; Grădinaru, 2017). There is a strong correlation between the consumption of meat and nutritional value, as consumers perceive that a high intake of meat contributes to excess fat, cholesterol, and saturated fatty acids, which are strongly linked to obesity and cardiovascular problems.

The strong relationship between diet and health has led to changes in consumer habits, making them (consumers) demand products that meet their dietary and nutritional preferences. Hence, it is important to assess their perception of rabbit meat with other meats to better understand their behaviour pertaining to rabbit meat and the promotion of its consumption. Madiga Village consumers purchase rabbit meat as a full carcass from local hunters from their good catch since there is no area where they can go and buy rabbit meat for consumption.

Moreover, it is worth noting that consumers are heterogeneous and therefore, their consumption patterns differ owing to their preferences, behaviour, and perception of meat and meat products which depend on many factors. Factors that influence consumers' preferences, behaviour and perception of meat and meat products include psychological factors (willingness, risk, expectations), socio-cultural factors, (lifestyle, and values), sensory qualities (visual appearance, texture, flavour, and odour), and marketing factors (price, label, brand, and availability) (Font-i-Furnols and Guerrero, 2014). Understanding consumers is a vital component to design competitive strategies in a competitive market such as the meat industry because rabbit meat competes with other meats such as chicken, beef, etc. Although rabbit

meat is often overlooked, it is one of the solutions to reducing the problem of malnutrition in most vulnerable continents, such as the African Continent (Niyonzima *et al.*, 2017; Owusu-Sekyere *et al.*, 2014). This study, therefore, attempted to fill the information gap when it comes to consumers' perception and willingness to pay for rabbit meat to promote its consumption.

1.3. Aim and objectives

This study aimed to understand consumers' perception and analyse their willingness to pay for rabbit meat in Madiga Village.

1.3.1. Objectives of the study

The objectives of the study were to:

- i. identify and describe the socio-economic characteristics of meat consumers in Madiga Village.
- ii. assess the reasons for non-consumption of rabbit meat and consumers' perception of rabbit meat as compared to chicken, beef, pork and mutton.
- iii. determine socio-economic factors affecting the perception of and willingness to pay for rabbit meat by meat consumers.

1.3.2. Hypotheses of the study

- i. Socio-economic characteristics of consumers do not affect their willingness to pay for rabbit meat.
- ii. Socio-economic characteristics of consumers do not have any association with consumers' perception of rabbit meat compared to other meat types.
- iii. Consumers' perception of rabbit meat compared to other meat types does not affect their willingness to pay for rabbit meat.

1.4. Rationale of the study

Pereira and Vicente (2013) and Randolph *et al.* (2007) reported that, from healthy nutrition and well-being standpoint, meat is a good source of protein, minerals (iron, zinc, calcium), and vitamins (A, B12 and other B vitamins). As part of a nutrition transition (Popkin *et al.*, 2012) and livestock revolution (Delgado, 2003), the growth of meat consumption in developing countries is likely to increase. Worldwide, levels of meat consumption are projected to increase by 72% in 2030 compared to 2000

(Fiala, 2008). Moreover, FAO (2011) indicated that, in sub-Saharan Africa, the demand for meat products is growing rapidly and likely to increase by 140% between 2000 to 2030.

In this regard, it (rabbit meat) stands the chance of supplying the ever-increasing meat demand in the globe and thus food security. Madiga Village is one of the potential areas for effective rabbit production farm operation in the sense that the product under consideration is well known by the consumers, hence selected as the study area. Therefore, it was difficult for consumers to express their willingness to pay for rabbit meat if it was available on a farm as outlined in the questionnaire.

Rabbit meat is one of the nutritional meats with dietary and health benefits for different people facing certain diseases and is also one of the best sources for the prevention of diseases such as heart disease (NARCI, 2003). However, Nyete, as cited by Gittens (2000), stated that South Africans are not aware of the benefits of rabbit meat. Furthermore, the knowledge and culture of consumers can affect the consumption of certain food items (Asp, 1999) and this predicament may therefore negatively impact rabbit consumption.

Rabbit farming is one of the potential enterprises that promise great returns, especially in rural areas. This stems from the idea that rabbit farming uses less land and capital to operate (French, 1982; Reimund and Somwaru, 1985). Rabbits have the potential to contribute to both commercial and subsistence meat production in South Africa. They share many of the advantages of poultry, as they can be reared intensively (Szendrő and Dalle Zotte, 2011), can easily be handled by women and children (Lukefahr, 2007; Abu *et al.*, 2008), and can be slaughtered as required for consumption. Moreover, Finzi (2000) and Abu *et al.* (2008) mentioned that rabbits are highly prolific and grow rapidly. Moreover, there is limited food competition with humans as the use of cheap vegetal matters such as cellulose from wood, or sundry craps from industry or agriculture which are poor in macronutrients can be used (Petrescu-Mag *et al.*, 2014; Sima and Sima, 2015). Another advantage is that two serious rabbit viral diseases, namely, rabbit haemorrhagic disease and myxomatosis, have never been reported in South Africa (CABI, 2019a, b).

The maintenance of a disease-free status of the country has required banning the importation of all rabbits and rabbit material, implying that for the past 34 years or so

the rabbit population of South Africa has been genetically isolated from the rest of the world. Furthermore, despite their potential, rabbits are under-utilised within the country. Moreover, North *et al.* (2019) asserted that only two published studies have examined the perceptions of rabbit meat by South African consumers (Hoffman *et al.*, 2004; Hoffman *et al.*, 2005).

1.5. The organisation of the study

This paper is organised as follows:

Chapter 1 is the introduction which contains the background and problem statement, the justification of the study, aim and objectives that form the basis for conducting this study. Chapter 2 consists of a literature review of rabbit production from around the world, followed by livestock production in South Africa and a brief discussion of rabbit meat. Furthermore, factors affecting food choices are discussed together with the review of past literature and methods used to estimate Willingness to pay (WTP). Chapter 3 entails the methodology used in this study: where data sources, sampling method and sample size, method of data collection, and analytical techniques used to achieve the objectives of the study are discussed. Chapter 4 presents the findings of the research in line with the objectives and discussion of the study. Chapter 5 provides the summary, conclusions and recommendations for policy and further research as well as advice for producers who would like to practice rabbit farming.

CHAPTER TWO: LITERATURE REVIEW

2.1. Definition of keywords

Perception is a complex process by which we (the brain) select, organise, and interpret sensory stimuli into a meaningful and coherent picture of the world (Brunswik, 1943). Brunswik's (1943) definition of perception simply boils down to a complex process by which we select, organise, and interpret sensory stimuli into a meaningful and coherent picture of the world.

2.2. Continental rabbit production

Lebas *et al.* (1997) mentioned that specialised rabbit farming for meat purposes first occurred in southern California and some European countries such as Italy, France, Spain, Belgium, and the Federal Republic of Germany, in the 1920s and 1970s, respectively. In the Mediterranean region, the meat came from *Oryctolagus cuniculus*, Leporidae family, Lagomorph order, which are European rabbits, and has a history of trading as well as consumption which dates to the Phoenicians around 1100 BC (Dalle Zotte, 2014). In their study on rabbit production, McNitt *et al.* (2013) mentioned that rabbit farming intensification for meat production first occurred at southern California and in some Mediterranean countries such as France, Italy and Spain, and then rabbit farming became a livestock industry which was characterised as highly specialised, technically advanced and unique.

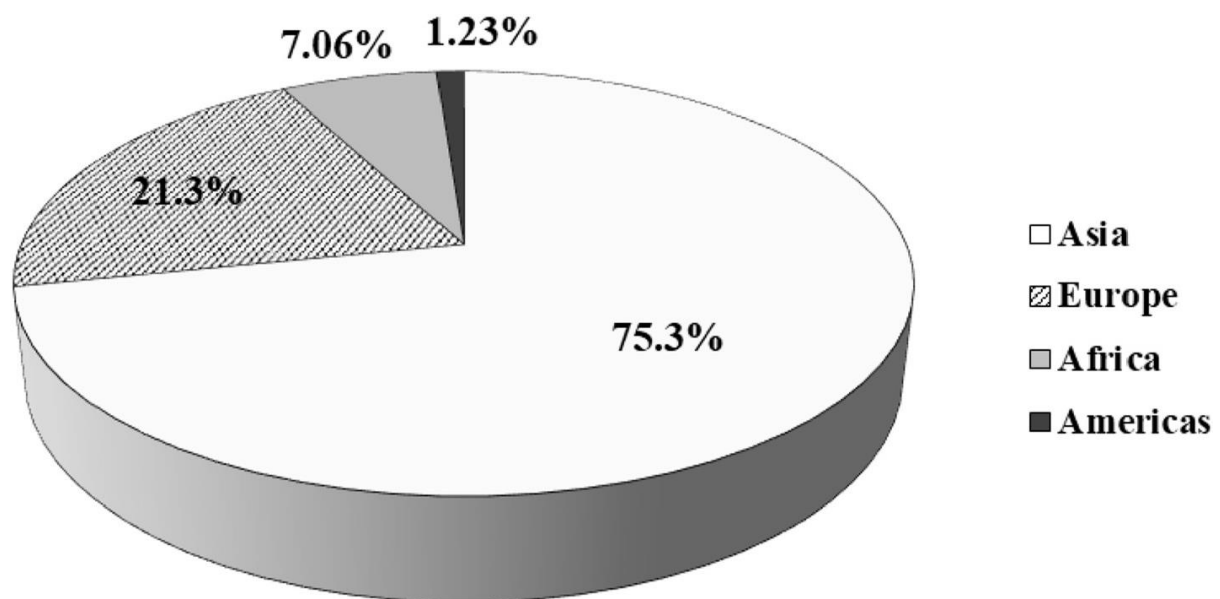


Figure 2.1: Continental rabbit meat production in 2016 (% of total rabbit meat production).

Source: FAOSTAT (2018)

Figure 2.1 illustrates global rabbit meat production according to the different data sources, regardless of data discrepancies in statistics, and according to FAOSTAT (2018), a total world production of about 1.4 million tonnes of rabbit meat arising from Asia (75.3%), Europe (21.3%), Africa (7.1%) and the Americas (1.2%). Globally, in terms of rabbit production, China was the largest producer with 849,150 t/year, followed by the Democratic People's Republic of Korea with 172,680 t/year, Egypt with 65,602 t/year, Italy with 54,397 t/year, Spain with 50,552 t/year and France with 48,396 t/year (FAOSTAT, 2018). These figures indicate that Europe is the second-largest rabbit meat producing region with Asia being the largest producing continent. Recently, the study conducted by Szendro *et al.* (2020) revealed that there has been an increase in rabbit meat production in China from 370,00 to 865,477 t/year (+134%), from 4160 to 4483 t/year in Mexico (+8%), from 42,174 to 43,109 t/year in Italy (+2%). Trocino *et al.* (2019) mentioned that it decreased to 29,000 tonnes in 2017, and decreased from 3300 to 3000 t/year in Poland (-17%), from 73,367 to 43,886 t/year in France (-33%), from 2100 to 1194 tonnes/year in Brazil (-43%), from 103,596 to 55,824 t/year in Spain (-46%) and from 14,000 to 5641 t/year in Hungary (-60%) between 2000 and 2018 (FAOSTAT, 2020).

Moreover, in many national economies, including Europe, rabbit production plays a vital role (Dalle Zotte and Szendrő, 2011). In fact, FAOSTAT (2018), in its 2016 data, revealed that Europe held almost 93% and 67% of the world's imports and exports of rabbit meat, respectively, regardless of a relevant regression that occurred in total production of rabbit meat in 2016 compared to 2014 (see Fig. 2.2).

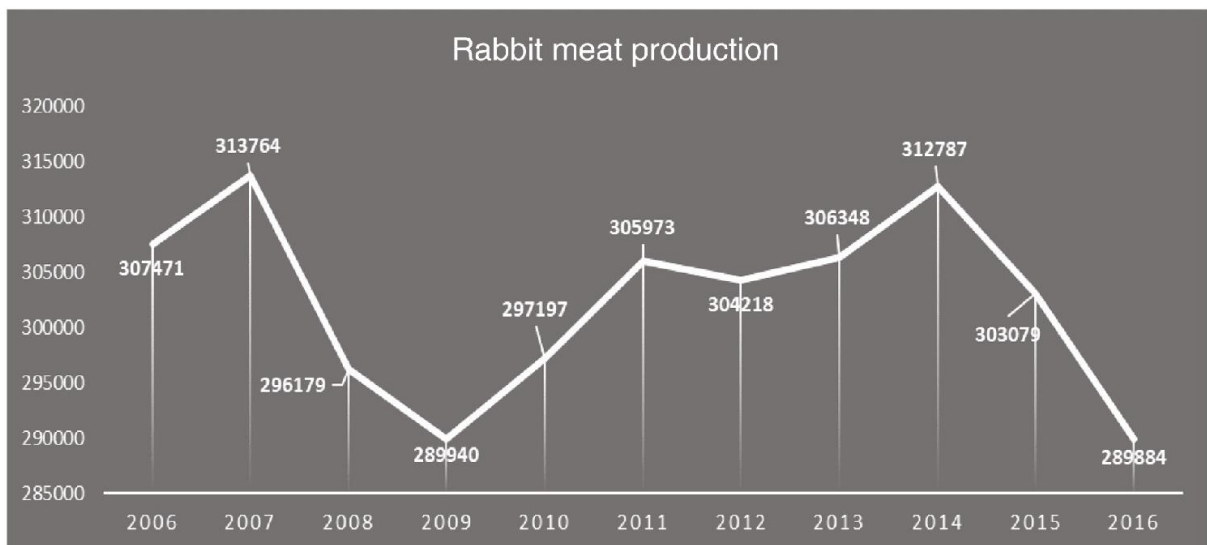


Figure 2.2: Variation in European rabbit meat production (in tonnes) from 2006 to 2016.

Source: FAOSTAT (FAOSTAT, 2018)

Rabbit Import and Export

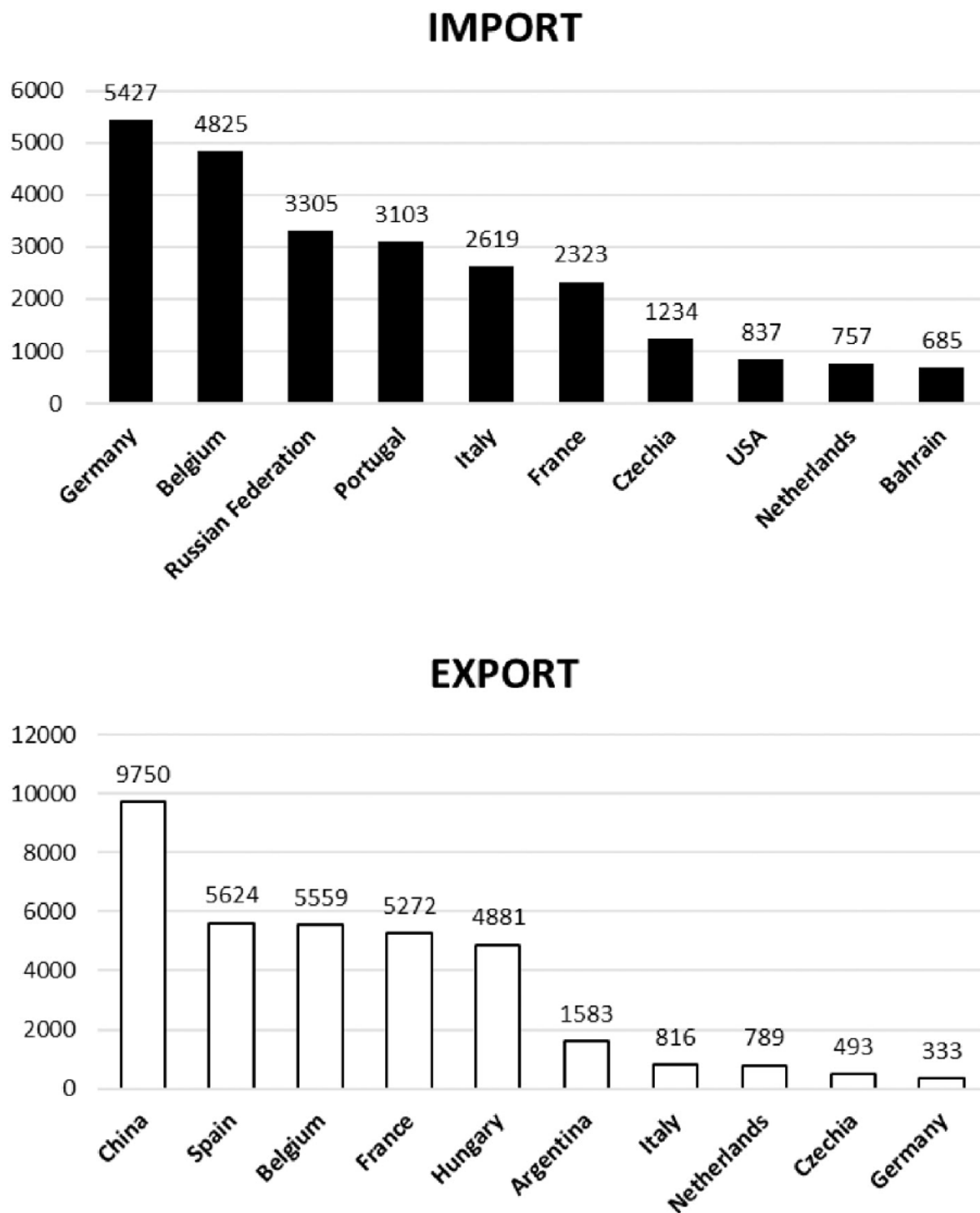


Figure 2.3: Top ten world rabbit meat import and export countries (in tonnes).

Source: FAOSTAT (FAOSTAT, 2018)

FAOSTAT (2018) indicates that the leading rabbit importing countries are Germany (5427 t), followed by Belgium (4825 t), Russian Federation (3305 t) and Portugal

(3103 t), while Spain (5624 t), Belgium (5559 t), France (5272 t) and Hungary (4881 t) are the four largest European exporting countries as illustrated in Figure 2.3. China, on the other hand, is the first exporting country in the world, accounting for 27% of total production, however, “there is no official data about import figures are available” (Cullere and Dalle Zotte, 2018).

Cullere and Dalle Zotte (2018) mentioned that the consumption of rabbit meat is not well received globally, including the Western Hemisphere, but is primarily limited to the Mediterranean region (Algeria, Cyprus, Egypt, France, Italy, Malta, Portugal, and Spain) and in some other European countries (Belgium, Czech Republic, Germany, and Luxembourg). Moreover, the European Commission (2015) stressed that there is scarcity and heterogenous official data about rabbit meat consumption. However, it only accounts for less than 3% of all meats consumed in the EU, being thus considered as a speciality market.

In the study on rabbit meat facts, Ardeng (1999) mentioned that since 1 500 BC, rabbits have served as a source of food. The study which was conducted in 64 developing countries revealed that 30% of the people surveyed were convinced that social, religious, or other reasons would not favour the development of rabbit production (FAO, 1999). Despite all these, rabbit production has demonstrated to be a viable enterprise in many countries, particularly in European countries (Bashi, 2002).

2.3. Rabbit production and its potential in Africa

The African continent is one of the hard hits when it comes to poverty with increasingly alarming trends over time. This problem made researchers question themselves given African resource endowments. Often, the existence of a problem exposes the potential of a certain country's or individuals' hidden potential and this is done through research.

World Bank report (World Bank, 2008) indicated that between years 1993 and 2002, there was an increase in the number of people living below the poverty line (\$1-a-day) in Sub-Saharan Africa (SSA), from 200 million to 220 million in rural areas and 80 to 100 million in urban areas. This report further noted that the number of the rural poor has continued to rise with an expectation that they might exceed the number of the urban poor by 2040.

Dolberg (2001) and Owen *et al.* (2005) reported that small livestock species such as rabbits, have been promoted as tools for poverty alleviation programmes. For over decades now, there is a recognition of the contribution of smallholder rabbit enterprises to food security in developing countries (Cheeke, 1986; Lukefahr and Cheeke, 1991a; Owen, 1976). Rabbits are particularly favoured for poverty reduction programmes because they require low investment and they have early benefits.

Furthermore, “rabbits are favoured on the account of their subsistence on renewable resources for feeding, housing and general management” (Oseni and Lukefahr, 2014). In the same vein, Lukefahr (1999a) mentioned that small-scale rabbit projects could be used as a vehicle for the poor to help themselves. A projected 5-year budget plan for an initial 3-doe operation for a typical rabbit farmer in Cameroon illustrated the low investment costs involved in small-scale subsistence rabbit enterprise (Lukefahr and Cheeke, 1991a). “The project can later be easily expanded to 5- to 10-doe operations to achieve a major favourable impact for the target family” (Oseni and Lukefahr, 2014).

There are documented reports that have been established with favourable impacts of rabbit development projects in terms of:

- (a) poverty alleviation (Cheeke, 1986; Lukefahr, 2000; Owen *et al.*, 2005);
- (b) rural development (Kpodekon and Coudert, 1993; Kpodekon *et al.*, 2000);
- (c) reducing rural-urban migration (Kamel and Lukefahr, 1990);
- (d) entrepreneurial skills (Kaplan-Pasternak, 2011);
- (e) humanitarian services, including recovery efforts from natural disasters (Kaplan-Pasternak and Lukefahr, 2011); and
- (f) gender empowerment (Lukefahr *et al.*, 2000).

2.3.1. Smallholder Rabbit production characteristics and its opportunities

The introduction of rabbits in SSA countries occurred probably over 100 years ago by the early European colonists and/or American and European missionaries, likely followed by a long period of repeated stock introductions (Lukefahr and Cheeke, 1991a; Lukefahr *et al.*, 2000). Normally for start-ups, small family rabbit units

averaging four does or less was enough for production in less developed economies owing to the local resources for feeding, housing, and healthcare (Lebas *et al.*, 1997; Onifade *et al.*, 1999; Oseni *et al.*, 2008). Lukefahr (1999) asserted that strategies to initiate small-scale backyard rabbit enterprises have been described as an 'alternative back to basics' approach. The author further mentioned that such downscaled units portray a more favourable economy of scale of production based on the use of renewable farm resources.

Finzi (2000) outlined smallholder rabbit units characteristics. The author in the study of raising rabbits for food security, Finzi (2000) outlined that smallholder rabbit units are characterised by the following: (a) few breeding rabbits in backyards; (b) use of local materials for hutches and equipment; (c) feeding of fresh forage and kitchen wastes; (d) integration of rabbits with other farm components; (e) sharing of family labour, (f) consumption of rabbits by the household or through the sale of excess stocks in the local market. Moreover, the author noted that smallholder rabbit units, despite the lack of economic resources, have available as assets both family labour and traditional knowledge of raising small livestock. The author saw the need for applied research that supports the development of rabbit cottage industries as he outlined in his recommendations.

The relative importance of rabbit production to the less developed economies was observed by Colin and Lebas (1996). In their study of rabbit meat production in the world: a proposal for every country, Colin and Lebas (1996) observed this importance to developing countries like Nigeria, Egypt, Ghana, Morocco, and Cape Verde. These authors mentioned that traditional farms with about 8 to 10 does, with a primary objective of family consumption and based on renewable resources, constitute 64% of farms in SSA and 58% in North Africa. Moreover, the percentage of does on traditional farms in North Africa and SSA was estimated at 67 and 76%, respectively. Oseni and Lukefahr (2014) stressed that these figures were high and provide a further justification of the need for client-focused research and development (R&D) for the long-term sustainability of these units. Report from the FAOSTAT (2011) indicated that between 1990 and 2010, countries such as Botswana, Burundi, Cameroon, Egypt, and Gabon, reported increases in national rabbit stocks (breeding females) from 15% to 41%; while other countries such as Kenya, Madagascar, Rwanda and Sierra-Leone showed exponential increases of

145%, 130%, 172% and 407%, respectively. Stock numbers were static for Algeria and declined in Mauritius (see Table 1). Furthermore, FAOSTAT (2011) reported a similar trend for rabbit meat production quantity (in tonnes) (see Table 2.2).

In Egypt, Kamel and Lukefahr (1990) reported that rabbit projects that were initiated in villages that directly involved young people had a positive impact on the rate of youth migration to urban areas. Vulnerable households such as people living with HIV/AIDS or recovery programmes from natural disasters like the devastating earthquake in Haiti in 2010 (Kaplan-Pasternak, 2011; Kaplan-Pasternak and Lukefahr, 2011). Moreover, Lukefahr (1999) described small-scale rabbit production as a humanitarian project because it provides opportunities that assist people who live in poor rural communities.

Table 2.1: Rabbit breeding females (thousands) for selected countries in SSA over a 20-year period.

Country	Year			
	1990	2000	2005	2010
Algeria	1400	1400	1400	1400
Botswana	100	100	100	120
Burundi	110	50	100	135
Cameroon	38	47	48	48
Egypt	6591	7300	7350	7300
Gabon	270	300	300	310
Kenya	214	313	472	525
Madagascar	50	120	110	115
Mauritius	15	15	7	5
Rwanda	292	339	519	793
Sierra-Leone	-	300	1350	1520

Source: (FAOSTAT, 2011)

Table 2.2: Rabbit meat production quantity (tonnes) for selected countries in SSA over a 20-year period.

Country	Year			
	1990	2000	2005	2010
Algeria	7000	7000	7000	7000
Botswana	900	900	900	990
Burundi	436	184	396	516
Cameroon	76	94	96	96
Egypt	49020	54240	54840	54600
Gabon	1620	1992	1800	1860
Kenya	1284	1860	2820	3000
Madagascar	300	720	660	690
Mauritius	81	81	38	25
Rwanda	1152	1332	2034	2040
Sierra-Leone	-	1500	6750	7500

Source: (FAOSTAT, 2011)

2.3.2. Success stories of backyard rabbit units in Africa

There is a record of about four decades ago that revealed success stories from across the African Continent emanating from the fruitful execution of R&D projects that involved large numbers of smallholder backyard rabbit units. Honourable mentions include:

(a) CECURI Rabbit Project of Benin Republic (Lebas *et al.*, 1997; Kpodekon and Coudert, 1993). This project was initiated with the primary objective of vitalising the rabbit production sector, where the initiators emphasised the need for local solutions to feeding, genetics and housing challenges (Kpodekon and Coudert, 1993; Lebas *et al.*, 1997). The primary objective of the project was to raise awareness and knowledge, breeding, pathology, etc., about rabbit production to improve local production and to extend a suitable method for its rearing. Kpodekon and Coudert (1993) mentioned that some of the impacts of the project included: (1) increased number of scientists involved in rabbit R&D; (2) increased number of smallholder rabbitries; (3) creation of a rabbit breeding association in the Benin Republic, and (4)

establishment of a functional R&D centre to provide client service to backyard rabbit units.

(b) The Heifer Project International, Cameroon Rabbit Project (or HPI-CAM) (Lukefahr *et al.*, 2000). Lukefahr and Goldman (1985); Lukefahr *et al* (2000) mentioned that for villages in Cameroon, HPI-CAM project was described to farm families that had the goal of bettering their family nutrition and income, community development and gender status. The project involved the use of local technologies and renewable on-farm local resources. In other Lesser Developed Countries (LDCs), the HPI project was described as a role model in developing rabbit projects. Lukefahr (1998) noted that the HPI-CAM model was applied to the HPI–Uganda smallholder rabbit project and other development projects (Lukefahr, 1998).

(c) National Rabbit Projects of Egypt (Kamel and Lukefahr, 1990; Galal and Khalil, 1994). Several Egypt reports of rabbit projects are noted. Galal and Khalil (1994) reported on the National Rabbit Project of Egypt, which involved collaboration between Zagazig University and the Egyptian Academy of Scientific Research and Technology. The objective of breeding focused on the distribution of purebred Californian and New Zealand White rabbits, along with an extension package to facilitate project uptake and adoption by small-scale rabbit farmers. A second farmers' project coordinated by the United States Agency for International Development (USAID) and the National Development Agricultural Bank of Egypt was initiated to enhance rabbit production particularly in rural areas through soft loans. Both projects documented good successes.

(d) the National Rabbit Project of Ghana (Mamattah, 1979; Lukefahr, 2000). Mamattah (1979), and Lukefahr (2000) reported that the National Rabbit Project (NRP) of Ghana was a widely distinguished programme and for decades, it has served as a model for lesser developed countries to abate national meat shortages and increase farm income. Provision of breeding stock, training, and extension support to limited-resource farmers were packages of the programme. Moreover, these authors reported that the NRP has served for many years as a role model to other developing countries concerning the government's role and duty in feeding its people through sustainable smallholder rabbit production.

(e) National Rabbit Fair in Kenya (Kamande, 2010; Oseni, 2010). The National Rabbit Fair of Kenya (Kamande, 2010; Oseni, 2010) involved 2000 smallholder rabbit farmers, key stakeholders, such as micro-finance and input suppliers and services, for example, veterinarians and feed millers. The primary objective was to sensitise the populace about the contributions of smallholder rabbit production to income generation and diversification, employment and family nutrition.

(f) Malawi: The Rabbit Research Project at Bunda College of Agriculture, Malawi (McNitt, 1979). The basis of the project was on nutrition, animal care, housing and general management. The project was established for the sole reason of investigating the requirements and needs of smallholder rabbit producers concerning housing, healthcare, nutrition, and breeding stock.

(g) Mauritius (Ramchurm, 1979);

(h) Mozambique (Gaspari, 1979; Demeterova *et al.*, 1991);

(i) Rabbit project in Ciskei, South Africa (Zeising, 2000);

(j) FAO and Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) support for rabbit project development in Tunisia (Belli *et al.*, 2008), and

(k) Rabbit projects in Uganda (Lukefahr, 1998).

Oseni and Lukefahr (2014) mentioned that because of their fruitfulness, some of these national projects gained global prominence, either for one or of these two reasons, (i) the number of people impacted by the project, for example, National Rabbit Project of Ghana; Heifer Project International in Cameroon, and the CECURI project of the Benin Republic or (ii) through project replication, for example, Heifer Project International in Cameroon. Other developing countries can take a leaf from the aforementioned and adopt strategies on how smallholder rabbit production can better shape their economic well-being. The projects mentioned above mark the genesis of rabbit production potentiality.

Kamel and Lukefahr (1990) reported the third project which was a comprehensive and integrated project which involved rural development in Ezbet Badir supported by the Near East Foundation. The project in approach was a participatory and community-based development project managed at the grass-roots level. And, these

projects work well as they are not top-down in approach. Furthermore, they are successful in fixing the problems faced by rural communities. The project also recorded some achievements, of which according to the authors includes stemming the tide of rural-urban migration among the youth and literacy improvement.

2.3.3. Constraints faced by the African continent in rabbit production

In their study of rabbit production in low-input systems in Africa, Oseni and Lukefahr (2014) mentioned that “Major constraints to the establishment of a viable rabbit industry in Africa range from institutional and policy limitation that hinder the development of sustainable programmes for smallholder rabbit units to critical environmental conditions (e.g. heat stress, poor stock adaptation and poor diet quality). Institutional limitations include the lack of an appropriate policy framework for small stock development that supports backyard and smallholder rabbit production systems.” Furthermore, these authors noted that the lack of ample evidence in consumer consumption patterns and perceptions over time for rabbit meat was also a predicament of developing viable smallholder rabbit units.

While the unique contributions of smallholder rabbit production units were well documented in Adu *et al.* (2005) on the one hand, Oseni and Lukefahr (2014) stated that the contributions of rabbits to household nutrition, income generation and food security are not recognised on the other hand. Nonetheless, despite the noted limitations such as the absence of a policy framework for small stock development and recognition of the contributions of rabbits to household production, there is a great amount of evidence of efforts by self-mobilisation rabbit farmers that have yielded good results. Evidence from Ciskei, South Africa (Zeising, 2000) and Guerrero State, Mexico (Clavel *et al.*, 2004), provide good examples. These studies proved that with a minimum investment required to initiate backyard rabbit farming, sustainable rabbit farms can be operated without technology or technical assistance. These are proven cases of marginal land communities that have initiated not only economically sustainable, but, also environment-friendly smallholder rabbit production systems which helped poor families.

Savietto *et al.* (2012) mentioned that heat stress is one of the key threats to rabbit production in the tropics. For instance, heat stress is one of the key environmental constraints towards rabbit production and/ or slow growth rate due to a multitude of

factors such as sub-optimal management, inadequate nutrition, inappropriate housing design, etc. Furthermore, Lukefahr and Cheeke (1991b) emphasised that high ambient temperatures can result in infertility in breeding rabbits and 30°C was considered the threshold beyond which infertility may likely result. An ample review of adaptation to heat stress, under hot and humid zones was conducted by El-Raffa (2004). The author mentioned that heat stress was ranked as the major problem facing the rabbit industry in the tropics and arid regions compared to other problems such as lack of quality in diets and diseases.

However, it is worth noting that despite harsh environmental conditions, rabbits are fruitfully reared and significantly contributing to family nutrition and welfare. This is probably because strategies on how to protect rabbits from extreme heat stress have been devised and recommended. For instance, appropriate housing design and placement or mating of animals in the early hours of the day, among other practices, have been recommended (Lukefahr and Cheeke, 1991b; Lebas *et al.*, 1997; Finzi, 2000). Furthermore, the non-existence of a tradition of consuming rabbit meat in some locations in SSA has also limited rabbit production in Africa (Oseni and Lukefahr, 2014). Nonetheless, this can be countered through promotional strategies like rabbit fairs and field days as well as cooperative marketing of stocks (Oseni, 2010).

2.4. Livestock production in South Africa

Livestock in South Africa plays a major role and contributes to the welfare of humans by providing food, security, fertilizer, fuel and many other products and services (Burditt *et al.*, 2000). Moreover, livestock provides meat and milk, which are essential in the diet of many people and by-products derived from livestock processing industries such as wool, mohair, hides, skins and they are used by people for many purposes (Cole, 1966; Cupps, 2001). Furthermore, the manure produced by livestock plays an important role in contributing to soil fertility (Burditt *et al.*, 2000; Cole, 1966), and in other developing countries, manure is used as fuel when dried not as fertiliser (Burditt *et al.*, 2000).

Animals also provide more protein than calories. Burditt *et al.* (2000) mentioned that animals supply one-third of the protein consumed in the world. The author further noted that meat, milk and fish supply the society with the necessary protein,

supplying 35%, 34% and 27%, respectively, of the world protein. Commonly produced domestic livestock in the world include cattle, sheep, goats, pigs and chickens. Cupps (2001) stated that these livestock animals contribute approximately 28% of the world's total value of agricultural products.

Low production of food in South Africa can be attributed to a lack of diversification and flexibility in agricultural production (Bashi, 2002). Producers tend to focus on certain livestock products and disregard others. Among the disregarded, but effective and efficient livestock products, are rabbits. In the study of the potential of rabbit production in tropical and sub-tropical agricultural systems, Cheeke (1986) stressed that small livestock such as rabbits resemble characteristics that might be advantageous in the smallholder, subsistence-type of a farming system. Moreover, FAO (1999) mentioned that rabbits have the potential to alleviate food insecurity amongst small-scale farmers around the world.

Moreover, Gebremedhin (1991) postulated that diversification into alternative agricultural activity appears to gain popularity and economic importance to augment family income and to provide an alternative source of high-quality food. Challenges that small-scale farmers battle with include a more competitive market, new environmental regulations and increasing production cost (Gebremedhin, 1991). As a result, farmers look for agricultural alternatives that are cost-effective which would ensure, not only income generation but the development of new markets, the development of new inputs, development of new products for consumers and the reduction of agriculture's adverse effects on human health (Gebremedhin, 1991).

2.5. Rabbit meat health attributes

2.5.1. Nutritional value of rabbit meat

The nutritional value of meat has become one of the vital factors determining meat quality and consumer acceptability. Meat is a major source of proteins and essential amino acids. However, it is worth noting that meat is also a major source of saturated fatty acids, of which excessive consumption is associated with chronic non-deficiency diseases such as obesity, type2 diabetes and cardiovascular diseases. Nonetheless, studies on the nutritional value of rabbit meat have been well-reviewed by several authors (Combes, 2004; Dalle Zotte, 2004; Combes and

Dalle Zotte, 2005), and they revealed that rabbit meat has a high nutritional value compared with other meats.

2.5.2. Chemical composition of rabbit meat

Other major components of meat, other than water, are proteins and lipids. Meat is also an essential source of highly available micronutrients, such as vitamins and minerals. Despite losses of nutrients during cooking, the change in the nutritional value of rabbit meat remains small (Dal Bosco *et al.*, 2001). Dalle Zotte (2004) mentioned that raw rabbit meat is characterised by its lower energetic value (on average 618 kJ/100 g fresh meat) compared with red meats, such as beef and lamb.

Rabbit meat generally has an increase in protein and fat contents and a decrease in water content with increasing age (Gondret *et al.*, 1998a, b; Hernández *et al.*, 2004) and weight (Szendrő *et al.*, 1996) of the animals. However, information about the chemical composition of rabbit meat is extremely variable, especially regarding fat content, depending on the part of the carcass studied (Pla *et al.*, 2004) and different productive factors (Dalle Zotte, 2002). Rabbit meat's chemical composition can also be influenced by the genetic line (Pla *et al.*, 1998, Hernández *et al.*, 1998), but it is scarcely influenced by gender (Pla *et al.*, 1996, Gondret 1998). Finally, rabbit meat is particularly tender owing to its lower content of elastine (Ouhayoun and Lebas, 1987) and the high solubility of its collagen compared to meat from other species (Combes *et al.*, 2003).

2.5.3. Fatty acids composition and cholesterol

Meat fat contains several types of lipids, such as triglycerides as the main components, phospholipids and cholesterol. The concentration of phospholipids is relatively constant in skeletal muscle, with amounts between 0.5 and 1g/100g of muscle, depending on the metabolic muscle type (Alasnier *et al.*, 1996). Rabbit meat fat is made up of, mostly saturated fatty acids (SFAs) and polyunsaturated fatty acids (PUFAs), with percentages around, 36.9% and 34.6% of total fatty acids in the hind leg, respectively (Hernandez and Gondret, 2006). In addition to fatty acids, cholesterol is a nutritionally essential component of meats. The proportion of cholesterol in rabbit meat was found to be around 59mg/100g of muscle (Combes, 2004), and some muscles as *Longissimus dorsi* and *Psoas major* have even lower values (45mg and 50mg/100g of muscle, respectively (Alasnier *et al.*, 1996). These

values are found to be lower than those presented in other meat types (61mg in pork, 70mg in beef, 81mg in chicken, Dalle Zotte, 2004).

2.5.4. Minerals and vitamins

The proportion of mineral content in rabbit meat is characterised by low contents in sodium (49mg and 37mg/100g for hind leg and loin, respectively) and iron (1.3mg and 1.1mg/100g for hind leg and loin, respectively), while the phosphorus level is high (230mg and 222mg/100g for hind leg and loin, respectively (Combes, 2004).

Meat is an essential source of vitamin Bs. Consumption of 100g of rabbit meat contributes to 8% of daily B2 vitamin, 12 % of B5 vitamin, 21% of B6 vitamin, 77% of B3 vitamin requirements, and provides fulfilment of daily B12 vitamin requirement (Combes, 2004). Rabbit meat like other meats, contains only trace amounts of A vitamin. However, it should be noticed that a high amount of this vitamin can be found in rabbit edible liver (Ismail *et al.*, 1992).

2.6. Factors affecting consumer food choices and rabbit meat consumption

It is without a doubt that food choices are driven by consumer perceptions and food-oriented attributes. For instance, consumers' food choices are driven by the quality and safety of the product in question. Zaibet *et al.* (2000) found that product quality and safety can well affect its demand owing to their (product quality and safety) association with cultural, social, and economic factors affecting diet habits.

Napolitano *et al.* (2010) proposed that consumers define the quality of animal-based products according to four major dimensions, which are sensory properties, healthiness, convenience and process characteristics. Sensory properties relate to appearance, odour, flavour, and texture. Healthiness relates to nutritional characteristics and health-promoting effects of a specific food, but also negative health issues it can result into in humans (i.e., because of high saturated fatty acid content, or for being a potential vector of infections and pollutants). Convenience relates to the ease of preparation of a food product, while process characteristics relates to the procedure to obtain a specific food product, which includes the farming system.

Henchion *et al.* (2014) stressed how the meat quality will be a key factor for consumers to the detriment of the product price or the income of the consumers.

Korzen and Lassen (2010) described how the perceptions of quality depended on two contexts, that is, the “everyday context” (of the consumer that purchases, prepares and eats the meat) and the “production context” (the pre-consumer side of the value chain: primary production, slaughtering and meat processing).

Grunert *et al.* (2004) analysed consumer perceptions of meat quality, focusing on beef and pork. The authors described the various intrinsic and extrinsic quality cues perceived by the consumer. Intrinsic quality cues are those which are physically part of the product itself, for example, shape, while extrinsic cues are not physically part of the product, for example, price (Grunert, 2006). Acebrón and Dopico (2000) stated that consumers infer the quality of beef based on intrinsic (colour, freshness and visible fat) and extrinsic (price, promotion, the designation of origin and presentation) quality cues.

Glitsch (2000) in his study on consumer perceptions of fresh meat quality: cross-national comparison, found that the place of purchase, colour, flavour and freshness are considered quality indicators of beef, pork, and chicken fresh types of meat in six European countries. Becker *et al.* (2000) reported similar outcomes for the same three fresh types of meat, plus the country of origin variable as an extrinsic cue for quality selection in the shop and for assessing the safety of meat.

2.6.1. Healthiness

Consumers are mainly attracted to the healthiness of meat product(s). The fact that meat products are supplemented with additives that perhaps help in the shelf life of meat products, substances that help in the growth or treat diseases during production, pesticides used in plants which are consequently used to feed animals, could potentially leave residues in meat products that pose a threat to consumers' health.

Health is acknowledged as a driving force towards eating habits among consumers and can eventually result in the shift of the most eaten meat (Escriba-Perez *et al.*, 2017). The nutritional status of rabbit meat beyond doubt aligns with the health requirements of the modern consumer. This criterion serves as a cornerstone to promote its consumption worldwide. Rabbit meat is high in protein and essential amino acids levels with low-fat content together with a favourable proportion of

saturated, monounsaturated, and polysaturated fatty acids. Moreover, rabbit meat has low cholesterol (47mg/100g loin meat) and sodium (on average 42mg/100g edible fraction) contents. Furthermore, rabbit meat is a good source of potassium (on average 430mg/100g edible fraction), phosphorus (228mg/100g edible fraction), selenium (on average 12µg/100g edible fraction, considering non-supplemented diets) and B vitamins, together with being one of the richest sources of vitamin B12. Moreover, the rabbit being a monogastric animal, dietary changes and/or supplementation with health-promoting ingredients are effective tools to further improve the nutritional quality of meat (Dalle Zotte and Szendrő, 2011).

2.6.2. Sensory properties

The sensory properties of meat products serve as an essential tool in consumer choices. Traditional consumers of rabbit meat generally recognise it to have positive sensory properties, giving favour to its flavour and remarkable tenderness. However, consumers that do not eat rabbit meat mainly refuse it due to the perceived wild taste (Dalle Zotte, 2002). Characteristics that can be seen, play a vital role in consumers' choice. Rabbit meat owing to its packaging strategies and storage time can change its appearance: it becomes darker, drier and/or wet and this can eventually affect consumers' acceptance. Dalle Zotte (2002) stressed that consumers associate freshness and quality with a good colour of lean meat.

Moreover, Petracci and Cavani (2013) mentioned that the fact that rabbit meat was still sold as a whole or cut-up carcass (i.e., 70% and 25% of total Italian rabbit meat distribution in 2011, respectively), proved to be a deterrent to most consumers, especially the young ones whose choice was particularly driven by product presentation. This aspect, together with the fact that when consumers are not used to eating a certain type of food, they tend to dislike it (Hoffman *et al.*, 2004), making food habit change particularly complex. "Appearance has a great impact on consumption, and thus, improving the rabbit meat image as well as promoting it both to traditional and new customers would be a key step to stimulate consumption" (Cullere and Dalle Zotte, 2018).

2.6.3. Convenience

There have been great changes in consumers' lifestyles in the past years with cooking and eating times regressing, hence the ease with which food is prepared is of paramount importance for consumers these days in selecting food products. Consumers are more interested in ready-to-cook and ready-to-eat meats (Dalle Zotte, 2002). Brunner *et al.* (2010) mentioned that the food market is more and more conditioned towards convenient meat products that are time-minimising in nature together with physical and mental efforts required for food preparations, consumption and clean up.

Although the rabbit market challenge has been to a greater extent exploited by the poultry meat industry (in 2007, 20% of total sales of poultry meat was made up of processed products), small amounts of ready-to-cook and ready-to-eat rabbit meat products are marketed and sold (Cullere and Dalle Zotte, 2018). Petracchi and Cavani (2013) indicated that in 2011, the Italian rabbit meat distribution market was made up of 70% whole carcass, 25% cut-up and only 5% processed products. Cullere and Dalle Zotte (2018) attribute this occurrence to the fact that rabbit meat is still considered traditional meat.

2.6.4. Process characteristics

In European countries, production strategies in rabbit farming have received alarming criticisms in the sense that the housing conditions where rabbits are held had threatening signs on the well-being of rabbits. For example, Villagra *et al.* (2012) stressed that cage design is one of the vital areas where the use of common wire mesh cages has been connected with poor welfare conditions.

However, Carlucci *et al.* (2009) mentioned that information dissemination that relates to farming methods can potentially result in a greater positive impact on consumer expectations, where high animal welfare standard connected with high expected quality is presented. Animal welfare in the minds of consumers and other stakeholders appears to be one of the important units of meat quality assurance and consumer demand.

Cullere and Dalle Zotte (2018) revealed that the prevailing housing conditions of rabbits in conventional farming operations are the reason for decades of research efforts that tried to detect a compromise between the natural behaviour of rabbits and production requirements. Moreover, the authors further indicated that due to emanating welfare requirements, there has been ample research carried out to assess the impact of different housing conditions. Morisse *et al.* (1999) mentioned that preference test on rabbits revealed that the conventional cage with the wire-floor system was preferred than the straw litter for the sole reason that the wire is clean and dry. Princz *et al.* (2008) stressed that increasing the height of the cage permits the rabbit to sit on its hind legs with erect ears, however, this was questionable. The authors further mentioned that rabbits showed a low preference for open top and taller cages compared to conventional ones. Furthermore, Cobes *et al.* (2010) and Morisse (1998) stressed that increased paralysis and low performance of carcass and meat quality traits are attributed to extensive housing conditions than conventional housing.

2.7. Review of past literature

2.7.1. Rabbit meat attributes and consumers' socioeconomic characteristics as factors affecting consumers' willingness to pay

Several studies have reported on rabbit meat attributes and willingness to pay by consumers. These attributes generally include healthiness, sensory properties, convenience and process properties.

For instance, 51% of respondents who consume rabbit meat in Hoffman *et al.* (2004) study on factors affecting the purchasing of rabbit meat: a study of ethnic groups in Western Cape, indicated that they preferred to buy rabbit meat only if it was presented in portions, than as a whole carcass. This notion was attributed to the idea that some consumers do not like rabbit meat presented as a whole because it looks like a cat or a human infant (Sonandi *et al.*, 1996). The study further showed that all ethnic groups preferred to buy rabbit meat in portions, with whites having a high percentage at 59% followed by coloureds at 56% and then blacks at 44%. The preference to buy rabbit meat in portions by white respondents was expected as they were presumed to be a high-income group. The study further evaluated the processing method preference for the purchase of rabbit meat and found that the

respondents who do not eat rabbit meat were willing to buy fresh meat (56%) instead of frozen meat (19%) and/or canned meat (64%).

In Hungary, Bodnar and Horvath (2008) in their study on consumers' opinion about rabbit meat consumption, revealed that 75% of the asked respondents had tasted rabbit meat and 76% of them perceived it as healthy meat. However, they perceived it the same as poultry meat. This resulted in 70% of them only buying rabbit meat once or twice a year. Respondents in Hungary were unwilling to pay for rabbit meat more than poultry meat. Moreover, Hungarian households were unwilling to buy rabbit meat from the supermarket with only 7% of them buying rabbit meat there. This behaviour was attributed to the fact that consumers do not trust supermarkets. However, it was found by the authors that 48% of the consumers buy rabbit meat from producers.

Villanueva *et al.* (2015) in their study on the behaviour of consumers and willingness to pay for quality attributes of organic meat attribute concluded that 98% of the respondents have tasted rabbit meat at least once in the past five years, with 89% consuming it every six months and the rest having consumed it more than once. However, an important aspect found by the authors was that 53% of the surveyed respondents were willing to pay a premium for the organic attribute. Furthermore, the study revealed that for quality attributes, 82% of the respondents mentioned food safety as very important followed by price and taste. The results of the study showed that as a range of willingness to pay a price premium increases, the number of consumers (frequency) decreases significantly. Forty-seven point five of the respondents said that they were not willing to pay (\$0/kg), 28.2% indicated that they were willing to pay 10 pesos/kg each and 18.8% were willing to pay 10 to 20 pesos/kg. Schooling, income, purchase price and the knowledge of organic foods were found to significantly affect the willingness to pay (WTP) for organic attributes.

Beal *et al.* (2004) in their study on an analysis of household consumption of rabbit meat, asserted that 23% of the respondents in the Southern United States were willing to buy rabbit meat nuggets, patties or roasts provided they were available at local grocery stores. These respondents were likely to be men without college degrees, with a household income level of below \$25 and live with children between 5 and 12 years old. This willingness to buy these processed products of rabbit meat

was found to be invariant to age, race, household size, marital status, employment status and geographical location. Moreover, these authors found that 29% of the sampled respondents were willing to try rabbit meat provided it was packaged with recipes and cooking instructions. Thirty-nine percent of men showed a willingness to buy rabbit meat if it had recipes and cooking instructions, compared to 28% of women. Furthermore, their results revealed that 71% of the respondents with household incomes that are at most \$50,000 were willing to buy rabbit meat if it had recipes and cooking instructions. Those who were living with children aged between 13 and 18 years, those with jobs, non-residents of Florida and Louisiana residents, were seen as other potential buyers.

Furthermore, age, race, education, household size, marital status, and geographical regions outside Louisiana were found to have no effects on consumers' willingness to buy packaged rabbit meat with recipes and cooking instructions. An analysis of willingness to buy pre-packaged, marinated, and ready-to-cook rabbit meat was also done. It was found that 27% of the respondents were willing to buy rabbit meat in this form (Beal *et al.*, 2004). The most likely buyers were respondents aged between 18 and 35 years old, men, non-Caucasians, respondents who live in multiple-person households, those without college degrees, those with household income levels below \$25,000 and those in households with children less than 12 years old. Thirty-one per-cent of the households with preadolescent children indicated some willingness to buy rabbit meat if it was packaged with a marinade and in ready-to-cook form. Thirty-five percent of Louisiana residents were willing to buy this form of rabbit meat. Purchase intentions were found to be invariant to marital and employment status and persons living outside Louisiana.

2.7.2. Consumers' perception and consumption of rabbit meat as compared to other meat types

Zoltan *et al.* (2009) found that 31% of the respondents that were involved in the survey used to eat rabbit meat with the less populated area showing more frequent consumption than in another area. The study showed that 69% of the respondents do not eat rabbit meat at all. However, they agreed on the fact that rabbit meat has low-fat content, especially when compared to other meat types. The results of the study showed that most of the panel agreed with the fact that rabbit meat has low-fat

content and that is true when compared to other meat types, mainly with pork and beef. This finding was found to be important because – through effective marketing communication – it can be fitted into the frames of healthy nutrition. The study further found that many people think that rabbit meat has lower fat content than that of poultry and many consumers associate low-fat levels with low cholesterol and energy contents, so the position of the product was found to be very favourable. The positive product image was indicated by low deviation values.

In Spain, Petrescu and Petrescu-Mag (2018) compared the consumption of rabbit meat with chicken, pork, sheep, beef, and fish. Rabbit meat in consumption in a comparative context was found to be 2.2 times lower than chicken and 1.8 times lower than pork as was expected. This finding was pinned to the fact that availability is limited to self-production, small producers, and few supermarkets in the cities of Spain. Consumers chose healthiness, taste and price as the most important attributes that influence their meat choices. The taste was proven to be one of the driving factors for food choices and dietary behaviours and intake.

For instance, Kourouniotis (2016) mentioned that 82% of Australian consumers rated taste as an extremely important factor for food choice. Moreover, in Spain, consumers selected good taste (72.4%), healthiness (35.9%) and having low-fat content (14.6%) as the three main reasons to consume rabbit meat (Buitrago-Vera *et al.*, 2016). Petrescu and Petrescu-Mag (2018) then compared rabbit meat to the most consumed meat types (chicken, beef, pork, and sheep and fish) and found that the interviewed respondents perceived rabbit meat as healthier than all tested meat types and fish supports its promotion as a functional food. This showed that most interviewed respondents were aware of rabbit meat. However, the fact that rabbit meat was perceived as expensive yet tastier than other meats served as an obstacle to its promotion and consumption, but, encouraging for producers and sellers who have an idea of marketing rabbit meat.

Escriba-Perez *et al.* (2019) conducted a study on children's consumption of rabbit meat and analysed the relationship of rabbit meat consumption with other meat types. They compared the consumption of rabbit meat with beef, chicken, pork, and lamb, and turkey. The authors found that the most frequently consumed meat in households with and without children under 18 years of age were chicken and beef.

In contrast, the meats consumed less frequently in households with children were rabbit (3.91) and lamb (3.85), while in households without minors they were lamb (3.66) and turkey (3.60). As a result, the frequency of rabbit meat consumption had an average value of 3.56. In both cases, the average frequency of rabbit meat was between once a month and once every 2 or 3 months.

In East Algeria, Sanah *et al.* (2020) reported that rabbit meat was chosen as the favourite meat by 14% of its consumers and it was at the fourth position with goat meat as the least favourite meat with 8% of its consumers. In the same study, sheep meat topped the group as the favourite meat followed by beef (20%) and poultry meat at 16%. Thirty-seven percent of consumers indicated that they perceived rabbit meat as similar to poultry meat, 17% compared it to goats, 7% and 4% of the surveyed compared it to cattle and sheep, respectively, while 35% of consumers said that it does not resemble any type of meat. Regarding the organoleptic qualities of rabbit meat, consumers mentioned that the latter has smell, shape, and tenderness similar to that of chicken meat, whereas, taste and colour are closer to goat meat.

Adanguidi (2020) analysed the place of rabbit meat among the meat products consumed by the respondents. The results showed that almost all respondents consumed traditional chicken and also called it bicycle chicken (97% of cases). About 91% of the respondents mentioned that they eat fish with goat meat having 69% of cases, improved/imported chicken (61% of cases) and beef meat (56% of cases). The respondents were further asked to classify the meat products consumed based on expenditure and preferences. The analysis of the concordance of the rankings made by the respondents showed that fish was in first place in terms of expenditure, while rabbits were in fourth place. In terms of preference, rabbits came in second place after local chickens. Although the rabbit was more popular than fish and goat, consumers spent less on it. This was explained by the price of the rabbit, which was relatively higher than that of other meat products. As a result, rabbit meat consumption was somewhat modest in the eating habits of the average Beninese. The relatively high price of farmed rabbits made them less competitive compared to chicken (Mailu *et al.*, 2012).

2.7.3. Consumers' perception of rabbit meat attributes

McLean-Meyinse *et al.* (1994) reported that the four most important nutritional and meat characteristics to respondents was found to be freshness, low-fat content, the taste of the meat and the price. The colour of the meat was generally found to be the least important characteristic. As for rabbit meat, respondents reported that the reasons for consuming rabbit meat were taste (3%), others consumed rabbit meat because of its low cholesterol (0.3%) and fat content (0.2%).

In Spain, Montero-Vincente *et al.* (2018) analysed the commercial value of rabbit meat based on the positioning of the different types of fresh meat and found that rabbit meat was associated with low fat and healthy attributes. The study used nine items to understand consumers' image of rabbit meat. Based on their results on the image of rabbit meat by consumers, the items that were found with the highest were "easily found in the premises where consumers do the shopping" with an average score of 4.5, and "it was a clean and healthy meat" scored 4.4 on average. However, as for being tasty meat with flavour and as a good value for money, rabbit meat scored the lowest scores at 3.86 and 4.11, respectively. The authors further analysed the standard deviations and found that the items with a higher standard deviation were "It's tasty meat, with flavour" (1.25) and "It's a quick and easy meat to cook" (0.86). However, in contrast, "Rabbit is a clean and healthy meat" (0.67) and "Rabbit meat is digestive, it doesn't sit heavy (0.73)" had a lower standard deviation.

In Nigeria, Maigida *et al.* (2018) found that the respondents had a positive attitude towards rabbit meat with an emphasis on its healthiness and good taste. These authors also found that the respondents did not find rabbit carcass unattractive and rabbit meat more palatable. However, rabbit meat was found to be expensive and unavailable. "This indicated that unavailability of rabbit meat in the market exploits consumers income and they perceive it less good than other meats." Some mentioned the difficulty of rabbit meat when processing it, while others said they do not know. "Hence difficulty in promoting its consumption."

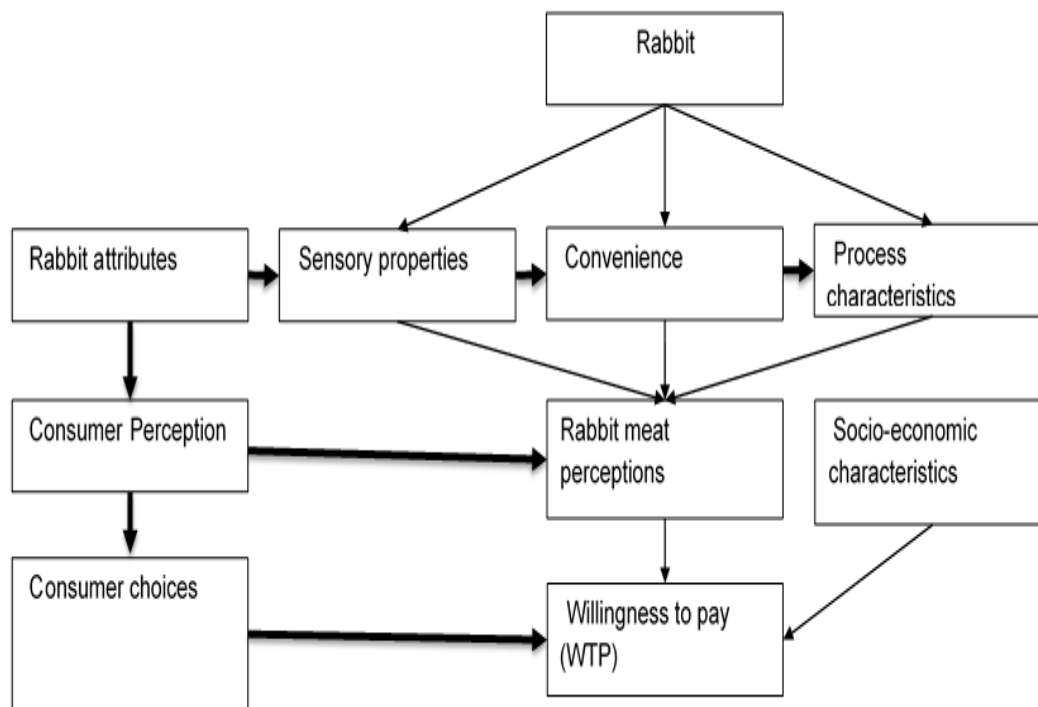


Figure 2.4: Rabbit meat conceptual framework

Source: Authors' compilation based on literature

From the literature review conducted in this study, a conceptual framework which is shown in Figure 2.4 was drawn. The conceptual framework simply says rabbit meat attributes comprise of sensory properties, convenience and process characteristics which shape consumers' perception. Together, rabbit meat perceptions driven by the three rabbit meat attributes, that is, sensory, convenience and process attributes by consumers and their socio-economic characteristics affect their choices, either willing to pay and/or purchase and/or buy rabbit meat. The bold arrows represent heading and unbolded arrows represent subheadings.

2.8. Review of methods used to estimate willingness to pay

Literature groups methods of estimating WTP into revealed and stated preferences. Both methods are applicable in estimating WTP depending on the type of good or service in question. In this study, we discuss some of these methods amongst others used in estimating WTP.

2.8.1. Revealed preference methods

Revealed preference methods infer prices for environmental services from observed market behaviour. Some of these techniques measure direct market impacts associated with changes in natural resource condition, like when productivity techniques assess the impacts on agricultural yields of changes in natural resource inputs. For example, Magrath and Arens (1989) assessed the effect of soil erosion on crop yields in Java, Indonesia. Brief description of some of the revealed preference methods are as follows:

2.8.1.1. Travel Cost

The travel cost method is one of the revealed preference methods that indirectly value environmental goods by observing WTP for related goods and services. The method is used to estimate the economic value of environmental amenities as well as other recreational sites (Butterfield *et al.*, 2016; Markandya and Ortiz 2011; Parsons, 2013). The travel cost method is employed when studying economic use values related to ecosystems (Butterfield *et al.*, 2016). The travel cost technique is based on time and travel cost expenses that individuals pay to visit a site and these (time and travel cost) represent the price to access that recreation site. As a result, an individual's WTP to visit various recreational sites can be estimated while reflecting on the number of trips people make at different travel cost.

2.8.1.2. Hedonic Pricing

Research shows that the hedonic pricing method is one of the potential approaches used to determine the environmental value of a given asset. In its earliest use, this technique was used to capture the aspect of WTP measures related to variations in property values, which usually result from the presence or absence regarding certain environmental attributes such as near forest, near the river, air pollution, noise and water waves (Abidoye and Chan, 2017; Burcharth *et al.*, 2007; Carson, 2001;). Hedonic pricing method is regarded as a non-market revealed preference approach with an indirect proxy that has been particularly influential (Carson, 2001; Markandya *et al.*, 2018;).

Freeman (1994) depicts natural resource assets as providing economic value to individuals in society in various ways. For traded goods, values are derived from markets about observed relationships between price and quantities supplied and

demanded. However, natural resource goods and services are often not traded in this way. For non-use environmental assets, there is no relevant market behaviour to observe from which inferences can be made like in the market. Therefore, a hypothetical or contingent market must be constructed using questionnaires. This is the basis for the stated preference methods.

2.8.2. Stated preference methods

Stated preference valuation is a family of techniques that use individual respondents' statements about their preferences to estimate the change in utility associated with a proposed increase in quality or quantity of ecosystem service or bundle of services (Carson *et al.*, 2002). Respondents are presented with one or more hypothetical policy or project scenarios that lead to a specified environmental change compared to a baseline situation. The answers respondents give, in the form of monetary amounts, ratings, or other indications of preference, are scaled following an appropriate model of preferences to yield a measure of the value of the proposed ecosystem service change. This value is often monetarily expressed as people's WTP. Stated preferences are often elicited through surveys (typically the web, phone, mail, or in-person) that use questionnaires following strict guidelines. The surveys are administered to representative samples of the people affected by the environmental change and the mean WTP per household or person is then aggregated over the relevant population as a measure of welfare change.

The most common categories of stated preference methods that are used to estimate the WTP for non-use environmental assets and services are CV and CM.

2.8.2.1. Contingent Valuation (CV) Method

The CV method is a survey technique that attempts direct elicitation of individuals' (or households') preferences for a good or service. It does this by asking the respondents in the survey a question or a series of questions about how much they value the good or service. People are asked directly to state or reveal what they are willing to pay to gain or avoid some change in the provision of a good or service.

A contingent market defines the good itself, the institutional context in which it would be provided and the way it would be financed. The situation that the respondent is asked to value is hypothetical (hence, 'contingent'), although the respondent is

assumed to behave as if he or she was in a real market. Structured questions and various forms of 'bidding game' can be devised involving yes/no answers to questions regarding maximum WTP. Econometric techniques are then used on the survey results to find the mean bid values of WTP. Carson (2000) provides a guide to the use of CV.

2.8.2.1. Choice Modelling (CM)

Choice Modelling (see Bennett and Blamey 2001,) is perhaps the main ABSC (Attribute Based Stated Choice) method used for environmental valuation. The elements of CM that are common with CV are that the attribute scenarios are hypothetical choice sets. The questionnaire formats are also broadly similar. The principal difference is that under CM, WTP is only elicited indirectly through a process of observed trade-offs made by the respondents. While CV directly asks for WTP on the one hand, CM infers it from choices made by respondents across a sequence of options on the other hand. CM is based on the idea that any good can be described in terms of its attributes and the levels that these take. For example, the forest can be described in terms of its species diversity, age structure, recreation facilities and entry price or transport cost.

Changing attribute levels will essentially result in a different "good" being produced and it is on the value of such changes in attributes that CM focuses. By choosing over these different "goods", including the implicit price attribute, respondents reveal the value of the other attributes indirectly. A well-structured CM questionnaire is designed to ensure that there is no correlation between attributes to enable the model to determine the importance of each attribute.

2.9. Summary

Consumption of rabbit meat is not well received worldwide, especially in the western hemisphere. It is limited in the Mediterranean region. The European Commission stressed that there is scarcity and heterogeneous official data about rabbit meat consumption. There is ample evidence about socio-economic characteristics that affect the consumption and willingness to purchase for rabbit meat. However, there is limited information about South African rabbit meat consumption, production, willingness to purchase and willingness to pay.

CHAPTER THREE: METHODOLOGY

This chapter describes the methods and materials used in the study. It provides information on the study area, data source(s), sampling method and sample size, method of data collection and method of data analysis employed in correspondence with each of the objective of the study. The method used to address consumers' WTP, Likert Scale measurement to understand consumers' perception and Chi-square contingency test to assess the effect of socio-economic factors on consumers' food choices are discussed.

3.1. Study area

The study was conducted at Madiga Village in Ga-Dikgale area, which is found in the Polokwane Local Municipality of Capricorn District in Limpopo Province, South Africa. The area is approximately 40 km from Polokwane City, the capital of Limpopo Province. Ga-Dikgale area is on the Highveld Plateau, which is bounded in the south and south-east by the Strydpoort Mountains and the east and northeast by the Wolkberge. Ga-Dikgale is a community of about 9,000 people and consists of 23 villages including Madiga Village (Shingai *et al.*, 2018). According to the South Africa Community Survey (2011), Limpopo Province is accounted for approximately 5.3 million of the 48.5 million national population.

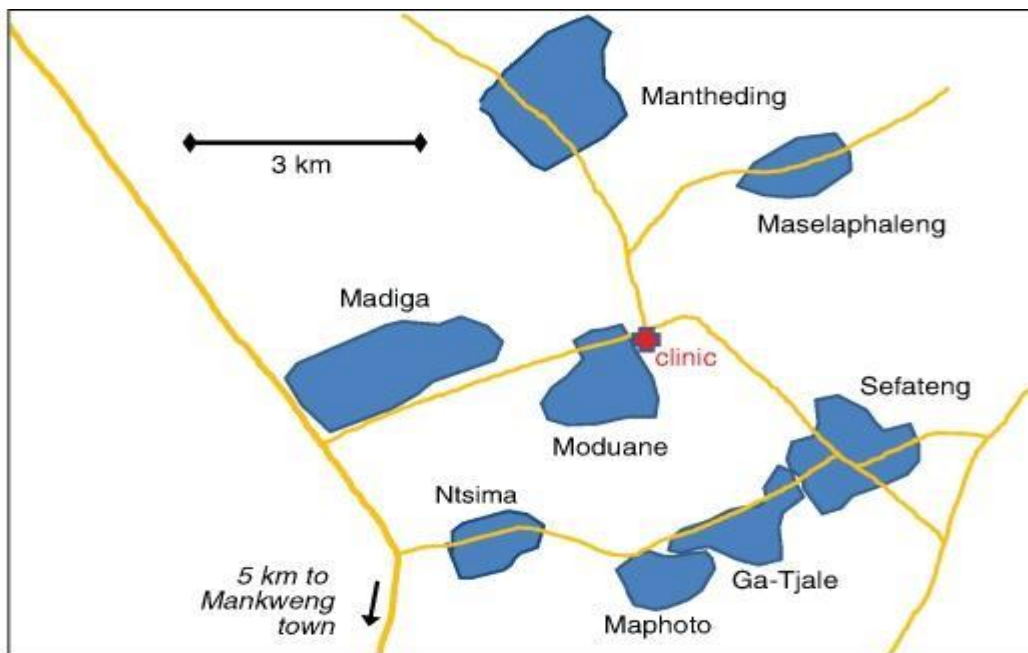


Figure 3.1: Map of Ga-Dikgale

Source: Kanjala *et al.* (2010)

3.2. Data Source

This study used primary data to meet its objectives. The data collected included information on the socio-economic characteristics of rabbit meat consumers such as age, gender, marital status, years of education, occupation, household income, household size, culture, and religion. To assess consumers' WTP for rabbit meat, a binomial response question was used where respondents were asked to state whether they would be willing to pay for rabbit meat if it was available or if they would not. Follow up questions on whether they would be willing to pay for rabbit meat above or below other meat types was also used.

3.3. Sampling method and sample size

For sampling purposes, this study employed a random sampling procedure to select respondents at Madiga Village. The study considered a sample of 120 respondents. Louangrath and Sutanapong (2019) noted that ideally, regardless of discrete or continuous and regardless of whether Likert or non-Likert scales used in the survey, they found that the minimum sample size is approximately 30. Moreover, the study considered 120 respondents as an enough sample size to give the required information in a village of approximately 576 households (Sustainable Energy and UL, 2016). And, 120 respondents are above the threshold of 10% representative of the sampling frame.

3.4. Method of data collection

This study, which analysed the household perception and WTP for rabbit meat, was conducted in the Madiga Village. Primary data was used to achieve the aim of the study. The primary cross-sectional data was collected with the use of a structured questionnaire administered through face-to-face interviews from respondents at Madiga Village. The data was collected on socio-economic characteristics (age, gender, marital status, household size, household income, years of education, religion and culture, occupation), reasons for not consuming rabbit meat as well as consumer perceptions of rabbit meat and other meat compared to rabbit meat. The questionnaire was divided into three parts as follows:

The first part was filled in by all the respondents, the second part was devoted to those who eat meat, even if they do not eat rabbit meat, while the last part was only

for those who had eaten rabbit meat before, never ate and no longer eat or who will be willing to eat and pay for rabbit meat if it was available.

3.5. Analytical techniques

The data collected in this study were subjected to SPSS (Statistical Package for Social Science) for analysis and a Microsoft Excel spreadsheet for Descriptive Statistics. The three techniques which were used to address the three objectives of the study are presented as follows:

3.5.1. Descriptive Statistics

To identify and describe the socio-economic characteristics of consumers, the descriptive statistics method was employed. Descriptive statistics such as frequency distribution table, mean, maximum and minimum, percentages were used to analyse the data collected.

3.5.2. Likert scale measurement and Chi-square contingency test

To assess reasons for non-consumers not to consume rabbit meat and consumers' perception of rabbit meat as compared to chicken, beef, pork and mutton; descriptive statistics analysis and 5-point Likert-scale specified as strongly agree = 5; Agree = 4; Neither agree nor disagree = 3; Disagree = 2 and strongly disagree = 1 were used. The Likert mean score was used to tell whether respondents had a positive or negative perception of the statements used in the study. The Likert mean was obtained by adding the five points of the Likert scale and dividing by 5, thus: $1+2+3+4+5= 15/5 = 3$ which was the weighted mean of the scaling statement for rate/level of respondents' perception.

The Likert scaling type measuring instrument is represented by the formula:

$$X = \sum Fx / N$$

Where X = mean score

Σ = summation sign

F = frequency

N = no of respondents.

$x = \text{no of nominal value of each response category } 5 + 4 + 3 + 2 + 1/5 = 3$ for the rate of rabbit meat perception as compared to other meats in this study by meat consumers. Therefore, 3 is the weighted mean for rabbit meat perception as compared to other meats.

Decision rule: any mean score value greater than or equal to 3, means the respondents had a positive perception (or one of the reasons they like rabbit meat) while any value below 3 shows that respondents had negative perception (or indicated they disliked the rabbit meat) towards rabbit meat assigned statement/item. However, for rabbit meat perceptions as compared to other meats, any mean score value greater than 3, means rabbit meat scored positive perception more than its compared counterpart and a value equal to 3 implies that respondents perceived rabbit meat the same as its compared counterpart, while a value less than 3 implies that the respondents perceived rabbit meat negative for the assigned statement than its compared counterpart.

Food choices are often associated with socioeconomic characteristics (Lutz *et al.*, 1993). Therefore, the Chi-square contingency test was used to check whether there are significant differences in consumers' consumption patterns due to socio-economic characteristics.

3.5.3. Binomial Logit model

There is a piece of ample evidence on consumers' WTP for food quality and safety (refer to Henson, 1996; Fu *et al.*, 1999; Govindasamy and Italia, 1999; Gil *et al.*, 2000; Smed and Jensen, 2003; Krystallis and Chrysosoidis, 2005). For instance, Govindasamy and Italia (1999) found that among the important factors that were found to affect WTP were demographic characteristics such as gender, age, income, and education. However, results regarding these variables were found to be conflicting (see for instance Angulo *et al.*, 2003; Davis *et al.*, 1995; Henson, 1996). To determine socio-economic factors affecting consumer perception and WTP for rabbit meat, the study employed the binomial logit model (Greene, 2003). This model is one method applicable for analysing the determinants of choice between two discrete alternatives, say $y = 1$ (willing to pay for rabbit meat if it was available) and $y = 0$ (not willing to pay for rabbit meat even if it was available). In line with mainstream consumer behaviour models (Blackwell *et al.*, 2006) and the

international literature on WTP for food quality and safety, we assume that the choice of a particular consumer product can be described as a function of consumer socioeconomic characteristics.

The logit model estimates the probability:

$$P(Y=1|X) = L(X\beta) = 1/[1 + e^{-X\beta}] \dots \dots \dots (1)$$

Where:

where X denotes the explanatory variables included in the model and β the parameters to be estimated.

Model specification is as follows:

$$WTP = \beta_0 + \beta_1AGE + \beta_2GEND + \beta_3MAST + \beta_4HHS + \beta_5HHI + \beta_6EDU + \beta_7RELI + \beta_8CULT + \beta_9OCCU + \beta_{10}Perception1 + \beta_{11}Perception2 + \beta_{12}Perception3 + \beta_{13}Perception4 + U_i \dots \dots \dots (2)$$

Table 3.1: Description of variables

Variable	Code	Description	Measure
Dependent			
Willingness to pay	WTP	1, if the respondent would be willing to pay for rabbit meat if it was available on a farm, 0 otherwise	Dummy
Independent variables			
Age	AGE	Age of the respondent	Years
Gender	GEND	1, if the respondent is male, 0 female	Dummy
Marital Status	MAST	1, if the respondent is married, 0 otherwise	Categorical
Household size	HHS	Number of people in the household	Number
Household income	HHI	Total household income in the previous 12 months	Rands
Years of education	EDU	Number of years spent in school	Years
Religion	RELI	1, if the respondent is a Christian, 0 otherwise.	Dummy
Culture	CULT	1, if culture affects willingness to pay for rabbit meat, 0 otherwise	Dummy
Occupation	OCCU	1, if the respondent is full-time employed, 0 otherwise	Dummy
Perception 1	Perception 1	1, if rabbit is better than chicken meat, 0 otherwise	Dummy
Perception 2	Perception 2	1, if rabbit is better than beef meat, 0 otherwise	Dummy
Perception 3	Perception 3	1, if rabbit is better than pork meat, 0 otherwise	Dummy
Perception 4	Perception 4	1, if rabbit is better than sheep meat, 0 otherwise	Dummy
β_1 - β_{13} are parameters to be estimated, U_i is the error term			

3.6. Ethical Consideration

This study adhered to the Turfloop Research Ethics Committee (TREC)'s rules and regulations. This study was not harmful to the respondents and considered ethical issues such as confidentiality, permission, informed consent, respect and danger or risk involved in participating during data collection. Respondents were not forced by any means to participate in this study but voluntarily participated and were informed of their right/willingness to participate in this study or not.

3.6.1. Permission

Permission to proceed with this study on “analysing consumers’ perception and WTP for rabbit meat: A case study of Madiga Village” was sought before commencement from the traditional authorities at Madiga Village.

3.6.2. Inform consent

The researcher and the enumerators that assisted in data collection informed the sampled respondents that their participation is voluntary and that they are free to withdraw from participating at any time. The sampled respondents were asked to sign a consent form to show that they agreed to participate in this study.

3.6.3. Confidentiality and anonymity

In this study, the confidentiality and anonymity of the respondents were taken into consideration. Respondents’ real names were not mentioned in the study and the information they provided was used for the study only.

3.6.4. Protection from harm

Since this study involves human beings, respondents were only involved in the research out of their own will and their rights and privacy was kept confidential and respected as required by the Turfloop Research Ethics Committee rules and regulations. This ethical clearance aimed to ensure that the nature of the study does not embarrass, harm, impose or even negatively affect the respondents.

3.6.5. Respect

The researcher and enumerators expressed respect for the respondents in this study.

3.7. Summary

This study was conducted at Madiga Village situated within Ga-Dikgale found in the Polokwane Local Municipality of Capricorn District in Limpopo province, South Africa. The study used primary data that was collected by the use of a structured questionnaire administered through face-to-face interviews. Random sampling was used to select respondents at Madiga village. The collected data was analysed using SPSS and Microsoft Excel Spreadsheet. Specifically, descriptive statistics, Likert scale, Binomial Logit Model and Chi-square analyses were used.

CHAPTER FOUR: RESULTS AND DISCUSSION OF THE FINDINGS

4.1. Introduction

This chapter outlines the results of the descriptive statistics, Binomial Logit regression, Likert Scale and Chi-square analyses. The results are presented in tabular and graphical formats.

4.2. Results from Descriptive Analysis

This section outlines the socio-economic characteristics of the respondents interviewed in this study.

4.2.1. Respondents socio-economic characteristics

The results obtained from descriptive analysis for socio-economic characteristics are presented below in graphs and a table outlining the minimum, maximum, mean and standard deviation of certain variables. The results obtained revealed that from a sample of 120 respondents interviewed households at Madiga Village, 57% were males as compared to 43% were females (Figure 4.1). Results also revealed that 39% of the respondents were married, 3% divorced with 35% being widowed and only 23% were single (Figure 4.2). Moreover, the results revealed that 73% of the interviewed respondents were Christians and the remaining 27% were non-christian (Figure 4.3). Furthermore, the majority of the respondents were those who were not employed (58%). Also, 28% of them were on full-time employment while only 14% were self-employed (Figure 4.4).

Table 4.1: Socio-economic characteristics of the respondents

	Age	Household Size	Years of schooling	Household Income
Minimum	25	1	0	19200
Mean	59.8	4.91	8.79	105018.3
Maximum	89	13	24	494400
Standard Deviation	14.75	2.44	6.10	75667.34

Source: Authors' own compilation based on collected data

The average age of the sampled respondents was found to be 60 (59,8) years with a minimum and a maximum of 25 and 89 years, respectively. The household size of the respondents was found to be on an average of 5 (4.91) members with a minimum of 1 and a maximum of 13 members. Moreover, the standard deviation for household size is low suggesting that the data is fairly distributed around the mean as compared to other variables in Table 4.1. The average years of schooling was 8.79 with a maximum of 24 years and a minimum of 0 years. The average age of years schooling suggests that a majority of the respondents either did not go school at all or underwent primary schooling with a minority having secondary school and tertiary school. Finally, the household income of the sampled respondents was found to be at a maximum of R494 400.00 per year with a minimum of R19 200.00 per year as well as an average of R105 018.3 per year.

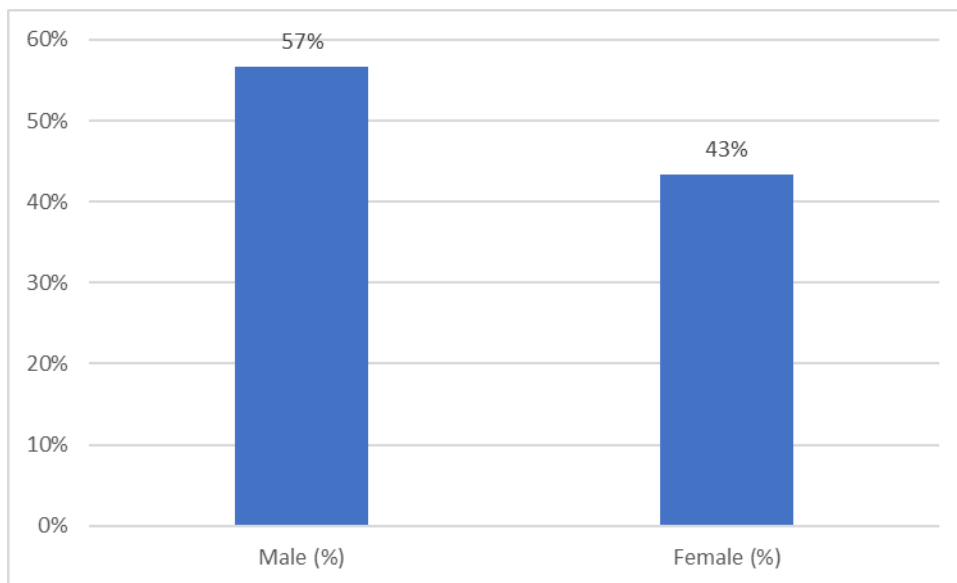


Figure 4.1: Gender distribution of respondents in the study

Source: Authors' own compilation based on collected data

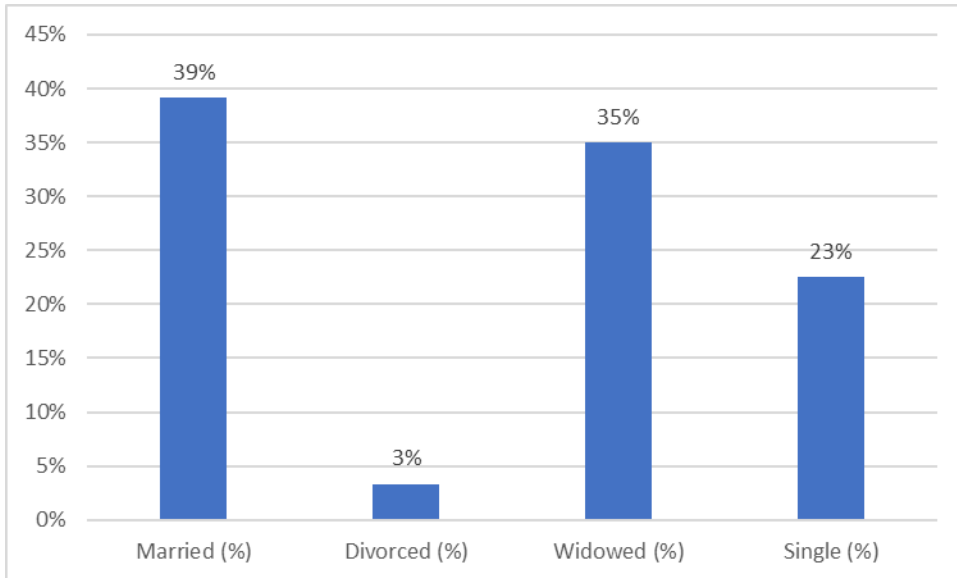


Figure 4.2: Marital status distribution of respondents

Source: Authors' own compilation based on collected data

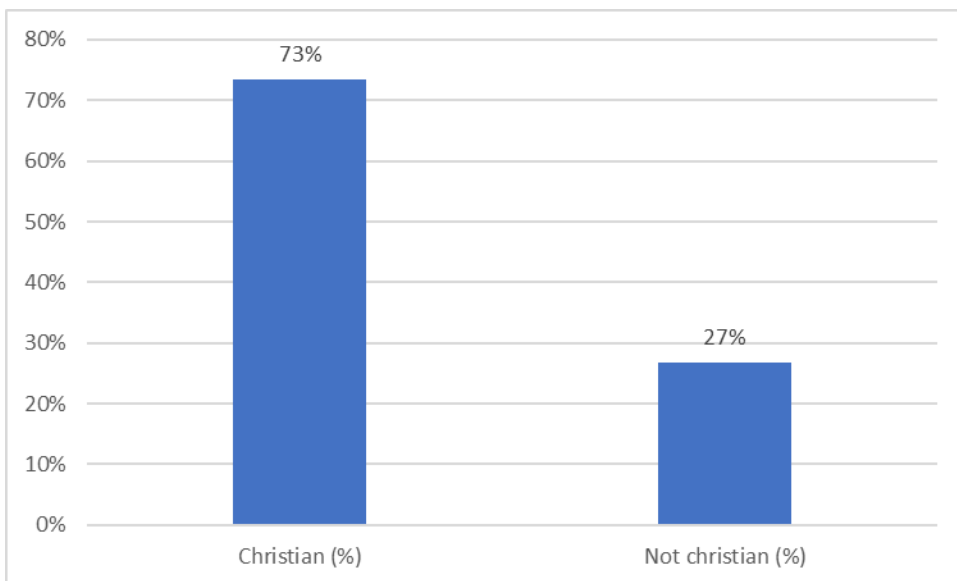


Figure 4 3: Respondents' religious belief distribution

Source: Authors' own compilation based on collected data

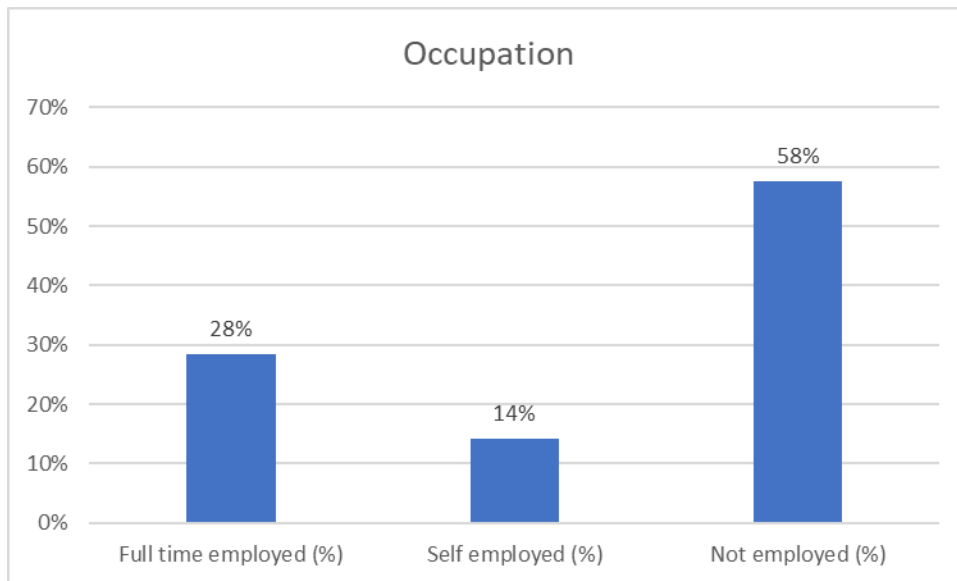


Figure 4.4: Respondents occupation distribution

Source: Authors' own compilation based on collected data

4.3. The importance of meat properties as rated by the respondents

Table 4.2: Respondents' meat attributes ratings

Items	Not very important (1)	Not important (2)	Undecided (3)	Important (4)	Very important (5)	Total	Mean Score	Decision
Low-fat	2(2)	1(2)	0(0)	34(136)	83(415)	555	4.63	Important
Low in cholesterol	1(1)	1(2)	86(253)	20(80)	12(60)	396	3.3	Important
Low in salt	0(0)	1(2)	1(3)	46(184)	72(360)	261	2.18	Not important
High in protein	0(0)	0(0)	0(0)	26(104)	94(470)	574	4.78	Important
Taste of the meat	0(0)	0(0)	0(0)	35(140)	85(425)	565	4.71	Important
Appearance	21(21)	55(110)	44(132)	0(0)	0(0)	263	2.19	Not important
Freshness	0(0)	0(0)	0(0)	44(176)	76(380)	556	4.63	Important
No additives	1(1)	0(0)	33(99)	69(276)	17(85)	461	3.84	Important
Red meat	17(17)	44(88)	39(117)	18(72)	2(10)	304	2.53	Not important
White meat	0(0)	1(2)	1(3)	55(220)	63(315)	540	4.5	Important

Source: Authors' own compilation based on collected data

Mean score= Total/N(120) , cut-off score = 3 (<3 = not important and >or=3, important/ neither important nor not important and numbers in parenthesis are products of Likert scale rate and number of responses. Numbers outside the parenthesis represent the number of respondents who chose that Likert scale rate)

To obtain the results in Table 4.2, this study used the Likert scale measurement with a mean score for decision making. Of the 10 items that were used in this study as outlined in Table 4.2, the respondents rated low in salt, appearance and being “red meat” as not important factors that could drive their WTP for meat as compared to low in fat, low in cholesterol, high in protein and taste, freshness, no additives, and being “white meat” which were rated as important attributes. However, low in cholesterol scored almost 3 which would have suggested neither important nor not important. In contrast, to a low score of low in cholesterol (3.3), low in fat, high in protein, the taste of the meat and freshness as well as being “white meat” scored high at 4.63, 4.78, 4.71, and 4.63 and 4.5, respectively.

The results on taste agree with the study by Kourouniotis (2016), where the author mentioned that taste was chosen as an extremely important factor for food choices. In the same vein, Petrescu and Petrescu-Mag (2018) mentioned that taste was the most important attribute that influences meat choices. Moreover, McLean-Meynise (1994) mentioned the taste of the meat, low-fat content and freshness as the most important meat characteristics to respondents.

4.4. Rabbit meat perceptions as compared to other meat types

Table 4.3: Consumers' perceptions of rabbit meat as compared to chicken meat

Item	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly Agree (5)	Total	Mean Score	Decision
Taste RC	48 (48)	32(64)	20(60)	14(56)	6(30)	258	2.15	Less tasty
Texture RC	1(1)	2(4)	18(54)	89(356)	10(50)	465	3.88	More texture
Smell RC	59(59)	51(102)	3(9)	6(24)	1(5)	199	1.66	Smelly
Easy to cook RC	0(0)	1(2)	14(42)	97(388)	8(40)	472	3.93	Easier to cook
Difficult to prepare and cook RC	47(47)	22(44)	22(66)	27(108)	2(10)	275	2.29	Easier to prepare
It is cheap RC	0(0)	9(18)	10(30)	87(348)	14(70)	466	3.88	Cheaper
More nutritional properties RC	0(0)	1(2)	2(6)	33(132)	84(420)	560	4.67	More nutritious
Easy to swallow RC	0(0)	1(2)	20(60)	41(164)	58(290)	516	4.3	Easily swallowed
It is healthy RC	0(0)	1(2)	0(0)	29(116)	90(450)	568	4.73	Healthier
Easy to find RC	50(50)	49(98)	0(0)	14(56)	7(35)	239	2.0	Difficult to find

Source: Authors' own compilation based on collected data

Mean score= Total/N(120) , cut-off score = 3 (<3 = not important and >or=3, important/ neither important nor not important and numbers in parenthesis are products of Likert scale rate and number of responses. Numbers outside the parenthesis represent the number of respondents who chose that Likert scale rate)

Table 4.4: Consumer perception of rabbit meat as compared to beef meat

Item	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly Agree (5)	Total	Mean Score	Decision
Taste RB	61(61)	30(60)	21(63)	5(20)	3(15)	219	1.83	Less tasty
Texture RB	1(1)	4(8)	40(120)	72(288)	3(15)	432	3.6	More texture
Smell RB	55(55)	50(100)	4(12)	10(40)	1(5)	212	1.77	Smelly
Easy to cook RB	2(2)	1(2)	8(24)	105(420)	4(20)	468	3.9	Easy to cook
Difficult to prepare and cook RB	75(75)	34(68)	8(24)	3(12)	0(0)	179	1.49	Easy to prepare
It is cheap RB	0(0)	0(0)	15(45)	65(260)	40(200)	505	4.21	Cheaper
More nutritional properties RB	7(7)	22(44)	43(129)	19(76)	29(145)	401	3.34	More nutritious
Easy to swallow RB	2(2)	0(0)	22(66)	74(296)	22(110)	474	3.95	Easily swallowed
It is healthy RB	5(5)	18(36)	37(111)	20(80)	40(200)	432	3.6	Healthier
Easy to find RB	48(48)	53(106)	0(0)	12(48)	7(35)	237	1.98	Difficult to find

Source: Authors' own compilation based on collected data

Mean score= Total/N(120) , cut-off score = 3 (<3 = not important and >or=3, important/ neither important nor not important and numbers in parenthesis are products of Likert scale rate and number of responses. Numbers outside the parenthesis represent the number of respondents who chose that Likert scale rate)

Table 4.5: Consumer perceptions of rabbit meat as compared to pork meat

Item	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly Agree (5)	Total	Mean Score	Decision
Taste RP	4(4)	15(30)	31(93)	63(252)	7(35)	414	3.45	Tastier
Texture RP	0(0)	1(2)	23(69)	90(360)	6(30)	461	3.84	More texture
Smell RP	1(1)	14(28)	21(63)	71(284)	13(65)	441	3.68	Better smell
Easy to cook RP	0(0)	0(0)	8(24)	96(384)	16(80)	488	4.07	Easier to cook
Difficult to prepare and cook RP	61(61)	54(108)	4(12)	1(4)	0(0)	185	1.54	Easier to prepare
It is cheap RP	2(2)	2(4)	19(57)	82(328)	15(75)	466	3.88	Cheaper
More nutritional properties RP	0(0)	0(0)	0(0)	36(144)	84(420)	564	4.7	More nutritious
Easy to swallow RP	1(1)	0(0)	23(69)	27(108)	69(345)	523	4.36	Easily swallowed
It is healthy RP	0(0)	0(0)	0(0)	27(108)	93(465)	573	4.78	Healthier
Easy to find RP	46(46)	54(108)	0(0)	13(52)	7(35)	241	2.01	Difficult to find

Source: Authors' own compilation based on collected data

Mean score= Total/N(120), cut-off score = 3 (<3 = negative perception and >or=3, positive perception/ positively perceived the same and numbers in parenthesis are products of Likert scale rate and number of responses. Numbers outside the parenthesis represent the number of respondents who chose that Likert scale rate)

Table 4.6: Consumer perceptions of rabbit meat as compared to sheep (mutton) meat

Item	Strongly Disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly Agree (5)	Total	Mean Score	Decision
Taste RS	39(39)	27(54)	33(99)	20(80)	1(5)	277	2.31	Less tasty
Texture RS	2(2)	4(8)	35(105)	77(308)	2(10)	433	3.61	More texture
Smell RS	10(10)	43(86)	37(111)	29(116)	1(5)	328	2.73	Smelly
Easy to cook RS	0(0)	1(2)	8(24)	102(408)	9(45)	479	3.99	Easier to cook
Difficult to prepare and cook RS	68(68)	42(84)	9(27)	1(4)	0(0)	183	1.53	Easier to prepare
It is cheap RS	1(1)	1(2)	13(39)	72(288)	33(165)	495	4.13	Cheaper
More nutritional properties RS	1(1)	0(0)	14(42)	37(148)	68(340)	531	4.43	More nutritious
Easy to swallow RS	0(0)	0(0)	22(66)	55(220)	43(215)	501	4.18	Easily swallowed
It is healthy RS	0(0)	0(0)	10(30)	49(196)	61(305)	531	4.43	Healthier
Easy to find RS	43(43)	57(114)	0(0)	13(52)	7(35)	244	2.03	Difficult to find

Source: Authors' own compilation based on collected data

Mean score= Total/N(120) , cut-off score = 3 (<3 = negative perception and >or=3, positive perception/ positively perceived the same and numbers in parenthesis are products of Likert scale rate and number of responses. Numbers outside the parenthesis represent the number of respondents who chose that Likert scale rate)

Table 4.3 above presents consumer perceptions of rabbit meat as compared to chicken meat. The results showed that respondents perceived chicken meat as tastier (2.16), easy to find (2.0) together with a good smell (1.66) as compared to rabbit meat. Rabbit meat was found to be better in texture, easy to cook, easy to

prepare and cook, and cheaper (see Table 4.3 above: the values for the assigned statements are greater than three). However, difficult to prepare is a negative statement with the lowest score, implying that the statement is perceived positively, that is, it is easy to prepare. Moreover, respondents perceived rabbit meat as more nutritious, easy to swallow and being healthy meat as compared to chicken meat.

Results of this study indicate that respondents perceived rabbit meat as less tasty as compared to chicken and beef. From Table 4.4 above, the results show that the respondents perceived rabbit meat as less tasty at the mean score of 1.83. Same as compared to chicken meat, rabbit meat was found to be very smelly as compared to beef meat which was perceived to have a good smell. Rabbit meat was still perceived as difficult to find at the mean score of 1.98.

In contrast to chicken and beef, rabbit meat was perceived to be tastier at the mean score of 3.45 compared to pork meat (see Table 4.5). However, rabbit meat is still perceived to be difficult to find and scored high scores as compared to pork meat for all the remaining items as shown in Table 4.5 above. This can be because most of the respondents were Christians that do not eat pork meat because of their religious beliefs.

In Table 4.6, the results show that rabbit meat was perceived as less tasty (2.31) than sheep meat. However, it has scored high scores for all the remaining items than sheep meat. This can be attributed to the idea that sheep meat is generally not readily available to most rural households and is generally expensive.

This study found that comparing the selected meat types used in this study which are chicken, beef, pork and sheep to rabbit meat, consumers, for all the used items perceived rabbit meat more in texture, easy to cook, easy to prepare, cheaper, more nutritious and healthier. The results on healthiness tally with the findings of Petrescu and Petrescu-Mag (2018) who mentioned that rabbit meat was perceived as healthier than all the tested meats they used. However, rabbit meat for the other three meat types, which were chicken, beef and sheep, was perceived as less tasty and smelly. Moreover, it was perceived as difficult to find and this is due to the unavailability of a rabbit market or availability of rabbit in market stores for purchases. Nevertheless, pork and rabbit meat was found to be tastier.

4.4. Rabbit meat

Table 4.7: Rabbit consumption (N =120)

	Frequency	Percentage
Yes	100	83%
No	20	17%
Total	120	100%

Source: Authors' own compilation based on collected data

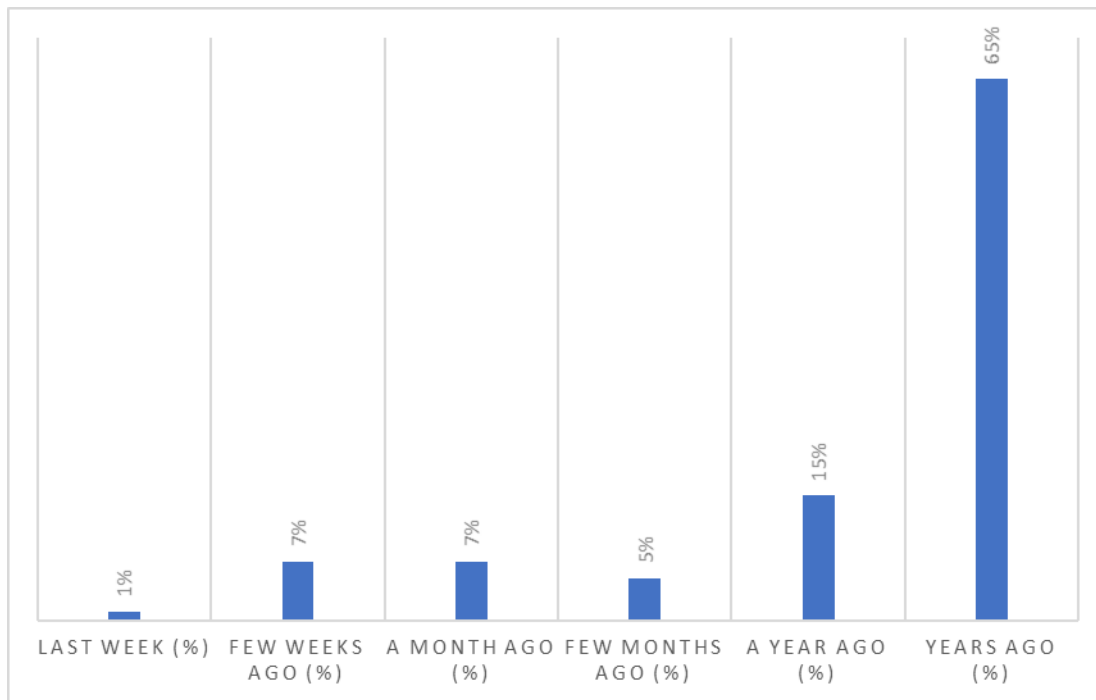


Figure 4.5: Last time respondents ate rabbit meat (%)

Source: Authors' own compilation based on collected data

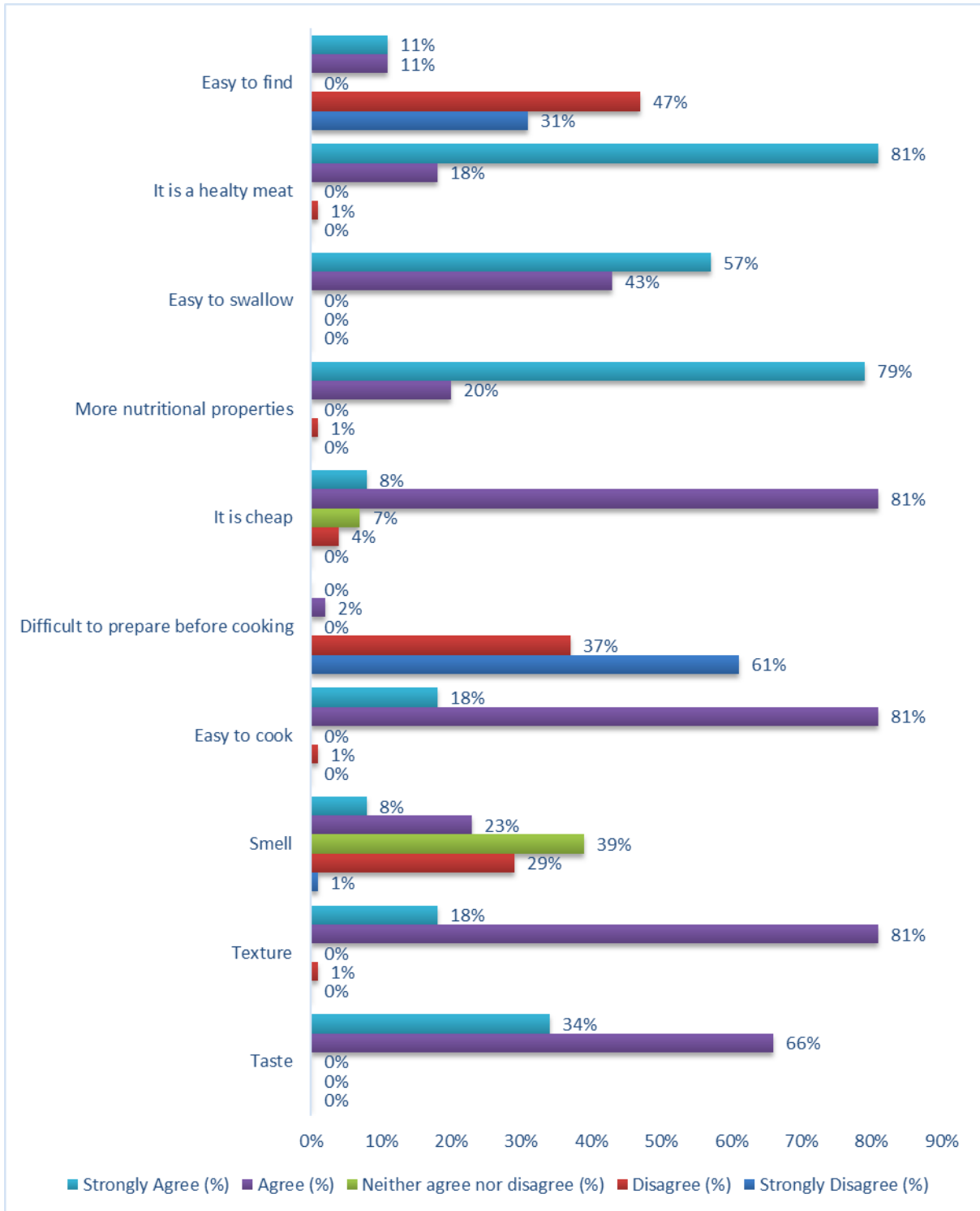


Figure 4.6: What respondents liked about rabbit meat

Source: Authors' own compilation based on collected data

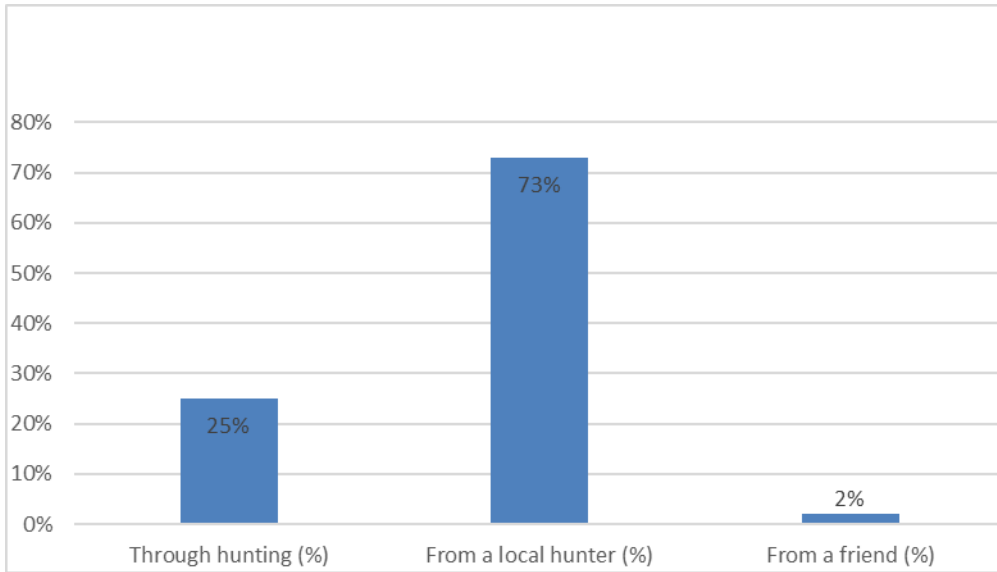


Figure 4.7: Location where rabbit meat was bought or obtained

Source: Authors' own compilation based on collected data

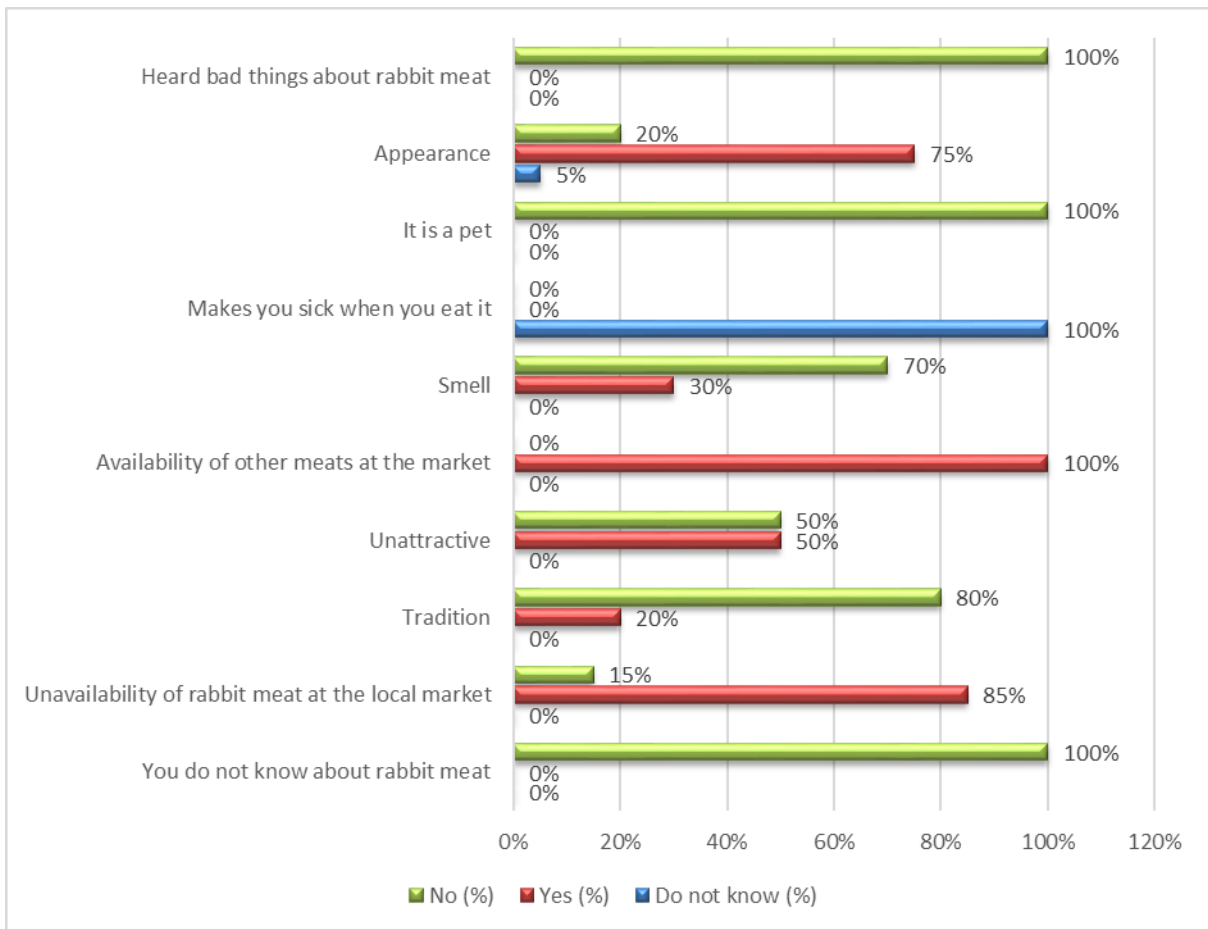


Figure 4.8: Reasons for not consuming rabbit meat

Source: Authors' own compilation based on collected data

4.4.1. Rabbit consumption and perception

Results for respondents that once consumed rabbit meat are presented in Table 4.7. Table 4.7 shows that 83% of the interviewed respondents once consumed rabbit meat with the remaining 17% of those who never consumed rabbit meat. Although there is a high percentage of those who once consumed rabbit meat, the study found that a high percentage (65%), comprises those who once consumed rabbit meat more than a year ago, and 15% of those who consumed it a year ago. Furthermore, the respondents who once consumed rabbit meat mentioned that the last time they ate rabbit meat was a few months ago (5%), a month ago with a few weeks ago shared each at 14% and the remaining 1% only consumed rabbit meat a week ago (refer to Figure 4.5 above).

Furthermore, respondents that once consumed rabbit meat were asked what they liked about rabbit meat. Results for what consumers liked about rabbit meat are shown in Figure 4.6. Taste scored high percentages for agreed at 67% with texture, easy to cook, being cheaper meat and being healthy meat scoring 81% each. These results on healthiness and good taste agree with the findings of Maigida *et al.* (2018), where they mentioned that the respondents had a positive attitude towards rabbit meat as a healthy and tasty meat. In Spain, consumers also nominated good taste (72.4%), and healthiness (35.9%) as the two main reasons for eating rabbit meat (Buitrago-Vera *et al.*, 2016). Respondents liked rabbit meat for its cheapness because they perceived that rabbit can be hunted if one wants one or buy from a local hunter at a lesser negotiable price. This can be pinned to the fact that perhaps, rural people consider rabbit meat rural meat than a marketable product.

Moreover, respondents strongly agreed that rabbit meat is more nutritious (79%), healthy (81%) and easy to swallow (57%). However, respondents strongly disagreed (31%) and disagreed (47%) that rabbit meat is easy to find. This finding on easy to find tallies with Maigida *et al.* (2018) results, where they mentioned that rabbit meat was declared unavailable by the respondents. This is because there are no markets where rabbit meat is sold as they depend upon local hunters for consumption. In contrast to the study conducted in Spain, Montero-Vincente *et al.* (2018) mentioned that rabbit meat was found easily in the premises where the respondents did their shopping. Rabbit meat was liked for the reason that it was easy to prepare before cooking as the respondents strongly disagreed (61%) that

rabbit meat is difficult to prepare before cooking. Lastly, rabbit meat was neither liked nor disliked due to its smell at 39%. The smell was not one of the reasons they liked rabbit meat. These respondents were dependent on local hunters (73%) and hunting (25%) for consumption than their friends (2%) (Figure 4.7).

4.4.2. Respondents WTP for rabbit meat

The results of respondents willing to pay for rabbit meat are shown in Table 4.8 below. In addition, Table 4.8 presents the results for the respondents who never ate rabbit meat and/not willing to pay and not sure to pay for rabbit meat if it had meat properties that they rated important. This follows after the respondents were asked if they would buy rabbit meat if it had meat properties that they rated important in the study. Table 4.8 shows that of all 120 respondents, 66% were willing to pay for rabbit meat if it was sold on a farm and the remaining 34% were not willing to pay at all. Moreover, respondents that never ate rabbit meat were not sure (80%) if they would purchase rabbit meat provided it contains meat properties they prioritise in a meat product with only 20% saying they would not change their minds. Otherwise, none of the respondents were showing a clear WTP even if rabbit meat has such meat properties they consider important.

Table 4.8: Respondents WTP

Respondents WTP for rabbit meat		
WTP	Frequency	Percentage
Willing to pay	79	66
Not willing to pay	41	34
Total	120	100
WTP for respondents that never ate rabbit meat		
Willing to pay	0	0
Not willing to pay	4	20
Not sure	16	80
Total	20	100

Source: Authors' own compilation based on collected data

4.4.3. Reasons for not consuming rabbit meat

Results for the respondents that never consumed rabbit meat are shown in Figure 4.8. Respondents mentioned appearance (75%) as one of the reasons they do not consume rabbit meat, availability of other meats at the market (100%), unavailability of rabbit meat (85%) and unattractiveness of rabbit meat (50%). The findings of this study on the unavailability of rabbit meat are in line with the study conducted by Petrescu and Petrescu-Mag (2018) who found that lack of availability of rabbit meat was one of the obstacles to rabbit meat consumption. Moreover, smell scored 30% as one of the reasons for not consuming rabbit meat. Moreover, others indicated they do not know (100%) if rabbit meat made them sick after they consumed it.

4.4.4. Respondents' WTP for rabbit meat relative to other meat types

In this study, respondents were asked if the price of rabbit meat would play an important role when purchasing rabbit meat and if they would be willing to pay more or less for rabbit meat as compared to other meat types. The results are presented below.

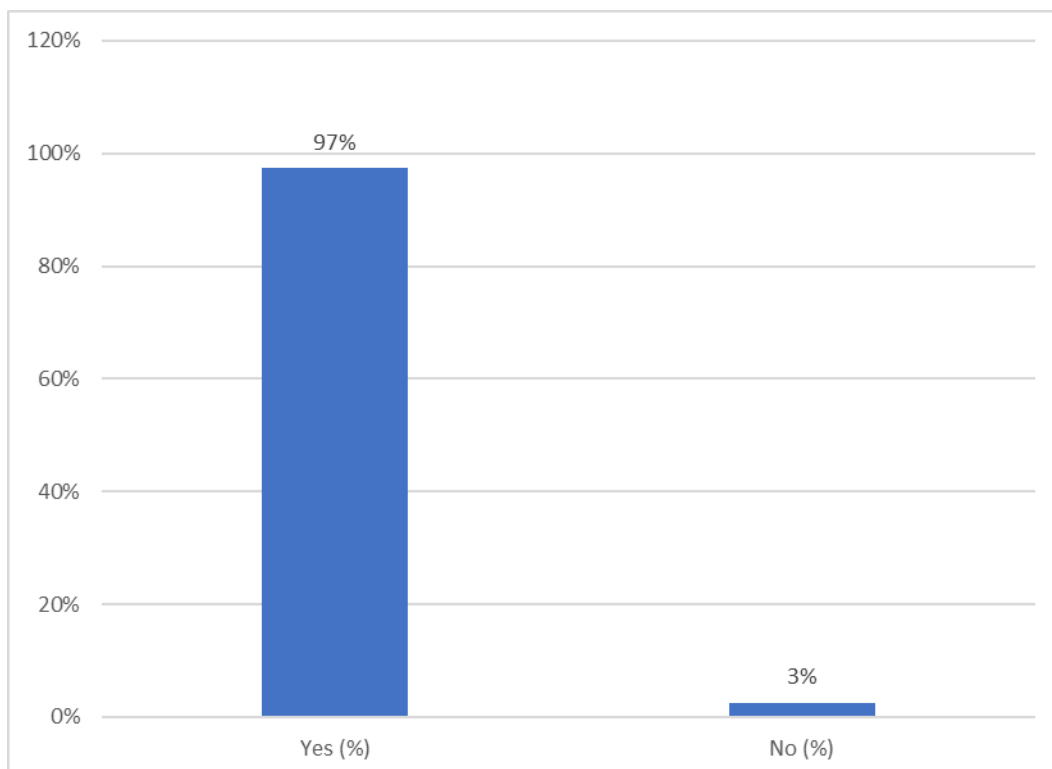


Figure 4.9: Role of rabbit meat pricing during purchasing

Source: Authors' own compilation based on collected data

Table 4.9: Respondents WTP for rabbit meat as compared to other meat types

Item	Percentage			
More than chicken meat (%)	9%	0%	0%	0%
Less than chicken meat (%)	91%	0%	0%	0%
More than beef meat (%)	0%	7%	0%	0%
Less than beef meat (%)	0%	93%	0%	0%
More than pork meat (%)	0%	0%	0%	25%
Less than pork meat (%)	0%	0%	0%	75%
More than sheep meat (%)	0%	0%	0%	0%
Less than sheep meat (%)	0%	0%	100%	0%
Total	100%	100%	100%	100%

Source: Authors' own compilation based on collected data

Figure 4.9 shows that the respondents rated the price of rabbit meat relative to other meat types very important (97%) while the remaining 3% mentioned that they do not see any role of rabbit meat pricing as playing an important role when purchasing rabbit meat. Table 4.9 shows that respondents were WTP for rabbit meat more than chicken (9%), while 91% mentioned that they would only be WTP for rabbit meat if it was sold less than chicken meat. Seven percent mentioned that they would be willing to pay for rabbit meat more than beef meat, with the remaining 93% saying they would rather pay for rabbit meat if it was sold less than beef meat. There were no respondents that were willing to pay for rabbit meat if it was sold more than sheep meat. Finally, they were willing to pay for rabbit meat more than pork meat (25%) with 75% of them saying they would not be willing to pay for rabbit meat more than pork meat if it was sold on a farm.

4.4.5. Respondents purchasing form preferences

In this study, the respondents were asked how they would like to purchase rabbit meat relative to other meat types if it was sold on a farm. The results are presented in the figure below.

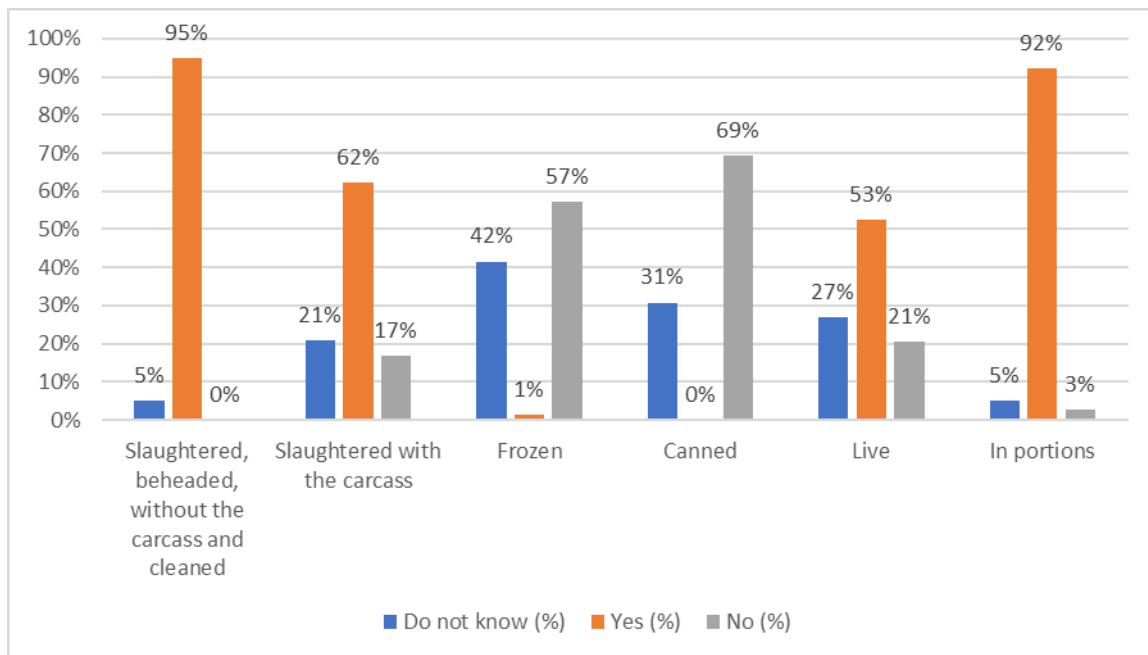
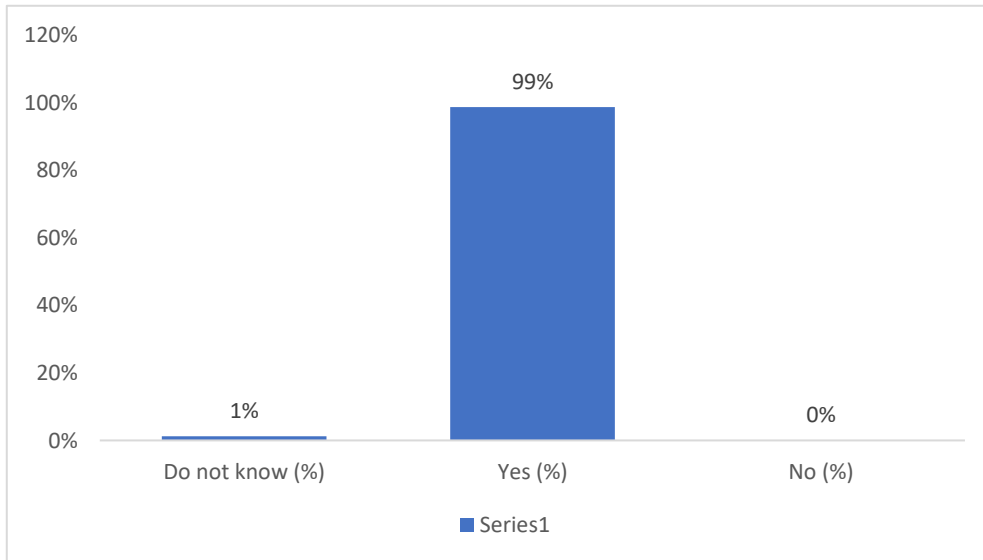


Figure 4.10: Purchasing form preferences by respondents

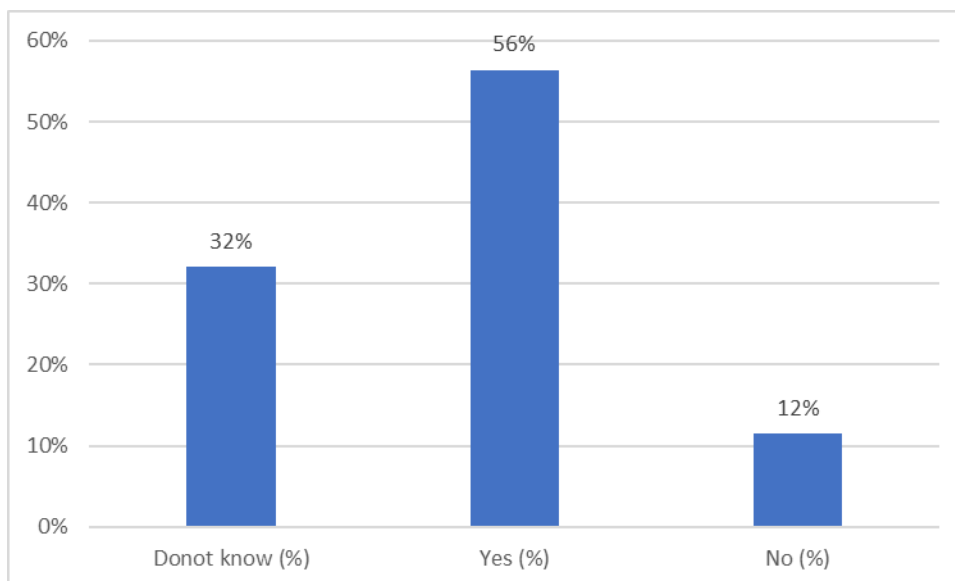
Source: Authors' own compilation based on collected data

Slaughtered, beheaded without the carcass and cleaned together with “in portions” were preferred more than other purchasing forms at 95% and 92%, respectively. The result on “in portion” agree with the findings of Hoffmen *et al.* (2004), who found that most people preferred to buy rabbit meat if it was presented in portion than as a whole carcass. However, there were other forms that respondents preferred to purchase rabbit meat if it was sold at the farm. These are slaughtered with the carcass (62%) and live (53%). Most people mentioned that they would not like to purchase rabbit meat if it was frozen (57%) or canned (69%). Furthermore, respondents were asked if they would mind the colour of the rabbit if they were to purchase it alive and if they would like to try rabbit meat coming from other colours. The results are presented below.



Source: Authors' own compilation based on collected data

Figure 4.11: Respondents who would mind the colour of the rabbit when purchased live



Source: Authors' own compilation based on collected data

Figure 4.12: Respondents who would like to try rabbit meat coming from other colours

From Figure 4.11, the results show that 99% of the respondents mentioned that they would mind the colour of the rabbit. However, they would like to try rabbit meat

coming from other meat types (56%), while others said they do not know (32%) and 12% said they would never try to eat rabbit meat coming from other colours.

4.5. The effects of respondents' socio-economic characteristics on their willingness to pay

To determine factors affecting WTP and perception due to socio-economic characteristics of meat consumers at Madiga Village, equation 2 was estimated using Binomial Logit Model and Chi-Square Analysis, respectively. Due to poor regression results, four additional variables were created and inserted in the model which includes Perception1 to Perception4 for improvements. Perception1 to Perception4 were created from the respondents' responses on whether rabbit meat was better than, not better than, the same as or do not know as compared to chicken, beef, pork and sheep meats. However, Perception2 variable was omitted due to high standard errors. The perception of the respondents on rabbit meat compared to other meat types was recoded to 1, if the respondent perceived rabbit meat better than the other meat and 0 otherwise (for those who chose either, rabbit meat was the same as the other meat and/or not better than the other meat and those who could not tell the difference). This was done for analysis purposes. The model contained 13 variables in total, one variable (i.e.culture) was found to be linear and another variable (i.e.perception2) had high errors for analysis. Therefore, the two variables were excluded in the final model. Consequently, 11 variables were entered for analysis (refer to Table 4.10).

Table 4.10: Binomial Logit results of factors affecting willingness to pay (WTP)

Variables	B(Coefficient)	Standard error	Significance
Age	-.035	.025	.156
Gender	2.178	.771	.005***
Household size	.284	.133	.033**
Years of schooling	.010	.058	.866
Marital Status	.071	.829	.932
Household Income	.000	.000	.656
Occupation	.130	.740	.861
Religion	-.752	.650	.247
Perception1	1.020	.835	.222
Perception3	1.535	.733	.036**
Perception4	1.088	.565	.054*
Note * **and ***; Significant at 10%, 5% and 1% respectively.			
Cox and Snell R ² = .382			
Nagelkerke R ² = .528			

Source: Authors compilation from the collected data

Estimating equation 2 was solely to detect factors affecting the respondents' WTP. Table 4.10 above reveals that of the 11 variables included during analysis, 4 variables were found to be significant. These variables are gender, household size, perception³ and perception⁴. The specification of the model is statistically significant and the fit of the model is acceptable as shown by the goodness of fit measures, which can be interpreted as the R² measure in multiple regression analysis (Hair *et al*, 2006). The variation in the dependent variable explained by independent variables amounts to 52.8% (Table 4.10).

Considering the respondents' socio-economic characteristics in Table 4.10, it is revealed that the gender of the respondents had an expected positive and significant effect on respondents WTP for rabbit meat if it was sold on a farm at a 1% level. However, it is was males who were more likely to pay for rabbit meat if it was sold on a farm and they were twice likely to do so. This can be due to the idea that rabbit is wild meat and in rural areas, it is mostly hunted and females hardly go to the bush for hunting. This finding is in contrast to the study conducted by Udomkun *et al*. (2018), who found that gender had a negative significance on WTP for meat products. Household size's coefficient was found to be positively significant at the 5% level. This result indicates that with one more increase in the number of household members, respondents are likely to pay for rabbit meat.

Secondly, looking at the respondents' perception of rabbit meat, perception³ was found to be positively significant at a 5% level. This result implied that the respondents who perceive rabbit meat better than pork are one and half likely to pay for rabbit meat than those who perceive rabbit meat the same or not better than pork meat or those who do not know. This positive significance can be because pork meat is less consumed due to religious beliefs.

Similarly, perception⁴ was found to be positively significant, but at a 10% level. This shows that respondents who perceive rabbit meat better than sheep (mutton) meat were likely to pay for rabbit meat than respondents who perceive rabbit meat the same and/not better and/those who do not know than mutton meat. Age, years of schooling, household income, and marital status, occupation and religion were found to not affect WTP in the study area.

4.6. Comparison of meat consumers' perception due to socio-economic characteristics

Table 4.11: Respondents' perception comparison between rabbit and chicken meat by socio-economic characteristics

	Rabbit meat is better than chicken	Otherwise	Chi-square
Total	27	93	
	Percentages		
Gender			6.323**
Female	11.7	40.3	
Male	15.3	52.7	
Marital Status			.407
Married	10.6	36.4	
Otherwise	16.4	56.6	
Occupation			.099
Full-time employed	7.7	26.4	
Otherwise	19.4	66.7	
Note * **and ***; Significant at 10%, 5% and 1% respectively.			

Source: Authors compilation from the collected data

Table 4.12: Respondents' perception comparison between rabbit and beef meat by socio-economic characteristics

	Rabbit meat is better than beef meat	Otherwise	
Total	6	114	
	Percentages		
Gender			.257
Female	2.6	49.4	
Male	3.4	64.6	
Marital Status			2.005
Married	2.4	44.7	
Otherwise	3.6	69.4	
Occupation			2.497
Full-time employed	1.7	32.3	
Otherwise	4.3	81.7	

Source: Authors compilation from the collected data

Table 4.13: Respondents' perception comparison between rabbit and pork meat by socio-economic characteristics

	Rabbit meat is better than pork meat	Otherwise	Chi-square
Total	30	90	
	Percentages		
Gender			1.629
Female	13.0	39.0	
Male	17.0	51.0	
Marital Status			.571
Married	11.8	35.3	
Otherwise	18.3	54.7	
Occupation			2.681
Full-time employed	8.5	25.5	
Otherwise	21.5	64.5	
Note * **and ***; Significant at 10%, 5% and 1% respectively.			

Source: Authors compilation from the collected data

Table 4.14: Respondents' perception comparison between rabbit and sheep meat by socio-economic characteristics

	Rabbit meat is better than sheep meat	Otherwise	Chi-square
Total	75	45	
	Percentages		
Gender			4.380**
Female	32.5	19.5	
Male	42.5	25.5	
Marital Status			6.550***
Married	29.4	17.6	
Otherwise	45.6	27.4	
Occupation			.274
Full-time employed	21.3	12.8	
Otherwise	53.8	32.3	
Note * **and ***; Significant at 10%, 5% and 1% respectively.			

Source: Authors compilation from the collected data

From Table 4.11 above, it is clear that most respondents did not perceive rabbit meat as better than chicken meat. This perception was associated with gender at a 5% level of significance. Only 12 (11.7) of female respondents perceived rabbit meat better than chicken meat and 15(15.3) of male respondents perceived rabbit meat

better than chicken meat. Comparing sheep meat with rabbit meat, it was found that there was an association between the respondents' perception, gender and marital status at a 5% level of significance each. Most respondents who were not married {46(45.6)} perceived rabbit meat not better than sheep meat while those who were married {29(29.4)} perceived rabbit meat better than sheep meat. The results indicated that there was no association between the socio-economic characteristics of the respondents and their perception of rabbit meat compared with pork and beef meats.

4.7. Summary

The results from descriptive statistics shows that males (57%) dominated the in this study. Respondents that were married amounted to 39% while the remaining 61% were not married rather divorced, widowed and single.

Respondents rated low-fat, high in protein, taste of the meat and freshness as some of the important meat attributes when making purchasing decisions. Appearance, low in salt and red meat were not rated as important meat attributes that in WTP decision by respondents (Table 4.2). Rabbit meat was perceived not tastier than chicken, sheep and beef. However, it was perceived tastier than pork. Moreover, rabbit meat was perceived more nutritious and healthier compared to all used meat types against it (Table 4.3-4.5).

Most respondents in this study were willing to pay for rabbit meat (Table 4.8), however, they were willing to do so if it was slaughtered, beheaded, without carcass and cleaned and in portions than frozen and canned. This study shows that males were twice likely to pay for rabbit meat than females (Table 4.10). Rabbit perception compared to other meat types was found to be significantly associated with gender and marital status (Table 4.11 and Table 4.14).

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary of the study, and conclusion based on the research findings. Furthermore, recommendations are made for how best to meet the needs of consumers and suggestions for further research are provided.

5.1. Summary

Meat is a good source of protein, minerals (iron, zinc, calcium), and vitamins (A, B12 and other B vitamins). These properties are important for the fruitful functioning of the body. Rabbit meat is one of the nutritional meats with dietary and health benefits for different people facing certain diseases and is also one of the best sources for the prevention of diseases such as heart disease.

Worldwide, levels of meat consumption are projected to increase by 72% in 2030 compared to 2000 (Fiala, 2008). Moreover, FAO (2011) indicated that, in sub-Saharan Africa, the demand for meat products is growing rapidly and likely to increase by 140% between 2000 to 2030. In this regard, it (rabbit meat) stands the chance of supplying the ever-increasing meat demand in the globe and thus food security. Feeding the world today requires extensive information as consumers are heterogeneous. No general conclusion can be made from the single finding of a single country/province/municipality/townships, etc., to the other.

This study aimed to determine consumer perception and willingness to pay from a village point of view. The data was collected from households at Madiga Village using a structured questionnaire administered through face-to-face interviews. The data was then entered into a Microsoft Excel spreadsheet and SPSS to detect factors affecting WTP and the respondents' perception in relation to their socio-economic characteristics. The results indicated that most respondents who were willing to pay for rabbit meat preferred to purchase it slaughtered, beheaded without the carcass (95%), slaughtered with the carcass (62), live (53%) and in portions (92%). In portions and slaughtered, and beheaded without the carcass were chosen because most people do not want to deal with removing the carcass and seeing the rabbit as some thought it resembles a cat or human infant.

The data in Tables 4.10 to 4.14 were analysed using the Binomial Logit Model and Chi-Square Analysis, respectively. It was found that consumers' WTP and perception were dependent on their gender. Furthermore, WTP was found to be

dependent on household size, and perception of rabbit meat as compared to pork and sheep meat. Respondents' perception was associated with gender at a 5% level of significance for rabbit meat as compared to chicken meat. Only 12 (11.7) of female respondents perceived rabbit meat better than chicken meat and 15(15.3) of male respondents perceived rabbit meat better than chicken meat. Moreover, rabbit meat perception compared to sheep meat was found to be associated with gender and marital status at a 5% and 10% level of significance, respectively.

5.2. Conclusion

The result obtained in this study led to the conclusion that most people interviewed were aware of rabbit meat and showed interest in willing to pay for rabbit meat if it was sold on a farm. This result is positive and encouraging for farmers who would like to initiate business in rabbit production at Madiga Village and most other rural areas.

Furthermore, respondents rated low in fat, high in cholesterol, high in protein and white meat as important factors when it comes to meat products. Given this perception, rabbit meat stands the chance of being a highly consumed product if people, especially rural people are made aware of rabbit meat attributes.

Most respondents in this study once ate rabbit meat, however, a large percentage of them consumed rabbit meat years back and this can be pinned to the idea that rabbit meat is not sold in local fast-food restaurants or spaza shops. Respondents in this study were dependent on local hunters for purchases and some hunted rabbit for themselves for household or individual consumption.

Respondents that never ate rabbit meat mentioned that rabbit meat was unavailable in the market and the availability of other meats was one of the reasons they could not eat rabbit meat. However, the taste of rabbit meat, its easiness to prepare and cook together with healthiness, were amongst the reasons respondents ate rabbit meat. Respondents also chose its nutritional properties as one of the reasons they consume rabbit meat. Although rabbit meat properties were not explicitly mentioned, they pinned rabbit meat as more nutritious to the idea that it spends most of the time in the bush.

Rabbit meat was not perceived to be tasty when compared to chicken, beef and sheep meat. However, it was perceived as tasty when compared to pork meat.

Respondents' WTP was found to be dependent on gender, household size, respondents' perception of rabbit meat as compared to pork and sheep meat. Moreover, the perception of the respondents was found to be dependent on their gender and marital status. Therefore the null hypotheses that socio-economic characteristics of consumers do not affect their WTP was rejected because gender and household size were found to significantly affect respondents' WTP, that is accepting the alternative hypothesis. Moreover, the perception of rabbit meat compared to other meat types was found to significantly affect respondents' WTP. For this reason, the null hypothesis that consumers' perception of rabbit meat compared to other meat types do not affect their willingness to pay was rejected, that is, accepting the alternative hypothesis. The study found that there was an association between consumers' perception and their socio-economic characteristics. For this reason, the null hypothesis that socio-economic characteristics of the respondents do not have an association with their perception of rabbit meat compared to other meat types was rejected, therefore, accepting the alternative hypothesis.

Finally, most respondents mentioned that they were not willing to pay more than what they pay for chicken, beef, pork and sheep meat. Therefore, farmers need to be wise in their pricing strategies for rabbit meat.

5.3. Contribution to knowledge

This study contributes to the existing knowledge about rabbit meat and understanding Madiga Village's consumption behaviour related to rabbit meat. The study also provides information on how best rabbit meat can be marketed in the rural domestic market such as Madiga Village with prevailing socio-economic characteristics of the area and their perception of the meat. Moreover, this information attempts to help in promoting effective rabbit meat marketing to meet the demands of consumers. Dissemination of this information about consumer perception and WTP for rabbit meat to marketers mainly focusing on increasing consumer satisfaction is a bonus to designing profitable enterprises regarding market re-orientation and development or even reduce health costs. Understanding

household perception and WTP are vital elements to effectively improve rabbit meat consumption and solve the problem of malnutrition in Africa. As of today, anyone who wants to launch a business venture, that person should have a market first before production. This study provides an understanding as far as consumer behaviour is concerned in lieu of their purchasing patterns that are essential for the future operation of any enterprise.

5.4. Policy recommendations

Africa being the hardest hit when it comes to malnutrition, governments needs to place investments in healthy, nutritional meat products such as rabbit meat. Rabbit meat with its nutritional properties can reduce the problems of malnutrition and other diseases associated with a high intake of fats, etc. The rabbit meat was perceived as nutritious at Madiga Village, suggesting that the problem of malnutrition can be reduced in most rural areas such as Madiga Village with awareness creation programmes of the benefits rabbit meat and findings of this study.

Moreover, as much as there is a high unemployment rate in South Africa, the South African government can support new business ventures financially, especially those that promote healthy lifestyle such as rabbit enterprises. Rabbit meat proves to be promising at Madiga Village and this can consequently lead to greater demands that require hiring of labour (skilled and unskilled with a provision of training) to meet the needs of the consumers. Rabbit business can be practiced at a commercial level with a focus on rural areas such as Madiga Village.

Rabbit farming requires less capital for production and maintenance and promises greater returns, therefore, financing business ventures can help in terms of job creation and maintaining a healthy lifestyle. An establishment of an enterprise like rabbit production promises to be profitable at Madiga Village as there is high percentage of those who once ate rabbit meat and were willing to pay for rabbit meat.

5.5. Further research recommendations

This study only focused on a limited area, that is, the village. Therefore, there is still an opportunity for a wider audience such as the municipality or province and a country as a whole. These studies can primarily focus on increasing awareness of rabbit meat attributes and its health benefits. Furthermore, other studies can focus

on willingness to purchase with the provision of purchasing forms. Other studies can focus on willingness to pay with a provision of a minimum price and follow-up questions using semi-structured questionnaires. Other wild meat products such as gazelle, impala, etc., can also be investigated in terms of willingness to pay and purchase.

6. REFERENCES

- Abu, O. A., Onifade, A. A., Abanikannda, O. T. F. and Obiyan, R.I. (2008). Status and promotional strategies for rabbit production in Nigeria. Proc. 9th *World Rabbit Cong.*, Verona, Italy, 10-13 June 2008, pp. 1499-1504.
- Acebrón, L. B., Dopico, D. C. (2000). The importance of intrinsic and extrinsic cues to expected and experienced quality: an empirical application for beef. *Food Qual Prefer* 11: 229-238. [https://doi.org/10.1016/S0950-3293\(99\)00059-2](https://doi.org/10.1016/S0950-3293(99)00059-2)
- Adanguidi, J. (2020). Analysis of consumer demand and preference for rabbit meat in Benin. *Int. J. Mark. Stud.*, 12. <https://doi.org/10.5539/ijms.v12n1p14>
- Abidoye, R. B., and Chan, A. P. (2017). Critical review of hedonic pricing model application in property price appraisal: A case of Nigeria. *International Journal of Sustainable Built Environment*, 6(1), 250-259. doi:10.1016/j.ijbsbe.2017.02.007
- Adu, E., Paterson, R., Rojas, F., Laswai, G., Fielding, D., and Osafo, E. (2005). Grasscutters, guinea pigs and rabbits. In: Owen E., Kitalyi, A., Jayasuriya, N. and Smith, T. (eds.). *Livestock and Wealth Creation*. DFID, LPP. Nottingham University Press, 325-340.
- Alasnier, C., Réminon, H., and Gandemer G. (1996). Lipid characteristics associated with oxidative and glycolytic fibres in rabbit muscles. *Meat Sci.*, 43, 213-224.
- Angulo, A.M., Gil, J.M. and Tamburo, L. (2003), "Food safety and consumers' willingness to pay for labelled beef in Spain", paper presented at the 83rd EAAE Seminar, Chania, 4-6 September, available at: www.maich/eaee.gr
- Ardeng Rabbit Meat. (1999). Rabbits facts. <http://www.ardengrabbit.com> 07 July 1999.1-4: 11:55 am.
- Asp, E. H. (1999). Factors affecting food decisions made by individual consumers. *Food Policy*, 24(2,3):287-294.
- Bashi, M.J. (2002). Rabbit production and consumption in South Africa, p47.

- Beal, M.N., McLean-Meyinsse, P.E., and Atkinson, C. (2004). An analysis of household consumption of rabbit meat in the Southern United States. *Journal of Food Distribution Research*, 35(1), 24–29.
- Becker T, Benner E, Glitsch K, 2000. Consumer perception of fresh meat quality in Germany. *Br Food J* 102 (3): 246-266.
<https://doi.org/10.1108/00070700010324763>
- Bennett, J. and Blamey, R. (eds) (2001). The choice modelling approach to environmental valuation, Edward Elgar, Northampton.
- Belli, P., Fontana, E., Sommariva, M., Scarpelli, L., Rucci, C., and Luzi, F., and Haddad, B. (2008). The Tunisian traditional rabbit system versus the commercial system: an epidemiological perspective. *World Rabbit Sci.*, 16: 221-228. doi:10.4995/wrs.2008.617
- Billet, R. (1992). New hope for rabbit farming: Smallholder. *Farmer's Weekly*, 30 October 1992:54-56.
- Blackwell, R. D., Miniard, P. W. and Engel, J. F. (2006), *Consumer behavior*, 10th ed., Thomson/South Western, Hastings.
- Bodnar, K., and Horvath, J. (2008). Consumers' opinion about rabbit meat consumption in Hungary. 9th World Rabbit Congress, 10-13 June, 2008, Verona, Italy, 1519-1522.
- Bosco, A. D., Castellini, C., and Bernardini, M. (2001). Nutritional quality of rabbit meat as affected by cooking procedure and dietary vitamin E. *Journal of Food Science*, 66(7), 1047-1051.
- Brunner, T. A., Van der Horst, K., and Siegrist, M. (2010). Convenience food products. Drivers for consumption. *Appetite*, 55, 498–506.
- Brunswik, E. (1943). Organismic achievement and environmental probability. *Psychol. Rev.*, 50, 255.
- Buitrago-Vera, J., Escribá-Pérez, C., Baviera-Puig, A., and Montero-Vicente, L. (2016). Consumer segmentation based on food-related lifestyles and analysis of rabbit meat consumption. *World Rabbit Science*, 24, 169–182.
- Burcharth, H. F., Hawkins, S. J., Zanuttigh, B., and Lamberti, A. (2007). Design tools related to engineering. *Environmental Design Guidelines for Low Crested Coastal Structures*, 203-333. doi:10.1016/b978-008044951-7/50033-6

- Burditt, L., Buchanan, D., and Fitch, J. (2000). Breeds of livestock. Department of Animal Science, Oklahoma State University. <http://www.ansi.okstate.edu/breed>. 28 November 2001.
- Butterfield, B. J., Camhi, A. L., Rubin, R. L., and Schwalm, C. R. (2016). Tradeoffs and compatibilities among ecosystem services. *Ecosystem Services: From Biodiversity to Society, Part 2*, 207-243. doi:10.1016/bs.aecr.2015.09.002
- CABI. (2019a). Rabbit hemorrhagic disease virus. In: *Invasive species compendium*. CAB International, Wallingford, UK.
<https://www.cabi.org/ISC/datasheet/96420>
- CABI. (2019b). Myxomatosis. In: *Invasive species compendium*. CAB International, Wallingford, UK. <https://www.cabi.org/ISC/datasheet/73879>.
- Carlucci, A., Monteleone, E., Braghieri, A., and Napolitano, F. (2009). Mapping the effect of information about animal welfare on consumer liking and willingness to pay for yogurt. *Journal of Sensory Studies*, 24, 712–730.
- Carson, R. T. (2000), 'Contingent Valuation: a user's guide'. *Environmental Science and Technology*, 34(8): 1413-18.
- Carson, R. (2001). Resources and environment: Contingent valuation. *International Encyclopedia of the Social & Behavioral Sciences*, 13272-13275. doi:10.1016/b0-08-043076-7/04196-6.
- CIA. (2012). Central Intelligence Agency. Country Reports. Accessed at https://www.cia.gov/library/publications/the-world-factbook/fields/print_2046.html
- Cheeke, P. R. (1986). Potentials of rabbit production in tropical and sub-tropical agricultural systems. *J. Anim. Sci.*, 63: 1581-1586.
- Clavel, C., Hernández, E., Herrera, J., Hernández, V., and Hernández, D. (2004). Small cuniculture family farms on the south coast of Guerrero State, Mexico. In Proc.: 8th World Rabbit Congress, Puebla, Mexico. 7-10 September, 2004. 146-1470.
- Combes, S., Lepetit, J., Darce, B., and Lebas, F. (2003). Effect of cooking temperature and cooking time on Warner- Bratzler tenderness measurement and collagen content in rabbit meat. *Meat Sci.*, 66, 91-96.
- Combes, S. (2004). Valeur nutritionnelle de la viande de lapin. *INRA Prod. Anim.*, 17, 373-383.

- Combes, S., and Dalle Zotte, A. (2005). La viande de lapin : Valeur nutritionnelle et particularités technologiques. In Proc. 11èmes Journ. Recherche Cunicole, 29-30 Novembre, Paris, France, 167-182.
- Combes, S., Postollec, G., Cauquil, L., and Gidenne, T. (2010). Influence of cage or pen housing on carcass traits and meat quality of rabbit. *Animal*, 4, 295–302.
- Cole, H.H. (1966). Introduction to livestock production: Including dairy and poultry. 2nd edition. Freeman and Company, San Francisco.
- Colin, M., and Lebas, F. (1996). Rabbit meat production in the world. A proposal for every country. In Proc.: 6th World Rabbit Congress, Toulouse, France. 9-12 July, 1996. Vol. 3, 323-330.
- Cullere, M. and Dalle Zotte, A. (2018). Rabbit meat production and consumption: State of knowledge and future perspectives. *Meat Science*, 143, 137-146.
- Cupps, P. T. (2001). *Animal husbandry*. Encarta Encyclopedia. <http://www.encarta.msn.com>. 01 August 2001. 09:50 am.
- Dal Bosco, A., Castellini, C., and Mugnai, C. (2001). Effet du mode d'élevage (cage ou parc) sur l'évolution postmortem du pH et sur les caractères qualitatifs de la viande de lapin. In Proc. 9èmes Journ. Recherche Cunicole, Paris, France, 35-38.
- Dalle Zotte, A. (2002). Perception of rabbit meat quality and major factors influencing the rabbit carcass and meat quality. *Livestock Science*, 75, 11–32.
- Dalle Zotte, A. (2004). Dietary advantages: rabbit must tame consumers. *Viandes Prod. Carnés*, 23, 161-167.
- Dalle Zotte, A., and Szendrő, Z. (2011). The role of rabbit meat as functional food. *Meat Science*, 88, 319–331.
- Dalle Zotte, A. (2014). Rabbit farming for meat purposes. *Animal Frontiers*, 4, 62–67.
- Davis, A., Titterington, A. ,J. and Cochrane, C. (1995), “Who buys organic food? A profile of the purchasers of organic food in N. Ireland”, *British Food Journal*, 97 No. 10, pp. 17-23.
- Delgado, C. L. (2003). Rising consumption of meat and milk in developing countries has created a new food revolution. *Journal of Nutrition*, 133(11), 3907S–3910S. <https://doi.org/10.1093/jn/133.11.3907S>
- Demeterova, M., Pereira, C. I., and Dade, A. C. (1991). Rabbit production under tropical conditions in Mozambique. *World Animal Review*, 69: 36-43.

- Djazayery, A., Siassi, F., and Kholdi, N. (1992). Food behaviour and consumption patterns in rural areas of Sirjan, Iran: Factors affecting food consumption, energy, nutrient intakes and food beliefs. *Ecology of Food and Nutrition*, 28, Part. 1-2: 119-130.
- Dolberg, F. (2001). A livestock development approach that contributes to poverty alleviation and widespread improvement nutrition among the poor. *Livest. Res. Rural Dev.*, 13, Available at: <http://www.lrrd.org/lrrd13/5/dolb135.htm> Accessed: September, 2012.
- El-Raffa, A. M. (2004). Rabbit production in hot climates. In Proc.:, 8th World Rabbit Congress, Puebla, Mexico. 7-10 September, 2004. 1172-1180.
- Escriba-Perez, C., Baviera-Puig, A., Buitrago-Vera, J., and Montero-Vicente, L. (2017). Consumer profile analysis for different types of meat in Spain. *Meat Science*, 129, 120–126.
- Escriba-Perez, C., Baviera-Puig, A., Buitrago-Vera, J., and Montero-Vicente, L. (2019). Children's consumption of rabbit meat. *World Rabbit Sci.* 2019, 27: 113-122 doi:10.4995/wrs.2019.11991
- European Commission. (2015). Report from the Commission to the European Parliament and the Council regarding the mandatory indication of the country of origin or place of provenance for milk, milk used as an ingredient in dairy products and types of meat other than beef, swine, sheep, goat and poultry meat. https://ec.europa.eu/agriculture/sites/agriculture/files/milk/origin-labelling/com-2015-205_en.pdf.
- FAOSTAT (2018). The Statistics Division of the FAO. <http://www.fao.org/faostat/en/#data>.
- FAOSTAT. (2020). The Statistics Division of the FAO. Available online: <http://www.fao.org/faostat/en/#data> (accessed on 10 March 2020).
- Fiala, N. (2008). Meeting the demand: An estimation of potential future greenhouse gas emissions from meat production. *Ecological Economics*, 67(3), 412–419. <https://doi.org/10.1016/j.ecolecon.2007.12.021>
- Finzi, A. (2000). Raising rabbits for food security. Proc. 7th World Rabbit Cong., Valencia, Spain, volume B., 4-7 July 2000, pp. 13-38.
- Font-i-Furnols, M., and Guerrero, L. (2014). Consumer preference, behaviour and perception about meat and meat products: An overview. *Meat Science*, 98, 361–371. <https://doi.org/10.1016/j.meatsci.2014.06.025>

- Food and Agriculture Organisation (FAO). (1999). Breeding rabbits for food and income: 1-2. <http://ovwww.fao.org/news/1999/990101-e.hhn>.
- Food and Agriculture Organization. (2011). World livestock 2011 – Livestock in food security. Rome, Italy: FAO.
- Food and Agriculture Organisation. (2017). *The future of food and agriculture: Trends and challenges*. Rome, Italy: Food and Agriculture Organization of the United Nations.
- Food and Agriculture Organisation. (2018). *The future of food and agriculture: Alternative pathways to 2050*. Rome, Italy: Food and Agriculture Organization of the United Nations.
- Freeman, A. Myrick III. (1994). *The measurement of environmental and resource values: Theory and methods*. Resources for the Future, Washington, D.C.
- French, F.M. (1982). *Small animal enterprises for small farms*. Washington, DC: USDA AER 1422.
- Fu, T. T., Liu, J. T., and Hammit, J. (1999), “Consumer willingness to pay for low-pesticide fresh produce in Taiwan”. *Journal of Agricultural Economics*, 50 (2): 220-33.
- Galal, E.S.E., and Khalil, M.H. (1994). Development of rabbit industry in Egypt. CIHEAM – Options Mediterraneennes, 43-53.
- Gaspari, D. (1979). Rabbit breeding production in Mozambique. IFS Provisional Report No. 4, Rabbit Husbandry, Morogoro, Tanzania. December, 1978. 43-48.
- Gebremedhin, T. G. (1991). The economics of small-scale rabbit production. *American Journal of Alternative Agriculture*, 6 (4): 180-183.
- Gil, J. M., Gracia, A., and Sanchez, M. (2000), “Market segmentation and willingness to pay for organic products in Spain”, *International Food and Agribusiness Management Review*, 3: 207-26.

- Gittens, C. (2000). Encouraging the rabbit habitat. *Farmer's Weekly* 26 May 2000:50-53.
- Glitsch, K. (2000). Consumer perceptions of fresh meat quality: cross-national comparison. *Br Food J* 102(3): 177-194.
<https://doi.org/10.1108/00070700010332278>
- Gondret, F. (1998). Lipides intramusculaires et qualité de la viande de lapin. *In Proc. 7èmes Journ. Recherche Cunicole*, Paris, France, 101-110.
- Gondret, F., Juin, H., Mourot, J., and Bonneau, M. (1998a). Effect of age at slaughter on chemical traits and sensory quality of Longissimus lumborum muscle in rabbit. *Meat Sci.*, 48, 181-187.
- Govindasamy, R., and Italia, J. (1999), "Predicting willingness to pay a premium for organically grown fresh produce". *Journal of Food Distribution Research*, 30 (2): 44-53.
- Grădinaru, A. C. (2017). The Transylvanian Giant Rabbit: an efficient selection for qualitative and quantitative genetic traits. *Rabbit Gen.*, 7: 1-6.
- Greene, W. (2003), *Econometric analysis*. Prentice Hall, Englewood Cliffs, NJ.
- Grunert K. G. (2006). Future trends and consumer lifestyles with regard to meat consumption. *Meat Sci.*, 74 (1): 149-160.
<https://doi.org/10.1016/j.meatsci.2006.04.016>
- Grunert, K. G., Bredahl, L., and Brunsø, K. (2004). Consumer perception of meat quality and implications for product development in the meat sector—A review. *Meat Sci.*, 66: 259-272. [https://doi.org/10.1016/S0309-1740\(03](https://doi.org/10.1016/S0309-1740(03)
- Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (2006), *Multivariate Data Analysis*, 6th ed., Pearson/Prentice Hall, Englewood Cliffs, NJ.
- Henson, S. (1996), "Consumer willingness to pay for reductions in the risk of food poisoning in the UK". *Journal of Agricultural Economics*, 47: 403-20.

- Henchion, M., McCarthy, M., Resconi, V. C., and Troy, D. (2014). Meat consumption: Trends and quality matters. *Meat Sci.*, 98 (3): 561-568. <https://doi.org/10.1016/j.meatsci.2014.06.007>
- Hernández, P., and Gondret, F. (2006). Rabbit meat quality. In: *Maertens L., Coudert P. (Eds.). Recent Advances in Rabbit Sciences*. ILVO, Merelbeke, Belgium, 269-290.
- Hernández, P., Pla, M., and Blasco, A. (1998). Carcass characteristics and meat quality of rabbit lines selected for different objectives. II. Relationships between meat characteristics. *Liv. Prod. Sci.*, 54:125-131.
- Hernández, P., Aliaga, S., Pla, M., and Blasco, A. (2004). The effect of selection for growth rate and slaughter age on carcass composition and meat quality traits in rabbits. *J. Anim. Sci.*, 82, 3138-3143.
- Hoffman, L.C., Pulane, N., Schutte, D.W. and Charlyn, V. (2004). Factors affecting the purchasing of rabbit meat: A study of ethnic groups in the Western Cape, South Africa. *Journal of Family Ecology and Consumer Sciences*, 32. <http://www.ajol.info/index.php/nc>
- Hoffman, L. C., Vosloo, C., Nkhabutlane, P., and Schutte, D. W. (2005). Associations with rabbits and rabbit meat of three different ethnic groups in Stellenbosch, South Africa. *Journal of Family Ecology and Consumer Science*, 33: 63-72.
- Kamande, W. (2010). Where rabbit meat competes with 'Githeri'. *The Standard*, February, 2010. 18.
- Kamel, L., and Lukefahr, S. D. (1990). A note on the social impact of village scale rabbit project development in rural Egypt. *J. Applied Rabbit Res.*, 12: 259-262.
- Kanjala, C., Alberts, M., Byass, P., and Burger, S. (2010). Spatial and temporal clustering of mortality in Dikgale HDSS in rural northern South Africa. *Global Health Action*, 3:1, DOI:10.3402/gha.v3i0.5236

- Kaplan-Pasternak, M. (2011). Promoting entrepreneurial opportunities through rabbit production in Haiti. *Rabbit Production in Developing Countries. 4. World Rabbit Science Association. Available at: <http://world-rabbit-science.com>*
- Kaplan-Pasternak, M., and Lukefahr, S. D. (2011). WRSA project: Rabbit project development in response to the earthquake disaster in Haiti. *Interim Report to the World Rabbit Science Association. Available at: <http://world-rabbit-science.com>*
- Kohls, R.L., and Uhl, J.N. (1990). Marketing of agricultural products. 7th edition. Macmillan, New York.
- Korzen, S., and Lassen, J. (2010). Meat in context: On the relation between perceptions and contexts. *Appetite*, 5: 274-281. <https://doi.org/10.1016/j.appet.2009.11.011>
- Kourouniotis, S., Keast, R., Riddell, L., Lacy, K., Thorpe, M., and Cicerale, S. (2016). The importance of taste on dietary choice, behaviour and intake in a group of young adults. *Appetite*, 103, 1-7. <https://doi.org/10.1016/j.appet.2016.03.015>
- Kpodekon, M., and Coudert, P. (1993). Impact of a rabbit research and information centre on research activity and development of rabbit production in Benin. *World Rabbit Sci.*, 1: 25-30. doi:10.4995/wrs.1993.192
- Kpodekon, M., Gnimadi, A., Djago, Y., Bhouin, S., and Faourougou, S. (2000). Rabbit production and network in Benin in 1998. In Proceedings, 7th World Rabbit Congress, Puebla, Mexico. 7-10 September, 2004.
- Krystallis, A., and Chryssohoidis, G. (2005), "Consumers' willingness to pay for organic food. Factors that affect it and variation per organic product type". *British Food Journal*, 107 (5): 320-43.
- Lebas, F., Coudert, P., Rouvier, R., and De Rochambeau, H. (1997). The Rabbit: Husbandry, Health, and Production. Rome: Food and Agriculture Organization of the United Nations.

- Li, S., Zeng, W., Li, R., Hoffman, L. C., He, Z., Sun, Q., and Li, H. (2018). Rabbit meat production and processing in China. *Meat Science*, 145, 320-328.
- Louangrath, P. I., and Sutanapong, C. (2019). Minimum sample size calculation using cumulative distribution function. *International Journal of Research & Methodology in Social Science*, 5(1): 100. ISSN 2415-0371. www.socialsciencepublication.com
- Lukefahr, S. D., and Goldman, M. (1985). A technical assessment of production and economic aspects of small-scale rabbit farming in Cameroon. *J. Appl. Rabbit Res.*, 8: 126-135.
- Lukefahr, S.D. (1998). Rabbit production in Uganda: Potential vs. opportunity. *World Rabbit Sci.*, 6: 331-340. doi:10.4995/wrs.1998.365
- Lukefahr, S.D. (1999). Teaching international animal agriculture. *J. Anim. Sci.*, 77: 3106-3113.
- Lukefahr, S.D., and Cheeke, P.R. (1991a). Rabbit project development strategies in subsistence farming systems. 1. Practical considerations. *World Animal Rev.*, 69: 26-35.
- Lukefahr, S.D., and Cheeke, P.R. (1991b). Rabbit project development strategies in subsistence farming systems. 2. Research applications. *World Animal Rev.*, 69: 60-70.
- Lukefahr, S.D. (2000). National Rabbit Project of Ghana: A genetic case study. *ICAR Technical Series*, 3, 307-317.
- Lukefahr, S. D. (2007). Strategies for the development of small- and medium-scale rabbit farming in South-East Asia. *Livest. Res. Rural Dev.*, 19(9): 1-12.
- Lukefahr, S.D., Nkwocha, H.I., Njakoh, H., Tawah, E., Akob, J.M., Kongyu, F.A., Njwe, R.M., and Gudahl, D. (2000). Present status of the Heifer Project International – Cameroon Rabbit Programme: Back to the future. *World Rabbit Sci.*, 8: 75-83. doi:10.4995/wrs.2000.423
- Lutz, S. M., Blaylock, J. R. and Smallwood, D. M. (1993). Household characteristics Affect Food Choices. *Food Rev.*, 16: 12-18.

- Magrath, W., and Arens, P. (1989), 'The costs of soil erosion on Java: a natural resource accounting approach', *Environment Department Working Paper* 18, The World Bank, Washington D.C.
- Maigida, R., Kabir, M. S., and Jibir, M. (2018). Attitudes to rabbit meat and problems associated with its consumption in Sokoto Metropolis. *The International Journal of Engineering and Science (IJES)*, 7.9; 08-12. DOI: 10.97901813-0709010812
- Mailu, S.K., Muhammad, L., Wanyoike, M.M., and Mwanza, R.N. (2012). Rabbit meat consumption in Kenya (p. 11). MPRA Paper No. 41517.
- Mamattah, N. (1979). Sociological aspects of introducing rabbits into farm practices. IFS Provisional Report No. 4, Rabbit Husbandry, Morogoro, Tanzania, December, 1978. 93-99.
- Markandya, A., and Ortiz, R. (2011). General introduction to valuation of human health risks. *Encyclopedia of Environmental Health*, 871-878.
- Markandya, A., Ortiz, R. A., and Chiabai, A. (2018). Estimating environmental health costs: General introduction to valuation of human health risks. Reference Module in Earth Systems and Environmental Sciences. doi:10.1016/b978-0-12-409548-9.10657-8
- McLean-Meynsse, P.E., Hui, J. and Meynsse J. (1994). Consumer perceptions of, and attitudes towards rabbit meat. *Journal of Agribusiness*, 21(1):55-67.
- McLeod, N. D., McDonald, C. K., and van Oudtshoorn, F. P. (2008). Challenges for emerging livestock farmers in Limpopo Province, South Africa. *African Journal of Range and Forage Science*, 25(2): 71-77. Doi:10.2989/AJRFS.2008.25.2.5.484.
- McNitt, J.I. (1979). Methods of smallholder rabbit production. IFS Provisional Report No. 4, Rabbit Husbandry, Morogoro, Tanzania, December, 1978. 100-112.
- McNitt, J.I., Lukefahr, S.D., Cheeke, P.R., and Patton, N.M. (2013). Rabbit production. Oxfordshire: CABI Publishers.

- Montero-Vicente, L., Escribá-Pérez, C., Baviera-Puig, A., and Buitrago-Vera, J. (2018). Analysis of the commercial value of rabbit meat based on positioning of the different types of fresh meat. *Spanish Journal of Agricultural Research*, 16(3), e0110. <https://doi.org/10.5424/sjar/2018163-13407>
- Morisse, J.P. (1998). Le bien-être chez le lapin: Rapport de synthèse. 7^{èmes} Journées de la Recherche Cunicole en France, Lyon (France): 205–214.
- Morisse, J.P., Boilletot, E., and Martrenchar, A. (1999). Preference testing in intensively kept meat production rabbits for straw on wire grid floor. *Applied Animal Behaviour Science*, 64, 71–80.
- Napolitano, F., Girolami, A., and Braghieri, A. (2010). Consumer liking and willingness to pay for high welfare animal-based products. *Trends in Food Science & Technology*, 21:537–543.
- Nasr, M. A. F., Abd-Elhamid, T., and Hussein, M. A. (2017). Growth performance, carcass characteristics, meat quality and muscle amino-acid profile of different rabbits breeds and their crosses. *Meat Science*, 134: 150-157.
- Nistor, E., Bampidis, V.A., Păcală, N., Pentea, M., Tozer, J., and Prundeanu, H. (2013). Nutrient content of rabbit meat as compared to chicken, beef and pork meat. *J. Anim. Prod. Adv.*, 3: 172-176.
- Niyonzima, E., Ongold, M. P., Brostaux, Y., Koulagenko, N. K., Daube, G., Kimonyo, A., and Sindic, M. (2017). Consumption patterns, bacteriological quality and risk factors for Salmonella contamination in meat-based meals consumed outside the home in Kigali, Rwanda. *Food Control*, 73 (Part B): 546–554. <https://doi.org/10.1016/j.foodcont.2016.09.004>
- North American Rabbit Cooperative, Inc. (NARCI). (2003). “Rabbit the Other White Meat.” <http://www.narci.info/food.htm>
- North, M.K., Dalle Zotte, A., and Hoffman, L.C. (2019). Growth, carcass and meat quality traits of two South African meat rabbit breeds. *South African Journal of Animal Science*, 49 (5): 816-823.

- Onifade, A.A., Abu, O.A., Obiyan, R.I., and Abanikannda, O.T.F. (1999). Rabbit production in Nigeria: Some aspects of the current status and promotional strategies. *World Rabbit Sci.*, 7: 51-58. doi:10.4995/wrs.1999.380
- Oseni, S.O., Ajayi, B.A. Komolafe, S.O. Siyanbola, D., Ishola, M. and Madamidola, G. (2008). Smallholder rabbit production in southwestern Nigeria: current status, emerging issues and way forward. In Proc.: 9th World Rabbit Congress, Verona, Italy, 10-13 June, 2008. 1597-1601.
- Oseni, S. O. (2010). Report of an exhibition by the Rabbit Breeders Association of Kenya - January 2010. Project Stories from the Field. Rabbit production in developing countries. World Rabbit Science Association. Available at: <http://world-rabbit-science.com>
- Oseni, S. O., and Lukefahr, S. D. (2014). Rabbit production in low-input systems in Africa: Situation, knowledge and perspectives- A review. *World Rabbit Science*, 22:147-160 doi:10.4995/wrs.2014.1348
- Ouhayoun, J., and Lebas, F. (1987). Composition chimique de la viande de lapin. *Cuniculture*, 73: 33-35.
- Owen, J.E. (1976). Rabbit production in tropical developing countries: A review. *Trop. Sci.*, 18: 203-210.
- Owen, J.E., Kitalyi, A., Jayasuriya, N., and Smith, T. (2005). Livestock and wealth creation. DFID, LPP. Nottingham University Press. Nottingham, UK.
- Owusu-Sekyere, E., Owusu, V., and Jordaan, H. (2014). Consumer preferences and willingness to pay for beef food safety assurance labels in the Kumasi Metropolis and Sunyani Municipality of Ghana. *Food Control*, 46, 152–159. <https://doi.org/10.1016/j.foodcont.2014.05.019>
- Parsons, G. (2013). Travel cost methods. *Encyclopedia of Energy, Natural Resource, and Environmental Economics*, 349-358. doi:10.1016/b978-0-12-375067-9.00002-4

- Pereira, P. M. D. C. C., and Vicente, A. F. D. R. B. (2013). Meat nutritional composition and nutritive role in the human diet. *Meat Science*, 93(3): 586–592. <https://doi.org/10.1016/j.meatsci.2012.09.018>
- Petracci, M., and Cavani, C. (2013). Rabbit meat processing: Historical perspective to future directions. *World Rabbit Science*, 21: 217–226.
- Petracci, M., Soglia, F., and Leroy, F. (2018). Rabbit meat in need of a hat-trick: from tradition to innovation (and back). *Meat Science*, 146: 93-100.
- Petrescu-Mag, R.M., Oroian, I.G., Botha, M., Covrig I., and Petrescu-Mag, I.V. (2014). Morphological, productive and reproductive characterization of the Transylvanian giant rabbit (*Oryctolagus cuniculus*): First statistical report. *North-Western J. Zool.*, 10:400-403.
- Petrescu, D.C., and Petrescu-Mag, R.M. (2018). Consumer behaviour related to rabbit meat as functional food. *World Rabbit Sci.*, 26, 321–333. <https://doi.org/10.4995/wrs.2018.10435>
- Pla, M., Hernández, P., and Blasco, A. (1996). Carcass composition and meat characteristics of two rabbit breeds of different degrees of maturity. *Meat Sci.*, 44, 85-92.
- Pla, M., Guerrero, L., Guardia, D., Oliver, M.A, and Blasco, A. (1998). Carcass characteristics and meat quality of rabbit lines selected for different objectives: I. between lines comparison. *Livest. Prod. Sci.*, 54, 115-123.
- Pla, M., Pascual, M., and Ariño, B. (2004). Protein, fat and moisture content of retail cuts of rabbit meat evaluated with the NIRS methodology. *World Rabbit Sci.*, 12, 149-158.
- Popkin, B. M., Adair, L. S., and Ng, S. W. (2012). Global nutrition transition and the pandemic of obesity in developing countries. *Nutrition Review*, 70(1), 3–21. <https://doi.org/10.1111/j.1753-4887.2011.00456.x>
- Princz, Z., Radnai, I., Biró-Németh, E., Matics, Zs., Gerencsér, Zs., Nagy, I., and Szendrő, Zs. (2008). Effect of cage height on the welfare of growing rabbits. *Applied Animal Behaviour Science*, 114, 284–295.

- Ramchurm, R. (1979). New feed resources for rabbits in Mauritius. IFS Provisional Report No. 4, Rabbit Husbandry, Morogoro, Tanzania, December, 1978. 49-55.
- Randolph, T.F., Schelling, E., Grace, D., Nicholson, C.F., Leroy, J.L., Cole, D.C., and Ruel, M. (2007). Invited Review: Role of livestock in human nutrition and health for poverty reduction in developing countries. *Journal of Animal Science*, 85(11), 2788–2800. <https://doi.org/10.2527/jas.2007-0467>
- Reimund, D. A., and A. Somwaru. (1985). *Farm income by type of farm*, 1982 and 1983. Washington, DC: usda aer 531.
- Sanah, I., Becila, S., Djechim, F., and Boudjellal, A. (2020). Rabbit meat in the East of Algeria: Motivation and obstacles to consumption. *World Rabbit Sci.* 28:221-237. doi: 10.4995/wrs.2020.13419
- Savietto, D., Blas, E., Cervera, C., Baselga, M., Friggens, N., Larsen, T., and Pascual, J. (2012). Digestive efficiency in rabbit does according to environment and genetic type. *World Rabbit Science*, 20:131-139. doi:10.4995/wrs.2012.1152
- Sima, N., Sima R. (2015). Perennial fodder plants - potential feed sources in nutrition of rabbits. *Rabbit Gen.*, 5: 6-12.
- Shingai, E.C., Mugambiwa, S.S., Tirivangasi, H.M., and Rankoana, S.A. (2018). Climate change and variability perception in Ga-Dikgale community in Limpopo Province, South Africa. *IJCCSM*, 11, 3.
- Smed, S. and Jensen, J. D. (2003), “Demand for low-fat dairy products – demand for healthiness or taste?”, paper presented at the 83rd EAAE Seminar, Chania, 4-6 September, available at: www.maich/eaee.gr
- Sonandi, A., Masika, P. J., and Van Averberke, W. (1996). Rabbit production systems in selected areas of five provinces in South Africa. Proceedings of the 6th World Rabbit Congress. Toulouse, France.
- Statistics South Africa. (2011). Community Survey, available at: www.statssa.gov.za (accessed August).

- Sustainable Energy and UL. (2016). Household energy use and supply survey of Dikgale Subdistrict of Polokwane, Limpopo: 8.
- Szakaly, Z., Szigeti, O., Szente, V. and Polereczki, Z. (2009). Consumer habits on the market of Hungarian beef and rabbit meat. 4th Aspects and Visions of Applied Economics and Informatics, March 26 - 27. 2009, Debrecen, Hungary.
- Szendrő, Zs., Radnai, I., Biró-Németh, E., Romvári, R., and Milisits, G. (1996). Changes in water, protein, fat and ash content in the meat of rabbits between 2.2 and 3.5 kg live weight. In Proc. 6th World Rabbit Congress, Toulouse, France, Vol. 3, 269.
- Szendrő, Zs., and Dalle Zotte, A. (2011). Effect of housing conditions on production and behaviour of growing meat rabbits: A review. *Livest. Sci.*, 137: 296-303.
- Szendro, K., Szabó-Szentgróti, E., and Szigeti, E. (2020). Consumers' attitude to consumption of rabbit meat in eight countries depending on the production method and its purchase. *Foods*, 9, 654:1-16. doi:10.3390/foods9050654
- Trocino, A., Cotozzolo, E., Zomeño, C., Petracci, M., Xiccato, G., and Castellini, C. (2019). Rabbit production and science: The world and Italian scenarios from 1998 to 2018. *Ital. J. Anim. Sci.* 18:1361–1371. [CrossRef]
- Udomkun, P., Ilukor, J., Mockshell, J., Mujawamariya, G., Okafor, C., Bullock, R., Nabahungu, N.L., and Vanlauwe, B. (2018). What are the key factors influencing consumers' preference and willingness to pay for meat products in Eastern DRC?. *Food Sci. Nutr.*, 6:2321-2336. <https://doi.org/10.1002/fsn3.813>
- Villagrà, A., Olivas, I., Estellés, F., Blas, E., Rodríguez, T., Rosell, J., and Pascual, J. J. (2012). How far may rabbit cage's space recommendations reach: The gap between science and regulations. Proceedings 10th World Rabbit Congress, September 3–6 2012 (pp. 1057–1061). Egypt: Sharm El-Sheikh.

- Villanueva, J.L.J., López, S.M., and Rodríguez, J.D.D.G. (2015). Behaviour of consumers and willingness to pay for quality attributes of organic meat rabbit. *Revista Mexicana De Ciencias Pecuarias*, 6: 221–232.
- Williams, W.F and Stout, T.T. (1964). Economics of the livestock-meat industry. Macmillan Company, New York and Collier-Macmillan Limited, London.
- World Bank (2008). World Development Report, 2008. Agriculture for Development, The World Bank, Washington, DC. 386 pp. Available at: <http://www.ukfg.org.uk/docs/wdr2008.pdf> Accessed: April, 2012.
- Zaibet, L., Mtimet, N., Hammami, S., Khammassi, M and Ammar, A. (2000). Assessing meat product quality: a consumer perception approach. *Institut National de Recherche vétérinaire de Tunis (IRVT)*, 22 (4):106-111.
- Zeising, C. (2000). Rabbit production in Ciskei – Do more than ten years of existence prove sustainable development? In Proc.: 7th World Rabbit Congress, Valencia, Spain, 4-7 July, 2000. Vol B: 141-148.

7. APPENDICES

Appendix A: Participant Consent form

Title of the research project: Analysing consumers' perception and willingness to pay for rabbit meat: A case study of Madiga Village, Polokwane Municipality, Limpopo Province, South Africa.

Dear Respondent

This study aims to understand consumers' perception and their willingness to pay for rabbit meat to better supply their needs. Furthermore, this study aims to generate knowledge that will assist farmers to undertake profitable and productive businesses.

Your participation in this study is strictly voluntary. You have the right to take part in this study and not to take part without any penalty. There are no right or wrong answers. The information you will provide will remain confidential and be used strictly for the purpose it is collected for.

There are no direct benefits for participating in this study, however, this study will benefit you indirectly by providing you with the information that can help you as a participant who eats and does not eat rabbit meat and those who would like to take an initiative in rabbit farming.

If you have any questions at any time regarding this study, you may contact the researcher on this email, jmatsobane46@gmail.com or the supervisors at abenet.belete@ul.ac.za or mmapatla.senyolo@ul.ac.za

Consent

I have read the information above relating to the research and have also heard the verbal version and declare that I understand it.

Signature of the respondent.....

Signed at.....on.....

Appendix B: Request for permission letter

Stan no 608

Madiga Ga-Dikgale

Sovenga

0727

Head of Department

Department of Agriculture

Limpopo Province

Polokwane

0699

Request to research Madiga village in Ga-Dikgale in Polokwane Municipality.

I, Lekota Matsobane Johannes, student number:201511921, ID no:9603265565087 hereby wish to request to research Madiga Ga-Dikgale under your jurisdiction.

My area of interest is of the topic titled: Analysing consumers' perception and willingness to pay for rabbit meat: A case study of Madiga Village Ga-Dikgale, Polokwane Municipality, Limpopo Province, South Africa.

Yours Sincerely

Lekota MJ

.....

Appendix C: Ethical Clearance



University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email:
makoetja.ramusi@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE
ETHICS CLEARANCE CERTIFICATE

MEETING: 17 February 2021

PROJECT NUMBER: TREC/04/2021: PG

PROJECT:

Title: Analysing consumers' perception and willingness to pay for rabbit meat: a case study of Madiga Village, Polokwane Municipality, Limpopo Province, South Africa
Researcher: MJ Lekota
Supervisor: Prof A Belete
Co-Supervisor/s: Dr MP Senyolo
School: Agricultural Economics and Animal Production
Degree: Master of Science in Agriculture (Agricultural Economics)

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:

- i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
- ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
- iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Finding solutions for Africa

Appendix D: Questionnaire



**University of Limpopo, Department of Agricultural Economics and Animal
Production
School of Agricultural and Environmental Sciences
Faculty of Science and Agriculture
South Africa**

Matsobane Johannes Lekota

**Mobile: (+27) 72 498 9950
Email: jmatsobane46@gmail.com**

Questionnaire number.....

Enumerator.....

Name of the consumer.....

Consumers' contact details.....

Village.....Madiga Village.....

Date of interview.....

The information collected will be handled confidentially and the respondents will be participating voluntarily without any force. And, this research project will not be harmful to the environment and the respondents.

Research topic: Analysing consumers' perception and willingness to pay for rabbit meat: A case study of Madiga Village, Polokwane Municipality, Limpopo Province, South Africa.

Aim of the study: To understand consumers' perception and analyse their willingness to pay for rabbit meat.

Would you like to participate in this study?

Yes	No
-----	----

Instruction: Please use x or tick where necessary

SECTION A: Socio-economic characteristics

1. Age of the consumer

.....years

2. Gender

1. Male	0. female
---------	-----------

3. Household size _____ -

4. Number of years schooling

.....years

5. What is your marital status?

1. Married	2. Divorced	3. Widowed	4. Single
------------	-------------	------------	-----------

6. Household income per year

.....rands

7. Occupation

1.Full time employed

2.Self employed

3.Not employed

4.Other

8. Are you Christian?

1.Yes

0. No

9. Does culture forbid you to consume rabbit meat?

1 Yes

0 No

SECTION B: Perceptions of rabbit meat compared to other types of meat by consumers

10.How would you rate the importance of the following meat attributes, on a scale of 1, not important to 5, extremely important?

Item	1 Not very important	2 Not important	3 Undecided	4 Important	5 Extremely important
Low in fat					
Low in cholesterol					

Low in sodium					
High in protein					
Taste of the meat					
Appearance					
Freshness					
No additives					
Being a red meat					
Being a white meat					

11. Rate your perception of rabbit meat compared to chicken meat using the items given below from 1: Strongly disagree to 5: Strongly agree

Item	1: Strongly disagree	2: Disagree	3: Neither agree nor disagree	4: Agree	5: Strongly agree
It is tasty					
Better in texture					
Better smell					
Easy to cook					
Difficult to prepare and cook					
It is cheap					
Rabbit has					

many nutritional properties					
Easily digested					
Rabbit meat is a clean and healthy meat					
Easy to access					

12. Rate your perception of rabbit meat compared to beef meat using the items given below from 1: Strongly Agree to 5: Strongly Disagree

Item	1: Strongly disagree	2: Disagree	3: Neither agree nor disagree	4: Agree	5: Strongly Agree
It is tasty					
Better in texture					
Better smell					
Easy to prepare and cook					
Difficult to prepare					

and cook					
It is cheap					
Rabbit has many nutritional properties					
Easily digested					
Rabbit meat is a clean and healthy meat					
Easy to access					

13. Rate your perception of rabbit meat compared to pork meat using the items given below from 1: Strongly disagree to 5: Strongly agree

Item	1: Strongly disagree	2: Disagree	3: Neither agree nor disagree	4: Agree	5: Strongly agree
It is tasty					
Better in texture					
Better smell					
Easy to					

prepare and cook					
Difficult to prepare and cook					
It is cheap					
Rabbit has many nutritional properties					
Easily digested					
Rabbit meat is a clean and healthy meat					
Easy to access					

14. Rate your perception of rabbit meat compared to mutton meat using the items given below from 1: Strongly disagree to 5: Strongly agree

Item	1: Strongly disagree	2: Disagree	3: Neither agree nor disagree	4: Agree	5: Strongly agree
It is tasty					
Better in					

texture					
Better smell					
Easy to prepare and cook					
Difficult to prepare and cook					
It is cheap					
Rabbit has many nutritional properties					
Easily digested					
Rabbit meat is a clean and healthy meat					
Easy to access					

15. Would you say rabbit meat is?

	1) Better than	2) Same as	3) Not better than	4) Don't know
--	----------------	------------	--------------------	---------------

Chicken				
Beef				
Mutton				
Pork				

SECTION C: Rabbit meat consumption and willingness to pay

16. Have you eaten rabbit meat before?

1 Yes

0 No

17. If yes, when was the last time you ate rabbit meat?

1) Last week	2) Few weeks ago	3) A month ago	4) Few months ago	5) A year ago	6) Years ago

18. What did you like about rabbit meat? Rate your response using the following options, 1, Strongly disagree to 5, Strongly agree

Item	1: Strongly disagree	2: Disagree	3: Neither agree nor disagree	4: Agree	5: Strongly agree
It is tasty					
Better in texture					
Better smell					
Easy to prepare and cook					
Difficult to prepare					

and cook					
It is cheap					
Rabbit has many nutritional properties					
Easily digested					
Rabbit meat is a clean and healthy meat					
Easy to access					

19. If yes, where did you purchase or get it?

1) Through hunting	2) From a local hunter	3) Friend	4) Other

20. If no, what are the reasons you never or no longer eat rabbit meat?

Reason	0.Don't know	1.Yes	2.No
Unaware of rabbit meat			
Unavailability of rabbit at the market			
Tradition			
Unattractive			
Availability of other meat			
Smell			
It makes you sick when you eat it			

Rabbit is a pet; it should not be consumed			
Appearance			
Heard bad things about rabbit meat			

21. If you were told that the attributes you consider important from question 14 are available in rabbit meat, would you purchase/consume rabbit meat?

- 0. Yes
- 1. No
- 0. Not sure

22. Would you be willing to pay for rabbit meat if it was available on a farm?

- 1. Yes
- 0. No

23. How would prefer to buy rabbit meat?

- 1. Fresh without the carcass and cleaned
- 2. Fresh with the carcass
- 3. Frozen
- 4. Canned
- 5. Live
- 6. In portions
- 7. Other

24. Would you give special attention to the packaging of rabbit meat?

- 1 Yes
- 0 No

25. If yes, choose one or more of the reasons below.

	1. Yes	0. No
1. Quality of the meat		
2. Taste		
3. Price		
4. Other		

26. How would you rate the following meat qualities according to importance when purchasing rabbit meat? 1, not important to 5, extremely important

	1 Not important	2 Not very Important	3 Somewhat important	4 Very important	5 Extremely important
Colour					

Appearance					
Smell					
Weight					

27. Would price play an important role when buying rabbit meat?

1 Yes

0 No

28. If yes, are you prepared to pay more or less for rabbit meat than chicken, beef?

1 More than chicken meat

2 Less than chicken meat

3 More than beef meat

4 Less than beef meat

29. If yes, are you prepared to pay more or less for rabbit meat than mutton, pork?

1 More than mutton

2 Less than mutton

3 More than pork

4 Less than pork

30. If you were to buy rabbit alive would you mind the colour of the rabbit?

1 Yes

0 No

31. Would you like to try to consume rabbit meat coming from other colours?

0. Don't know

1. Yes

2. No

32. What do you associate rabbit with?

1 Pet

2 Wool

3 Meat

4 Both pet and meat

5 Other

33. Would you describe rabbit meat as...

Item	0. Don't know	1. Yes	2. No
------	---------------	--------	-------

Rural meat			
Meat for the urban rich			
Both rural and for the urban rich			
Other			

34. Any other thing you would like to say about rabbit meat?

.....
.....

THANK YOU