

**ANALYSIS OF CONSUMER PREFERENCE FOR PRODUCT
ATTRIBUTES:A CASE OF INDIGENOUS CHICKEN IN MAKUENI AND
NAIROBI COUNTIES, KENYA**

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**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
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UNIVERSITY**

MARCH, 2019

DECLARATION

I declare that this thesis is my original work and has never been submitted in this or any other University for the award of a degree.

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DEDICATION

I dedicate this work to my dear wife Mrs. Christine Nyangweso and our two daughters; Elizabeth and Valary for their encouragement and tolerance while I was away from home, my Sister Mrs. JerusahSaisi for being resourceful and finally to my Mother Mrs. MableNdenga for her prayerful and motivational support.

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LIST OF ACRONYMS AND ABBREVIATIONS

CVM	Contingent Valuation Method.
CIDP	County Integrated Development Plan
EPZA	Export Processing Zone Authority
GDP	Gross Domestic Product
GoK	Government of Kenya
I.C	Indigenous chicken
IIC	Improved Indigenous Chicken
MoLD	Ministry of Livestock Development
PCA	Principal Component Analysis
USAID	United States Agency on International Development

ABSTRACT

Indigenous chickens (*Gallus domesticus*) are important source of livelihoods and food to majority of rural and urban households in Kenya. Consumers prefer indigenous chicken due to its nutritional and health benefits. Despite these benefits, productivity levels of Indigenous chicken are low resulting to shortages in supply. In the recent past, research has focused on increasing productivity levels of indigenous chicken resulting to improved indigenous chickens. However, acceptability and utilization of indigenous chickens is still higher compared to that of improved indigenous chickens. This can be attributed to a dearth in information on consumer preference attributes in indigenous chicken which are not available in improved indigenous and exotic chickens. This study aimed to fill this gap in knowledge by analyzing preference attributes in indigenous chicken meat and eggs which influences their choice in Makueni and Nairobi counties. This was achieved through three specific objectives that aimed to; evaluate social economic factors influencing consumption frequency of indigenous chicken, assess indigenous chicken meat and eggs attributes that influences choice and analyze the influence of indigenous chicken meat and eggs attributes on price. Multistage sampling technique was used to select 200 respondents in Nairobi and Makueni counties. Primary data was collected in a cross sectional survey design using semi structured questionnaires that were administered through interview schedules. Both descriptive and inferential statistics were used in data analysis with the aid of Microsoft Excel and STATA 11 version software. For the first objective, binary logistic regression model was employed, in the second objective principal component analysis was used while hedonic pricing model analyzed the third objective. Results of the logit model indicated that age, education, gender, price and household size influenced consumption frequency. Principal component analysis results revealed that; Skin colour, size, tenderness, sex, freshness, skin texture and price influenced choice of indigenous chicken in both counties. Consumers in Nairobi paid a premium price of 6% for cocks while in Makueni, chickens aged 8-20 weeks attracted price premium of 10% over those aged above 28 weeks. Chickens with black and white plumage colour received price discounts of 23% and 18% respectively. In indigenous chicken eggs, consumers in Makueni paid price premium of 10% for white shell colour eggs while those in Nairobi paid price premium of 9% for brown colour over white coloured eggs. The study recommended that farmers should adopt production methods that enhance incorporation of the preference attributes. Traders should adopt appropriate marketing mix based on attributes of preference and segment the chicken market based on the social economic characteristics of the consumers. Research institutions need to incorporate attributes of interest to consumers in their breeding programmes so as to enhance consumer acceptability and utilization.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Indigenous chickens (*Gallus domesticus*) play important roles among many Kenyan households by contributing towards food and nutritional security. They provide a key source of proteins from meat and eggs for human diets. The subsector also serves as a source of households income and employment (ASDS, 2010). Indigenous chickens are widely distributed across most African countries (Gueye, 2002). In East African region, consumers generally prefer indigenous to exotic chicken breeds due to the perception that they taste better, are more nutritious and have perceived health benefits (USAID, 2010). The Kenyan poultry sub sector contributes 55% to the livestock sector, 30% to the agricultural sector and 7.8 % to the GDP (USAID, 2010). The sub sector also employs 2 – 3 million people in Kenya. In 2010 the total number of chickens in Kenya stood at 37.3 Million distributed as follows: 84% indigenous, 5.7% broilers, 8.3% layers and 2% other birds (USAID, 2010). White meat (poultry and pig) accounts for about 19% of the meat consumed locally in Kenya and for export (Export Processing Zone Authority [EPZA], 2005).

Indigenous chicken contribute 71% of the total poultry egg and meat produced in Kenya and therefore significantly influence the rural trade, welfare and food security of the smallholder farmers (Nyaga, 2007). In Africa, the average

percapita consumption of poultry meat is 4.5 kg (USAID, 2010). In Kenya, poultry meat consumption is expected to increase from 376,200 metric tons(MT) in 2010 to 1,124,505 MT in 2020(USAID, 2010) representing a 200 Percent increase over the consumption in 2010. This anticipated increase in demand calls for measures to increase the production levels by similar magnitude. The growth in demand for poultry meat and eggs from indigenous chickens(IC) in Kenya particularly in urban areas is high. This is due to the perceived taste, toughness and freedom from chemical contaminants.However, this demand is not met due to the low productivity levels of indigenous chickenswhich limit their potential for commercialization(Okitoi, 2007).

Makueni County is among the main producers of indigenous chicken in Kenya (Muthee, 2009).However, majority of the population (62%) livesbelow the poverty line and experience erratic rainfall that result in crop failure hence making livestock production akey economic activity(ACF-USA, 2012). Makueniderives 50% of their income fromlivestock and 30% from crops (GoK, 2006). Therefore, indigenous chicken has asignificant role in the livelihoods of rural resource poor household (Kabuage,20 I0). In both Makueni and Nairobi Counties, IC has been recognized as an avenue toimprove livelihoods of the ruralperi-urban and urban households by increasing productivity (USAID, 2010). The demand for IC meat and eggs in Nairobi exceeds its local supply due to increased population. Nairobi forms the main terminal market as well as abattoir for indigenous chicken that comes from Makueni. The market serves consumers of diverse socio economic

orientation. Being the capital city, the population is therefore composed of consumers from different backgrounds who are expected to have diverse preferences. Consequently, up to 60% of indigenous chicken produced in Makueni is sold in Nairobi (MoLD – Makueni, 2013).

In an effort to increase productivity at farm level, research institutions among them Kenya agricultural research and livestock organization (KARLO) have developed improved indigenous chicken (IIC) for adoption by farmers in different parts of the country including Makueni County. The IIC have high productivity levels and their adoption by farmers was expected to bridge the gap between demand and supply in IC. Despite this milestone by research institutions, indigenous chickens still dominate the market; consumers show high preference for IC and the country is chicken deficit. For instance, in 2012, Kenya produced 22,700 tones of chicken meat and imported 1,830 tones to fill the shortage in supply (FAO, 2015). The deficit is an indication of the local market failure to stimulate production despite the development of IIC.

The continued rise in consumer preference for IC and the inability of IIC to bridge the gap in supply is an indication of knowledge gap on consumer preference for attributes of indigenous chicken (IC) meat and eggs that is probably not in the recently released improved indigenous chicken (IIC). This implies that research institutions have focused on improving productivity levels at the farmers' advantage while disregarding the focus to consumer preference attributes in IC. Lack of consumer preference attribute analysis could be a factor that limits

acceptability, utilization and subsequently low production of the newly released improved indigenous chicken meat and eggs. The problem therefore is insufficient information on the preference attributes of ICmeat and eggs that influences choice and consumption. The overall objective of this study is to fill this gap in knowledge.

1.2 Chicken improvement in Kenya

The National Poultry Development Programme (NPDP) launched by the Ministry of Livestock Development in 1976 was the biggest single initiative nationally that targeted improvement of local poultry. The NPDP was designed to address the main constraints in small scale poultry development. Its overall objective at inception was to develop and improve small scale commercial poultry keeping through extension and applied research which ultimately would raise production and consumption of both poultry meat and eggs. Recent improvement in the indigenous chicken value chain by research institutions has been geared towards increasing productivity levels and resistance to diseases.

Focus has been on indigenous chicken since they contribute 75% of total poultry production in Kenya (Nyaga, 2007). This has led to the development of different types of improved indigenous chicken by research institutions including; Kari Kienyeji, Rainbow roosters, Kenbro and Kuroilers. Despite these efforts by research firms, production and utilization of chicken meat and eggs before and after the introduction of improved indigenous chicken still remains in favor of indigenous chicken. This is attributed to the fact that consumers show preference to

IC products compared to other chicken products (Bett et al., 2011). Table 2.1 below shows production of chicken meat and eggs in Kenya from 2004 to 2017.

Table 1.1: Production of chicken Meat and eggs in Kenya in Metric tones

YEAR	Chicken eggs (MT)	Chicken Meat (MT)
2004	60,000	19,174
2005	57,850	19,846
2006	66,700	21,460
2007	68,600	23,460
2008	76,580	24,284
2009	81,015	25,176
2010	92,559	27,144
2011	81,997	21,515
2012	83,229	21,650
2013	81,823	23,754
2014	71,325	25,643
2015	77,406	30,236
2016	84,132	31,887
2017	79,389	35,090

SOURCE: FAOSTAT, 2019

From the table above, the pre-IIC period (2003 – 2010) experienced a steady rise in the production rates of chicken meat representing 26% increment compared to the base year (2003). The post IIC period (2011 – 2017) on the other hand, indicates a reduction in the production of both chicken meat and eggs. This implies that the introduction of IIC has not resulted into increased chicken meat and eggs production when compared to the pre-IIC period (2004-2010). This implies that despite efforts made by researchers on development of IIC, the trigger for local production and demand by consumers is still low. Consumer preferences in chicken attributes could be used to explain low demand and utilization.

1.3 Problem statement

In the past one decade, the demand for indigenous chicken meat and eggs has grown considerably higher compared to other chicken types. The rise in demand is attributed to their unique desirable quality attributes by consumers. Furthermore, there is a growing perception among consumers that IC has both nutritional and health benefits. Besides, the supply of indigenous chickens does not meet its demand. This has been attributed to low productivity levels of indigenous chicken which is characterized by; low growth rates/delayed maturity, low fertility rates, low feed conversion ratio/poor feed utilization, low number of eggs per clutch among other challenges. It is on the basis of these challenges that research institutions developed the improved indigenous chickens (IIC). However, despite these developments, indigenous chickens (IC) still dominates the market share and

the country is chicken deficit. The inability of IIC to bridge the gap in supply of indigenous chicken and the continued preference for IC by consumers over other chicken types implies that there is inadequate information on attributes of IC most preferred by consumers that is probably not in the recently released improved indigenous chickens (IIC) and other chicken types. Lack of consumer preference attribute analysis could be a factor that limits utilization and subsequently low production of the newly released improved indigenous chickens. The problem therefore is insufficient information regarding attributes of indigenous chicken which influences their choice, preference and consumption. The overall objective of the study is to fill this knowledge gap.

1.4 General objectives

The overall objective of this study was to analyze consumers' preference attributes in indigenous chicken Meat and Eggs in Makueni and Nairobi counties.

1.5 Specific objectives

The specific objectives were:-

1. To evaluate socio-economic factors influencing consumption frequencies in indigenous chicken meat and eggs in Makueni and Nairobi counties.
2. To assess attributes of indigenous chicken meat and eggs that affect consumer choice.
3. To determine the influence of indigenous chicken meat and egg attributes and socio demographic variables on the market price.

1.6 Hypotheses

The study hypothesized that;

1. Socio-economic factors do not significantly affect consumption frequencies in indigenous chicken meat.
2. Attributes of indigenous chicken meat and eggs do not significantly affect consumer choice.
3. Indigenous chicken' meat and eggs attributes and socio-demographic factors do not significantly influence market price.

1.7 Justification of the study

Indigenous chicken rearing and marketing is vital in the Kenyan poultry sub-sector due to its immense contribution to the overall GDP of the country. Increasing productivity is aimed to commercialize the sub-sector and remains an area of interest. The current study aimed to analyze preference attributes in indigenous chicken meat and eggs by consumers in both Makueni and Nairobi Counties. The results of this study are expected to ultimately improve the income of producers of IC in Makueni and Nairobi County. The producers are likely to enhance incorporation of valuable attributes of choice to consumers. Retailers in the IC value chain will benefit from determinants of consumption frequency. Consequently, significant socio demographic factors will form the basis for market segmentation and formulation of marketing mix to enhance profitability levels.

The third beneficiary will be the government. The various corporations and ministries within National and County Government that are associated with

production and marketing of indigenous chicken products will benefit from adopting the recommendations made. They will hence be able to improve on their regulatory and coordination functions in the production and marketing of indigenous chicken. The results of the study will guide policy makers, government institutions and researchers on chicken attributes in the development of a profitable and sustainable chicken value chain. Therefore, the general objective of the study was in line with the country's Vision 2030 and Sustainable Development Goals. Additionally, the study will contribute significantly to the existing body of knowledge while recommendations will point towards further areas warranting more research in the same field.

1.8 Scope of the study

The study covered Makueni and Nairobi counties. Specifically, Kaiti and Wote sub counties were covered in Makueni while in Nairobi, two sub counties thus Starehe and Westlands were studied. In addition, consumers were sampled from market centers where the concentration of indigenous chicken was highest such as Burma, Kariokor, Kangemi and City' market. Consumer preference attributes in IC were covered by evaluating consumption patterns, assessing attributes influencing consumption and the determinants of IC price. The study was part of the wider project on Indigenous Chicken Value Chain (ICVC) in Makueni and Kakamega Counties', funded by World Bank under Kenya Agricultural Productivity and Agribusiness Project (KAPAP).

1.9 Limitation of the study

The researcher experienced challenges in accessing data from the consumers who had limited information. Some of the respondents only consumed IC meat and not eggs and hence difficult to give data on preferred eggs attributes. Assessment of the size of chicken in kilograms was based on subjective judgement by both traders and buyers due to unavailability of measurement scales in the market.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covers literature review that is relevant to the study. The chapter highlights an overview of consumer preference, conceptual framework, prior studies in consumer preference and a critical review on the gaps in literature.

2.2 Consumer preferences

Consumer preferences are subjective tastes, as measured by utility of various bundles of goods. They permit the consumer to rank these bundles of goods according to the levels of utility they derive from them. As a tool, it helps reveal an option that has the greatest anticipated value among a number of options. Consumers are rational and hence will choose those goods that maximize their utility at a given budget constraint. Goods and services are seen as composite of both extrinsic and intrinsic characteristics or attributes that collectively give utility to the consumers (Lancaster, 1966). Consumers will therefore select indigenous chicken meat and eggs that contain attributes of choice while making their purchase decisions. In order to obtain the highest utility, consumers undertake several steps; they analyze choices available to them given their limited budget, such as, the different chicken types sold in the market (Economides, 2010). Next they analyze

their preferences given choices that are available. Highest preference is given to the chicken or egg type whose attribute combination offers maximum utility.

When consumers choose one level of attribute against a similar one in a different type in order to maximize utility, a trade-off occurs; marginal rate of substitution. An additional unit of a given attribute will raise the level of satisfaction of a consumer by the marginal utility of that attribute. Socio economic characteristics of respondents have also been shown to influence consumer preferences. Socio economic characteristics that influence consumer preferences include; age, education level, household size, gender and income levels of the respondents. The amount of disposable income will determine the quality and quantity of a product to be purchased by an individual since consumers tend to maximize their utility subject to budget constraint. Consequently, the level of education of a consumer may impact on the type, quantity and quality of goods and services purchased for consumption due to the level of awareness on the benefits accruing from the consumption of such goods and services.

2.3 Conceptual framework

The conceptual framework depicted in Figure 1.1 below is based on two theories; the new consumer theory (Lancaster, 1966) which postulates that the decision to purchase a good is dependent not on the good *per se* but on the utility derived from the goods' intrinsic and extrinsic attributes. Consequently, there is a functional relationship between the price of a good and its attributes (Rosen, 1974). Based on these theories, this study hypothesizes a functional relationship between

the price of indigenous chicken meat and eggs and its attributes which presents a typical hedonic model. It is anticipated that the decision by a consumer to purchase indigenous chicken is subject to evaluation of the presence of attributes that gives the highest utility. This evaluation is based on the previous experience of the indigenous chicken meat and egg consumption or the information of available attributes.

Consumers of IC meat and eggs will evaluate characteristics such as; skin colour, skin texture, size, age, plumage colour, fat content, tenderness, sex, shell colour, shape and cleanliness and choose those which give them the highest utility. Socio economic characteristics of consumers such as age, gender, income levels, education and marital status are also expected to impact on their decisions hence influencing the price they pay for IC meat and eggs (Figure 1.1). Similarly, consumers' perceptions and awareness on IC products also influences the prices they pay. These perceptions are further influenced by IC attributes and social economic factors of the consumers. Knowledge of preference attributes is expected to inform policy on measures to take in order to incorporate the attributes of choice which will raise consumption levels of IC and increase profitability levels of farmers and retailers in the IC value chain.

Independent Variables

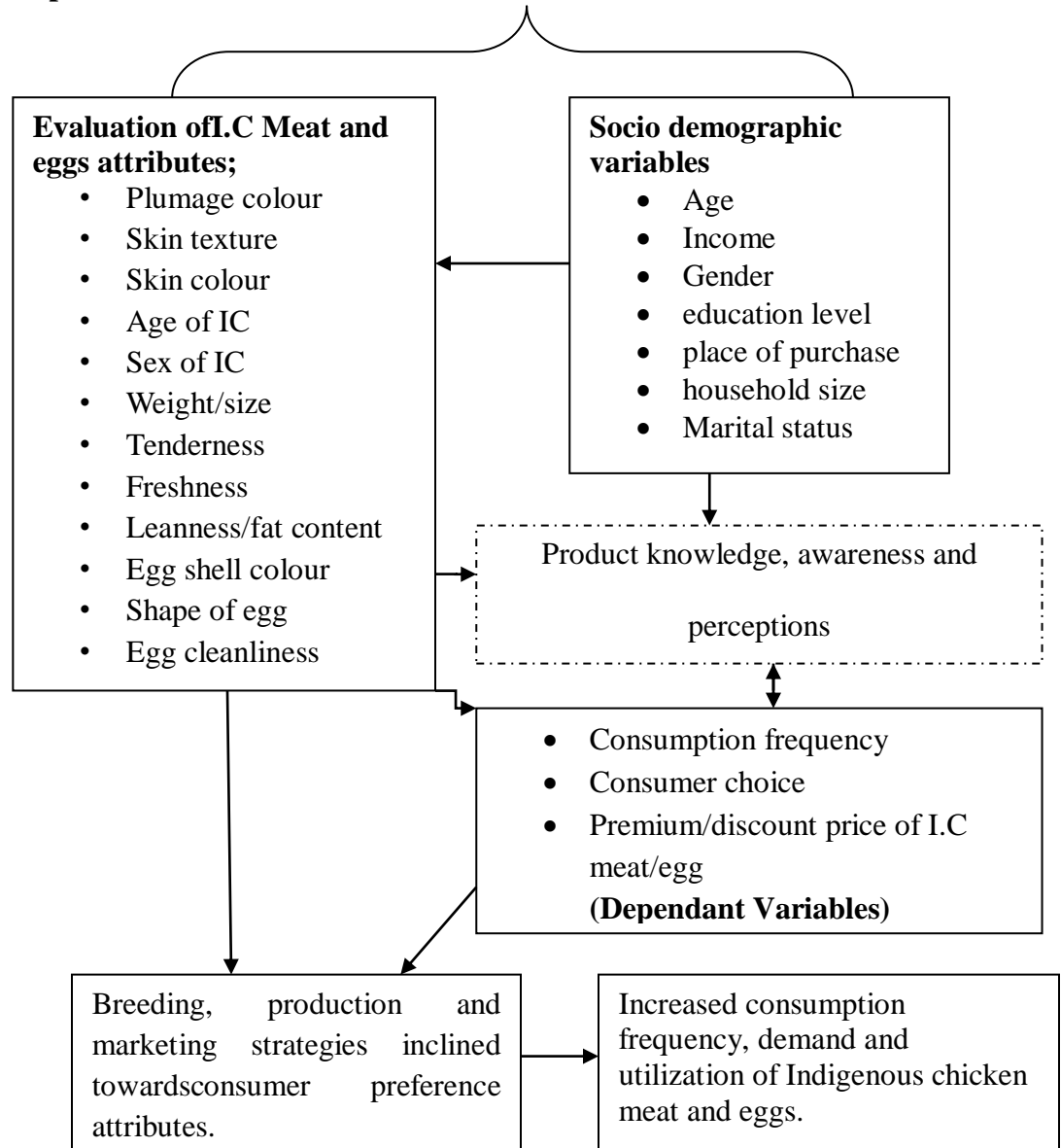


Figure 1.1: Conceptual framework

Source: adopted and Modified from Felix; 2013

2.4 Empirical review on attributes influencing consumer choice

Shang-ho et al. (2016) sought to determine preferences for meat labeling in Taiwanese traditional markets. The results indicated that younger females with higher education had a positive willingness to pay (WTP) for food safety related information, i.e. traceability and growth hormone. Studies on socio economic variables can also inform traders on the best marketing strategies to adopt during market segmentation and the development of market mix. In Benin, chickens that have white plumage are offered in sacrifices to the Voodoo god “Doukounou” (owner of wealth) in order to ask for good wealth (Vidogbena et al. 2010). Sonaiya and Swan (2004) found a similar result in Northern Ghana (West Africa) where in Mamprusi society, a red cockerel is sacrificed to ask for rain or good harvest.

Sex of the chicken has also been shown to influence consumer preferences, for instance, Sodjinou et al. (2014) found that the price of a duck tended to be higher by 25% for male duck than for the female. This indicated that consumers were willing to pay a premium for a drake. Similarly the age of chicken was found to affect price and consumers preferred chickens aged between 6-12 months than older chickens (>12 months). Black plumage chickens attracted price discounts due to the perception that they are used in black magic. In another study, Aklilu (2007) found that in Ethiopia, consumers consider the age of chicken as an attribute when they buy them. The size of chickens was also considered by consumers in Benin and positively influenced price (Sodjinou et al., 2014).

2.5 Overview of willingness to pay

Consumer preferences are measured using willingness to pay methods. Willingness to pay (WTP) refers to the maximum price an individual is willing to pay for a given good or service without reducing his/her welfare and utilization of the same good or service (Hannah, 2015). There are two methods used in measurement of WTP; stated and revealed preference methods. Stated preference methods are used to value non-market goods and services that have no related markets where consumer preferences are elicited using hypothetical scenarios. Individual respondent's statements about their preferences for a specific good or service are used to elicit their willingness to pay values. Stated preference methods consist of hypothetical questions that inquire from respondents how much they are willing to pay for a specific good or attribute (Carson *et.al.*, 2001).

Stated preference methods are further divided into two; direct surveys (Contingent Valuation) and indirect surveys (Choice modeling). In open ended CVM, respondents are asked to state their willingness to pay (or accept compensation) for a given change or improvement in a single product over the status quo. Dichotomous-choice questions can be used in CVM where respondents are asked to state whether they are willing to accept or reject a fixed price for a certain product (Koistinen, 2010 & Hannah, 2015). Direct surveys are cost efficient and time effective. The most limiting factor about CVM is that open ended questions are difficult to answer since respondents are not used to pay for non-market goods and services, (Honeiman, 1984). Indirect surveys comprise of conjoint and discrete

choice analysis. In a Conjoint experiment, the researcher constructs a set of hypothetical products by combining selected levels of each attribute, these combinations result in the design of a stimuli which is presented to the respondent. Consumers will provide their evaluation on the basis of the behavior of interest, known as the choice task (Bonilla, 2010).

Stated preference methods suffer from certain shortcomings. First, they are not incentive compatible due to their hypothetical set up and the fact that no actual behavior is observed. Second, they do not accommodate preference heterogeneity among consumers i.e. the coefficients of the variables in the models are assumed to be the same for all respondents. However stated preference methods are commonly used in market survey since revealed preference methods cannot be used in market research for new products and hence stated preference becomes ideal. The most commonly used stated preference method is Contingent valuation method (CVM) in which consumers are asked to state the maximum price they are willing to pay for a given product based on the prevailing attributes.

Revealed preference methods are used for assessing individual's willingness to pay by examining actual behavior in the market (Mundua, 2010). Revealed preferences are derived from market data and experimental auctions. Market data involves collection of individual purchase data of a customer panel member or sales record from retail outlet. In experimental auctions, real purchases are simulated by giving respondents real money and asking them to make purchase decisions on the specific selection of goods (Hannah, 2015). Revealed preference is

highly preferred to other methods in that real purchases are involved instead of stated purchase intentions. This study employed revealed preference method in eliciting willingness to pay for attributes of indigenous chickens' meat and eggs in Makueni and Nairobi counties

2.6 Empirical review on Willingness to pay

In a study to determine consumer willingness to pay for dairy goat milk in Siaya County, Rebecca(2012) employed double-bounded dichotomous choice contingent valuation method to assess consumers' mean WTP for goat milk and logit model to determine socio-economic factors influencing consumers' WTP. Results of the study indicated that consumers were willing to pay an average premium of 38% above the current prevailing price of cow milk. Furthermore, age, number of years in schooling and number of children (18 years of age and below) present in a household had a positive and significant effect on WTP. The study recommended for policy intervention aimed at facilitating development of marketing infrastructure, creation of awareness of important nutritional and health benefits of goat milk, and boosting the development of goat milk dairy processing plants and systems that can add value to goat milk, so as to capture existing market opportunities.

Tao et al. (2015) sought to determine whether grocery shoppers of households with weight concerned members were willing to pay more for nutritional information on roasted peanuts and salad mix in U.S.A. They employed

both experimental auction and eye tracking device to elicit willingness to pay. Results indicated that for both salad mix and roasted peanuts shoppers of households with weight concerned members (shoppers included) gave more visual attention to most of nutritional content information than other shoppers. Furthermore,detailed nutritional information influenced the WTP of shoppers of households with weight concerned members (shoppers included) differently compared to other shoppers. In general,shoppers were willing to pay more for organically produced or locally grown /processed products,including minimally processed salad mix and moderately processed roasted peanuts. Additionally, their WTP for salad mix was not greatly influenced by detailed nutritional information or health claims (Tao et al. (2015).

Solomie et al. (2015) analyzed consumer preference and willingness to pay for fish farmed in treated waste water in Ghana. The authors utilized a dichotomous - choice contingent valuation methodology to estimate willingness to pay for fresh tilapia and smoked catfish farmed in waste treated water and analyze factors that affect consumers' choice. Results indicated that price, size and quality of fish measured by taste and freshness were the most important attributes influencing their purchase decision.Furthermore,results indicated that households with children are more likely to pay for smoked catfish compared to fresh tilapia.

Cheryl et al. (2015) used choice experiment to identify preferred attributes for a high selenium beef product and the characteristics of potential market

segment. Results indicated that labeling reflecting scientific support linking selenium and reduced cancer risk and natural source selenium was ineffective forming the general population of respondents. The study recommended for targeting consumers with high incomes and education, 45 to 55 years of age and with children. Shang-ho et al. (2016) sought to determine preferences for meat labeling in Taiwanese traditional markets. The authors used a discrete choice format to assess each type of product variable where participants were provided with a list of payment-card choices from zero and positive WTP. Results of their study indicated that younger females with higher education had a positive willingness to pay (WTP) for food safety related information, i.e. traceability and growth hormone. The study recommended for provision of information to ease the concerns of food-safety issues as a necessary strategy for traditional markets.

David et al. (2015) employed a choice experiment method to establish consumer willingness to pay for animal welfare attributes in chicken. Data was drawn from 200 chickens in Nairobi, Kenya and estimated using a random parameter logit model. Results indicated that consumers were willing to pay a premium for humanely-treated chicken. There was a positive and significant preference for use of certified transportation means, humanely slaughtered chicken and animal welfare labeling. However, consumers showed a negative preference for use of antibiotics in chicken production.

2.7 Empirical review on influence of price on attributes

Changhee(2010) analyzed retail prices of eggs in Korea using hedonic price model in order to identify those attributes that affect prices and the respective value of each attribute. The results showed that the status of eggs fertility, organic feeding and free range feeding are the main attributes that affect the retail price of eggs. The implication of these findings is that both producers and retailers need to formulate strategies in production and marketing that addresses the above attributes. However the study suffers from certain shortcomings; first, the study was conducted in supercentres of Seoul city and hence cannot be generalized to the whole Korean consumers since differences in demographics across the country could have far reaching implications on the overall attributes of choice. Second, the study relied on store data which did not capture demographic variables. Inclusion of demographic variables in hedonic model has been found to positively impact on product prices.

Consumers' tastes and preferences towards chicken meat in Uganda was assessed by Kyarisiima (2011) who established that about 80% of chicken consumers prefer local chicken meat to that of exotic chicken stains. Quality attributes that were evaluated included; perceived taste, meat texture and naturalness in the management of birds. The study found that level of education, consumers' gender and residence during childhood did not influence the tastes and preferences. Yellow colour was the only attribute used to identify dressed indigenous chicken meat. The study recommended for farmer sensitization on the

proper use of drugs followed by assurance to the public on the safety of exotic chicken meats to include change in perceptions.

Timothy *et al.* (2006) sought to analyze cattle prices in central corridor of West Africa by employing hedonic price model. Specifically, the study was to determine if market participants have systemic preferences for cattle attributes and their willingness to pay premium price for the attributes. The results of the study indicated that; animal age, sex, breed, body condition, purpose of purchase, season of sale and market location were the most significant factors influencing short run cattle prices in the study region. The study recommended for effective market information gathering and dissemination systems to transmit market preferences to producers. The study failed to incorporate the effect of demographic variables in price determination.

Ramatou *et al.* (2014) sought to determine the quality characteristics of dressed local and imported chicken that influence consumer preference and how these affect the prices of chicken. The study employed hedonic pricing model which indicated that consumers were willing to pay premiums for imported, non fatty and tender attributes of chicken. The study recommended for incorporation of some quality attributes in the domestic research and production activities so as to compete well with imports. To enhance awareness of health problems associated with fatty meat, the study recommended measures such as increasing awareness about the quality attributes of chicken breast. However, the study assumed a perfect

competitive market situation with zero influence of socio-economic variables. In practice, such market conditions do not exist. There are varying degrees of market information which results in imperfections. The proposed study will fill this knowledge gap by incorporating socio demographic factors in IC price analysis.

To investigate the physical traits of indigenous poultry in Benin, Sodjinou, *et al.* (2014), employed hedonic pricing model. The results of the study indicated that preference for village poultry is much more a traditional perception of their organoleptic and dietetic qualities and their cultural values. The results indicated that birds aged between six and twelve months, meatier and with white plumage colour were more preferred. The study recommended for inclusion of those traits in breeding goals to improve customer satisfaction. Lee *et al.* 2012 employed hedonic model to determine how product attributes of retail beef steak affect prices in United States of America. The study established that organic production claims, religious processing claims and boneless products were major characteristics that influenced premium prices.

Nadarajah (2012) employed simple linear form of hedonic price model to evaluate the relationship between price and quality attributes of shrimp. The results indicated that market price is influenced by extrinsic quality attributes such as carapace length, weight, origin, species, freshness, and product form and preservation method. The study recommended for a consideration of the mesh size of trawler to avoid harvesting very small shrimp as they attract low prices in the

market. In the study, both intrinsic quality characteristics and socioeconomic factors were not incorporated.

Fulgence et al. 2007 determined the cowpea grain quality characteristics that command premium prices in Ghana, Mali and Nigeria using hedonic price model. The study specifically looked at the impact of grain size, texture, colour, eye colour and bruchid-damaged grains on cowpea market prices. The results of the study indicated that cowpea consumers in Ghana, Mali and Nigeria were willing to pay premiums for large cowpea grains and discounted grains with storage damage from very first bruchid hole. The study recommended that for any improvement in cowpea markets in West Africa, emphasis should be on cowpea grain size and cowpea storage technology. Researchers and technology transfer organizations could offer a portfolio of grain colour, eye colour and skin texture to fit local preferences.

Bett et al. (2011) used hedonic price analysis to determine live indigenous chicken attributes and socio economic characteristics that influences the chicken price in Kenya. The study was carried out in six counties and segmented the markets into; local, secondary and terminal. Attributes of interest were plumage colour, sex, body condition, age, weight and body size. All factors were found to have significant influence on price. The study recommended for the formation of marketing groups by farmers to access information and concentrate more on raising chicken based on preferred attributes for the market. The study was limited in scope

and failed to consider the effect of attributes such as skin colour, fat content, skin texture and tenderness. Similarly, categories/levels of attributes were not evaluated in the study. The assessment of preference in attribute categories is important in informing producers and retailers on specific areas of focus. The proposed study will fill this gap by focusing on consumer prices for all observable attributes and their specific categories/levels.

Benjaminet *al.* (2011) assessed influential factors on consumer preference for various rice brands and quality characteristics which affect prices. The Kendall's coefficient of concordant was used to determine the factors that influence consumer preference while hedonic price model was used to analyze the effect of these preference attributes on price. The results indicated that the most preferred attributes were; taste, cooking quality, cooking time and aroma. The least preferred attributes were; price, impurities and source of rice. Consumers paid premiums for aroma and source of rice. The study recommended for rice free from foreign matter and incorporation of preferred attributes in breeding programmes.

2.8 Summary and critique of Literature review.

Based on the literature reviewed, studies on consumer preference attributes on indigenous chicken are a few with only one study (Bett et al., (2011) having been done in Kenya. Several gaps exists in the literature discussed above; first, majority of studies did not incorporate socio-demographic variables in hedonic price estimations despite their significance as evidenced in Bett et al., 2011; and

Kyarisiima, (2011). In practice, the absence of a perfect market condition implies that such variables play an important role in product price determination. Second most studies were limited in the scope of attributes analyzed with more focus given to production rather than consumption attributes. Thirdly, most studies were focused on valuation of attributes from the traders' perspective rather than from the final consumers of the products. Assessment of indigenous chicken attributes using data from consumers tends to give realistic information on product choice and preferences. This study will fill this gap and use consumers' views in assessing IC preferences.

Finally, from all the literature reviewed, none of the attributes analyzed were segregated into specific aspects for evaluation. It is therefore unclear on what aspect of the attribute is preferred since the results were generalized. For instance, previous studies concluded that plumage colour, sex, age and size were among the attributes that had premium prices. The studies did not segregate the specific aspects of plumage colour (white, black or brown); sex (male or female); age (young, mature or very old) that were preferred by consumers. This generalized attribute information does not specifically inform the players in the value chain on the specific areas for intervention. The present study will address this limitation. Consequently, most studies concentrated in major cities while assessing product attributes. This hinders generalization of the results to other non urban areas due to variation exhibited in demographic variables of consumers between the

two regions. This study sought to address this challenge by focusing on both Makueni and Nairobi Counties.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter covers the important aspects of research methodology in this study. It begins by describing the location of the study area, sampling procedures and sample size determination. It also highlights data collection methods and data sources used in the study. Further, it illustrates data analysis techniques employed in addressing the research objectives, empirical specifications and finally diagnostic tests for the models employed in the study.

3.2 The study area

This study was conducted in Makueni and Nairobi counties of Kenya. Makueni was selected for the study because poultry production is a major economic activity in the area due to its location in the arid and semi-arid region where crop production becomes unfavourable. Furthermore, in 2015, Makueni produced 2,178 tonnes of chicken meat making it the fourth largest producer in the country (GoK, 2015). Nairobi was included since it's a major terminal market as well as abattoir for indigenous chicken produced in Makueni and other regions in Kenya. The market serves consumers of diverse socio economic status. Consequently, being the capital city, the population is therefore composed of consumers from different backgrounds and social status who are expected to have diverse preferences. Similarly, up to 60% of indigenous chicken produced in Makueni is sold in Nairobi (MoLD – Makueni, 2013).

Makueni county lies between latitude 1°35' South and longitude 37° 10' East. Annual rainfall ranges from 300mm to 1200mm in the high areas. The altitude range is 600 meters to 1900 meters above sea level. It lies in the arid and semi-arid zones of the eastern region of the country hence making it suitable for livestock production (Makueni County Integrated Development Plan, 2013). Two sub counties; Kaiti and Makueni out of six sub counties were selected for the study. On the other hand, Nairobi county lies between latitude 1° 17' south and longitude 36° 49' East and has nine sub counties. The county has a total of 696.1 KM² with an estimated population of 3,942,054 (Kenya Bureau of Statistics, 2017). Temperature ranges from 10⁰c to 29⁰c. It has a bimodal rainfall pattern with long rains falling between March and May and short rains experienced between October and December. The mean annual rainfall is 786.5 mm. Consequently, two sub counties; Westlands and Starehe were selected for the study.

These climatic conditions and the geographical locations make the two counties suitable for the development of chicken value chain which thrives well in the tropics and subtropics of Africa. Furthermore, the location of the study area in the tropics of sub-saharan region signals the priority and opportunities in the livestock sector especially chicken due to poor performance of crops enterprises in such areas.

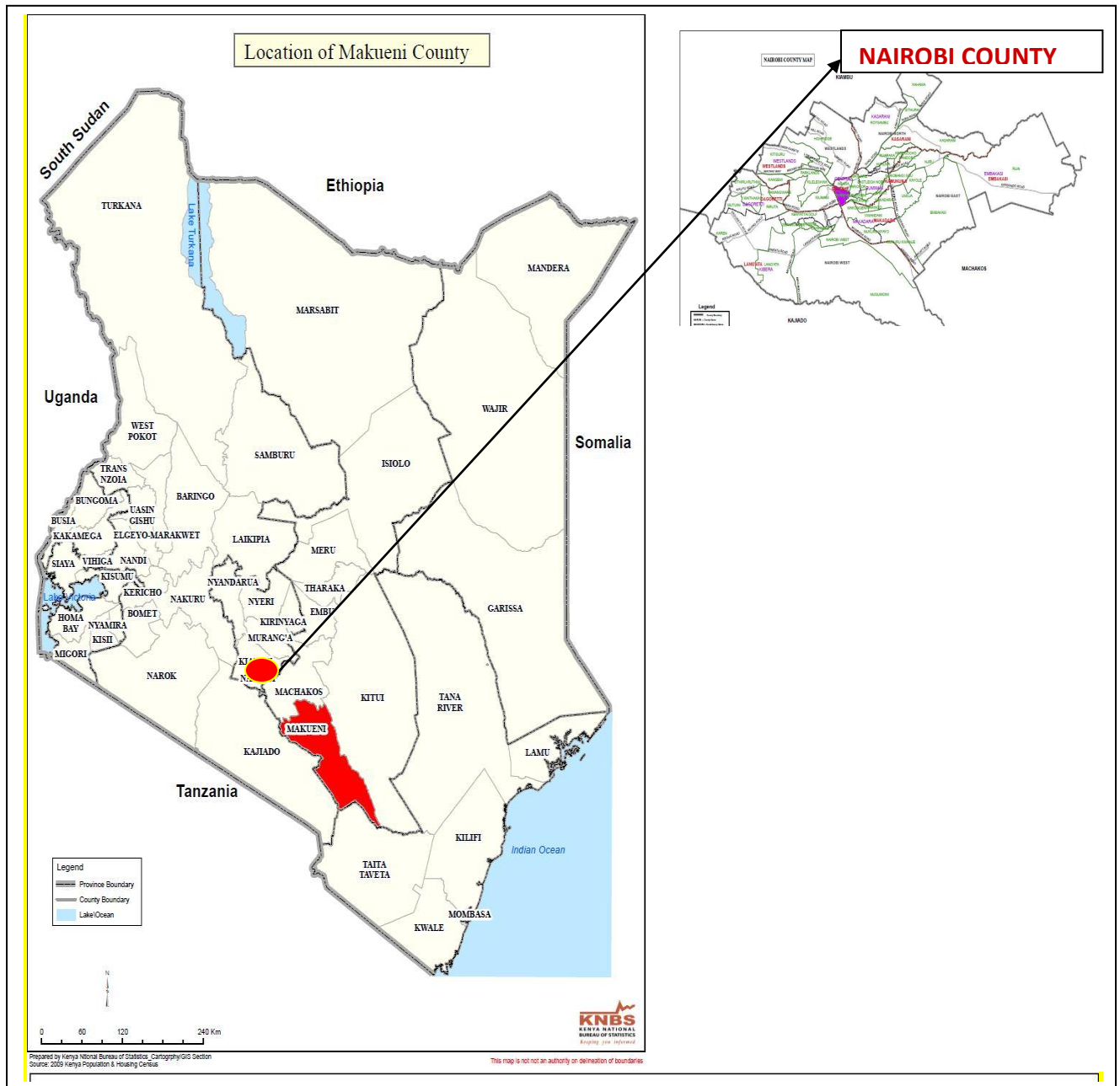


Figure 3.1: Location of Nairobi and Makueni

Source: Kenya national bureau of statistics(KNBS); 2013

3.3 Sampling Techniques

The target population for this study consisted consumers of indigenous chicken meat and eggs in Nairobi and Makueni counties. Multistage sampling technique was used. In the first stage, two sub counties were purposively selected from each county based on the consumption rates of IC meat and eggs. Thus Makueni and Kaiti from Makueni County while Starehe and Westlands sub counties from Nairobi County were selected. Major market centres in the four subcounties were purposively selected for the study based on availability of indigenous chicken traders.

Determination of the sample size was based on the formula below as specified by Cochran (1963) and used by Kothari (2004).

$$n = \frac{z^2 pq}{e^2} \dots\dots\dots (3.1)$$

n is the sample size,

p is the proportion of the population (50%) containing the major attributes of interest (consumption of indigenous chicken meat and eggs). This is chosen because the proportion of population consuming IC meat and eggs is unknown.

Q is 1-p,

Z is the standard variation of 1.96 given a confidence level of $\alpha = 0.05$ and

e is the acceptable precision level of 6.93%

Since it is difficult to determine the population of people consuming indigenous chicken in the study area due to continuous influx of people in urban areas, the assumption was that 50% of the population in the study area consume indigenous chicken products. The acceptable precision of 6.93% was chosen because of the smaller sample size hence higher confidence level of the results.

$$1.96 \times 1.96 \times 0.5 \times 0.5 / 0.0693 \times 0.0693 = 200$$

Systematic random sampling was used to select 200 indigenous chicken consumers in the selected sub counties.

The sample size obtained(200) was distributed based on proportionate to size sampling using the 2015 KNBS population projection in the four sub counties. The actual sample distribution is as follows; Kaiti 38, Makueni 62, Starehe 48 and Westlands 52 consumers. The same consumers of indigenous chicken were also interviewed on their consumption of indigenous chicken eggs.

3.4 Data sources and collection

Both primary and secondary data were used in the study. Primary data was collected by trained enumerators who were recruited from within the area of study due to their familiarity with local language. Data was collected with the aid of semi-structured questionnaire administered to IC consumers by enumerators. Data on indigenous chicken and eggs' prices, quality cues (age, sex, size, skin colour, plumage colour, fat content, tenderness and skin texture, shell colour, shape, freshness and cleanliness), socio-demographic variables (age, income, gender,

education level, marital status and household size of the respondents), awareness on the important of indigenous chicken consumption, frequency of purchase and sources of information regarding indigenous chicken were collected for the study. Enumerators strategically positioned themselves next to IC traders where they interviewed every second consumer who came to purchase IC and eggs. Secondary data was collected from Ministry of livestock annual reports in Makueni and Nairobi counties, government records and published journal papers.

3.5 Theoretical framework

This study was based on Becker's (1965) and Lancaster's (1966) new consumer theories. The theories are based on the assumption that goods are made up of utility bearing characteristics and that consumers derive utility from this attributes and not the goods themselves. The research focuses on the extrinsic and intrinsic attributes that buyers consider when buying indigenous chicken meat and eggs. The attributes which gives utility to consumers of IC are hypothesized as; skin colour, skin texture, plumage colour, age, size, freshness, sex, fat content and tenderness for meat and shape, size, shell colour and cleanliness for eggs. In order to maximize utility from these attributes, Consumers are constrained with disposable budget. Therefore they can compare various bundles of chicken meat and eggs attributes and decide which bundle gives them the greatest utility.

This utility function can be represented as;

$$Max U = U(q_1 q_2 \dots q_n)$$

s. t

$$M = \sum P_1 Q_1 \dots \dots \dots (3.2)$$

Where; U is the utility function, M is the total income and P₁ is the price of the qth attribute.

Furthermore, it is assumed that, for any good (indigenous chicken meat and eggs for this case), there is a functional relationship *f* between its price *p* and its characteristics vector *x*, i.e.

$$p = f(x) \dots \dots \dots (3.3)$$

This function specifies the hedonic relationship or hedonic regression typical for the good (Hans, 2003).

In addition to indigenous chicken attributes, other factors such as individual characteristics (age, gender, household size, income and education level) are anticipated to influence the product price. This is because the market conditions do not enable the existence of perfect competitive market. Hedonic prices are therefore implicit prices of various attributes embodied in indigenous chicken meat and eggs. The price of a good is a function of socio demographic factors and the implicit prices paid for individual attributes contained in the product (Carman, 1997). This can be represented as:

$$P = \beta_0 + \sum_{j=1}^m (\beta_j Z_j + \varepsilon) \dots \dots \dots (3.4)$$

Where; Z stands for a particular attribute of indigenous chicken meat and eggs, β_0 is the intercept; β_j is the regression coefficient or the implicit price of the attribute and ε is the random error term satisfying the classical regression assumption. The regression coefficient β_j indicates the marginal change of price with respect to a unit change in the j^{th} attribute; Z_j changes by one unit when all other marginal effects are kept constant.

Hedonic model was employed to analyze indigenous chicken meat and eggs attributes that influence price. The model presupposes that a product is made up of utility bearing attributes whose value collectively contribute to the products' explicit price. The observed price of a good is therefore a composite of the implicit prices of its attributes (Parcel and Schroeder, 2007). Rosen (1974) proposed a two sided equation while estimating hedonic models to avoid simultaneous equation bias. However, many researchers have used a single equation approach arguing that product attributes supplied by producers tend to be highly inelastic (Wilson, 1984; McConnel and strands 2000; Kristofferson and Rickertsen, 2007; Bett et al., 2011). In this case empirical hedonic price model requires only market clearing prices rather than both demand and supply schedules. Following most previous studies, single hedonic price equation that represents market equilibrium conditions at some point in time is estimated in this study.

Focusing on the demand side of the market, utility is not generated by goods *per se* but by characteristics of those goods. The hedonic model would generally then be written as;

$$P = f(X_k) \dots \dots \dots (3.5)$$

Where P is the price of the commodity and X_k represent a vector of product attributes.

It suffices to mention that despite its wide use, theory does not provide guidance on the preferred functional form for estimating hedonic equations (Dalton, 2004). Most researchers content that the choice of a functional form is more of an empirical issue than it is theoretical. However, Diewert (2001) argued that log-linear is more preferred since the residuals are less likely to be heteroskedastic and that linear function is not consistent with homothetic preferences. On the other hand, log-log cannot deal with situations where one or more characteristics are equal to zero. This study will employ log-linear model as represented below;

$$\ln P = a_0 + \sum_{n=1}^k (\beta_n x_n) + \varepsilon_k \dots \dots \dots (3.6)$$

Where $\ln P$ is the price of the good in its natural logs; β_k is the corresponding parameter estimate, x_k is the nth attribute of the product and ε_k is the error term with an expected value of zero and constant variance.

3.6 Data Analysis

Data collected was analyzed using both descriptive and inferential statistics with the aid of Excel and STATA version 11 software. The analytical technique based on the objectives of the study is described below;

3.6.1 Socio-economic factors influencing consumption frequency of IC

This was achieved through both descriptive and inferential statistics. Descriptive statistics were used to characterize consumption patterns and involved use of frequencies, percentages and mean. The results were presented in form of tables, bar graphs and pie charts. To evaluate the influence of socio-economic factors on consumption frequencies of indigenous chicken meat and eggs, binary logistic regression model was employed. The discrete nature of the dependent variable implied that ordinary least square estimation methods are inappropriate and hence the use of maximum likelihood estimation procedures. The dependent variable was consumption frequency which was expressed in binary (frequent or non frequent consumers) form while independent variables included both socio-economic and demographic variables. Probit model which gives similar results as logit model was not used due to its computational complexity. Consequently, logistic distribution has more density mass in its bounds than probit model (Zhao, 2008).

In this study, consumption frequency is the interval in days between which consumers skip before purchasing indigenous chicken meat and/or eggs. The average consumption interval for IC meat computed in this study was one

monthwhile for eggs was one week. These average consumption frequency of one month and one week for IC meat and eggs respectively formed the basis for choosing the interval for dependent variable. If a consumer bought IC meat at an interval of less than one month, then he/she was regarded as being a frequent consumer while if the consumption interval was more than one month, then he/she would be regarded as non frequent consumer. Similarly for IC eggs, if a consumer bought IC eggs at an interval of one week, then he/she was regarded as a frequent consumer whereas those who bought at an interval of more than one week were regarded as non frequent consumers. Frequent consumers of both IC meat and eggs were assigned a value of 1 in the logit model while non frequent consumers were assigned a value of 0. More specifically, the method that was used for econometric analysis was the logistic regression.

$$Y_i = aX_i + \epsilon_i \dots\dots\dots(3.7)$$

Where: y_i is a dependent dummy variable, X_i is the vector of explanatory variables, a is the estimated coefficient of the regressors and ϵ_i is the disturbance term of the regression. The logit model was expressed as;

$$L_i = \ln\left(\frac{P_i}{1 - P_i}\right) = \beta_1 + \beta_i X_i \dots\dots\dots(3.8)$$

Where: L_i is the *log of odds ratio called logit*, P_i is the probability in favour of frequent consumption, $1 - P_i$ is the probability of non frequent consumption, $\left(\frac{P_i}{1 - P_i}\right)$ is the odds ratio representing the ratio of average probability for frequent consumers to non frequent consumers (Erdal and Esengun, 2008), X_i represents a

vector of independent variables, β_i are slope coefficients which represents the marginal effect in the *log of odds* and β_0 is a constant representing the value of *log of odds* when all other predictors have a value of zero.

In binary logistic regression model, the coefficient of the independent variable cannot be directly interpreted as the marginal probability on the dependent variable but rather the log of odds. Getting the antilog on both sides of the equation gives the odds ratio which indicates the magnitude in frequent consumption due to a unit change in the independent variable holding other factors constant. In econometric analysis, the main question was which factors determine the level of frequency in consumption of indigenous chickens meat and eggs? The following model was developed to predict factors affecting the probability of consumption frequency in IC meat and eggs. The model was formulated as:-

$$ICFRQ = \beta_0 + \beta_1GEN + \beta_2INC + \beta_3AGE + \beta_4EDU + \beta_5REAR + \beta_6HS + \beta_7CNT + \beta_8PR + \beta_9QTY + \varepsilon_i \dots \dots \dots (3.9)$$

Table 3.1: Definition of variables used in the Logit model

Variable	Definition	Prior Sign
GEN	Gender: 1 – Male, 0- Female	+
AGE	Age in years	+
EDU	Education 1 - up to primary school 2 - Secondary school 3 – Tertiary level	+
HS	Household size	+
INC	Income earned per month in Kenya shillings 1- Less than 15,000 2- Between 15,000 and 30,000 3- Greater than 30,000	+
REAR	Rearing indigenous chicken 1- Yes 0- No	+
CNT	County (1- Nairobi, 0 – Makueni)	+
PR	Price of indigenous chicken in Kenya shillings	-
QTY	Quantity of IC purchased in Kilograms	+ ₋

Source: Own survey 2016

Gender of the household head is expected to positively impact on consumption frequency of IC. Male household heads are likely to consume IC more frequently than their female counterparts since they control family resources. Aged consumers will have more consumption frequency than their younger counterparts while households with higher income levels are expected to consume more frequently due to high purchasing power. Respondents that rear IC are likely to have higher consumption frequency since they use part of the reared chickens for own

consumption. Consumers with high literacy levels are expected to have high consumption frequency compared to those with low literacy levels. This is due to acquisition of knowledge on the health benefits of IC. The price of IC is expected to inversely influence consumption frequency of IC among different consumers.

3.6.2 Attributes of indigenous chicken influencing consumer choice

To assess attributes of indigenous chicken meat and eggsthat influences choice and consumption, a five point likert scale analysis of 11 items for IC meat and 7 items for IC eggs was used. Principal component analysis is used to reduce large number of variables into a few components that explains most of the variation in the original variables. Variable reduction into a few components eliminates redundancy which occurs when variables are highly correlated. This procedure involvedexecution of five steps which led to the generation of principal components. The first step involved testing for internal reliability using Cronbachs' Alpha where values greater than 0.7 indicates internal consistency among the variables and valuesless than 0.7 are unreliable (Cronbach, 1951). In the second step, all the variables were subjected to Kaiser Meyer Olkin(KMO) test to ensure sampling adequacy. Based on KMO rule, variables withvalues equal to or greater than 0.6 can be used for further analysis (Vines, 2000).

The third step involved calculation of eigen values and cumulative variance proportion. Eigen values indicate the total variance explained by a component on the variables. The component that had eigen values equal to or greater than 1 were considered in the next step while those with eigen values less than 1 were dropped

from the subsequent analysis (Kaiser, 1974). Significant components were subjected to Varimax rotation in order to minimize the number of variables with high loadings on the components. Consequently, varimax is an orthogonal rotation that ensures variables are not correlated. The final step in principal component analysis involved interpretation of principal components based on the variables that produced high correlation coefficient with their respective components. In this study, after the varimax rotation, variables that had a correlation coefficient of 0.3 or more were retained and used in the explanation of principal components (Tabachnick and Fidell, 2011).

3.6.3 Influence of IC attributes and socio-demographics on Price

Four regression equations were carried out as follows; two equations on IC meat attribute (one representing Makueni and the other representing Nairobi County). Similarly, two equations on indigenous chicken eggs attributes were analyzed representing Makueni and Nairobi counties. The unit price is the dependent variable upon which product attributes are regressed.

For indigenous chicken meat attributes, the following model was employed:

$$\begin{aligned}
\ln p_i = & \alpha_0 + \sum_{n=1}^k \beta_{fatcontent} + \sum_{n=1}^k \beta_{size} + \sum_{n=1}^k \beta_{plumagecolor} \\
& + \sum_{n=1}^k \beta_{skincolor} \\
& + \sum_{n=1}^k \beta_{skintexture} + \sum_{n=1}^k \beta_{age} + \sum_{n=1}^k \beta_{tenderness} + \sum_{n=1}^k \beta_{sex} \\
& + \sum_{n=1}^k \beta_{SD} + \varepsilon \dots \dots \dots (3.10)
\end{aligned}$$

For indigenous chicken eggs, the model used was;

$$\begin{aligned}
\ln p_i = & \alpha_0 + \sum_{n=1}^k \beta_1 shellcolor + \sum_{n=1}^k \beta_2 size + \sum_{n=1}^k \beta_3 clean + \sum_{n=1}^k \beta_4 shape \\
& + \sum_{n=1}^k \beta_7 flock size + \sum_{n=1}^k SD_8 + \varepsilon \dots \dots \dots (3.11)
\end{aligned}$$

Where p_i represents the price of IC and eggs in Kenya Shillings, SD represents socio-demographic factors influencing market price which included education, income, marital status and frequency of purchase, β_s are parameter estimates and ε is stochastic error term.

There is no priori rule about which quality characteristics should be included in the model, but the characteristics should be observable and economically relevant for the buyers (Orden et al., 2005 as quoted in Sodjinou et al., 2014). The attributes were measured using five point likert scale and the

consumers/buyers were expected to give their own judgement on the value to be assigned to each based on perceptions and experiences. All attributes were expressed as dummies grouped into categories whose impact on price was sought by this study. After buying live IC, its weight was estimated by the buyer, trader and the researcher in kilograms through observation and subjective judgement. Dressed indigenous chicken bought in open air market had their weight indicated. The market price per kilogram was then established through mathematical computation. Consequently, the buyer of IC was considered as the consumer and household head and where not, the respondent gave socio economic information regarding the household head. The dummy categories were identified during a preliminary survey conducted in the two counties and their expected signs on the dependant variable hypothesized as follows;

Table 3.2: Explanatory Variables and the Priori expectations for the study

Dummy Variable	Categories/levels	Priori Expectation
Plumage colour	White	+
	Black	-
	Brown	+
	Mixed colours	+
Skin texture.	Rough	+
	Smooth	-
Skin colour.	Yellow	+
	White	-
Age.	8- 20 weeks	-
	21-28 weeks	+
	Above 28 weeks	+ -
Sex.	Male	+
	Female	-
Fat content	Low fat	+
	Moderate	+
	High	-
Size	Less than 1kg.	-, +
	1-2 kg	+
	More than 2 kg.	+, -
Tenderness	Very tender	-
	Tender	+
	Stiff/hard	-
Shell colour	White	+
	Brown	-
Shape	Oval	+
	Non oval	-

Source: Own survey 2016

Chicken are heterogeneous in types and attributes which appeal to consumers in different ways. These attributes are indicators of nutritional and health benefits inherent within them. For instance, consumers show preference for

indigenous chicken products more than other types of chicken. Indigenous chicken product attribute evaluation is important to establish positions these characteristics are given by consumers during the purchase process for effective I.C improvement, development and business establishment. Indigenous chicken products considered in this study are eggs and meat. For indigenous chicken meat, two forms found in the market are live and dressed. Whichever form, consumers use a combination of attributes to identify and differentiate this type of chicken from others based on their preferences. Some of the attributes considered during purchase decisions are; plumage colour, sex, body size, skin colour, tenderness, age and fat content for meat and shell colour, size, cleanliness and shape of shell for eggs (Sodjinou et al, 2014). Majority of consumers perceives colour of the chicken to be an important attribute. In most African countries, chickens are consumed during ceremonies and hence the colour becomes an important attribute.

Sex of the chicken has also been shown to influence consumer preferences, for instance, Sodjinou et al. (2014) found that the price of a duck tended to be higher by 25% for male duck than for the female. This indicated that consumers were willing to pay a premium for a drake. Similarly the age of chicken was found to affect price and consumers preferred chickens aged between 6-12 months than older chickens (>12 months). Black plumage chickens attracted price discounts due to the perception that they are used in black magic. In another study, Aklilu (2007) found that in Ethiopia, consumers consider the age of chicken as an attribute when

they buy them. The size of chickens was also considered by consumers in Benin and positively influenced price (Sodjinou et al., 2014).

3.7 Diagnostic Tests

Multicollinearity occurs when there is a high degree of dependency among the independent variables making it difficult to identify the separate effect of one or more independent variables on the dependent variable because of the strong relationship existing among them (Gujarati, 2003). Multicollinearity results in large standard errors among the coefficients of independent variables and hence low significant levels. In this study, multicollinearity was tested using Variance inflation factors (VIF). Variables with VIF greater than 5.0 are kicked from the model since they possess serious multicollinearity problem (Greene, 2000).

Heteroscedasticity occurs when the variance in the error term is different for all combinations of outcomes of the independent variable (Woolridge, 2002). One of the assumptions of ordinary least square estimation procedures is that the error term is constant of all the variations in the independent variables a condition called homoscedasticity. Violations of this assumption imply that the estimators remain consistent and unbiased but will be inefficient hence unreliable. If the error term is heteroskedastic, coefficients of the independent variables will have large standard errors and small t-values hence likelihood of committing type 1 error (Gujarati and Sangheeta, 2007). The Breusch – Pagan statistics are the standard

tests for the presence of heteroscedasticity (Baum et al., 2003). Consequently, in this study Breusch-pagan test was used to test the hypothesis for homoskedasticity.

3.8 Ethical Consideration

The researcher obtained a permit to carry out the study based on the procedures laid down in various authorization bodies. First, the approval was sought from Kenyatta University graduate school which certified all aspects of ethics in carrying out research. Second, the proposal was forwarded to the National Commission for Science, Technology and Innovation (NACOSTI) a national body mandated to issue research permits in Kenya for their review advice and approval. The researcher upon getting clearance certificate to carry out research sought for consent from the local administration including the county commissioner and county director of livestock in Makueni and Nairobi counties. Finally the researcher sought for consent from respondents after clearly explaining to them the purpose of research and the confidentiality of the information thereafter.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses results of the study based on data collected from 200 consumers of indigenous chicken meat and eggs in Makueni and Nairobi counties. The chapter is divided into five sections. Section one presents and discusses socio economic characteristics of the respondents in the two counties. Section two presents and discusses results on descriptive characteristics of indigenous chicken meat and eggs' attributes. Section three indicates consumption patterns in indigenous chicken and the determinants of consumption frequency in indigenous chicken meat and eggs. Section four assesses attributes of indigenous chicken meat and eggs that influences choice and consumption. Finally, section five presents and discusses results on the influence of indigenous chicken meat and eggs attributes on retail prices using hedonic pricing approach.

4.2 Socioeconomic characteristics of the sampled households

Socio economic characteristics of consumers are important in product market assesement since they influence consumption patterns of a given commodity (Bett et al., 2011 and Lee et al, 2012). Table 4.1 below shows the socio economic characterisitcs of indigenous chicken consumers in the two counties.

Table 4.1: Socio Economic Characteristics of the sampled households

Variable	Category	Nairobi		Makueni	
		Frequency	%	Frequency	%
Gender	Male	68	62.39	45	49.45
	Female	41	37.61	46	50.55
Age	15-25	23	21.1	23	25.27
	26-35	40	36.7	29	31.87
	36-45	25	22.94	15	16.48
	46-55	10	9.17	13	14.29
	Above 55	11	10.09	11	12.09
Marital Status	Married	85	77.98	61	67.03
	Single	24	22.02	30	32.97
Education	no education	5	4.59	2	2.2
	Primary	16	14.68	20	21.98
	Secondary	46	42.2	51	56.04
	College	42	38.53	18	19.78
Income	<10,000	18	16.51	54	59.34
	10001-20000	28	25.69	26	28.57
	20001-30000	23	21.1	8	8.79
	Above 30000	40	36.7	3	3.3
Household Size	1-3	49	44.95	41	45.05
	4-6	51	46.79	31	34.07
	Above 7	9	8.26	19	20.88

Source: Own survey 2016

In Makueni, majority of the sampled respondents were women at 51% compared to their male counterparts. However, in Nairobi, majority of the sampled consumers were male at 62%. The results indicated that in rural areas (Makueni), women are dominant house hold heads whereas in urban areas (Nairobi), males dominated as household heads. This can be attributed to rural to urban migration in search of employment and other opportunities by majority of men. Furthermore, in rural areas food choice decisions are made by women as compared to men. These findings are in line with those of other researchers such as Mundua(2010) who found that 55% of women in Uganda were charged with household chores in relation to food decisions.

Majority of the current study consumers belonged to the youthful age bracket (26-35 years) in both counties. In Nairobi, 36% of the consumers were aged between 26-35 years while only 11% belonged to an older age bracket of above 55 years. This indicates that majority of indigenous chicken are consumed by the youthful age bracket in the study area. The preferred IC attributes should be enhanced with consideration of this age bracket since they form the bulk of the consumers. With regard to marital status, married consumers dominated the consumption of indigenous chicken and eggs in both counties. In Nairobi, 78% of the sampled consumers were married while 22% were single.

Majority of the consumers had secondary level of education with an illiteracy rate of less than 5%. Nairobi county had more consumers with college education (39%) compared to Makueni (20%). The findings imply that Nairobi

consumers due to higher literacy rate are more informed with regard to the nutritional and health benefits associated with indigenous chicken consumption. Nairobi consumers earn more income than their Makueni counterparts (Table 4.1). Majority of sampled consumers in Nairobi (37%) earn monthly income above Ksh. 30,000 while in Makueni county, only 3 % of the sampled consumers earn above Ksh. 30,000. Additionally, majority of the consumers in Makueni (57%) earn a monthly income less than Ksh. 10,000. The higher income for Nairobi consumers compared to Makueni implies higher incentives to purchase more indigenous chicken products. Consequently, consumers with higher income are able to demand superior quality chicken meat and eggs. In Nairobi majority of the consumers(47%) had between 4 and 6 members in each household while in Makueni, majority of the consumers (45%) had 1-3 members per household. The highest number of household members in Nairobi can be attributed to rural to urban migration in search of employment by most rural families.

4.3 Characteristics of indigenous chicken meat and eggs bought

4.3.1 Characteristics of indigenous chicken meat

Table 4.2 illustrates the characteristics of IC meat in Makueni and Nairobi counties. According to the results, 98% and 75% of the consumers in Makueni and Nairobi respectively preferred IC with smooth skin over rough skin. This can be attributed to the perception that meat with rough skin is tough and hence difficult to prepare and hard to chew with less taste. Accordingly, in Nairobi results from PCA indicated that skin texture correlated highly with the third component. This implies

that consumers in Nairobi are more sensitive to skin texture and hence producers need to supply IC with this trait. Chickens with moderate fat content was preferred by consumers from both counties at 71% and 63% in Makueni and Nairobi respectively compared to low and high fat content chickens(Table 4.2).

With regard to age, whereas majority (42%) of consumers in Makueni preferred 8-20 weeks old IC chicken, in Nairobi majority (44%) of the consumers preferred IC between 21 – 28 weeks. The probable reason for preference of lower

Table 4.2: Characteristics of Indigenous Chicken meat

Attribute	Category	MAKUENI % Preference	NAIROBI % Preference
Plumage colour	White	12	5
	Black	9	0
	Brown	42	56
	Mixed	37	39
Skin Texture	Rough	2	25
	Smooth	98	75
Skin Colour	Yellow	66	89
	White	34	11
Age	8-20 weeks	42	37
	21-28 Week	38	44
	>28 weeks	10	18
Sex	Male	61	55
	Female	39	45
Tenderness	Verytender	12	12
	Tender	79	86
	Hard	9	2
Fat content	Low fat	19	34
	Moderate	71	63
	High fat	10	3
Size	<1 kg	4	2
	1-2 kg	65	71
	>2 kg	31	26
Freshness	Fresh	93	97
	Frozen	7	3
Average price/Kg		Ksh. 377.30	Ksh. 454.44

Source: Own survey 2016

age category in Makueni could be due to other uses of IC such as rearing purposes as opposed to Nairobi consumers where majority buy for consumption hence the target for physiologically mature chickens. Producers in Makueni and other producing counties should therefore endeavor to supply physiologically mature chickens.

Majority (66% and 89%) of the consumers in Makueni and Nairobi respectively purchased IC with yellow skin compared to white skin. This indicates the popularity of yellow skin IC in both counties by consumers who hold that yellow skin is an indication of nutritional importance. The PCA results indicated that consumers considered skin colour while making purchase decisions hence the preference for yellow colour could be explained by perceptions among consumers on the presence of nutrients in such meat. Regarding plumage colour, 42% and 56% of consumers in Makueni and Nairobi, respectively, preferred chickens that are of brown colour as opposed to other colours such as black, white and mixed. Accordingly, consumers' preferred male chicken compared to females in both counties at 61% and 55% in Makueni and Nairobi respectively. Males were preferred due to their tendency to have low fats, big in size at an early age hence making them tender at maturity compared to the females. Majority of consumers in both counties preferred chicken weighing between 1 and 2 kilograms.

4.3.2 Characteristics of Indigenous chicken eggs

Analysis for indigenous chicken eggs characteristics are presented in Table 4.3. According to the results, majority (80% and 76%) of the eggs bought in Makueni and Nairobi respectively had a white shell colour. With regard to shape, majority of the respondents, bought oval shaped compared to those that were not oval in shape. Majority of consumers in Makueni (49) purchased large eggs whereas their counterparts in Nairobi (58%) bought medium eggs. Sensitivity to large eggs in Nairobi could be attributed to the perception that larger eggs come from chickens that are produced with use of antibiotics hence unhealthy for human consumption. In Nairobi, 100% of the consumers purchased clean eggs (Table 4.3). Majority of consumers in Nairobi (84%) bought non packed eggs compared to those who purchased packed eggs (16%).

Table 4.3 Characteristics of indigenous chicken eggs

Characteristic	Category	MAKUENI % Preference	NAIROBI % Preference
Shellcolour	White	80	76
	Brown	20	24
Shape	Oval	93	96
	Non oval	7	4
Cleanliness	Clean	89	100
	Non clean	11	0
Size	Small	1	13
	Medium	45	58
	Large	49	28
	Extra large	5	1
Package	Packed	-	16
	Non Packed	-	84
Average price/egg		Ksh.17.49	Ksh. 18.37

Source: Own survey 2016

4.4 Consumption patterns in indigenous chicken meat

Players in the indigenous chicken value chain need information on consumer consumption patterns in order to match their activities with market need and requirement hence achieving high level competitiveness. Such information includes; frequency of consumption, purchase quantities, preference market, forms of purchase and utilization.

4.4.1 Characterization of consumption patterns in indigenous chicken meat

4.4.1.1 Frequency of consumption

Table 4.4 below shows a higher consumption frequency for indigenous chicken by consumers in Nairobi than Makueni. In Nairobi, indigenous chicken is consumed on weekly basis by 64% of the consumers while in Makueni, 52% of the consumers consume IC on weekly basis. The differences occasioned in consumption frequency between the two counties can be attributed to differences in socio demographic characteristics such as income levels. Accordingly, the study found that Nairobi consumers earn more income than their Makueni counterparts (Table 4.1). These findings are in line with previous studies; Higenyi et al. (2014) found that prices of native poultry in Eastern Uganda affected the consumption frequency while Gossard and York(2003); Kostakis (2013) and Mehmet et al.(2015) found that socio-economic factors influences consumption levels for meat.

Table 4.4 Consumption frequency for indigenous chicken meat

Consumption Frequency	MAKUENI		NAIROBI	
	Frequency	%	Frequency	%
Weekly	47	51.65	70	64.22
Monthly	44	48.35	39	35.78

Source: Own survey 2016

4.4.1.2 Preference market

Majority of consumers in both counties prefer buying IC from Open air market. In Makueni, 63% of the consumers buy their IC from open air market as compared to 37% who buy from roadside traders while in Nairobi, 53% of the consumers prefers open market over roadside traders (Table 4.5). The probable reason for this could be due to perception that in open air market, prices are low due to large number of traders available hence competitive prices. Similarly, there is a wider choice of variety selection in an open air market.

Table 4.5: Preference market place for indigenous chicken

Market type	MAKUENI		NAIROBI	
	Frequency	%	Frequency	%
Roadside	34	37.36	51	46.79
Open market	57	62.64	58	53.21

Source: Own survey 2016

4.4.1.3 Preparation method

Table 4.6 below shows the various preferred cooking methods for IC by consumers in the two counties.

Table 4.6: Method of Preparation

Preparation Method	MAKUENI		NAIROBI	
	Frequency	%	Frequency	%
Stew	58	63.74	73	66.97
Deep fry	27	29.67	27	24.77
Grilling	6	6.59	9	8.26

Source: Own survey 2016

The most preferred method of cooking for IC in both counties is stewed meat. In Makueni and Nairobi, 63.74% and 66.97% of the consumers preferred stewed IC meat compared to 6.59% and 8.26% who preferred grilling method (Table 4.6). The preference for stew can be associated with family composition and size where the study found that majority of the respondents especially in Nairobi were large and consisted of married couples as opposed to single families (Table 4.1).

4.4.1.4 Consumption of IC at special occasions

The views of consumers on whether indigenous chicken is consumed during special occasions such as wedding ceremonies, christmas, funerals and visitation was sought in the two counties. Figure 4.1 below indicates that majority of the respondents, 77% in Makueni and 79% in Nairobi do not associate consumption of IC with special events compared to 23% and 21% of the respondents in Makueni and Nairobi respectively who associate consumption of IC with special events in the family. These results are inconsistent with the findings of other researchers; (Masuno, 2008) found that poultry consumption for rituals accounts for 88.9% of the total chicken consumption in Northern Thailand.

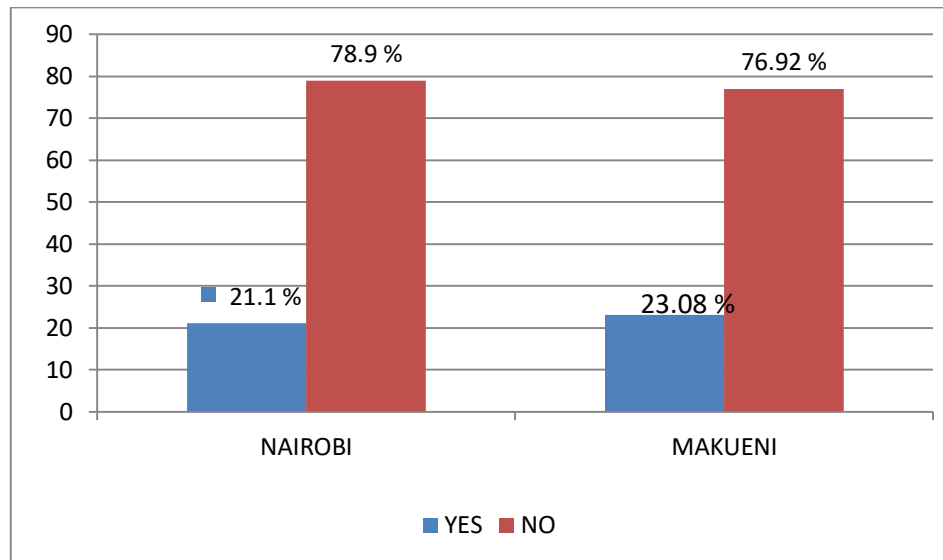


Figure 4.1: Consumption of IC during special occasions

4.4.1.5 Form of purchase

Figure 4.2 below indicates that majority of consumers prefer live IC compared to the dressed IC. Accordingly, 82% and 60% of the consumers in Makueni and Nairobi bought live indigenous chicken respectively. The results indicate that Nairobi consumers prefer more of value added IC compared to their Makueni counterparts. This could be probably attributed to the fact that majority of Nairobi consumers belong to the working category hence have little time to spend in processing of IC. The results particularly those from Makueni consumers corroborate with those of Sodjinou (2014) who found out that majority of consumers in Benin prefer live poultry due to the lack of trust regarding the type of slaughtering method used and fear of diseased or sick birds being slaughtered. In contrast, Laroche Dupraz et al. (2008) argued that wealthy consumers in Cameroon

preferred imported frozen chicken due to difficulties associated with processing local live broilers.

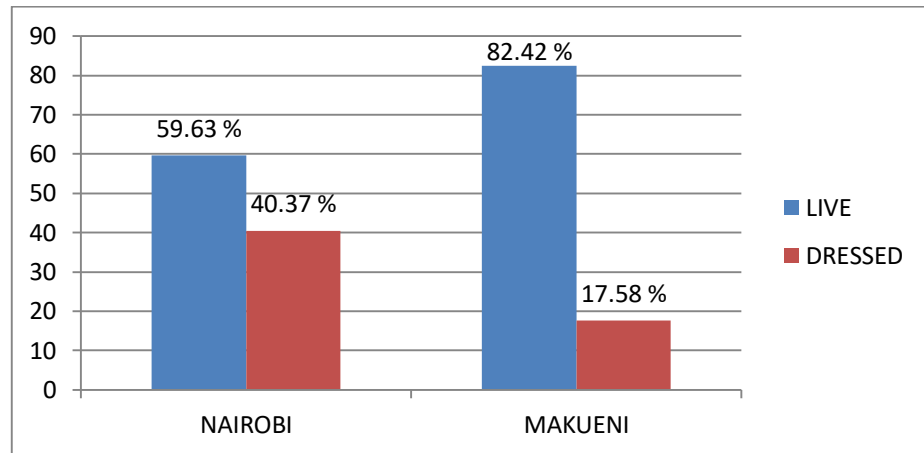


Figure:4. 2Preferred form of IC

4.4.1.6 Preferred Purchase quantity

Consumers in Makueni on average prefer large quantity of IC (2 kg) than their Nairobi counterparts who prefers indigenous chicken with an average weight of 1.65 kg (Figure 4.3). The different can be attributed to the fact that most of Nairobi consumers prefer ready processed (dressed) than live which are usually smaller in sizes due to removal of body parts.

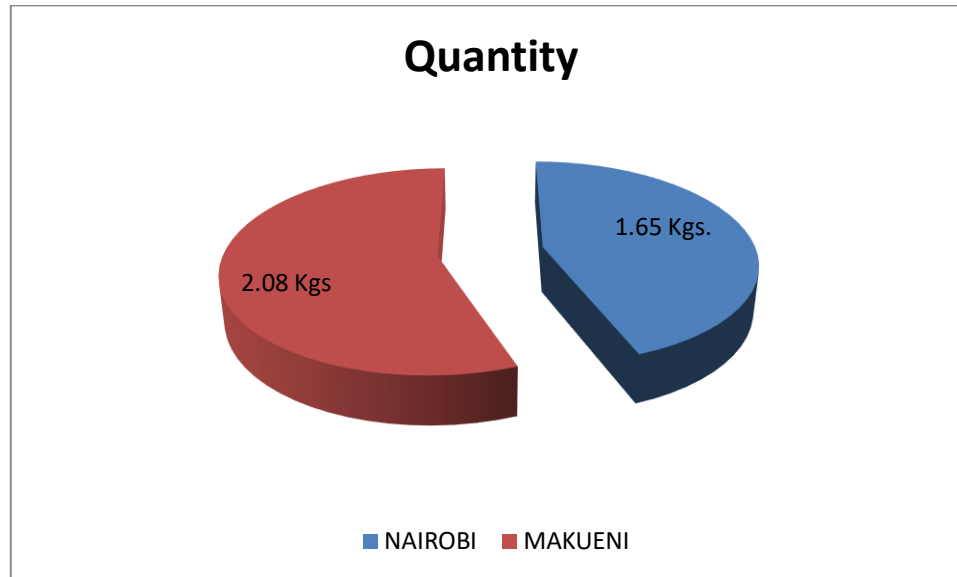


Figure:4. 3 average purchase quantity in the two counties

4.4.1.7 Price per quantity of IC bought

Figure 4.4 below compares prices of one kilogram of IC between Makueni and Nairobi. Results indicated that Nairobi consumers paid higher price for each kilogram of IC bought (Ksh. 454) compared to Makueni where a kilogram of IC costed Ksh. 377. The high prices for Nairobi markets can be attributed to several factors; first, the geographical distance covered in transporting IC from producing region such as Makueni, increased demand for IC in Nairobi brought about by high population pressure compared to Makueni and finally the higher disposable incomes for residents in Nairobi which implies high purchasing power for IC. These results are in line with the findings in section 4.3.1.1 of this study where 64%

of Nairobi consumers purchase IC on a weekly basis. Producers and traders can increase their revenues *ceteris paribus* by selling their IC in Nairobi.

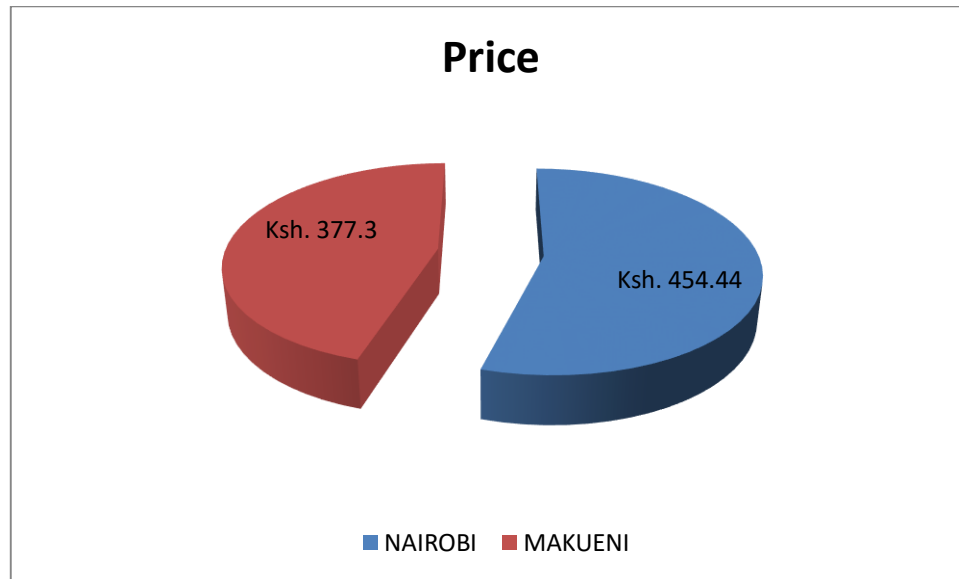


Figure: 4. 4:Price per kilogram of IC in Nairobi and Makueni

4.4.2 Factors influencing consumption frequency in indigenous chicken meat

The logit regression model was fitted to explain socio demographic factors influencing the frequency to consume indigenous chicken meat. The model was significant at $P < 0.05$ for Makueni and $P < 0.05$ for Nairobi with predictive powers of 13% and 12% respectively for Makueni and Nairobi models (Table 4.7). Correlation matrix for the coefficients reported weak relationships which can be interpreted to mean low or lack of multicollinearity between independent variables. In Makueni,

four variables; age, gender, education and price of IC were significant in explaining the variation in consumption frequency of indigenous chicken while in Nairobi, three variables; age, household size and price were significant in the fitted model(Table 4.7). Rearing of IC and income did not significantly affect the likelihood of frequent consumption in indigenous chicken.

Table 4.7: Logistic regression for the determinants of consumption frequency in IC meat

Variable	MAKUENI				NAIROBI			
	β	Std error	P	Exp (β)	β	Std error	P	Exp (β)
Age	-0.446**	0.201	0.02	0.639	-0.428**	0.216	0.049	0.652
Gender	0.898*	0.490	0.067	2.455	0.630	0.461	0.172	1.878
Education	-0.897**	0.378	0.018	0.407	-0.249	0.298	0.404	0.779
Income	0.018	0.270	0.946	1.018	-0.338	0.229	0.140	0.712
HH size	0.256	0.262	0.328	1.292	0.705*	0.393	0.073	2.024
Price	0.006*	0.004	0.091	1.006	0.005*	0.003	0.076	1.005
Rear IC	0.450	0.500	0.368	1.569	0.610	0.403	0.130	1.841
Constant	0.322	2.027	0.987		-0.923	1.764	0.601	
Pseudo R²	0.130				0.122			

***Significant at 1%, **Significant at 5%, *Significant at 10%;

Source: Own survey 2016

According to the results in Table 4.5, age of the household head has a negative significant ($p < 0.05$) effect on consumption frequency in Makueni county. *Ceteris paribus*, each unit increase in age resulted in a decrease in odds ratio in favour of frequent consumption. Similarly, age had a negative significant ($p < 0.05$) effect on consumption frequency of indigenous chicken in Nairobi county. These results connotethat the older the household head in both counties, the less frequently they consume IC compared to the younger consumers. These findings are also consistent with the results of this study where it was reported that 36% and 31% of the consumers in Nairobi and Makueni respectively belonged to a youthful age bracket of 26 – 35 years (Table 4.7). This finding is similar to that of Kostakis (2013) who found that as age increases, the probability of reducing food expenditure increases. One possible reason to this is that elderly people pay attention to a healthier lifestyle and would prefer being vegetarian. Mehmet et al. (2015) found that age of the respondent was a significant predictor for fish consumption frequency in Turkey.

Gender significantly ($p < 0.1$) influenced consumption frequency of IC in Makueni. The relationship between gender and consumption frequency was positive implying that males consumed IC more frequently than their female counterparts in Makueni. The probable reason for this could be the dominance of men as household heads hence able to control resources in their favor. The trend was different in Nairobi County where no significant difference in consumption frequency among the two genders was evidence. These could be attributed to the

fact that Nairobi consumers have high income levels which increases their purchasing power. The results in Makueni are in agreement with those of Gossard and York (2003) who found that gender had strong influence on meat consumption in US residents. They implied that men physiologically required more meat than women due to the average differences in weight (Gossard and York, 2003).

Education level was found to be an important factor for healthy diet behaviour. This variable was included in the model because better educated families have better nutritional awareness. According to the results, it was found that there is a negative and statistically significant ($P < 0.05$) relationship between education level and indigenous chicken (IC) consumption frequency in Makueni county. It was determined that when education level rises, IC consumption frequency decreases (Table 4.7). These connotes that *ceteris paribus*, educated household heads tend to minimize consumption of meat related products due to health related risks and hence prefer to be on more of vegetarian diets. These results are contrary to those of Kostakis, (2013) who found that highly educated consumers in Greece were less likely to reduce their expenditures on food.

Household size is considered as a variable for explaining the amount of IC consumption. Results indicated that household size positively and significantly ($P < 0.1$) influenced consumption frequency of IC in Nairobi county. This implies that households with large family members consume IC more frequently than those with small number of family members. This can be attributed to the differences in choice and preferences among different household members which influences the

need for frequent utilization. Furthermore, Nairobi consumers were found to earn high income than their Makueni counterparts which gives them an incentive to consume more frequently. Moni (2014) reported that household size positively influenced the consumption of chicken, beef and pork in central Kenya.

The price of IC had a positive and significant ($P < 0.01$) influence on the consumption frequency in both Makueni and Nairobi Counties. The results indicate that as price of IC increased, consumption frequency increased also. This implies that IC can be categorized as a Veblen good in the study area and hence Consumers associate its consumption with status in the society. Accordingly the perceptions on health benefits associated with consuming white meat could explain the inelastic nature of its demand with respect to price change.

Rearing of IC did not significantly influence consumption frequency in both counties but had the expected positive sign. This implies that households that rear IC have a higher tendency to increase consumption frequency compared to those where IC is not reared. These can be connoted to the fact that those families that rears IC are able to consume part of their produced birds compared to those who don't rear. Mozumdar et al. (2009) found that consumption of meat and eggs increased in households who reared more small scale poultry in Bangladesh.

4.4.3 Factors influencing consumption frequency in indigenous chicken eggs

Logistic regression model was employed to explain the influence of socio demographic factors on the frequency to consume indigenous chicken eggs. The model was significant at $P < 0.1$ for both Makueni and Nairobi with predictive powers (R^2) of 17% and 11% respectively for Makueni and Nairobi counties (Table 4.8). In Makueni, price of egg, gender and previous purchase were significant in explaining the variation in consumption frequency of indigenous chicken eggs. Nairobi model indicated that; marital status, price of egg and previous purchase significantly influenced the frequency to consume indigenous chicken eggs (Table 4.8). The coefficients of independent variables were converted into the exponential form to explain the direct effect on the dependent variable.

Gender of the household head had a negative and significant ($P < 0.1$) effect on the frequency to consume IC eggs in Makueni. *Ceteris paribus*, families headed by females consumed IC eggs more frequent than their male counterparts. The coefficient ($\text{Exp } \beta = 0.3562$) indicated that a change from female to male headed household resulted into an increase in consumption frequency by less than one unit. The results connotes that in less urbanized areas, household chores such as shopping and cooking are performed mostly by women compared to more urban areas. In Nairobi, gender of the household head did not significantly ($P > 0.1$) influence consumption frequency. The findings are consistence to those of Kostakis (2013) who established that gender of the household head significantly influenced food expenditures in Turkey.

Table 4.8: Logistic regression for the determinants of consumption frequency in IC Eggs

Variable	MAKUENI				NAIROBI			
	β	Std error	P	Exp (β)	β	Std error	P	Exp (β)
Age	0.0226	0.0264	0.391	1.0228	0.0082	0.0246	0.738	1.0082
Gender	-1.0322*	0.6216	0.097	0.3562	-0.2361	0.5120	0.645	0.7897
HH size	0.0209	0.1204	0.862	1.0211	0.0470	0.1359	0.729	1.0481
Price	0.1122*	0.1221	0.058	1.1187	0.0544	0.0676	0.420	1.0559
Rear IC	-0.2783	0.7475	0.710	0.7570	-0.4470	0.3647	0.902	0.6395
Previous purchase	-1.3826*	0.4974	0.005	0.2509	-0.6672*	0.2878	0.020	0.5134
Quantity	0.0008	0.0060	0.883	1.0008	-0.0265*	0.0148	0.073	0.9738
Marital status	0.1760	0.6258	0.779	1.1924	0.5951*	0.6334	0.047	1.8132
Constant	2.5232	2.8742	0.380	12.4684	0.2814	2.0715	0.892	1.3249
Pseudo R²	0.1743				0.1128			
P- value	0.0507				0.0971			

***Significant at 1%, **Significant at 5%, *Significant at 10%;

Source: Own survey 2016

Marital status had a positive and significant ($P < 0.1$) effect on consumption frequency in Nairobi county. Married consumers had a higher consumption frequency than non married consumers. The coefficient indicated that a change from non married to married respondent increased the frequency to consume by more than one unit ($\text{Exp } \beta = 1.8132$). The findings can be attributed to the relatively large number of family members for married cohort with different desires than single cohort. Marital status did not significantly influence consumption frequency in Makueni County.

Price of the IC egg negatively and significantly ($P < 0.1$) influenced consumption frequency in Makueni County. *Ceteris paribus* an increase in the price of an IC egg by one unit resulted in a decrease in consumption frequency by 1.1187 units (Table 4.8). Price increase results to reduction in consumer surplus and hence low purchasing power. Price of an IC egg did not significantly influence consumption frequency in Nairobi County. This could be attributed to the differences in income levels between the two counties where Nairobi respondents had high income levels than their Makueni counterparts (Table 4.1). The findings are consistent with the findings of Issa et al. (2015) who established that taste and price were the main determinants of indigenous chicken consumption in ND'jamena. The period from last purchase negatively significantly ($P < 0.1$) influenced consumption frequency in both counties. *Ceteris paribus*, as the period from previous purchase increases, the frequency to consume IC eggs is reduced. The findings posit a consistency in the consumption frequency of IC eggs.

4.5 Assessment of attributes of Indigenous Chicken meat and eggs that influences consumer choice

This section cover an assessment of consumer preference attributes in both indigenous chicken meat and eggs. Principal component analysis was used to elicit components of attributes that are significant in explaining consumer choice for indigenous chicken meat and eggs.

4.5.1 Attributes of indigenous chicken meat influencing consumer choice

Eleven variables were identified to influence consumer choice for IC meat. The variables which included; sex, age, skin colour, skin texture, plumage colour, size, fat content, freshness, smell, price and tenderness were then subjected to Principal component analysis (PCA) in order to derive new variables that had significant influence on consumption of IC meat through variable reduction technique. The first step in the process involved testing for reliability in variables. Consequently, Cronbach's alpha was used to test for internal reliability and a reliability coefficient of 0.710 for Makueni and 0.73 for Nairobi implied that factor analysis through PCA was possible. The second step involved testing for sampling adequacy where Kaiser-Meyer-Oklin test (KMO) was employed and values of 0.655 and 0.651 for Makueni and Nairobi respectively obtained indicated that data collected in both counties were adequate for conducting PCA analysis. According to Kaiser (1974), significant components are those that yield eigen values greater

than 1. Eigen values indicate the total contribution of variables in each component whereas a component is a set of closely related variables.

Results in Tables 4.9 and 4.10 indicate that in both Makueni and Nairobi, four components were extracted with eigen values greater than 1. These four components explained 61% and 63% of the variance in the variables for Makueni and Nairobi data respectively. The four components are therefore important in explaining consumer preferences and choice for indigenous chicken meat in Makueni and Nairobi Counties. The eigen values were plotted against their corresponding components to produce a scree plot. The number of significant components coincides to the point on the scree plot (Figure 4.5 and 4.6) where an elbow is observed.

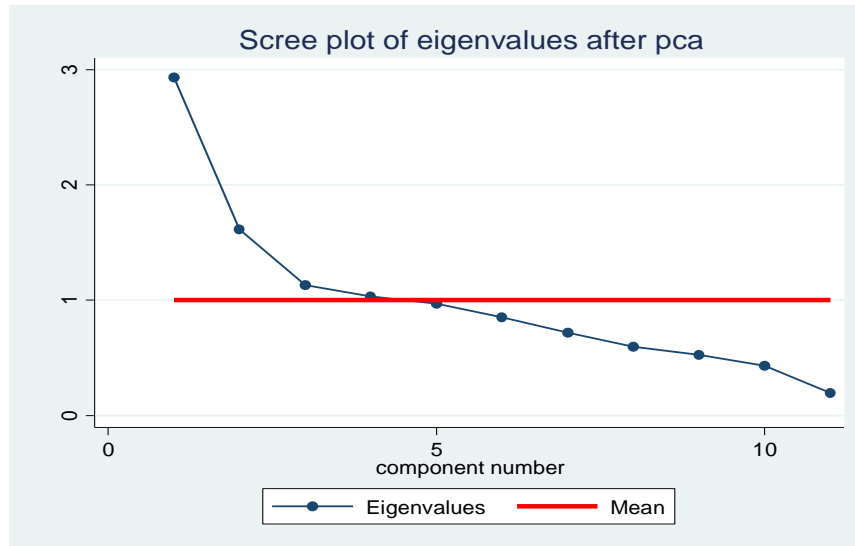


Figure:4. 5: Scree plot for the 11 components in Makueni

The scree plot above indicates that four components (above the mean gridline) are important in explaining attributes of choice. The components have eigen values greater than or equal to 1 on the y-axis. The other seven variables are not significant due to low eigen values (Kaiser, 1974).

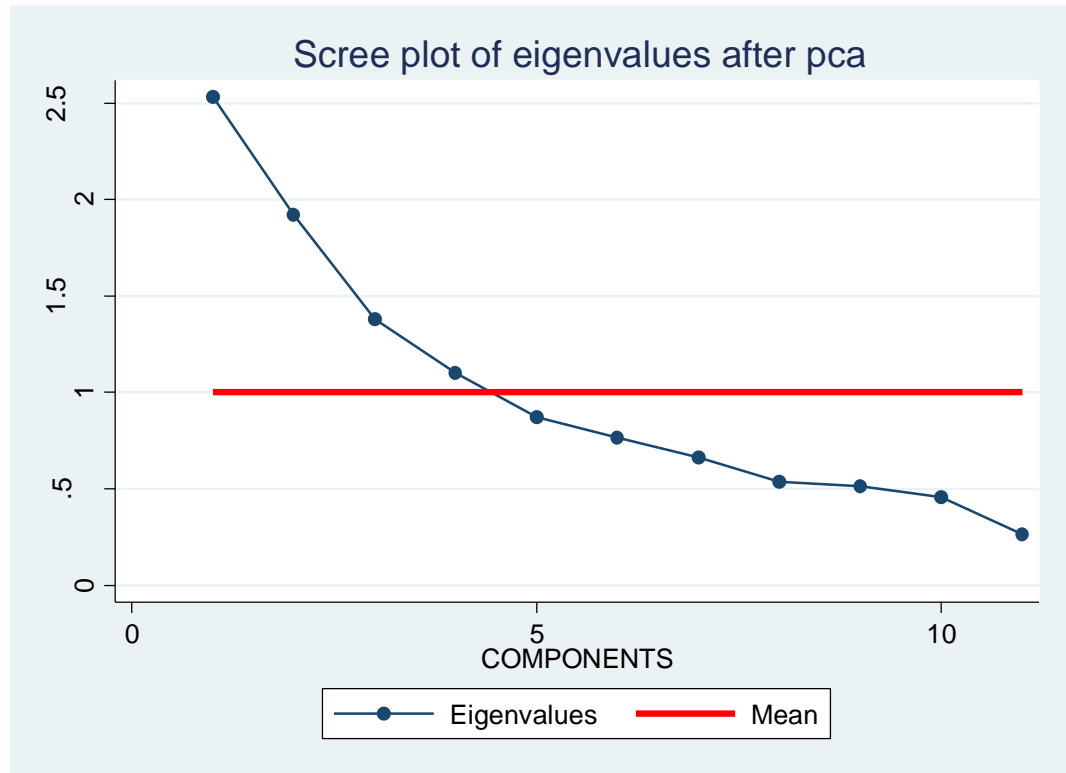


Figure 4.6: Scree plot for the 11 components in Nairobi

The scree plot for Nairobi indicated that four components had eigen values greater than 1 and hence significant in explaining attributes of choice (Figure 4.6).

The significant components were rotated using varimax rotation which gave loading coefficients. The rotated variable coefficients were used in the interpretation of principal components based on which variable had the highest correlation with the respective component. The decision was to accept variables with correlation coefficient value of 0.3 and above which meant strong association and to reject those variables whose correlation coefficient with respect to the component is less than 0.3.

Table 4.9: Results of Exploratory factor analysis for meat in Makueni County

Factor and item	Factor/Component loadings	% variance explained
Factor 1: Appearance		26.60
Smell	0.4334	
Freshness	0.5336	
Skin colour	0.5331	
Factor 2: Tenderness		14.6
Age	0.4834	
Tenderness	0.5758	
Factor 3: Size		10.2
Size	0.6112	
Plumage colour	0.3876	
Skin texture	0.3981	
Sex	0.6075	
Factor 4: Price		9.3
Price	-0.6757	
Fat content	0.5951	
Total explained variance (%)		61.75

Source: Own survey 2016

Table 4.10: Results of Exploratory factor analysis for meat in Nairobi County

Factor and item	Factor/Component loadings	% variance explained
Factor 1:		23.0
Smell	0.5762	
Freshness	0.6123	
Factor 2:		17.4
Age	0.4516	
Tenderness	0.5136	
Sex	0.6169	
Factor 3:		12.5
Skin texture	0.6074	
Fat content	0.3443	
Skin colour	0.5576	
Factor 4:		9.9
Price	0.6818	
Size	0.5784	
Plumage colour	0.3881	
Total explained variance (%)		63.0

Source: Own survey 2016

Skin colour, freshness and smell had the highest weights in component one in Makueni. Component 1 can therefore be regarded as representing appearance. These results indicate that skin colour of IC is highly considered by consumers before making a purchase decision in Makueni. Yellow skin colour in IC is associated with both the taste and nutritive component of the meat making it highly preferred. Consequently, the study found that 66% of IC bought in Makueni (Table 4.2) had a yellow skin colour as opposed to other colours. In Nairobi, freshness and smell were highly correlated with component 1. This indicates that consumers in Nairobi consider freshness as a major determinant of choice and consumption of indigenous chicken.

Fresh meat is considered to be tastier than frozen meat as preservation results in loss of nutrients and taste. This implies that traders should endeavor to supply live IC to consumers and offer chicken dressing as an after sales service in order to increase their sales revenue. This is in line with the findings of this study where Nairobi had more consumers who purchased dressed IC than Makueni.

These results agree with those of other researchers; Nantachai et al. (2007) who established that brown and yellow meat colour was highly correlated with chicken preferences in Thailand. Prameela and Husain (2007) argued that product features such as taste and freshness determined consumers' choice and preference while Kyarisiima (2011) found that yellow skin colour was responsible for increased preferences of chicken meat in Eastern Uganda. However, the findings contradict those of Toluwase et al. (2017) who found that freshness reduced the

preference and choice for local chicken in Ghana while imported, frozen and cheap chicken meat was highly preferred due to low price and the perception that imported chicken was the best. To guarantee freshness in IC in Makueni and Nairobi, small slaughter sites managed by IC traders have emerged to assist in slaughtering live chickens bought by their customers. This trend should be replicated by IC traders all over the country in urban areas to enhance their sales.

The second component was highly correlated with tenderness and age in Makueni which implied that this component can be regarded to represent tenderness in meat. The probable reason for tender meat is due to ease in preparation and the softness in chewing hence better eating experience. Ramatou (2014) found that consumers in Ghana preferred and paid premium prices to very tender imported chicken meat. In Nairobi, component 2 is highly correlated to sex and tenderness. Preference for male IC is due to the perception that they tend to have low fat content and are big at an early age hence making them tender compared to the females. This result is in agreement with the findings of other researchers; Aklilu (2007) found that buyers look at the age of chicken when they buy them for different purposes while Sodjinou, (2014) indicated that consumers paid premium prices for chickens between 6 – 12 months due to their tenderness and low fat content. Higenyi et al. (2014), found that age, sex and tenderness were considered by consumers while purchasing native poultry in Uganda. However, the results contradict those of Sodjinou, (2014) who found that sex of chicken and guinea fowl in Benin did not influence their consumption. Increasing production of male IC

would be expected to increase sales revenue for producers due to preference for male chicken by consumers in Nairobi.

The third component was highly correlated with size, sex and skin texture in Makueni while in Nairobi, skin texture and skin colour were highly correlated with the third component. The components therefore represent size and appearance respectively for Makueni and Nairobi. These findings indicate that Makueni consumers consider size of chicken before purchase and prefer large IC. Accordingly, Nairobi consumers consider skin texture of indigenous chicken while making purchase decision. The probable reason for this is the perception that high utility is derived from large size IC in Makueni while in Nairobi consumers perceive smooth skin texture to represent tenderness in meat. The findings are consistent with those of Higenyi et al. (2014) who established that texture, taste and flavour were the most significant meat quality attributes for consumption and use of native poultry in Uganda. Nantachai et al. (2007) found that smoothness of skin influenced consumer preference for chicken meat in Thailand.

The fourth component was highly correlated with price in both Makueni and Nairobi counties. This indicates that price of IC positively influences consumers' choice and preferences. This is probably due to perceptions of benefits associated with consumption of IC where price is an indicator of meat quality. These findings however are in contrast to the findings of Toluwase et al. (2017) who established that price of chicken did not significantly influence consumer preference in
Ghana.

4.5.2 Attributes of indigenous chicken eggs influencing consumer choice

Principal component analysis (PCA) method was used to derive new variables significant in IC eggs through variable reduction technique. The first step involved testing for reliability in variables. Cronbach's alpha was used to test for internal reliability. The reliability coefficients of 0.71 and 0.70 for Makueni and Nairobi respectively implied that factor analysis through PCA was possible. The second step involved testing for sampling adequacy (Kaiser, 1974). The KMO values of 0.71 and 0.75 were obtained for Makueni and Nairobi respectively. The values indicated that PCA can be conducted.

The third step was extraction of eigen values using PCA and matching with factor loadings in varimax rotation. According to Kaiser (1974), significant components are those that yield eigen values greater than 1. Results in Tables 4.11 and 4.12 indicate that in both Makueni and Nairobi, two components were extracted with eigen values greater than 1. These two components explained 55% and 52% of the variance in the variables for Makueni and Nairobi, respectively. The two components are therefore important in explaining consumer preferences and choice for indigenous chicken eggs in Makueni and Nairobi Counties. The eigenvalues were plotted against their corresponding components to produce a scree plot (Figure 4.7 and 4.8).

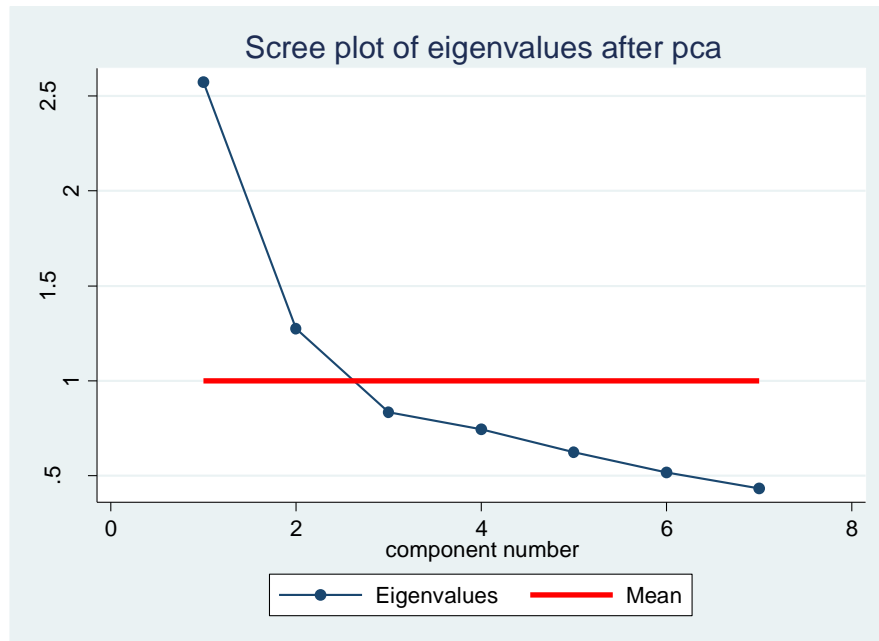


Figure:4. 7: Scree plot of eigenvalues after PCA in Makueni

Figure 4.7 indicates that two components had eigen values greater than 1hence significant in explaining egg attributes of choice. The mean grid line crosses the curve where eigen value is 1 and an elbow formed. Five components were not significant.

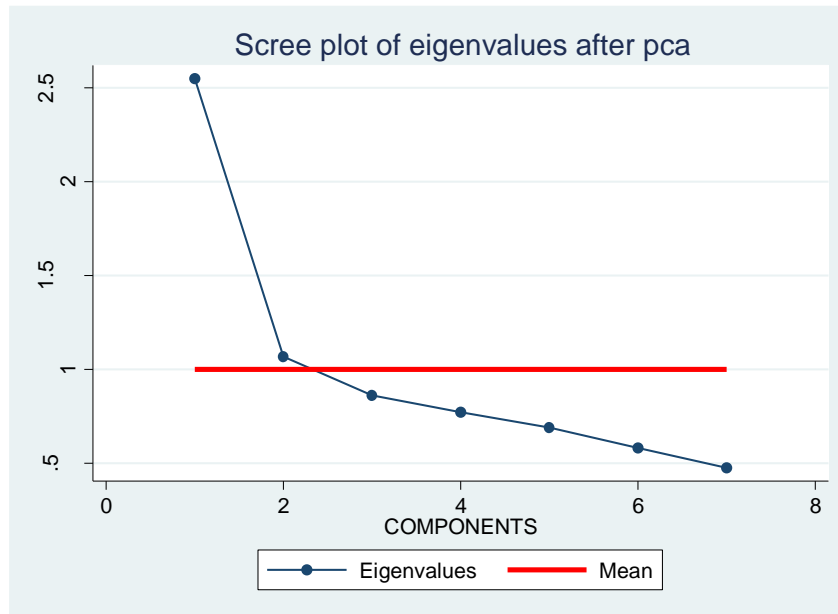


Figure:4. 8: Scree plot of eigen values after PCA in Nairobi

Scree plot in Figure 4.8 indicates that two component were significant in explaining attributes of choice for eggs in Nairobi. Similarly, five components were insignificant due to low eigenvalues of less than 1(Figure 4.8).

The rotated variable coefficients were used in the interpretation of the principal components based on those variables that had the strongest correlation with the respective component. A correlation coefficient of 0.3 and above was used in this study to indicate strong association between the original variables and the principal components.

Table 4.11: Results of Exploratory factor analysis for eggs in Makueni County

Factor and item	Factor/Component loadings	% variance explained
Factor 1: Cleanliness		36.76
Shell colour	0.3912	
Cleanliness	0.5278	
Freshness	0.4918	
Shape	0.4978	
Factor 2: Size		18.22
Price	0.6528	
Size	0.6669	
Total explained variance (%)		54.98

Source: Own survey 2016

Table 4.12: Results of Exploratory factor analysis for eggs in Nairobi County

Factor and item	Factor/Component loadings	% variance explained
Factor 1: Value		36.41
Price	0.5334	
Size	0.5323	
Shell colour	0.4691	
Packaging	0.3508	
Factor 2: Fresh		15.28
Cleanliness	0.5714	
Freshness	0.7099	
Shape	0.3881	
Total explained variance (%)		51.69

Source: Own survey 2016

The first component highly correlated with cleanliness and shape of an egg in Makeni and price and size of an egg in Nairobi. The first component can be considered to represent egg appearance in Makeni. This indicates that consumers in Makeni consider cleanliness and shape of an egg before making purchase decision. Shell colour and freshness also had high factor loadings in this component implying their relevance in purchase decision. In Nairobi, the first component can be considered to represent value of an egg which is anchored on price and size. The result implies that consumers in Nairobi are more focused on the price of an egg and its size while making purchase decisions. The probable reason is that eggs that

are large in size give more utility to consumers than small sized eggs. Accordingly, low price for eggs implies high purchasing power and hence consumers can increase the quantity of purchase. Conversely, in Makueni consumers perceive clean eggs to be an indicator of freshness hence more taste. These findings are similar to those of other researchers; Senbeta et al. (2015) found that consumers preferred large eggs with brown colour in Ethiopia while Hanis et al. (2013) established that consumers paid premium prices for large and brown coloured eggs. Players in the egg distribution chain should therefore endeavor to market large sized eggs in Nairobi and clean eggs in Makueni to maximize their returns.

The second component is correlated with size and price in Makueni and freshness in Nairobi. The component can therefore be regarded to represent value and appearance for Makueni and Nairobi respectively. The attributes of choice in the two counties are dissimilar; whereas Nairobi consumers give preference to price and freshness, in Makueni preference is given to cleanliness and size. The probable reason for sensitivity to freshness among Nairobian egg consumers can be attributed to the fact that most eggs consumed are imported from other regions and hence the likelihood of loss in quality of eggs while in stores and transit. Value chain players need to enhance quality by proper preservation of eggs while in transit and stores to increase sales and utilization

4.6 Influence of Indigenous Chicken Meat and Eggs' attributes on Price

Hedonic pricing model was applied to extract significant attributes of IC meat and eggs which influence prices. Attributes which significantly influence the price of IC meat and eggs are regarded as the most important in explaining consumer preferences (Rosen, 1974).

4.6.1 Influence of Indigenous Chicken Meat Attributes on Price

Hedonic pricing model was estimated to assess the influence of indigenous chicken meat attributes on price. Based on the model results, approximately 39% and 24% (R^2) of the variance in price of indigenous chicken meat in Makueni and Nairobi counties respectively was explained by the independent variables in the models (Table 4.13). The F-test results indicated that the models were significant at ($p < 0.01$) and ($p < 0.1$) for Makueni and Nairobi respectively. T-tests were used to

Table 4.13: Hedonic model results for Indigenous chicken meat attributes

Attribute	Makueni				Nairobi				
	coefficient	Std error	t-value	p-value	coefficient	std error	t-value	P-value	
Plumage colour	-White	0.1832**	0.0763	-2.40	0.019	0.0226	0.277	0.18	0.860
	-Black	-0.2331**	0.0924	-2.52	0.014	0.0830	0.1252	0.66	0.509
	-Brown	-0.0242	0.0339	-0.71	0.477	-0.0505	0.0383	-1.32	0.191
Skin texture	-Rough	0.0236	0.0335	0.71	0.477	0.0099	0.0460	0.22	0.829
Skin colour	-Yellow	-0.0475	0.0367	-1.30	0.199	0.0225	0.0528	0.43	0.671
Age	-8-20	0.1049*	0.0586	1.79	0.078	-0.0141	0.0569	-0.25	0.805
	-21-28	0.0728	0.0673	1.08	0.283	-0.0230	0.0514	-0.45	0.655
Sex	-Male	-0.0003	0.0393	-0.01	0.993	0.0629*	0.0356	1.77	0.081
Tender	-tender	0.0021	0.0626	0.03	0.972	-0.0755	0.0810	-0.93	0.353
	-Moderate	0.0719	0.0585	1.23	0.223	0.0184	0.0696	0.26	0.792
Fat content	-Low	-0.0914	0.0709	-1.29	0.201	0.0129	0.0761	0.17	0.865
	-Moderate	-0.1132	0.0723	-1.57	0.122	0.0107	0.0716	0.15	0.881
Size	-1 kg	-0.0182	0.1100	-0.17	0.869	-0.1089	0.1285	-0.85	0.399
	-1-2 kg	0.0390	0.0399	0.98	0.332	-0.01086	0.0388	-0.28	0.780
Marital status		-0.0312	0.0352	-0.89	0.379	-0.0721*	0.0409	-1.76	0.082
Education		0.0436	0.0274	1.59	0.116	0.0233	0.0228	1.02	0.310
Income		0.0156	0.0140	1.11	0.270	0.0006	0.0180	0.04	0.970
Frequency		0.0818**	0.0378	2.16	0.034	0.0712*	0.0360	1.98	0.051
Occasion		-0.0040	0.0385	-0.11	0.911	-0.1065*	0.0410	-2.59	0.011
Constant		5.7573	0.1404	41.00	0.00	6.0645	0.1330	45.59	0.00
R ²			0.2493					0.389	
Prob> F			0.0000					0.0863	

*, **, *** indicates significant levels at 10%, 5% and* 1% respectively

estimate the significant levels of individual independent variables. The influence of eight indigenous chicken attributes (plumage colour, sex, size, skin texture, skin colour, tenderness, fat content and age) on price was thus estimated in both counties. The hypothesis for a coefficient not different from zero was rejected for three variables; plumage colour, age and sex at 5%, 10% and 10% significant levels respectively, while all the other chicken meat attributes were statistically insignificant.

White plumage has a significant and negative influence ($P < 0.05$) on the chicken price compared to the mixed colour type (reference group) in Makueni. *Ceteris paribus*, the price of a white chicken tends to be 18% less than that of mixed colour chicken. This is probably because white chicken are believed to be associated with religious rituals hence their scarcity in the market places. Accordingly, this study found that only 12% of white chicken were preferred in Makueni (table 4.2). In Nairobi however, white plumage was not statistically significant ($p > 0.1$) and had a positive sign (table 4.13) which indicated that consumers will pay premium prices for white chicken compared to mixed colour chicken.

Black plumage had a negative and significant ($p < 0.05$) effect on the price of IC meat in Makueni. The price of chicken with black plumage colour was 23% less compared to the price of chicken with mixed plumage colours holding other factors constant. However, in Nairobi black plumage was positively related to price but not significant even at 10%. The study also found that 9% and 0% of the consumers in

Makueni and Nairobi respectively preferred black plumage chicken. Similarly, black chicken are believed to be associated with religious sacrifices and hence the probable reason for discount prices in Makueni. The low demand for chicken with black plumage implies that producers loose utility while rearing these chickens and hence need to concentrate in production of chicken with mixed colours. This result is similar to the findings of other researchers; Sodijnou *et al.*, (2014) found that buyers paid premium for white and red colours and discounted chickens with black plumage colour. The discount prices received for black plumage by farmers could be contributing to the scarcity of such chickens as farmers fear rearing such chickens due to lower profit margins with regard to escalating production costs (Aklilu, 2007; Vidogbena *et al.*, 2010). Consistent with reports by these authors, farmers believe that they lose utility when keeping chickens with black colour as compared to chickens of white, mixed or Brown colours.

Male indigenous chicken in Nairobi received price premium and this was statistically significant at 10%. *Ceteris paribus*, male chickens attracted price premiums of 6% compared to their female counterparts. Accordingly, the study found that 55% of consumers preferred male chickens (Table 4.2). Results of PCA also indicated that component two was highly correlated with sex in Nairobi (Table 4.10). Male IC are preferred due to their tendency to have low fats and are big in size at an early age hence making them more tender compared to the females. For producers to increase their revenue, Nairobi market should be targeted with male IC while in Makueni market, female IC would generate more revenue due to their

preference as a rearing stock. This finding is consistent with those of other researchers; Higenyi et al. (2014) found that buyers considered sex of native poultry when they bought for different purposes in Uganda while in Benin, the price of male duck was found to be higher than that of the female duck (Sodjinou, 2014). On the contrary Sodjinou (2014) found that sex of the chicken and guinea fowl in Benin did not influence their respective prices.

Makueni had chickens aged between 8 and 20 weeks receiving significant ($P < 0.10$) price premiums compared to those aged 28 weeks and above. *Ceteris paribus*, the price of IC aged 8 to 20 weeks was 10% higher than that of IC aged 28 weeks and above. This is probably because of the multiple use of this age category as both rearing stock and consumption. Accordingly, majority of consumers in Makueni (42%) preferred IC aged between 8 to 20 weeks (Table 4.2). This result corroborates with the findings of other researchers; Aklilu (2007) found that buyers consider age of chicken when they buy them for different purposes. Sodjinou, (2014) found that consumers paid premium prices for chickens between 6 – 12 months in Benin.

This study also sought to establish the influence of socio demographic characteristics on chicken prices. Results revealed that marital status, frequency of purchase and consumption of IC during occasions had significant impact on the price of indigenous chickens (Table 4.13). Married consumers in Nairobi significantly paid price discounts compared to non married consumers ($p < 0.10$). *Ceteris paribus*, the price paid for 1 kilogram of IC by married consumers in

Nairobi was 7% less compared to the price paid by non married consumers. Accordingly, results in table 4.1 indicated that majority of the consumers in Nairobi were married (77%). The probable reason for this finding is that due to large number of members in the family, married consumers tends to buy IC chicken in large quantities hence benefiting from price cuts. On the contrary, consumers from single families buy small quantities including meat parts which tend to be more expensive. In Makueni however, there was no significant difference in prices of IC between married and single consumers. Retailers can focus on market segmentation based on socio demographic characteristics so as to increase their revenue from IC meat sales.

Consumption of indigenous chicken during special occasions significantly had negative influence on price ($p < 0.10$) in Nairobi (Table 4.13). *Ceteris paribus*, the price of IC was 10% lower when bought during special occasions than during non special occasions. The study also found that 21% of the consumers in Nairobi consumed IC during special occasions. The probable reason for this is that during such events in the families, consumers procure large quantities of IC hence benefiting from low prices that result from economies of large scale purchase than in normal purchase situations where small quantities for a few members of the family are bought. These findings are in line with other previous researchers; Sodjinou et al. 2014 found that “bicycle poultry” was highly preferred due to its role in socio-cultural functions in Benin while Masuno (2008) found that poultry was highly consumed for rituals at 88.9% of total chicken consumption in Thailand.

Frequency of purchase in indigenous chicken significantly influenced the price in Makueni and Nairobi at $p < 0.05$ and $p < 0.10$) respectively. *Ceteris paribus*, the price paid by frequent consumers was 8% and 7% higher than the price paid by non frequent consumers in Makueni and Nairobi counties respectively. These findings could be attributed to the fact that frequent consumers of IC are driven by intrinsic cues such as perceived health benefits, taste and nutritional benefits and not the price of indigenous chicken. Consequently, IC can be regarded as a Veblen good as found by this study (Table 4.7).

4.6.2 Influence of indigenous chicken eggs attributes on price

Hedonic pricing model was estimated to assess the influence of IC egg attributes on price. The F-test results indicated that variables in the model were significant in explaining variations in egg prices of indigenous chicken in both Makueni and Nairobi at $p < 0.05$ and $p < 0.01$ respectively (Table 4.14). The total variation in price was explained by the value of R^2 which indicated that approximately 18% and 20% of the variance in price of indigenous chicken eggs in Makueni and Nairobi counties respectively was explained by the independent variables in the models (Table 4.14). The T-tests were used to estimate the significant levels of individual independent variables (Table 4.14). The influence of four indigenous chicken egg attributes (shell colour, size, shape and cleanliness) on price was thus estimated in both counties. The study also estimated the influence of socio-economic factors such as; income, education and flock size on the price of IC eggs. The hypothesis for a coefficient not different from zero was rejected for

four variables; shell colour, education, income and flock size, all the other variables were statistically insignificant.

White shell colour had a positive sign and was statistically significant at ($p < 0.10$) in Makueni (Table 4.14). *Ceteris paribus*, the price of white shell egg was

Table 4.14: Hedonic model results for Indigenous chicken eggs attributes

Attribute	Makueni				Nairobi			
	coefficient	Std error	t-value	p-value	coefficient	std error	t-value	P-value
White shell	0.1091*	0.0548	1.99	0.050	-0.0996*	0.0535	-1.86	0.066
Oval shape	0.0456	0.1343	0.34	0.735	0.0412	0.0765	0.54	0.591
Clean	-0.1194	0.1180	-1.01	0.315	0.1039	0.0743	1.40	0.165
Small size	-0.0294	0.0343	-0.86	0.394	-0.0336	0.0255	-1.32	0.190
Flock size	-0.0008***	0.0002	-3.17	0.002	-0.0002	0.0002	-0.85	0.399
Education	-0.0504*	0.0302	-1.67	0.099	0.0796***	0.0229	3.47	0.001
Income	0.0131	0.0217	0.60	0.548	-0.0324***	0.0175	-1.85	0.000
Constant	2.9606	0.1650	17.93	0.000	2.7607	0.1366	20.20	0.000
R ²	0.1791				0.2015			
Prob>F	0.0212				0.0020			

***, **, *** indicates significant levels at 10%, 5% and 1% respectively**

10% more compared to the price of brown shell eggs in Makueni. In PCA analysis, results indicated that shell colour correlated with the first component in Makueni (Table 4.11) hence the relevance of the attribute in consumer choice and preference. The probable reason for this is that consumers perceive that white eggs come from indigenous chicken reared on organic feeds and hence healthy. Accordingly, majority (80%) of eggs bought in Makueni were white in colour (table 4.11). In Nairobi however, white shell eggs had a negative and significant effect on price ($p < 0.10$). *Ceteris paribus*, the price of white shell egg in Nairobi was 9% lower than that of brown shell eggs. This finding indicates that Nairobi consumers pay higher prices for brown eggs than for white eggs. This is contrary to the other results from this study where 76% of eggs purchased in Nairobi had white shell. This implies that although consumers in Nairobi prefer white shell, they are unable to value them when making purchase decisions. Consequently, it can be deduced from these findings that preference for egg shell colour is dependent both on region and cultural dimension of the populations in those regions. These findings are in line with other researchers; Hanis et al. (2013) who found that Malaysian consumers were willing to pay higher prices for white eggs compared to brown eggs.

Similarly; Jacob et al. (2000) found that white shell eggs were highly demanded among the Americans. On the contrary, Odabasi et al. (2007) found that consumers in United Kingdom, Italy, Portugal, Ireland, Southeast Asia, Australia and New Zealand preferred brown eggs over white eggs. Shell colour therefore

presents a market niche which can be exploited by both producers and retailers in these two counties depending on the consumer preferences in those counties. Literature provides no evidence on nutritional importance of egg shell colour despite its preferences.

The study found that 93% and 96% of consumers in Makueni and Nairobi respectively preferred oval eggs compared to non oval. Whereas in Nairobi cleanliness had the expected positive sign implying that clean eggs commands premium price, in Makueni the sign was negative indicating price discounts for clean eggs. Accordingly, 89% and 100% of eggs bought in Makueni and Nairobi were clean. Results of PCA analysis indicated that cleanliness was correlated with components 1 and 2 for Makueni and Nairobi respectively (Table 4.11 & 4.12). Producers and traders should endeavor to supply clean eggs to the consumers in Nairobi. The small sized egg did not significantly influence price in both counties but had the expected negative sign indicating price premium for large eggs than small eggs. Results of PCA established that size of an egg is highly considered by consumers while making purchase decisions. This implies that consumers loose utility by consuming small eggs and hence will tend to discount them compared to large eggs. Jacob et al. (2000) reported increased demand for large and extra large eggs in America. Changhee et al. (2011) established that egg prices increased with increase in size in Korea while Hanis et al. (2013) found that large eggs were put as grade A and were highly preferred followed by the medium sized eggs.

With regard to socio-economic factors, education was statistically significant ($p < 0.10$) in Makueni and Nairobi (Table 4.14). In Makueni, education level was negatively related to the price of eggs. This indicates that the most educated consumers in Makueni paid price discounts of 5% compared to less or not educated consumers. This connotes that retailers and producers should target less educated consumers in Makueni to increase their revenue. On the other hand, educated consumers in Nairobi paid price premiums to eggs and this was statistically significant at ($p < 0.01$). Education is correlated to acquisition of information on nutritional and health benefits associated with indigenous chicken eggs hence the likelihood for payment of premium prices. Shang-ho et al. (2016) sought to determine preferences for meat labeling in Taiwanese traditional markets. The results indicated that younger females with higher education had a positive willingness to pay (WTP) for food safety related information, i.e. traceability and growth hormone.

Income levels had negative and significant effect on price of eggs in Nairobi ($p < 0.01$). *Ceteris paribus*, consumers in high income category paid 3% less compared to those in lower income category. This connotes that IC eggs can be regarded as normal goods where consumers tends to reduce their expenditures as income increases. Players in the IC egg value chain should focus on middle income consumers to maximize their revenue. In Makueni, income was not significantly related to price of eggs probably because majority of the consumers belonged to low income category. Flock size negatively significantly influenced the price of IC

eggs in Makueni ($p < 0.01$). Consumers who reared large amount of IC paid less for eggs compared to those who had little flock size or did not rear IC at all. The findings connotes that rearing of IC enriches consumers with adequate information on prevailing market prices of eggs compared to those who do not rear.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary, conclusion and recommendations to this study. Summary is an abstract of the results, Conclusions are based on the results obtained from the study in an attempt to address three objectives. Recommendations are proposed for policy makers, government institutions, research institutions, farmers and retailers in the indigenous chicken meat and eggs value chain.

5.2 Summary

This section presents the analysis of indigenous chicken consumption patterns and their preference attributes. The logistic regression model showed that age, gender, education, household size and price significantly influenced the level of consumption frequency of indigenous chicken meat. Principal component analysis (PCA) was conducted to evaluate attributes of indigenous chicken meat and eggs that influences consumption. The analysis showed that whereas in Makueni consumers considered skin colour, tenderness, size and price to be important attributes influencing their choice and preferences for IC meat, in Nairobi the focus was on freshness, sex, skin texture and price as the major attributes that

influenced their consumption. In indigenous chicken eggs, cleanliness and size were considered the most important attributes by consumers in Makueni while price and freshness influenced choice and consumption for Nairobi consumers.

The hedonic pricing model for IC meat showed that plumage colour and age of IC had significant influence on the price in Makueni while in Nairobi, sex of IC and frequency of purchase significantly influenced retail prices. In indigenous chicken eggs; shell colour and flock size significantly influenced consumer prices.

5.3 Conclusion

This study aimed to establish consumer preference attributes in indigenous chickens' meat and eggs so as to aid players in the IC value chain strategize their activities in line with consumer expectations. In indigenous chicken consumption patterns, the study found that Nairobi consumers purchased IC more frequently than their Makueni counterparts. The most preferred method of preparing IC was stew at 66% in Nairobi and 63% in Makueni and majority of consumers had large family members. The study concluded that family size dictates the method in which IC will be prepared. The study found that gender and price of IC significantly had a positive influence on the consumption frequency of indigenous chicken meat in Makueni while education level and age had a negative influence. Low consumption level of IC among the educated and elderly consumers was attributed to lack of awareness on the nutritional benefits associated with consumption of IC. In Nairobi, it was established that age and household size had negative significant

influence on the consumption frequency while price had a positive impact. The elderly consumed less frequently while families with large members consume more frequently. The study concluded that socio demographic variables influences consumption frequency in IC.

Skin colour, tenderness, size and price are important IC meat attributes that influences choice and consumption in Makueni. In Nairobi, consumers will focus on freshness, skin texture, sex and price of IC while making their purchase decisions. The study concluded that supply of live IC on the market followed by establishment of slaughter facilities will enhance consumption by consumers who are sensitive to fresh meat. In indigenous chicken eggs, cleanliness and size were important attributes that influenced choice and consumption in Makueni County while in Nairobi county, freshness and size influenced preferences for indigenous chicken eggs. The preference for size by consumers in both counties was attributed to the anticipated increased utility that consumers are likely to get when consuming such eggs as opposed to small sized eggs.

The third objective sought to establish the influence of indigenous chicken meat and eggs attributes on price. Indigenous chickens with white and black plumage colours had negative significant effect on chicken prices. The discount prices paid to this attributes had resulted in their scarcity in the market since they were associated with religious rituals. On the other hand, chickens that were aged between 8 and 20 weeks had a positive and significant effect on the price. The

positive influence on price was attributed to their multiple uses especially their use as a rearing stock. The study showed that in Makueni, the attributes included in the model explained 24% of the variation in price. In Nairobi County, sex of indigenous chicken significantly had a positive influence on the price. This study concluded that significant premium prices paid for male indigenous chicken was due to their big size which was as a result of faster growth compared to the females hence enabling them to put on less fat and maintaining tender meat at mature stage. The study established that attributes in the model explained 38% of the variation in price. Socio-demographic factors such as consumption frequency and marital status influenced indigenous chicken price. The study concluded that consumption of indigenous chicken is preferred by majority of consumers due to both extrinsic and intrinsic health and nutritional cues.

In the analysis of indigenous chicken eggs, the study established that shell colour had a positive and statistically significant effect on the price in both counties. However it was discovered that whereas Makueni paid premium prices for white shell eggs, their counterparts in Nairobi discounted white shell and paid premium prices for brown shell eggs. The study concluded that preference for shell colour was on the basis of the region and consumers' perception.

5.4 Recommendations

Producers in the chicken value chain have focused on productivity traits such as high growth rates/feed conversion rate, high fertility rates and high number of eggs per clutch. Emphasis on productivity traits ignored consumer preference attributes in chickens. This practice results in production of chickens that do not necessarily satisfy market needs leading to low utilization and performance of the chicken value chain. The findings of this study provide necessary information for policy formulation and value chain players to enhance performance of chicken market.

The preferred chicken attributes by consumers were; sex, freshness, skin colour, tenderness and size. These results form the basis upon which both private and public chicken breeders, farmers and traders establish development and improvement programs of these attributes. Traders will benefit from the results by stocking chickens with preferred attributes to accelerate acquisition and utilization by consumers. Consequently, results from chicken consumption patterns indicated that household size was significant in influencing consumption frequency of IC in Nairobi County. This offers traders the basis for market segmentation. Farmers should orient their chicken production practices by adopting production methods that enhance incorporation of significant preference attributes. In order to enhance utilization of dressed IC by consumers, the study recommends preservation of IC freshness by establishing chicken slaughter facilities across major market centers.

Research institutions should incorporate attributes of interest to consumers in their breeding programmes so as to enhance consumer acceptability and utilization of chicken meat. Additionally, attributes that attracted price discounts such as black and white plumage colour should be eliminated among the breeding traits so that farmers do not lose utility by raising chickens with those attributes. The findings on influence of chicken attributes on price also indicated that both players in the supply chain will maximize their total revenues by producing and stocking chickens which are of male sex and young age (8-20) weeks in Nairobi and Makueni County respectively. These attributes attracted price premiums in the respective counties. To enhance preference attribute awareness among chicken farmers, the study recommends adoption of supply driven approach to extension by the county departments of agriculture.

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APPENDICES

Appendix 1.1: Publications Emanating From the Thesis

1. **Ndenga Charles**, Eric K. Bett & Lucy W. Kabuage (2017). Consumers' preference attributes for indigenous chicken in Kenya. *Journal of Agricultural Economics and Development*, Vol. 6(1), 1-11.
2. **Ndenga Charles**, Lucy W. Kabuage & Eric K. Bett (2017). Analysis of Consumer Preference in product attributes: A case of indigenous chicken eggs in Kenya. *Journal of Economics and sustainable development*, Vol. 8, No. 2, pp. 145 – 151.
3. **Ndenga Charles**, Eric K. Bett & Lucy W. Kabuage (2017). Determinants of households' consumption frequency for indigenous chicken in Kenya. *Journal of Economics and sustainable development*, Vol.8, No.22, pp. 39-44.
4. **Ndenga Charles**, Lucy W. Kabuage & Eric K. Bett (2018). Economic analysis of Consumer demand for indigenous chicken eggs in Kenya. *Journal of Economics and sustainable development*, Vol.9, No.17, pp. 56-61.
5. Lucy W. Kabuage, **Charles Ndenga** & Eric K. Bett (2018). Assessing Consumer Priority attributes for Indigenous chicken products: Implications for Marketers. *Journal of Economics and sustainable development*, Vol.9, No.20, pp. 42-46.

Appendix 1.2: Questionnaire

The general objective of this research is to determine the consumer preferences towards indigenous chicken in Makueni County and Nairobi County. The information gathered from this survey will be treated with highest level of confidentiality. The information from this study will inform other stakeholders and inform the process of policy development concerning indigenous chicken production and marketing in Makueni County and Nairobi County.

SECTION A: GENERAL INFORMATION

Questionnaire No.....

1. Name of market_____County_____Sub county_____
2. Name of enumerator_____
3. Date
4. Name of Respondent.....Phone No.....
5. Gender of the respondent
 Male Femal

SECTION B: HOUSEHOLD CHARACTERISTICS

6. Please fill the table below relating to the respondent.

Age of respondent in years	Marital status (1) Married (2) Single (3) Widower/widow (4) Other (specify)...	Highest level of education. 1)No formal education 2)Primary 3)Secondary	Relationship to the household head. 1) Son 2) daughter 3) Father 4) Sister 5) Others	Household size (indicate the total number of members in the household)	Monthly income(Kshs.) (1)no income (2)less than 10,000 (3) 10,001 – 20,000 (4) 20,001 -

		4)Diplom a 5)Degree 6)Post graduate 7) Others (specify)			30,000 (5) 30,001 – 40,000 (6) 40,001 – 50,000 (7) 50,001 – 60,000 (8) above 60,001
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7. (a) Do you own land?

Yes No

(b)Which type of ownership?

Leehold Freeld counal.others

(c) What is the land size in acres?.....

SECTION C: INDIGENOUS CHICKEN ATTRIBUTES

8. (a) When did you last purchase indigenous chicken?

Todaythis week last weeklast month

Others (specify).....

(b) In what form was the indigenous chicken during your last purchase?

Live Dressed Meat parts

9. How often do you purchase the product form in 8(b) above?

Daily Weekly monthly yearly others (specify).....

10. Fill in the table below information relating to the purchases of the product in 8(b) for the last one year.

Month	Oct 014	Nov	Dec	Jan	Feb	Mar	Ap	Ma	Ju	July	Aug	Sept 2015
Unit Price Ksh/kg												
Quantity (kg)												

11. (i) Where did you last purchase your product form in 8(b) above?

- Trading centre
 Open air market
 City market
 Slaughter
 Butchery
 Supermarket
 Others (specify).....

(ii) State the market of your choice and give reasons for your preference.....
.....
.....

12. (i) Do you consider product attributes when purchasing the product form in 8(b) above?

- Yes No

(ii) If yes, indicate by a tick your attributes of preference in the table below and rank them in order of importance using a scale of 1 – 5, where 1 is most important and 5 least important

ATTRIBUTE	Preference (indicate by ticking √)	SCORE				
		1	2	3	4	5
Price						
Size						
Plumage colour						
Skin texture						
Age						
Meat colour						
Smell						
Freshness						
Tenderness						
Fat content						
Sex						
Skin colour						
Package						

13. Indicate your preferred attribute for the product in 8 (b) above while purchasing in the following attributes.

Attribute	Preferred quality aspect									
Plumage colour	<input type="checkbox"/>	White	<input type="checkbox"/>	Black	<input type="checkbox"/>	Brown	<input type="checkbox"/>	Mixed colours	<input type="checkbox"/>	Others

Skin texture	<input type="checkbox"/> Rough	<input type="checkbox"/> S mooth	<input type="checkbox"/> Others.....		
Skin colour	<input type="checkbox"/> Yellow	<input type="checkbox"/> White	<input type="checkbox"/> Orange		
Meat colour	<input type="checkbox"/> White	<input type="checkbox"/> Red	<input type="checkbox"/> Others.....		
Age	<input type="checkbox"/> Less than 8 weeks	<input type="checkbox"/> 8–20 wks	<input type="checkbox"/> 21 – 28 wks	<input type="checkbox"/> > 28 wks	
Sex	<input type="checkbox"/> Male	<input type="checkbox"/> F emale			
Tenderness	<input type="checkbox"/> Very tender	<input type="checkbox"/> T ender	<input type="checkbox"/> Hard		
Fat content	<input type="checkbox"/> Low fat	<input type="checkbox"/> Moderate	<input type="checkbox"/> High fat		
Size	<input type="checkbox"/> Less than 1 kg (small)	<input type="checkbox"/> > 1kg<2 kg (medium)	<input type="checkbox"/> >2 kg(large)		
Freshness	<input type="checkbox"/> Fresh	<input type="checkbox"/> F rozen			
Package	<input type="checkbox"/> unlabelled	<input type="checkbox"/> labelled			

SECTION D: CHOICE AND CONSUMPTION

14. Indicate your level of awareness of indigenous chicken using the scale below.

Factor	1Strongly disagree	2 disagree	3Neutral	4agree	5Strongly agree
1) Indigenous chicken leads to hunger and poverty alleviation					
2) Indigenous chicken offers more employment opportunities					
3) Market demand for indigenous chicken has positive impacts on rural economy					
4) Indigenous chicken leads to food security					
5) Indigenous chicken do not carry any drug residues					
6) Consumption of indigenous chicken reduces chronic diseases					
7) Indigenous chicken are produced without the use of antibiotics					
8) Indigenous chicken do not contain GMOs					
9) Indigenous chicken is rich in protein					
10) Indigenous chicken contain more nutrients					

11) Indigenous chicken is good for the environment					
12) High prices of indigenous chicken signals better quality					
13) Indigenous chicken are in harmony with environment					
14) I worry a lot about the existence of artificial flavours					
15) I care about knowing the source of I.C					

15. Where do you get information concerning indigenous chicken?

Radio T.V Newspaper internet verbal others

(specify).

16. (a) Do you rear indigenous chicken?

Yes No

(b) If yes, what is the flock size?.....

(c) How many indigenous chicken do you consume monthly.....

(d) How much income did you raise from indigenous chicken products last Month?

(e) How many IC did you give as gifts in the last year?.....

(f) How many IC did you receive in the last year as gift(s) in the last year?.....

17. In what form do you prepare your indigenous chicken meat for consumption?

Stew deep fry others (specify)...

18. (a) Are there restrictions on the parts of indigenous chicken to be consumed by females in the family?

Yes No

(b) If yes, what parts of indigenous chicken are they restricted from?

Specify.....

19. (a) Is the consumption of indigenous chicken associated with special occasions in the family?

Yes No

(b) If yes, specify the occasions.....

20. Using a scale of 1 – 5, where 1 is most preferred and 5 least preferred rank the following meat products based on your own assessment?

MEAT PRODUCT	RANK				
	1	2	3	4	5
Beef					
Indigenous chicken					
Exotic chicken					
Fish					
Pork					

SECTION F: INDIGENOUS CHICKEN EGGS ATTRIBUTES

21. When did you purchase indigenous eggs last?

Today last week last month last year other

(specify)

22. How often do you purchase the indigenous eggs?

Daily Weekly monthly yearly others (specify).....

23. Fill in the table below information relating to the purchases of the indigenous chicken for the last one year.

Month	Oct obe r 201 4	N ov	D ec	Janu ary	Febru ary	Mar ch	Ap ril	M ay	Ju ne	Ju ly	A ug	Septem ber 2015
Unit Price (Ksh/e gg												
Quanti ty (no.of eggs)												

24. (i) Do you consider product attributes when purchasing the eggs?

Yes No

(ii) If yes, what attributes do you consider? Tick the attributes in the Table below and indicate the level of importance by awarding scores 1-5, where 1 is most important and 5 least important

ATTRIBUTE	Preference (indicate by ticking √)	SCORE				
		1	2	3	4	5
Price						
Size						
shell colour						
Yolk colour						
Meat/blood spot						
Freshness						
Shape						
Packaging						

25. Indicate your preferred quality aspect of the I.C eggs above while purchasing in the following attributes.

ATTRIBUTE	PREFERRED QUALITY ASPECT				
yolk colour	<input type="checkbox"/> White	<input type="checkbox"/> Black	<input type="checkbox"/> Yellow	<input type="checkbox"/> orange	<input type="checkbox"/> Others
Shell colour	<input type="checkbox"/> White	<input type="checkbox"/> Brown	<input type="checkbox"/> Others.....		
Freshness	<input type="checkbox"/> Fresh	<input type="checkbox"/> S tored	<input type="checkbox"/> Others.....		
Shape	<input type="checkbox"/> oval	<input type="checkbox"/> Twin egg	<input type="checkbox"/> With protrusion		

Meat/blood spot	<input type="checkbox"/> clean	<input type="checkbox"/> Blood / meat spotted			
Size	<input type="checkbox"/> Small	<input type="checkbox"/> M edium	<input type="checkbox"/> Large	<input type="checkbox"/> Extra large	
Packaging	<input type="checkbox"/> Polythene	<input type="checkbox"/> P lastic	<input type="checkbox"/> trays	<input type="checkbox"/> Others	

26. Using a scale of 1 – 5, where 1 is most preferred and 5 least preferred, rank the following egg types based on your own assessment?

Type of egg	RANK				
	1	2	3	4	5
Indigenous chicken					
Exotic chicken egg					
Turkey egg					
Guinea fowl egg					
Quail egg					