AN ANALYSIS OF INDIGENOUS CHICKEN MARKETING EFFICIENCY AND MARKET PARTICIPATION AMONG PRODUCERS IN MAKUENI COUNTY- KENYA

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DECLARATION

Student Declaration

I David Michael Ochieng Ayieko declare that this thesis is my original work and has not been presented for the award of a degree in any other university or any other award

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This thesis has been submitted for examination with our approval as the university supervisors

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DEDICATION

This work is dedicated to my Parents, Brothers, Sister and Sisters in law for their unmatched support.

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ABD	Agribusiness Development
ASALs	Arid and Semi arid lands
BLUE	Best Linear Unbiased Estimate
CLRM	Classical Linear Regression Model
CR4	Concentration Ratio of 4 firms
DLPO	District Livestock Production Officer
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GM	Gross Margin
GMM_P	Producers Gross Marketing Margin
HHI	Herfindahl Index
IC	Indigenous Chicken
IMR	Inverse Mills Ratio
KAPAP	Kenya Agricultural Productivity and Agribusiness Project
Ksh	Kenya Shillings
KWFT	Kenya Women Finance Trust
ME	Marketing Efficiency
MM	Marketing Margin
MoA	Ministry of Agriculture
MOLFD	Ministry of Livestock and Fisheries Development
MS	Market Share

NGO	Non Governmental Organization
NMM	Net Marketing Margin
OLS	Ordinary Least Square
RoK	Republic of Kenya
SCP	Structure Conduct Performance
TC	Total Cost
TFC	Total Fixed Cost
TR	Total Revenue
TVC	Total Variable cost
USAID	United States Agency for International Development
VIF	Variance Inflation Factor

ABSTRACT

The indigenous chicken *Gallus domesticus* production is an important agricultural activity in many households in Kenya. Despite its importance, little research has been carried to enhance its productivity unlike other farm enterprises. The producers from Makueni are constrained in their participation in the indigenous chicken high value markets .Therefore, the objective of this study was to analyze the marketing efficiency of the indigenous chicken marketing channels in Makueni, determine the profitability of indigenous chicken to producers in Makueni and to determine the factors that have an effect on participation of producers from Makueni in the high value markets. A random sampling was used to sample 130 households from Makueni County and 66 traders from indigenous chicken markets in Makueni County. The Data used in this study was collected by the use of semi structured questionnaires, with additional information from key informant interviews and focus group discussion. This data was then analysed using Stata11 and Excel software. The SCP (structure-conduct-performance) approach coupled with the shepherd index, Gross margin analysis and Heckman two stage models were used to analyze the marketing efficiency, determine the profitability of indigenous chicken to producers and identify factors that have an effect on the high value markets participation of producers respectively. The results showed that the indigenous chicken markets had a concentration ratio (CR4) of 41% and a Herfindahl Hirschman index (HHI) of 1087.The 8 marketing channels identified had an average marketing efficiency of 2.29. The main constraints included: price fluctuations, inadequate access to credit and information, inconsistent supply, theft and lack of storage facilities. The producers got a gross margin of Ksh.8455 per year. Apart from the age of the household head, which had a negative effect on the producer decision to participate in indigenous chicken high value markets, processing, education level of household head, the farmer group membership status, the flock size and region all had a positive and significant effect decision to participate in indigenous chicken high value markets. On the other hand, the family size, the type of indigenous chicken, experience in selling indigenous chicken and the flock size all had a significant and positive effect on the number of indigenous chicken sold. However the age of the household head had a negative effect on the number of indigenous chicken sold. Therefore it is recommended that contract models should be used to improve the marketing efficiency. Secondly, the producers should use collective marketing to enhance their profits. Finally to increase the participation of the producers in the high value markets, the Government policy framework must focus on improving indigenous production and marketing in Makueni County.

CHAPTER ONE: INTRODUCTION

1.1 Background Information

1.1.1 Introduction

Agriculture contributes 25% of the Kenyan Gross Domestic Product (GDP) (RoK, 2010b). It provides 65% of the export earnings and employment to 70% of the Kenyan population in the rural areas (RoK, 2010a). Agriculture is one of the key sectors identified to deliver the growth rate of 10%, envisioned under the economic pillar, in the Vision 2030 (RoK, 2010a).Therefore, the performance of the Kenyan economy is closely tied to the performance of the agricultural sector (Gitau, 2009).

The Livestock sub-sector contributes 7% of the GDP and 17% of the Agricultural GDP (RoK, 2010a). It includes the dairy, beef, camel, poultry and other emerging livestock such as fishery and bee keeping. The sub sector plays a central role in the provision of raw materials to agro processing industries and also utilizes inputs from other industries (RoK, 2010b). Owing to the inter-linkages with other sectors any external interference to this sub – sector therefore impacts on the supply chain and the economy of Kenya.

The national poultry population in Kenya is estimated at 31 million birds (Nyaga, 2007).The indigenous chickens *Gallus domesticus* makes up about 76% of this national poultry flock (RoK, 2010a). Nearly all rural and peri-urban families in Kenya keep a small flock of free range chicken, with an average number of 13

birds (Nyaga, 2007). These indigenous chickens make significant contributions to household economic, social and cultural welfare (Kitalyi, 1998). The production and marketing of these indigenous chickens is a source of employment to 2 million people in Kenya (Kimani, 2006).

Poultry production in Kenya is characterized by dualism, with chicken produced by large scale and small scale producers (Okello *et al.,* 2010). They are classified into 4 different groups, which include industrial, integrated commercial, semi commercial and village or backyard. The bio – safety level varies in each of these groups (Nyaga, 2007). The large scale producers are fully integrated and linked to commercial markets (USAID, 2010). On the other hand, village or backyard production system is mainly associated with the small scale producers, with little input requirements and is mainly for household consumption (Okitoi *et al.*, 2006).

The global per capita consumption of meat has risen from 14.9 kg in 1991 to 16 kg in 2007 and is expected to rise to 22 kg in the year 2050 (FAO, 2009).According to Delgado *et al.* (1999) meat consumption is projected to grow from 209 million tons in 1997 to 327 million tons by 2020.There is also an increase in chicken consumption in Sub Sahara Africa including countries like Kenya (Hazell, 2007). The importance of indigenous chicken is emphasized by the fact that the contribution of poultry to animal protein is projected to rise to 40% by the year 2020 (Delgado *et al.*, 1999). This rise has been attributed to the preference

given to indigenous chicken in comparison to exotic chicken and red meats globally as shown by Upton (2000) in Kenya and in Ireland by McCarthy (2004). This is because indigenous chicken is lean, with an organic origin and fetches a premium in markets (Ndegwa *et al.*, 2000). Finally, urbanization is another factor associated with this rise in demand of indigenous in the urban and peri-urban areas (Delgado, 2005).

The end market for poultry meat in Kenya is classified into a low income market, middle income market and a high income market based on the consumer income (USAID, 2010).The indigenous chicken market similarly has these three levels that vary in terms of the operations, products, location and number of participants that are found at each level (Bett *et al.,* 2012). At the high income market, unlike in the other markets, the consumers are willing to pay higher prices to get safe and quality products; with product differentiation, value addition, packaging of products and selling of indigenous chicken as whole units being common features in these markets (Gamba *et al.,* 2005).

Makueni County is one of the main producers of indigenous chicken in Kenya (Muthee, 2009).However, a large part of the population (62%) lives below the poverty line and experience erratic rainfall that result in crop failure (ACF-USA, 2012). This population mainly derives 50% of their income from livestock and 30% from crops (GoK, 2006). Therefore, indigenous chicken has a significant role in the livelihoods of rural resource poor household (Kabuage,

2010). However, many of the households (77%) in Makueni sell their indigenous chicken at the local markets to meet their household needs, with only 4% selling their indigenous chicken at the high end terminal markets on commercial basis (KAPAP, 2012).

It is apparent from the background information that producers of indigenous chicken in Makueni are still constrained in production and marketing of the indigenous chicken. This results in the negative effect on the ability of indigenous chicken to alleviate poverty and improve livelihoods of the producers despite the presences of high value markets. This implies that there is a need to undertake studies on two key areas, where there is little available information. The first one is on the marketing efficiency of the indigenous chicken market. The second is on participation of producers from Makueni in indigenous chicken high value markets. The findings of such studies could lead to policy recommendation, with potential to improve the marketing efficiency and the participation of producers in the indigenous chicken high value markets.

1.2 Problem Statement

The indigenous chicken rearing enterprise in Kenya and Makueni in particular is popular owing to its low cost of production, high adaptability to varied ecological zones and quick returns on invested cash. These attributes make it an attractive avenue for income generation and poverty alleviation, hence improved livelihood for resource poor rural farmers. On the other hand, there is an

increase in demand for indigenous chicken in the urban and peri urban centers. This demand has lead to the emergence of high value markets that offer a premium. However, the supply of indigenous chicken to this high value market remains low. Further, producers from Makueni are constrained in regard to full participation in the high value market, which results into a negative effect on improved income and poverty alleviation. There is also a lack of information on the marketing efficiency and the factors that affect the participation of producers from Makueni County in these high value markets. Therefore, this study attempted to fill the existing knowledge gap.

1.3 Objective

The overall objective of this study was to analyze the marketing efficiency and participation of Indigenous chicken producers in Makueni County. This was achieved through the following specific objectives:

1. To analyze the marketing efficiency of indigenous chicken marketing channels in Makueni County

2. To determine the profitability of indigenous chicken to producers in Makueni County.

3. To describe the socioeconomic characteristics of producers and determine their effects on participation of producers from Makueni County in high value markets

1.4 Research Questions

To achieve the above objectives the following research questions were used:-

1. What is the marketing efficiency of the indigenous chicken marketing channels in Makueni County?

2. What is the profitability of the Indigenous chicken to producers in Makueni County?

3. Which socio economic characteristics of indigenous chicken producers from Makueni County have an effect on their participation in the IC high value market?

1.5 Scope of Study

This study was part of a wider project on indigenous chicken value chain in Makueni being undertaken by a consortium and funded by Kenya Agricultural productivity and Agribusiness Project (KAPAP). The study covered Makueni District in Makueni County, specifically Wote, Kaiti and Kee divisions, which are among the sources of supply of the indigenous chicken that is sold in Nairobi. The markets covered in Nairobi included Burma, Kariokor and City market. In addition, traders were sampled from restaurants, butcheries and supermarkets in Makueni. The marketing of indigenous chickens was covered by describing the market channels, identifying the actors in the market, describing the flow of indigenous chicken, determining the profitability of indigenous chicken to producers in Makueni and identifying the factors that affect participation in

indigenous chicken high value markets and proposing strategies to overcome the constraints. The period of reference was the 2012 calendar year.

1.6 Significance of Study

The results of this study are expected to ultimately improve the income of producers of IC in Makueni County. The producers are likely to participate more in high value markets. The second beneficiaries will be the indigenous chicken traders. The traders will be able to improve their marketing efficiency by adopting strategies that are recommended. This will allow them to make more profits. The third beneficiary will be the government. The various agencies and ministries within National and County Government that are associated with production and marketing of indigenous chicken will benefit from adopting the recommendations made. Therefore, they will be able to improve on their regulatory and coordination functions in the production and marketing of indigenous chicken. The other beneficiary will be non-governmental organizations and community based organizations, which will be in a position to identify intervention points for the indigenous chicken projects. The policy makers will be able to know specific areas to direct more resources to enhance producer participation in the indigenous chicken high value market. In addition, the results will narrow the existing knowledge gap and the recommendations will provide areas for further studies by researchers.

1.7 Theoretical and Conceptual Framework

The purpose of this study was to mainly understand why producers are constrained in their participation in the high value market. Consequently, it was assumed that participation in indigenous chicken high value markets was influenced by two sets of factors. The first set comprised the market structure, conduct and performance on one hand. The second one was the decision at the household level to participate in the indigenous chicken high value market. Therefore, this section presents the profit maximization theory and conceptual framework in relation to participation in markets.

The farm household decisions can be explained using profit maximization theory, utility maximization theory or the risk aversion theory. The current study adopted the utility maximization theory and used the producer household as an economic analysis unit. The producer maximized utility subject to constraints of production resources. The producer was assumed to interact with perfect competitive markets to determine price and demand for indigenous chicken.

The producer who was assumed to be rational then choose the indigenous chicken market that maximized the utility. The indigenous chicken markets were classified as high value markets and other markets based on form in which the indigenous chicken was sold. The markets in which the indigenous chicken was sold after slaughtering and packaging were classified as high value markets. The

actions were not observable and therefore the choices made by the producers were used to measure utility.

The utility theory proposes that if there are two or more alternative choices, then a rational producer chooses the alternative that yields the maximum utility. If the two alternative choices are shown by *j* and *k*, then the corresponding utilities can be represented by U_j and U_k respectively. The linear random utility model can be represented as by Green (2003).

$$U_{ij}(\beta_j X_i + e_j) > U_{ik}(\beta_j X_i + e_i), k \neq \forall_i, \quad \ldots\ldots (1)$$

According to Green (2003) X*i* represent the vector of the dependent variables that are assumed to affect the choices and e_j and e_i are the error terms, which are assumed to be independent and identically distributed. The probability that a household choose alternative *j* instead of *k* can be defined as:

$$P(Y=1/X) = P(U_i > U_k) \quad \ldots\ldots (2)$$

and the unknown parameters is given by

$$\beta' = (\beta_i - \beta_k) \quad \ldots\ldots (3)$$

The conceptual framework of this study is based on the structure conduct performance (SCP) model (Figure 1).

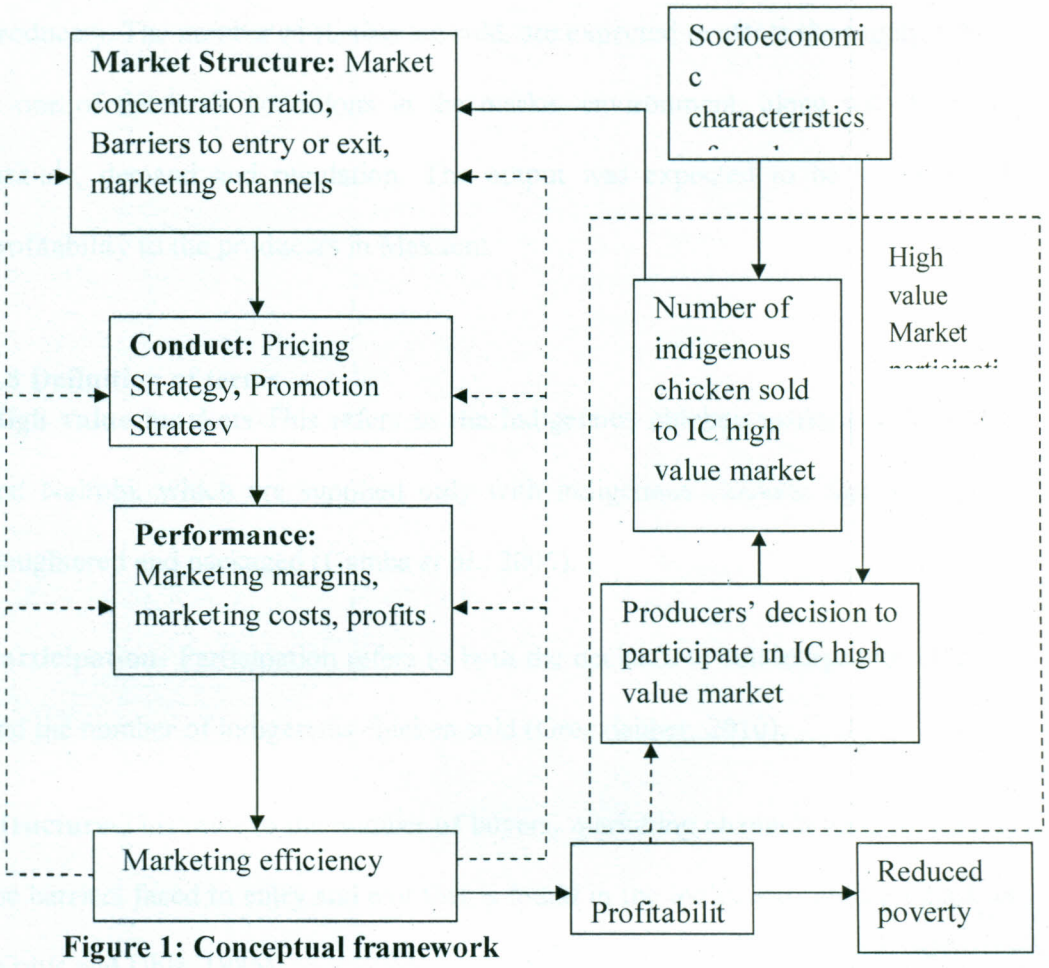

Figure 1: Conceptual framework

Source: Adopted from Greer (1992)

The proposition is that structure, conduct and performance are linked in a deterministic way for example the market basic conditions, determines its structure, which determines conduct and conduct in turn determines the performance. The study also, conceptualizes that the participation in IC high value market is a sequential process, whereby the producer make a decision to participate in the IC high value market and then decide on the number of the IC that will be sold. It is also visualized that the decision to participate and the number of the IC that are sold is affected by socio economic characteristic of the

producers. The number of IC that are sold, are expected to affect the supply, which is one of the basic conditions in the market environment, along with business attitude, demand and regulation. The output was expected to be an increased profitability to the producers in Makueni.

1.8 Definition of terms

High value markets-This refers to the indigenous chicken markets in Makueni and Nairobi, which are supplied only with indigenous chicken, that have been slaughtered and packaged (Gamba *et al.*, 2005).

Participation- Participation refers to both the decision to sell indigenous chicken and the number of indigenous chicken sold (Gregziabher, 2010).

Structure-This refer to the number of buyers, marketing channels used by sellers; the barriers faced to entry and exit that is found in the indigenous chicken markets (Kohls and Uhls, 1985).

Conduct-This refers to the production, promotion and pricing strategies found in the high value markets (Greer, 1992).

Performance-This refers to the equality or inequality among the market participants due to the structure and conduct of the market (Lutz, 1994).

Marketing efficiency-This refers to the extent to which marketing agents move goods from producer at a minimum cost and maximum service to consumer (Shepherd, 1965).

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews developments in IC markets and their implications for producers. The main issues reviewed with reference to the IC are marketing of IC and the high value market. Secondly, studies that have employed structure-conduct-performance (S-C-P) approach in agricultural marketing are reviewed with the aim of showing the gap that this study attempted to fill.

2.2The poultry value chain in Kenya

Okello *et al.* (2010) studied the value chain of the Poultry Industry in Kenya. This study described the main actors in the indigenous chicken value chains in Kenya as producers, rural retailers, rural wholesalers, urban retailers, urban wholesalers and brokers/traders. In addition, other actors who provided support to value chain included feed suppliers, veterinarians, millers and transporters. The intermediaries were broadly classified into live-bird traders, egg traders and traders that handle dressed carcasses of poultry. This study described the industrial and commercial integrated sector in poultry which may have varied aspects from the village or backyard sector which was dominated by smallholder farmers. This study had results which were consistent with those of Owuor and Bebe (2009) that identified similar actors in indigenous chicken markets in Kenya. In addition, it was consistent with the findings of Bett *et al.* (2012) that identified similar market segments in indigenous chicken markets. These studies therefore

provided background information to the current study in the identification of the actors along the indigenous chicken value chain.

A study by Nyaga (2007) on the overall Kenya poultry sector showed that the indigenous chicken markets in Kenya were characterized by limited biosecurity, with large commercial producers having more formalized arrangement and stronger biosecurity measures. Outside the organized sector the biosecurity concerns were ignored, with transportation of chicken done chicken *en masse* that lead to injuries, suffocation, loss of body weight and death in many cases. The results of this study were consistent with the findings of Okello *et al.* (2010) that identified low bio security levels in IC markets in Kenya. It also supports results by Mailu et *al.* (2009) in a study that revealed the low level of organisation in indigenous chicken markets in Eastern Kenya. However none of these studies were focused on production with a limited description of the markets on the basis of their structure, which the current study did.

Omiti and Okuthe (2007) carried out a study on the Kenyan poultry bio security status. The results showed that biosecurity levels varied in the four sectors namely: industrial integrated, commercial, semi-commercial, village and backyard. The markets also lacked a clear traceability mechanism. The use of slaughter houses in marketing poultry was a new feature necessitated by emergence of diseases and need for value addition. In areas where there were large Muslim populations the slaughter houses were able to meet the *Halal*

requirements. Slaughter houses were either private or Government operated and the target markets were individuals, supermarkets (local or distant), hotels (local or distant) and municipal markets. These findings concur with those of Bett *et al.* (2012) that showed that abattoirs and slaughter houses were few and mainly found in the terminal markets where they are controlled by municipal and the city councils. However Bett *et al.* (2012) did not assess the reason for weak linkages between producers and the high value markets, despite identifying the problem.

The current situation as shown by the literature reviewed in this section is that studies have been done on the marketing of indigenous chicken in Kenya. However most of the studies have focused on production related issued, with little quantitative information on the marketing efficiency of these markets. Even for those that have analysed marketing of indigenous chicken, none has employed the approach that the current study used to analyse the marketing efficiency and participation of producers in high value markets.

2.3 Linking smallholder producers to the high value markets

Weerahewa (2004) conducted a study in Asia on the marketing of indigenous animal products. This study focused on the supply, demand and consumption patterns of the indigenous animal products, including chicken. The results of the study showed that indigenous livestock products consumers were willing to pay more for these livestock products compared to exotic animals. This willingness to pay was conditional on availability of the indigenous animal

products. These findings are consistent with those of Upton (2000) which showed a preference of consumers in Kenya for indigenous chicken based on their taste, texture and origin .Therefore this showed that indigenous livestock are preferred to the exotic livestock on the basis of these qualities and created a special market segment.

Owuor and Bebe (2009) examined the factors that influenced the price efficiency of indigenous chicken in Kenya among the smallholder farmers. The results of the study showed that there were large differences in the prices of indigenous chicken along the marketing channels. In addition, there were distinct rural and urban markets for IC. The price was found to be set depending on the anticipated turn over and losses. It therefore recommended connecting rural producers to urban agribusiness in Kenya. This was to ensure a reduction in the price differences and to enhance linkage and information access between producers in rural areas and consumers in urban centers. Finally it recommended improving the feeding of IC by the farmers. This study therefore revealed the price inefficiency but did not link it to other elements of the market such as conduct and structure.

The peri-urban areas of towns in Eastern province, particularly in Kitui, Matuu, Machakos, Yatta, Makueni and Tala are some of the main areas where IC is produced (Omiti and Okuthe, 2007). Most of these areas are found in the ASALs where land has low productivity and erratic rainfall patterns (ACF-

USA, 2012). These areas which are found in the Eastern province of Kenya have 14.2% of all IC found in Kenya, (Muthee, 2009).These IC require small space to keep, feed on available grains and is adoptable to ASALs (Okeno *et al.*, 2010). Consequently, IC acts as a ready source of income, with no gender or taboo restrictions in these areas (Meseret *et al.*, 2010).However there are only a few households in this area that sell directly to the high value markets(KAPAP,2012).

2.4 The structure conduct and performance approach

The structure conduct performance (SCP) approach was developed by Mason in 1930s, used by Joseph Bain in 1950s and by Michael Porter in the 1980s (Seanicaa *et al.*, 2006). First this approach considers the structure of the market in terms of size of market, number of buyers and sellers. In addition, it considers the barriers to entry or exit of a market. Second, the conduct of the market considers behaviour and interactions among actors in addition to their coping techniques. Thirdly, the performance is assessed through marketing margins in the market, which represent the distribution of benefits (Van Melle *et al.*, 2008).

The structural characteristics can be used to classify markets into perfectly competitive, monopolistic or oligopolistic perfect competition (Tomek and Robinson, 1990). As a rule of thumb when the four enterprises' concentration ratios is 50% or more (as an indication of a strongly oligopolistic company), when it is 35-50% (weak oligopoly), and less than that is a competitive industry (Kohls

and Uhls, 1985). The main barriers to entry that are considered can be institutional, economical or technological (Zeberga, 2010).

The conduct of a market is assessed by the use of pricing strategies and promotion strategies (Greer,1992).The behaviour of the market participants include the survival techniques that they use to adjust to the changes within markets (Zeberga,2010).This may also involve considering relationships between actors, information flows and innovations in the market (Bett *et al.*,2012).

The performance of a market is analysed mainly by the marketing margins; with a big margin implying that profits are reduced or absent in some cases (Mussema, 2006). Therefore in a competitive market the margin would be a sum of the acceptable profits and costs. In addition, the efficiency of the chain actors and the distribution of the benefits also reflect on the performance of the market. The other indicators of performance are the impact on income and welfare (Lutz, 1994). According to Ferguson and Ferguson (1994) performance is related to customer satisfaction and can be measured by prices of commodity, marketing efficiency, amount of profits and costs incurred. However there are two competing hypotheses under the SCP paradigm, namely: the structure performance hypotheses and the efficient structure hypotheses (Edward *et al.*, 2006).

Karl *et al.* (2011) emphasized that alternative methods such as structure-conduct-performance approach are required to supplement the value chain analysis. This is first, because value chain analysis is unable to rank or

assess the impacts of interventions. Secondly, value chain analysis is unable to analyse complex market dynamics and feedbacks found in livestock systems. In addition value chain analysis does not have the ability of measuring performance by the use of performance metrics or conducting specific types of policy analysis. Therefore, they recommend the use of other models that are able to supplement the value chain analysis. It is on the basis of this that the study adopted the SCP model to assess the marketing efficiency of IC market.

Martin and Lorena (2007) conducted a study on the Portuguese Tomato processing sector using a structure-conduct-performance model. Their objective was to examine the effect of concentration on performance and firm strategy. They found a CR4 of 75 - 91% and Lener Value of 0.2 - 0.3 for several years in the Tomato market in Portugal. There was a higher concentration of the sellers and negative performance. Also there was no linkage between the market share and Research and Development expenses, which is contrary to the expectation that market share increases when research and development expenses rise. Consequently, their study had an implication on research and development policies, marketing policies and industrial establishment policies. The study recommended value addition to tomato and product differentiation to remain competitive in the European Union market. In addition, they recommended more efficient firms offering higher prices. However, the study was limited in terms of not addressing reasons for low value addition and differentiation of tomato.

Bosena *et al.* (2011) used the structure-conduct–performance to study marketing of cotton in Ethiopia. The objective of their study was to evaluate efficiency of marketing chain and farm supply of cotton. Their results showed that the cotton markets had a CR4 of 49.76%.This showed that they were oligopolistic, with barriers to entry and a poor market chain performance. The buying, selling and pricing strategies were used to assess the market conduct. These showed deviations from acceptable norms. There was also a poor performance of the market chains. This was shown by the costs analysis and market margins. The policy implication of the study was in areas of production, processing and marketing of cotton in Ethiopia. These studies similar to Martina and Lorena (2007) established a link between structure of market and performance. However, it had limited information on the determinants of participation in the cotton markets.

Dessalegn (1998) studied the constraints on grain market performance in Ethiopia. The objectives of the study were to determine the marketing efficiency of grain markets in Ethiopia and identify constraints on participants that influence performance. The results showed that some grain markets were dominated by a few major traders, which caused inequality in market share. The farmers carried grains to markets 10 kilometers away and used 79% of produce immediately after harvest. However there was no information on export markets, no access to extension and no decision making information. The flow of grain between markets was determined by brokers in Addis Ababa, while the prices were determined by

deducting the miscellaneous costs and net trader margins from prevailing wholesaler prices. In addition, the farmers lacked credit and storage facilities, while traders faced constraints of taxes, convenient marketing places and poor transport. However, the study by Dessalegn (1998) did not assess the marketing efficiency using the shepherd index (Shepherd, 1965).

Hanekom *et al.* (2010) studied the potato processing industry in South Africa. The study used a structure-conduct-performance model. The objective of the study was to qualitatively assess the performance of the industry. The results showed that there was a lack of trust between processors and producers in the potato processing in South Africa. The large firms were found to be price setters, with their economies of scale being one of direct issues of concentration. The profits margins were low, which lead processors to focus on quantity. Also, the high levels of concentrations lead to low competitiveness. The study recommended that processors had to increase efficiency by branding, advertising and contracting farmers to produce potato. In addition, they recommended lowering of barriers to entry and creating of incentives. The findings of the study were similar to those of Dessalegn (1998), Martina and Lorena (2007); Hanekom *et al.* (2010), and Bosena *et al.* (2011) which explained performance from the structure and not the efficiency of market.

Mussema (2006) carried out a study on the marketing of pepper in Alaba Kulito, Ethiopia, using a structure-conduct-performance model. The

objective of the study was to assess the marketing and supply of pepper. This was done using co-integration and error correction model between regional markets and terminal markets. The results showed that the traders were setting prices in isolation of bargains. The sampled markets were oligopolistic, with a low producer share and a high marketing cost. There was also poor information about the markets, where participation was influenced by crop yield. Finally, there were no cooperatives, which would improve farmers' bargains. This study considered farmer cooperatives unlike the previous study by Takele (2010) and Dessalegn (1998).

Nguyen *et al.* (2005) did a study on cassava value addition in North Vietnam using a value chain analysis approach. The objectives of the study were to examine the marketing chain of cassava and its effects on the livelihoods of the participants. In addition, the study aimed at providing strategies to overcome challenges in the marketing chain. The results showed the presence of many layers in the cassava value chains that lead to lower profit margins in the North Vietnam. There was also lack of governance in the cassava value chains, with farmers incurring high transaction and transport costs. The cassava was sold in unmodified form, while farmers were exposed to various environmental risks that threatened the existence of cassava processing villages.

The study by Nguyen *et al.* (2005) had policy implications in the areas of poverty alleviation, infrastructure, production and marketing of cassava in

North Vietnam. This study recommended construction of processing sites and reduction of administrative procedures before establishing processing plants. Also it recommended establishing strong backward linkages and good managerial practices. However, the study was qualitative in nature and depicted the insufficiency highlighted by Karl *et al.* (2011).

Afolabi (2007) studied the marketing of eggs in South Western Nigeria, using SCP model. The objective of this study was to analyse the egg market in terms of the performance, market structure and to determine the profitability of eggs in the study area. In addition, it used a production function to identify factors that affect the production of eggs. The results showed a high level of inequality among traders. The results showed that cost of purchase, storage and experience were statistically significant. The study recommended that egg marketing should be used as a viable strategy for poverty alleviation. However, the study like the study by Olufemi and Adeolu (2010) did not address participation in the market for the respective products but focused on the factors affecting production and the structure to performance of market.

Olufemi and Adeolu (2010) conducted a study on broiler processing enterprises in South Western Nigeria using an SCP model. The results showed a high degree of concentration, which caused a monopolistic market structure. There was also a vertical integration in the market. The large scale processors had a higher return on investment at between 4.3% and 6.2% compared to small scale

processors with less than 3%.This study had policy implications in areas of research in developing methods which result into low cost of producing live chicken. The study was therefore important in explaining why processing of broilers was done by large firms. The study unlike that of Afolabi (2007) despite not focusing on market conduct measured return on investments in poultry.

2.5 Agricultural markets and producer participation

Takele (2010) studied the marketing of rice in Amhara State in Ethiopia. The study combined a structure-conduct-performance model and a Heckman two stage model to analyse market participation. The results showed that the most important buyers of rice from producers were wholesalers (45%) and millers (27%).The Farmers traveled 0.6 hours to Woreda to sell rice in oligopolistic markets. The amount of rice sold were positively influenced by household education and total rice quantity sold, while the probability of participating in selling rice was increased by market information access, quantity of paddy produced, total value of livestock unit and extension contact with farmers. The cost benefit analysis showed that rice production is profitable to rice farmers. This study, unlike that by Dessalegn (1998), established the effect of extension and market information on amount of product supplied to the market and assessed profitability. However this study did not assess participation of producers in specific market segments but focused on the participation in the overall market.

Gebregziabher (2010) did a study on poultry marketing in Tigray Region of Ethiopia, with the objective of analysing the poultry market chain to identify the main constraints. The results showed that traders were constrained by permanent market place, diseases and trade licenses in the Tigray Region of Ethiopia. The Marketing channels for eggs and chickens were shorter compared to that of other agricultural commodities, with significant amounts going directly from the farmer to the consumer. The main constraints to poultry production were diseases, limited supply of exotic chicken and health services. Opportunities were employment; high turnover, small feed requirement and less land requirement. Sex of household head, education and distance from market were variables that influenced participation in markets negatively. Value of poultry sales were influenced by negatively by the region and positively by poultry owned. This study adopted a similar approach to Takele (2010) and did not proceed with further analysis using the marketing margins.

Kosgei *et al.* (2011) analysed the marketing of honey in West Pokot District. The results showed that market supply of honey in West Pokot was positively and significantly influenced by education level of household head, price of honey and quantity of honey produced. The channel was very short and direct between the consumers and producers. The main problems identified were drought, pests and diseases of bees, death of bee colony, lack of apiary skills and market problems. The study recommended interventions in capacity building for producers in production and marketing of honey. This study unlike the other

studies looked at previously introduces prices as influencing amount supplied. However like the other studies by (Takele, 2010; Gebregziabher, 2010) it offered little insight on the marketing efficiency of the honey.

Zeberga (2010) examined the marketing of eggs in Yigrelam and Alaba regions of Ethiopia. The study was done using S-C-P model. The results showed that there was a strong oligopolistic behaviour in egg markets in Yigrelam and Alaba at 98% and 93% with barriers to new entrants. Live bird trading was oligopolistic at 59.7% with the involvement of wholesalers. Production and trading of live birds was found to be profitable to farmers. Their participation was influenced by sex of household head, family size, number of birds kept, and purpose of poultry keeping. Traders faced constraints in capital, short and inconsistent supply, poor infrastructure, while the producers faced diseases, volatile prices and demand. The study by Zeberga (2010) like that of Kosgei *et al.* (2011) considers price as a constraint in supply of product to markets. It also identifies family size and purpose of poultry keeping as influencing participation in markets unlike the study by Gebregziabher (2010).

Bett *et al.* (2012) assessed linking utilisation and conservation of IC genetic resources to value chains. The study found that productivity of IC was hindered by diseases and parasites, predators, price fluctuations and lack of market for products. Age, education and occupation of house hold head were found to affect market participation. The other variables that were significant were found to

be number of IC owned and reared, distance to main road, market prices of indigenous chicken products, production system, access to market information, extension, preference for indigenous chicken genotype by farmers and preference for specific chicken traits by traders were significant. Although this study by Bett *et al.* (2012) focused on indigenous chicken market participation it did not look at participation of producers in specific segments of the markets. In addition the structure of the market was analysed qualitatively using descriptive statistics.

This study like that of Kosgei *et al.* (2011) established that price influenced participation. It also like that of Gebregziabher (2010) established the negative influence of distance on participation in poultry market. In addition, like the study by Gebregziabher (2010) it establishes the effect of extension on participation. The study by Bett *et al.* (2012) established the influence of the number of birds kept on participation just like the study by Zeberga (2010).However unlike the other studies it establishes the influence of traits and genotype of indigenous chicken on participation.

Ngigi (2002) evaluated the impact of transaction costs and market outlet risks on market participation of smallholder dairy farmers in central Kenya. This study used price decomposition models to characterise the marketing systems, logit and Tobit models to examine how the transaction and market outlet risks influence the participation of small holder farmers. The high perishability of milk and milk flow patterns were found to be the main source of transaction cost and

market outlet risks. These two sources were associated with quantity constraints and market accessibility constraints which had a significant effect on market participation, with the average milk production at 9 liters and the distances to main road at 4.3 km. The marketing system had varied market outlets and the size of milk surplus per household influenced the choice of the market outlet and the farmers decision to sell on cash or credit, and the proportion of milk that was sold. There was also a variation in the prices of milk depending on the market outlet used and the contractual agreements. However small dairy farmers preferred contractual agreements due to their comparative benefits in terms of time payment patterns.

The study by Ngigi (2002) recommended the creation of an environment that allows for innovation in diverse market outlets and modes of payment. Secondly, it recommended collective marketing as a way of reducing transaction cost risks and market outlet risks. However, despite having analysed participation of the small dairy farmers in Dairy markets this study did not focus on specific elements of the structure of the markets. This includes the classification of the market in terms of competition and analysing marketing efficiency.

2.6 Marketing efficiency and performance in Agricultural marketing system

Emam (2011) evaluated the marketing efficiency of tomato in Khartoum using the market margin analysis and marketing efficiency, computed using the shepherd index. The results showed that the tomato markets were

dominated by male traders, with varied levels of education and over 5 years experience. The wholesalers had higher margins compared to the retailers. However, the retailers had higher marketing efficiency compared to the wholesalers. Consequently, the study recommended reduction in the costs and increasing investments for higher efficiency. This study by Emam (2011) however focused on crop markets, compared to the current study that focused on livestock markets, specifically IC markets.

Massoud and Srinivasa (2012) analysed the marketing efficiency and price spread for saffron in Iran using marketing margin analysis and marketing efficiency. The Shepherd index was used to calculate the marketing efficiency. The results showed that middlemen received the maximum margins, while the wholesalers received the lowest margin. In addition, the highest price spread was found in the direct channels, while the lowest was found in channel with producer, middlemen, foreign traders and foreign consumers. There was also a challenge in regular supply and price fluctuations of saffron. Therefore, they recommended the streamlining of cooperatives and forward contracting between producers and marketing bodies.

The studies reviewed in this section were grouped into three. First were those that assessed the marketing performance using SCP .Second,there were those that analysed market participation of producers in the markets by combining SCP and the Heckman two stage models. Third were the studies that used market

margin analysis and shepherd index to analyse the marketing efficiency. It was evident that no studies in the livestock sector and specifically indigenous chicken had used the third approach, which combined the marketing margin analysis and the shepherd index to analyse the marketing efficiency of IC in Makueni. Further, none of the studies had examined IC market participation of producers in Makueni in the IC high value markets. Therefore, it was on that basis that this study was done to attempt to fill this knowledge gap.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents a description of the study site, research design that was used, population, sampling procedure and the sample size determination. The data collection tools and data analysis techniques that were used are also discussed.

3.2 Study Site

Makueni District, found within Makueni County, lies between Latitude 1^0 35′, South and Longitude $37^0$10′ East and $38^0$30′ East. The District covers 8,009 km^2 with an altitude of 600m – 1,900m above sea level. The district has rainfall variability with an annual range of 800 – 1,200mm per year in the hilly areas and less than 500mm per year in the other regions. The annual mean temperature range in the District is 20.2^0C – 24.6^0C (RoK, 2005).The study area has a comparative advantage in the production of IC since it is found in an ASAL area. Also it is one of the areas that were targeted by KAPAP project for intervention in the meat value chains for enhanced income to producers and poverty alleviation for improved livelihoods.

Makueni County is one of the main producers of indigenous chicken in Kenya (Muthee, 2009).However, a large part of the population (62%) lives below the poverty line and experience erratic rainfall that result in crop failure (ACF-USA, 2012). This population mainly derives 50% of their income from

livestock and 30% from crops (GoK, 2006). Therefore, indigenous chicken has a significant role in the livelihoods of rural resource poor household (Kabuage, 2010). However, many of the households (77%) in Makueni sell their indigenous chicken at the local markets to meet their household needs, with only 4% selling their indigenous chicken at the high end terminal markets on commercial basis (KAPAP, 2012).

3.3 Sampling Design and Sample Size

The sampling design that was used was a multistage sampling design. This was comprised of three stages. First, a random sampling was used to select Makueni District from among IC producing areas in Kenya. Secondly, random sampling was used to select three regions (divisions) from 25 other divisions in Makueni District. These divisions were Kee, Kaiti, and Wote in Makueni from where households were selected using random sampling technique.

Third, a purposive random sampling was then used for the selection of the high value markets in Nairobi and Makueni. This was done because the high value markets are mainly found in urban centers such as Nairobi. This urban center was chosen due to its close proximity to Makueni and availability of high value markets. Finally, traders were selected by purposive sampling within these markets.

Table 1: Distribution of sample size

Step	Sampling method	Location			Sample size
1	Random sampling	2 areas (Makueni and Nairobi)			Total = 196
2	Random sampling	**Makueni**			163
		Kee	Kaiti	Wote	
		Households=18	Households=62	Households=50	
		Middlemen=5	Middlemen=5	Hotel=3	
		Assemblers=6	Assemblers=6	Restaurants=2	
				Butcheries=2	
				Assemblers=2	
				Guest house=2	
3	Purposive sampling	**Nairobi**			33
		Burma	Kariokor	High Value Markets	
		Middlemen=5	Middlemen=5	Supermarkets=3	
		Wholesaler=6	Wholesalers=6	Butcheries=4	
				Guest houses=2	
				Restaurants=2	

Source: Author Computation (2013)

The households were randomly selected using systematic random sampling from a list of households provided by the District Livestock Production Officer (DLPO) for three divisions and based on the weighted household's distribution as shown in Table 2 below.

Table 2: Number of households in Makueni District

Division	Number of Households
Kee	3,293
Kaiti	9,136
Wote	11,327
Total	23,756

Source: DLPO, Makueni (2013)

A total of 130 households were sampled based on the formula:

$$n = \frac{Z^2 pq}{e^2} \text{ (Cochran, 1977) ;.....................................(4)}$$

Where n=Sample Size Z=1.96, p=Proportion of households rearing indigenous chicken in Makueni District. q=1-p, e =0.029270.e is the desired precision level.

$$n = \frac{1.96^2 \times 0.97 \times 0.03}{0.029270^2} = 130 \text{ Households}$$

The numbers of households sampled for each division were as follows:

$$\text{Kee} = \frac{3{,}293}{23{,}756} \times 130 = 18 \text{ Households}$$

$$\text{Wote} = \frac{11{,}327}{23{,}756} \times 130 = 62 \text{ Households}$$

$$\text{Kaiti} = \frac{9{,}136}{23{,}756} \times 130 = 50 \text{ Households}$$

The traders sampled were purposively selected based on the availability of markets, since there is no agreed method of finding the sample size at the different levels of a value chain (Mendoza, 1995). The number of traders was determined by use of the formula:

$n = \frac{Z^2 pq}{e^2}$ Cochran (1977) Where n=sample size, p=0.35 is the proportion of IC traders in Nairobi market, q=0.65 is weighting variable computed as 1-p and e=0.1150 is the acceptable error due to the slightly low precision of distinguishing traders from other individual in the market .This gave a sample size of 66 for traders $n = \frac{(1.96)^2 \times 0.35 \times 0.65}{0.1150^2} = 66$. The traders were then distributed as shown in Table 1, in order to meet the minimum sample size requirement of at least 30 individuals from the population.

3.4 Data Collection

The data collection was done by trained enumerators from the area to overcome challenges in language and due to their familiarity with the locality. The primary data was obtained from producers and traders, in the IC market in Makueni and Nairobi Counties. The pretested structured questionnaires (Appendices 1 and 2) were used to obtain information on socioeconomic characteristics of traders and producers involved in the IC production and marketing.

Secondary data was also obtained from the Ministry of Agriculture (MoA) and the Ministry of Livestock and Fisheries Development (MoLFD) regarding IC production and marketing in Kenya, Nairobi and Makueni County in particular. This was then used to identify and describe barriers to entry and exit in indigenous chicken markets. In addition, the existing policies in these areas were identified. The secondary data provided was also used in description of the study area and for calculating the sample size.

A Focus Group Discussion (FGD) was conducted to supplement information from the household level. The focus group was made of selected farmers from farmer groups in Makueni. These farmers were involved in indigenous chicken production and marketing. The main information obtained from this group was on constraints to production and marketing of IC in Makueni.

3.5. Summary of Data Analysis

The data obtained was analysed through qualitative and quantitative methods. The data collected was used to analyse SCP of indigenous chicken market, the profitability of IC and the participation in the high value markets. This section presents the methods that were used to analyse data collected from the households, traders and from the focus group discussion.

3.5.1. Analysing structure of indigenous chicken market

This study analysed the market structure conduct performance based on the SCP approach used by Greer (1992). First, data on socio economic characteristic

of traders was analysed through descriptive statistics. Secondly, data on barriers to entry and exit of market was analysed by descriptive statistics. Thirdly, data was obtained on where IC was purchased from and sold to along with the prices and quantities of IC. This was consequently used to describe the marketing channels. Finally the concentration ratio and the Herfindahl Hirschman Index (HHI) were calculated. The Herfindahl Hirschman Index is given by: $\sum_{i=1}^{N}\left(\frac{x_i}{T}\right)^2 = \sum_{i=1}^{N}(S_i)^2$ (Herfindahl,1959).Where S is a share of a firm in the market size, T is the total market size and Xi is quantity produced by the i^{th} respondent.

The concentration ratio is used in measuring the market share held by suppliers in a market (Pindyck, 2012) .The greater the degree of concentration, the greater the possibility of non competitive behaviour; it also refers to the number and size, distribution of sellers and buyers in the market. The concentration ratio is given by: $CR(4) = \sum_{i=1}^{n} s_i$ (Marfels, 1971).....(5)

Where s_i represents market share of i^{th} firm and n= 4 is number of largest firms for which the ratio is going to be calculated using the formula $S_i = \frac{V_i}{\sum V_i}$ Where S_i=Market share of i^{th} firm; V_i =Amount handled by buyer i; $\sum V_i$ =Total Volume handled by the n firms.

The HHI and concentration ratio (CR4) were both used for comparison purposes and to describe the competition in the IC market. According to United States Department of Justice and Federal Trade Commission (USDOJFTC, 2010), a HHI < 1500 indicates that a market is not concentrated, a HHI between 1500 and 2500 indicates that a market is moderately concentrated and a HHI greater than 2500 indicates that a market is highly concentrated.

3.5.2 Analysing market conduct of indigenous chicken market

The conduct of the market was assessed by collecting information from the traders and producers on the pricing strategy, promotion strategy and production strategy. The pricing strategy, promotion strategy and production strategy were assessed by asking the questions contained in the questionnaire (Appendix 2) under the respective sections. The information on these issues was then counter checked. This was done by holding Focus Group Discussion and using secondary information from the Key Informants such as DLPO offices at Wote and PDVS at Nairobi County.

3.5.3 Analysing performance of indigenous chicken market

After marketing channels for the IC between Makueni and Nairobi were described, the performance of the IC market was assessed by calculating marketing margins along these channels. In addition, the marketing costs along each channel was determined and subsequently used in calculation of the marketing efficiency of the IC market.

i) $\frac{EBP - FSP}{EBP} \times 100 = TGMM$ (Hays, 1975).... (6) where TGMM is the total Gross Margin, EBP is the end buyer price and FSP is first seller price

ii) $\frac{EBP - MGM}{EBP} \times 100 = GMMp$ (Hays, 1975)..... (7) where GMM*p* is the gross marketing margin of producers and MGM is marketing gross margin.

The marketing efficiency was calculated using the Shepherd index for each of the marketing channels that were identified.

iii) $ME = \frac{O}{I} - 1$ (Shepherd, 1965)..... (8)

Where ME= Marketing Efficiency Index

O= Consumer price of IC sold in Kenya Shillings per Kilogram (Ksh/Kg)

I= Total marketing cost in Kenya shillings per Kilogram (Ksh/Kg)

Mendoza (1995) recommends the use of gross margins when analysing performance of agricultural value chains as opposed to the use of net margin analysis. This is because it is hard to accurately determine most of the cash costs and imputed costs in agricultural value chains. Consequently, the marketing gross margins were calculated.

3.5.4 Determining the profitability of indigenous chicken

Gross Margin Analysis was used to determine profitability of IC to producers in Makueni. The revenue obtained from selling chicken and costs incurred by producers of indigenous chicken in Makueni County was calculated. The Gross sales and the variable costs were calculated, after which the variable costs were deducted from the Gross sales. The gross margin was done on the basis of a flock size of 100 birds. The formula that was used for calculating the gross margin was based on Barnard and Nix (1979) .

$$\text{Total Cost (TC)} = \text{TVC} + \text{TFC} \quad \ldots\ldots (9)$$

$$\text{Gross Margin (GM)} = \text{TR-TVC} \quad \ldots\ldots (10)$$

$$\Pi = \text{GM} - \text{TFC} \quad \ldots\ldots (11)$$

Where: Total fixed cost (TFC) =Summation of all fixed costs; Total Variable Cost (TVC) = Summation of all variable costs; Total amount realized (TR) = Total amount from the IC produce and Π=Profit

3.5.5 Factors determining participation in indigenous chicken high value markets

The decision to participate in indigenous chicken market was sequential. First, producers choose whether to participate in the indigenous chicken market or not, then they decide on the extent of participation i.e. the number of indigenous chicken to sell (Table 3).

Table 3: The Dependent and independent variables

Variable	Explanation	Category	Value	Hypotheses
PHVM(Dependent)	Participation in High Value Market	Dummy	0=No 1=Yes	
NICS(Dependent)	Number of IC sold	Continuous	Number	+
AGHH	Age house hold head	Continuous	Years	+
SEHH	Sex of house hold head	Dummy	0=Male 1=Female	+/-
EDHH	Education of house hold head	Dummy	0=Illiterate 1=Literate	+
FSZ	Family size	Continuous	Number	+
ICFLZ	IC Flock size	Continuous	Number	+
LASZ	Land Size	Continuous	Acres	+
OTHLISTCK	Other livestock	Continuous	Number	+
MINFO	Access to Market Information	Dummy	0=No 1=Yes	+
CRDTA	Credit Access	Dummy	0=No 1=Yes	+
WOD	Wote Dummy	Dummy	0=No 1=Yes	+
DAWR	Distance to main road	Continuous	Kilometer	+/-
DMKT	Distance to nearest Market	Continuous	Kilometer	+/-
EXTFRQ	Extension Frequency	Continuous	Number	+
PRSCG	Processing IC	Dummy	0=No 1=Yes	+
SOFIC	Source of IC	Dummy	0=Others 1=Research Institutes	+
MSHGRP	Group member	Dummy	0=No 1=Yes	+
EXPRIC	Experience selling IC	Continuous	Years	+

Source: Author (2013)

3.6 Heckman Sample Selection Model

The heckman two stage models was used. The first step involved the decision of where to sell IC. The second step involved how many IC to sell. On the basis of the decision made in the first step the households were grouped into those that sell IC to high value market and those that do not. A binary dependant variable was then generated which indicated the probability of belonging to each of these groups.

Those that sold the indigenous chicken to high value markets were assigned, value=1. While those that did not sell indigenous chicken to high value markets were assigned a value=0. Then the independent variables shown in Table 3 were used in a probit regression. This was because it was assumed that the decision to sell indigenous chicken and the number of indigenous chicken sold to the high value market were affected by different factors. Also it was selected since the decision to participate in indigenous chicken high value market and the number of IC sold to the high value market was assumed to be sequential. The second stage used the number of indigenous chicken sold to the high value market as the dependent variable in an OLS regression.

According to Nïcoletti (2011) the Heckman selection model is used in situations that involve participation. This is done to avoid selection bias that may arise as from using OLS (Ordinary Least Squares) regression. The model assumes that there are two successive choices that are made. The second choice is only

possible if the outcome of the first choice is positive. It is also assumed that the dependant variable follows a normal distribution. These two steps are assumed to be associated with a key factor called inverse mills ratio or hazard function, which is normally denoted by λ.

The Heckman selection model was used to identify the factors that affect the participation of producers from Makueni County in the high value market. A selection equation was used for the first part. This equation was a Maximum likelihood probit equation. The dependent variable is a dummy showing the decision to participate in the IC high value market (PHVM).

$Y=X_1\beta_1+U_1 \qquad U\sim N(0, 1)$.....(12)

PHVM=1 if $Y>Y^*$ PHVM=0 if $Y\leq Y^*$, where PHVM is Participation in IC high value market.

Where Y_{1i} is latent dependant variable which is not observed and $Y^*=0$

X_1 is a vector of variables that were assumed to affect the household decision to participate in IC market.

β_1 is a vector of the unknown parameter in the participation equation

U_1 is the residuals that were independently and normally distributed with a mean of zero and a constant variance.

The second stage involved the OLS equation that had the number of indigenous chicken sold by the participating households as the dependent variable. The assumption that was made is that only the households that had participated would be analysed at this stage.

$Y_1=X_2\beta_2+U_2$..... (13)

$U_2 \sim N(0, \delta^2)$ are NICS=Y is number of IC sold. This is observed if and only if PHVM=1.The variance of U_1 is normalized to one because only PHVM, not Y* is observed. The error terms, U_1 and U_2 are assumed to be bivariate and normally distributed. Then β_1 and β_2 is the vector of the unknown parameter to be estimated for the explanatory variables, X_{1i} and X_{2i} respectively. The inverse Mills ratios is represented by (λ_i) and is obtained from the selection equation and used in the OLS.

In the outcome equation Y_1 is the observed dependent variable, X_2 is factors assumed to affect number of IC sold. β_2 is vector of unknown parameter in the number of IC sold equation, while U_2 is residuals in the supply equation that are independently and normally distributed with zero mean and constant variance. Mills Ratio (λ_i) =F ($X_1\beta_1$) ÷ 1-F ($X_1\beta_1$). F ($X\beta$) is density function and 1-F ($X_1\beta_1$) is distribution function (Green, 2003).

3.7 Data analysis

The data collected from the farmers, traders and other sources was analysed using inferential and descriptive statistics. The data on the questionnaire was entered into the Excel software in a computer. The data was then validated and cleaned before being coded. Subsequently it was transferred to Stata 11 where data analysis was performed. First the histogram for each variable was produced and a kernel density superimposed on it to assess the normality of the data.

The variables that were found to have multicollinearity were transformed and the results of the VIF and correlations are shown in Appendix 6.According to Green (2003) multicollinearity refers to a situation where there exists a strong relationship between the dependent variable and the independent variables .This makes it hard to distinguish between the effect of the dependent and independent variable. In order to ensure that there was no multicollinearity, the VIF test for association was used. As a rule of thumb, if the individual VIF or average VIF is greater than 10, there is likely to be multicollinearity. Also if the correlation coefficient is higher than 0.4, there was likely to be multicollinearity in the data.

The variables were assessed for heteroscedasticity to ensure that the coefficients gave the right estimates.According to Guajarati (2003) when there is no uniformity in the variance of the disturbance term then there is heteroscedasticity. This is mainly caused by several factors. One factor is skewness in the data mainly due to majority of the observations tending to occur

on one side. Secondly, the presence of outliers leads to heteroscedasicity. Third, when the data is transformed incorrectly and the model functional form is poorly stated there is a likelihood of heteroscedasicity. Whenever the classical linear regression model (CLRM) is violated then the heteroscedasicity occurs. However, despite the presence of heteroscedasicity the estimator are still BLUE (best linear unbiased estimator) but are not efficient.

This current study used Breusch-Pagan/Cook test for heteroscedasicity. As a rule if the test is statistically significant, the null hypothesis is accepted. This means there is no constant variance and hence the presence of heteroscedasicity. The results for the Breusch-Pagan test are shown in Appendix 5.

CHAPTER FOUR: RESULTS

4.0 Introduction

This section presents the results of the study. The results of the SCP of the IC market are presented in this section. First, the traders' socio economic characteristics are presented. Second, the marketing channels are described and the actors identified. Third, in this section the results of the market concentration ratio are represented along with the barriers to entry. The other results in this section include the elements of the market conduct such as pricing strategy and production strategy. Finally, the results of the market performance which include marketing margins and marketing efficiency are presented.

This section contains results of the profitability of IC to producers. This includes the variable costs, fixed costs and gross income from IC. This was used to calculate the profitability of indigenous chicken in Makueni.

The other results are those of the socioeconomic factors that have an effect on participation of producers in the IC high value market. The results are shown as a selection equation and an output equation which make up the Heckman two step models.

4.1 Structure Conduct Performance of indigenous chicken market

This section contains the description of the socioeconomic characteristics of the traders that were sampled. The vertical integration was described by the use of marketing channels. In addition, the barriers to entry and exit of markets are identified and described. Finally, the results of the market concentration ratio and

Herfindahl Hirschman Index (HHI) are displayed. Consequently these results are used to represent the structure of the market.

4.1.1 Socioeconomic characteristics of traders

The main socioeconomic characteristics of traders are shown in Table 4. The traders travel long distance to markets and have a low membership in the trader groups. The male are the main traders with a low level of experience in terms of years. The reason for these results may have been due to the physical demanding activities involved in marketing of indigenous chicken and the long distance covered. These results agree with those of Gebregziabher (2010) which found that male traders covered long distance to markets.

Table 4: Summary of trader socio economic characteristics

Characteristic	Mean	Standard Deviation	Min	Max
Age (years)	37.07	11.02	22	60
Family size (number of members)	4.07	2.17	1	9
Distance to nearest market (Kms)	22.24	51.98	0.5	250
Group Membership (Yes=1 No=0)	0.20	0.41	0	1
Years of Experience (years)	8.72	6.75	0.5	23
Number of Market Days (number)	5.15	1.98	1	7
Sex of Trader (Male=1 Female=0)	0.75	0.44	0	1
Amount of capital (Ksh)	97,613.64	205,281.20	5,000	1,000,000

Source: Field Survey Data (2013); N=66

4.1.2 Market Channels

There were eight main marketing channels that were identified, as shown in Figure 2, between the producers and consumers, who were found in Makueni County and Nairobi County. The main actors that were identified along the channels included producers, assemblers, wholesalers, retailers and consumers.

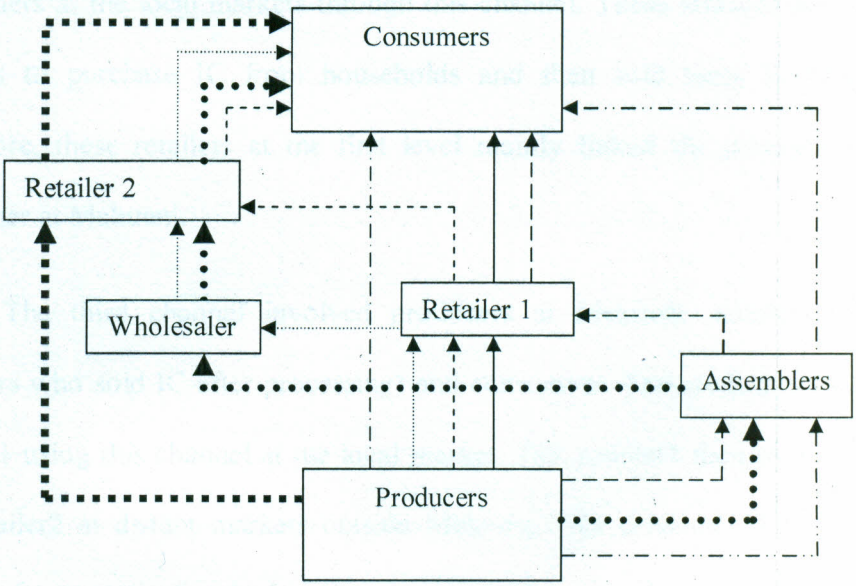

Figure 2: The main marketing channels for indigenous chicken

Key:-

——→	Channel 1	——→	Channel 5
——→	Channel 2	·····→	Channel 6
– – →	Channel 3	• • • →	Channel 7
- - - - →	Channel 4	▪ ▪ ▪ →	Channel 8

Source: Field survey Data (2013)

The first channel was a direct link between the producer and consumer. The producers sold at the farm gate to consumers or at the local market at Wote town. This channel was the shortest, with 33% of respondents out of the sampled households using this channel. The indigenous chickens were mainly sold in live

form by 94% of the sampled households. Only 2% of sampled households sold slaughtered chicken and 4% sold IC in other forms such as cooked.

The second channel involved producers, retailers that were found at the local market (retailer1) and consumers. The producers sold their produce directly to retailers at the local markets through this channel. These retailers also went to villages to purchase IC from households and then sold them to consumers. Therefore, these retailers at the first level mainly linked the producer and the consumer at Makueni.

The third channel involved producers at Makueni, retailer1, retailer2 (retailers who sold IC after processing) and consumers. The producers sold to the retailer1 using this channel at the local market. This retailer1 then sold directly to the retailer2 at distant markets outside Makueni. The consumer then purchased directly from retailer2 at the butcheries, supermarkets, hotels and guest houses.

The fourth channel was made up of the path that consisted of producers, assemblers, retailer1. The producers used this channel to sell to the assemblers who in turn sold to retailer1. The consumers then bought from the retailer1 at the local market at Wote.

The fifth channel involved the producers, assemblers and consumers. The producers used this channel to sell to the assemblers. Then these assemblers sold directly to the consumer.

The sixth channel involved producers, retailer1, wholesalers, retailer2 and consumers. The producers sold to the retailer1 who in turn sold to the wholesalers. These wholesalers were found in Burma Maziwa and Kariokor markets in Nairobi. In addition, they purchased a large number of IC from retailer1, which indicated bulking. They in turn sold to the retailer2 after slaughtering who finally sold to the consumer.

The seventh channel consisted of producers, assemblers, wholesalers, retailer2 and consumers. The assemblers moved around the households at Kee, Kaiti and Wote to purchase indigenous chicken from producers. Therefore the assemblers were also involved in bulking, although at a smaller scale in comparison to the wholesalers. These assemblers sold to wholesalers at the market at Burma Maziwa and Kariokor. The wholesalers sold the IC to retailers at the second level who finally sold to the consumers.

The eighth channel consisted of producers, retailer2 and consumers. The producers sold directly to the retailer2, mainly through contractual agreements. These retailer2 then sold directly to the consumer. The retailer2 collected IC from producers at intervals specified in the contractual agreements.

The slaughtering of indigenous chicken was mainly done at Kariokor and Burma market. The traders pay a fee of between Ksh 10 to Ksh 30 per bird depending on the facility. There were officers attached to these facilities to ensure maintenance of hygienic standards and to inspect the meat. The minimum live

weight requirement for indigenous chicken was 1.5 Kg. This was then slaughtered and packaged into polythene bags or crates to be sold to supermarkets, restaurants, hotels and butcheries. The main bi products from the slaughter house were the offal, head and feet. These were sold mainly to the low income segment of the market.

Some high class butcheries made orders directly to these slaughter houses and specified their standards and requirements particularly in terms of live weight, age, tenderness and even skin colour, where the yellow skin colour is preferred. The deeper yellow colour was associated with a better, more delicious flavour.

4.1.3 Constraints in the indigenous chicken market

There were some traders who faced constraints in marketing of indigenous chicken as shown in Table 5. These constraints placed barriers to entry and exit of markets. Among these problems price fluctuations was ranked first, followed by inadequate access to credit, inadequate access to information, inconsistent supply, theft and storage problems respectively.

Table 5: The constraints faced by traders

Constraint	Percentage of traders affected	Rank
Price fluctuations	28%	1
Access to credit	23%	2
Access to information	16%	3
Inconsistent supply	14%	4
Theft	11%	5
Storage problem	9%	6

Source: Field Survey Data (2013) N=66

4.1.4 Market Concentration Ratio

Results of the market concentration ratio (CR4) for the four leading traders, was 41%, as shown in Table 6. The total quantity of IC that was sold by the 66 traders was 591,120 Kgs per year. The maximum quantity of IC sold was 108,000 Kgs per year while the minimum amount of IC sold was 720 Kgs per year (Table 6). The largest seller had 18% of the market share while the lowest had 1 percent. The average quantity of IC that sold was 8,956 Kgs per year, while (15%) of the traders sold an average of 17,280 Kgs of IC per year (Table 6). The IC markets were therefore found to be weak oligopoly based on classifications by Kohls and Uhls (1985).

The results in Table 6 show that the market had a Herfindahl-Hirschman (HHI) index of 1,087 points on a scale between 0 to 10,000 points. This meant that

the markets were not concentrated based on the classification by USDOJFTC (2010). Therefore these markets are competitive with no dominant traders despite a few of the traders selling large quantities of IC.

Table 6: Market Concentration Ratio and Herfindahl Hirschman Index

A	B		C		D	E		E^2
Quantity of chicken sold(Kgs)	Number of Traders	Cumulative frequency of Traders	% of traders= (B/ 66)×100	Cumulative % of traders	Total Quantity of chicken sold=(A×B)Kgs	% share of sold=(D÷591,120)×100	% cumulative share	
108,000	1	1	1.51	1.51	108,000	18.28	18.28	333.80
50,400	2	3	3.03	4.54	100,800	17.06	35.34	306.25
31,680	1	4	1.51	6.05	31,680	5.36	40.70	28.73
20,880	2	6	3.03	9.08	41,760	7.07	47.77	49.84
17,280	4	8	6.06	15.14	69,120	11.70	59.47	136.89
13,680	2	10	3.03	18.17	27,360	4.63	64.10	21.34
10,800	3	13	4.55	22.72	32,400	5.48	69.58	30.03
9,648	1	14	1.51	24.23	9,648	1.63	71.21	2.65
7,200	10	24	15.15	39.38	72,000	12.18	83.39	148.35
5,760	3	27	4.55	43.93	17,280	2.92	86.31	8.53
5,040	4	31	6.06	49.99	20,160	3.39	89.70	11.63
3,456	3	34	4.55	54.54	10,368	1.75	91.45	3.06
2,880	8	42	12.12	66.66	23,040	3.90	95.35	15.21
2,160	2	46	3.03	69.69	4,320	0.73	96.08	1.59
1,728	3	49	4.55	74.24	5,184	0.88	96.96	0.77
1,440	6	55	9.09	83.33	8,640	1.46	98.42	2.13
1,008	5	60	7.58	90.91	5,040	0.85	99.27	0.74
720	6	66	9.09	100	4,320	0.73	100	0.53
293,760	66	66	100		591,120	100		1087

Source: Field Survey Data (2013) N=66

4.2 Indigenous Chicken Market Conduct

The results of the market conduct of traders are shown in Table 7.

Table 7: Conduct of traders

Means of payment for IC	Response (%)	**Pricing period**	Response (%)
Cash	57	At delivery	32
Credit	30	Before delivery	50
Cash and credit	13	After delivery	18
Promotion strategies	Response (%)	**Determinant of price**	Response (%)
Good prices	45	Negotiation	50
Fair treatment	34	Availability	32
Advertising	20	Seasons	16
Others	1	Others	2
Processing	Response (%)	**Source of capital**	Response (%)
Yes	45	Loans	16
No	55	Friends	5
		Own	80
Handling of unsold stock	Response (%)	**Source of input**	Response (%)
Kept for next day	38	Agro vet	33
Sold at lower price	48	Local market	60
Sold at another market	14	Others	6

Source: Field survey Data (2013); N=66

There were (57%) of the traders used cash as the means of payment and (45%) used good prices to attract customers. Most traders (77%) kept their unsold IC for the next market day and (45%) of them processed IC, and 50% of them determined the prices traders before delivery of IC. Finally (80%) of the traders used their own money for capital and 60% relied on the local market for inputs (Table 7).

Table 8 shows (60%) of producers were constrained by diseases, (94%) sold live birds, (55%) used family labour, (92%) had no contracts with buyers, (73%) received no receipts, (9%) sold their IC through groups, (50%) negotiated the prices and (41%) used motorcycle for transportation.

4.3. Market Performance

The results of the market performance is shown in Table 9 and include the Total gross marketing margin (TGGM), producers gross marketing margin (GMMp), gross marketing margin and IC prices at various stages along the marketing channel. The results indicate that channel 1 had the highest GMMp, while channel 8 had the lowest GMMp. However channel 8 had the highest TGGM, while channel 1 had the lowest TGGM.

Table 8: Producer conduct

Constraint	Response (%)	**Contractual agreements**	Response (%)
Diseases	60	No	92
Capital	19	Yes	3
Theft	11	No response	4
Inputs	7	**Selling through groups**	Response (%)
Predators	2	Yes	9
		No	91
Form in which IC is sold	Response (%)	**Negotiation of IC prices**	Response (%)
Live	94	Yes	50
Slaughtered	2	No	42
Others	4	No response	8
Source of labour	Response (%)	**Receipts issued for IC**	Response (%)
Family	55	No	73
Hired labour	45	Yes	27
Source of IC	Response (%)	**Means of transport of IC to market**	Response (%)
Bulkers	52	Walking	28
Households	22	Motor cycle	41
Institutions	16	Motor vehicle	31
Distant markets	10		

Source: Field Survey Data (2013); N=130

Table 9: Results of marketing margins

	Channel1	Channel 2	Channel 3	Channel 4	Channel 5	Channel6	Channel 7	Channel 8
Producer Price	**256.00**	**328.00**	**366.00**	**386.00**	**370.00**	**386.00**	**366.00**	**434.00**
GMMp	69.00	57.44	55.20	54.60	48.43	45.84	38.65	38.78
Assembler Price			**386.00**		**625.00**		**386.00**	
Marketing Margin			20.00	185.00	255.00	36.00	20.00	
Marketing Margin %			3.02	26.17	33.38	4.28	2.11	
Wholesaler Price						**422.00**	**422.00**	
Marketing Margin						420.00	247.00	
Marketing Margin %						49.88	26.08	
Retailer1		**571.00**	**663.00**	**571.00**				
Marketing Margin		243.00	277.00	92.00			342.00	
Marketing Margin %		42.56	41.78	13.01			36.11	
Retailer 2				**663.00**		**842.00**	**764.00**	**815.00**
Marketing Margin				44.00	139.00		278.00	381.00
Marketing Margin %				6.22	18.19		29.36	34.05
Consumer Price	**371.00**	**571.00**	**663.00**	**707.00**	**764.00**	**842.00**	**947.00**	**1119.00**
TGGM	31.00	42.56	44.80	45.40	51.57	54.16	61.35	61.22

Source: Field Survey Data (2013);*Figures in Kenya Shillings (Kshs)

Marketing Margin % = (Marketing margin ÷ consumer price) x100

The results shown in Table 9, in addition to the marketing costs/Kg, were used to calculate the market efficiency index for the 8 marketing channels. The marketing efficiency index ranged from 5.29 in Channel 1 to 1.48 in channel 3,

while the total marketing cost/Kg ranged from Ksh 381 in channel 8 to Kshs 59 in channel 1(Table 10). The marketing margin/Kg the ranged from Ksh.115 in channel 1 to Ksh.304 in channel 8, while the Gross margin/Kg ranged from Ksh.56 in channel 1 to Ksh.304 in channel 8.

Table 10: Marketing efficiency of the channels

	Channels							
	1	2	3	4	5	6	7	8
Total marketing cost/Kg	59	211	267	252	255	283	303	381
marketing margin/Kg	115	243	297	321	394	456	581	685
Profit/Kg	56	32	30	69	139	173	278	304
Marketing efficiency Index	5.29^{a}	1.71^{b}	1.48^{b}	1.81^{b}	2.00^{b}	1.98^{b}	2.13^{b}	1.94^{b}

4.4 Results for profitability of indigenous chicken

The results in Table 11 show the main components of the annual IC production costs for 100 birds. The Total cost was Ksh 109, 283, which was constituted of a Total variable costs of Ksh 106,175 and a Total fixed cost were Ksh 3108(Table 11). Therefore from the results shown in Table 11 the main components of the variable costs were Litter cost (37%), feeds cost (32%), medication costs (15%) and day old chick (9%) respectively. On the other hand the main components of the fixed costs were depreciation on housing (2%) and depreciation on equipments (1%). The housing cost and equipment cost were used to estimate fixed cost and were depreciated at 10% on annual basis.

Table 11: The annual production costs for 100 birds

Item	Cost (Ksh)	Depreciation (10%)	Total Cost (Ksh)
Day old chick	10000	-	
Litter cost	40000		
Feed cost	35053	-	
Labour cost	4430	-	
Medication cost	16692	-	
Total variable cost	**106175**	-	**106175**
Housing cost	25154	2515	
Equipment cost	5931	593	
Total Fixed Cost		**3108**	**109283**

Source: Field survey (2013)

Table 12 shows, the Gross profit for a flock size of 100 birds was Ksh 8455.

Table 12: Annual profit from producing 100 birds

Item	Total (Ksh)
Selling eggs	24000
Selling chicken	90630
Gross income	114630
Less Total variable costs (Table 11)	106175
Gross margin	**8455**
Less Total fixed cost (Table 11)	3108
Profit	**5347**

4.5 Heteroscedasicity test

These results in Appendix 5 indicated that there was no heteroscedasicity in the variables. None of the variable were found to have heteroscedasicity as shown by the chi-square value and the Prob>Chi2. However this was after those variables that were found to exhibit heteroscedasicity such as the amount of cash for credit, distance to all motor able roads, distance to the market had been transformed by taking their log to base 10.

4.6 Multicollinearity test

The results for the multicollinearity test of the variables indicate that there is no multicollinearity as shown by the values in Appendix 6. In case of multicollinearity presence, VIF exceeds 10.This is a rule of thumb that is considered as an indication of the presence of multicollinearity. Therefore, based on this results it is safe to assume that the data that was analysed has no problem of multicollinearity.

4.7 Socio economic characteristics of households

The results of the socioeconomic characteristics in the study area are shown in Table 13.The table shows the variable, mean of the variable, standard deviation, minimum and maximum value.

Table 13: Summary results of household socioeconomic characteristics

Variable	Mean	Std. Deviation	Minimum	Maximum
Age of Household head (years)	43.89	13.77	21.00	86
Education of household head (0=Illiterate 1=literate)	0.80	0.40	0	1
Family size (Number)	6.07	2.17	2	11
Land size (acres)	4.00	2.22	0.1	8
Total indigenous chicken owned (Number)	13.03	9.15	0	50
Distance to main road (Kms)	3.24	2.33	0.30	11
Distance to market (Kms)	6.45	3.43	0.50	15
Cash borrowed for IC production (Ksh)	4,776.54	6,828.05	0.00	70,000

Source: Survey Data (2013); N=130

The household heads had a mean age of 44 years as shown in Table 13.Most (68%) of these household heads were male and 46% of them had a primary level of education. However, some of them had secondary level of education (24%) and a few (9%) had a tertiary level of education. It is notable that 21% of the household heads were illiterate.

The ages of the household heads in Kee, Kaiti and Wote were generally different as shown in Figure 3. The average age of household heads in Kaiti, Kee and Wote were 52, 46 and 45 years respectively.

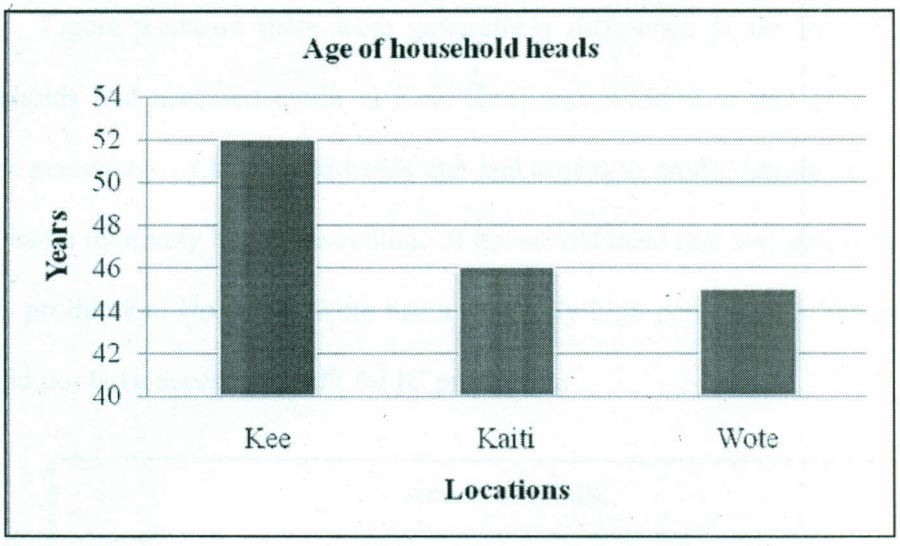

Figure 3: Distribution of age of household head

The average family size of the sampled households was 6 members as shown in Table 13 above. The smallest household had 2 members while the largest had 11. The average land size owned by these households was 4 acres. The smallest land size owned was 0.1 acres while the largest was 8 acres. There was a positive and statistically significant correlation between the land size and the distance to all weather road and other livestock units kept by the household as shown in Table 15.

Table 13 shows that average amount of credit accessed per household for indigenous chicken production was Ksh 4,777.The maximum credit accessed by

household head was Ksh 70,000 while the some households did not borrow any cash. Out of the sampled households 32% had access to credit while 68% did not have access to credit.

Figure 4 shows there were generally a difference in the percentage of households that accessed credit in Kee, Kaiti and Wote. Kee had generally the lowest percentage of household heads that had access to credit. On the other hand, Kaiti had a relatively higher percentage of household head that had access to credit for IC production. However, Wote had a relatively high percentage of households that did not have access to credit for IC production.

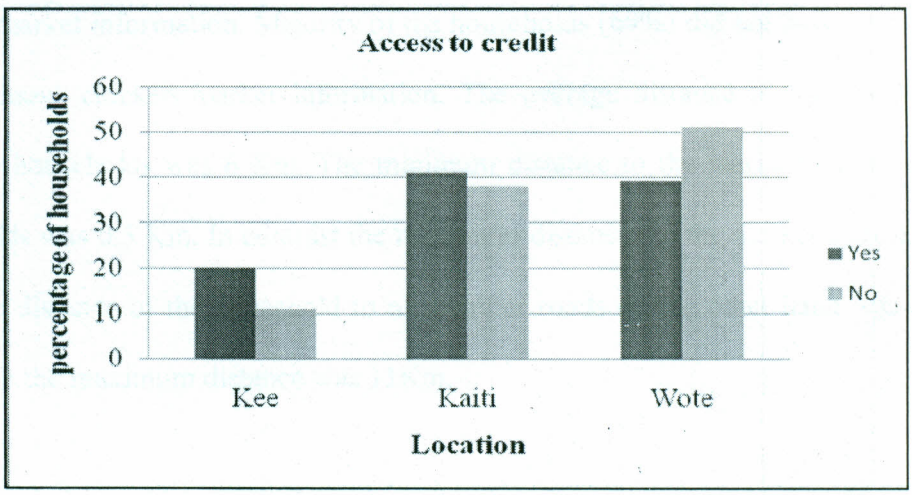

Figure 4: Access to credit in Kee, Kaiti and Wote

Figure 5 shows that a majority of the households (65%) had used extension services at least once in the previous year. These extension services included advice offered on indigenous chicken production. On the other hand, 36% of the sampled households had not used the extension services within one year.

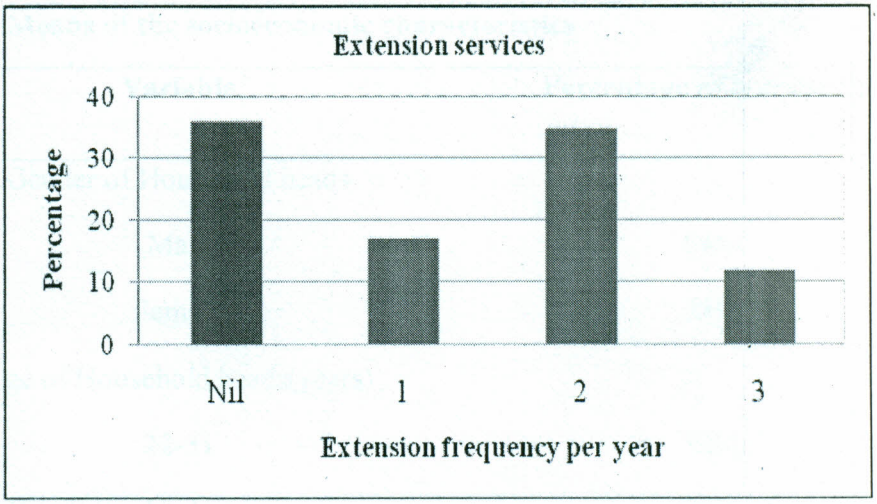

Figure 5: Household Extension services use frequency

Table 14 shows that 31% of the households had access to indigenous chicken market information. Majority of the households (69%) did not have access to indigenous chicken market information. The average distance to the market from the households was 6 Km. The minimum distance to the markets from the households was 0.5 Km. In contrast the maximum distances to the market were 15 Km. The distance of the household to all weather roads on the other hand was 3 Km while the maximum distance was 11Km.

Table 14: Means of the socioeconomic characteristics

Variable	Percentage of households
Gender of Household heads	
Male	68%
Female	32%
Age of Household heads(years)	
22-31	12%
32-41	26%
42-51	33%
52-61	22%
>=62	7%
Access to market information	
Yes	31%
No	69%

Source: Field Survey (2013)

There were more male headed households as compared to female headed households. This is shown in Figure 6. The households are mainly headed by males and this is 68% of all those households that were sampled.

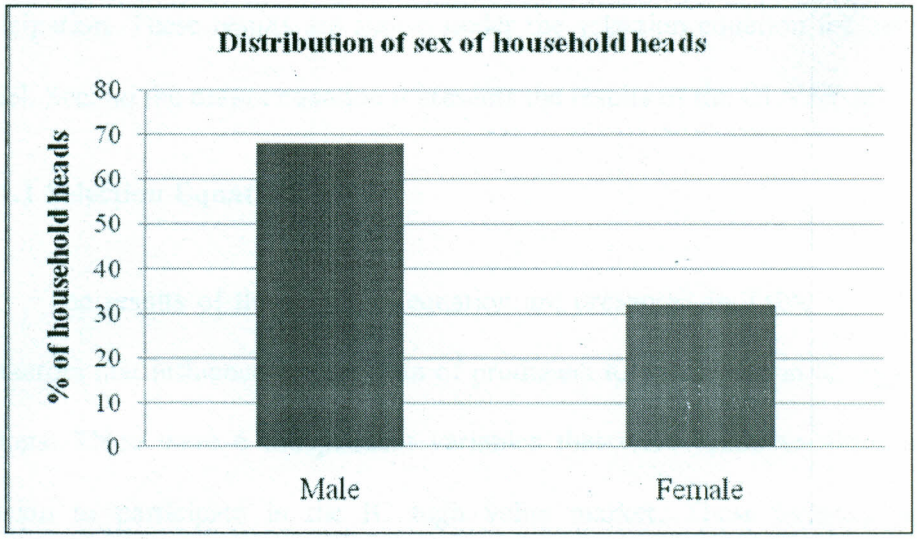

Figure 6: Sex of Households Head

Table 15 shows that there was a significant correlation between the land sizes, distance to all weather road and other livestock units.

Table 15: Partial correlations of land size and other variables

Variable	Partial Corr.	Semi partial Corr.	Partial Corr.^2	Semi partial Corr.^2	Significance Value
IC Flock size	-0.0011	-0.001	0	0	0.9905
Family size	-0.1274	-0.1237	0.0162	0.0153	0.1552
Distance to road	0.1709	0.1671	0.0292	0.0279	0.0557**
Other livestock units	0.1913	0.1878	0.0366	0.0353	0.0319**
Household head education	0.0369	0.0356	0.0014	0.0013	0.6818

4.8.1 Factors influencing participation in indigenous chicken high value market

The Heckman two stage model which included a probit model and an OLS model was used in the analysis of participation decision and the extent of

participation. These results are shown under the selection equation for the probit model. Second the output equation represents the results of the OLS model.

4.8.1.1 Selection Equation

The results of the selection equation are presented in Table 16.These are the factors that influence the decision of producers to participate in IC high value markets. There were 6 independent variables that were found to influence the decision to participate in the IC high value market. These included age of household head, education of the household head, the IC flock size, farmer group membership status, processing and the region dummy.

The Age of household head had a negative effect on the decision to participate in IC high value markets. It was found to be statistically significant at 10% level of significance. The coefficient implied that if the age of household head increased by one year then the probability of making the decision to participate in IC high value market reduced by 0.71 percent.

Table 16: Results of the probit equation

	Marginal effects $\partial y/\partial x$	Standard Error	z	P>|z|
Age of household head	-0.0071	0.0037	-1.93	0.053**
Sex of household head	0.0358	0.0897	0.40	0.690
Education of household head	0.2839	0.1076	2.64	0.008**
Family size	-0.0084	0.0242	-0.35	0.729
Indigenous chicken flock size	0.0109	0.0045	2.41	0.016**
Land size	-0.0288	0.0221	-1.30	0.192
Other livestock	0.0022	0.0104	0.21	0.833
Distance to all weather road	0.0521	0.0532	0.98	0.327
Distance to market	0.0101	0.0173	0.59	0.559
Group membership status	0.1795	0.0791	2.27	0.023**
Market price	0.0007	0.0009	0.78	0.437
Processing	0.2011	0.1130	1.78	0.075*
Wote dummy	0.1718	0.8748	1.96	0.050**
Kaiti dummy	0.0439	0.1212	0.36	0.717

Source: Own computation *significant at 10%, ** significant at 5%, ***significant at 1%; N=130

The results shown in Table 16 indicate that education of the household head had a positive effect on the decision to participate in IC high value market. It was statistically significant at 5% level of significance. The coefficient showed that if the level of education increased by one holding other things constant then the probability of deciding to participate in IC high value increased by 28.39 percent.

The farmer group membership status had a positive effect on the decision to participate in IC high value market as shown in Table 16. It was statistically

significant at 5% level of significance. The coefficient indicated that being a member of a farmer group increased the probability of deciding to participate in the IC high value market by 17.95%, holding all other variables constant.

The flock size, as shown in Table 16, had a positive effect on the decision to participate in IC high value market. It was statistically significant at 1% level. The coefficient indicated that when the flock size increased by one bird the probability of making the decision to participate in IC high value market increased by 1.09% while all other variable were held constant.

The processing of IC, as shown in Table 16, had a positive effect on the decision to participate in IC high value market. It was statistically significant at 5% level. The coefficient indicated that processing IC increased the probability of deciding to participate in high value market by 20.11 percent.

The results shown in Table 16 indicate that the region where the producer was found had a positive influence on the decision to participate in the IC high value market. It was significant at 10% level of significance. The coefficient implied holding all other variables constant that if a producer came from Wote the probability of making the decision to participate in the IC high value market increased by 17.18 percent. In all of the above cases it is assumed that all other variables are held constant while one is varied.

4.8.1.2 Output Equation

The output equation shows that some variables are statistically significant as shown by results in Table 17 and have an effect on the number of IC sold to high value market. These variables included age of household heads, family size, flock size, source of IC and the experience in selling IC. The IMR has a positive coefficient of 0.46 and is significant with p value of 0.04, which shows that coefficients were unbiased and reliable. In addition, it shows that there are some unobserved factors that affect participation in IC high value markets and number of IC sold.

The age of the household head, as shown in Table 17, had a negative effect on the number of IC sold to the high value market. It was significant at 10% level of significance. This as was shown by the coefficient, may have implied that holding all other variable constant, an increase in the age of the household head by one year reduced the number of IC sold by 7 percent.

The family size as, shown in Table 17, had a positive effect number of IC sold to the high value market. It was statistically significant at 5% level of significance. This implied, as shown by the coefficient, that holding all other variables constant, an increase in the family size by one member increased the number of IC sold by 37 percent.

Table 16: The results of the Output equation (OLS)

Variable	Coefficient	Std error	Z	P>z
Age of household head	-0.07	0.04	-1.75	0.07*
Sex of household head	-0.03	0.14	-0.21	0.82
Family size	0.37	0.19	1.95	0.05**
IC flock size	0.11	0.04	2.75	0.01***
Other livestock units	-0.02	0.02	-1.00	0.29
Market information	0.14	0.53	0.26	0.79
Distance to market	-0.11	0.10	-1.10	0.25
Distance to all weather road	0.34	0.30	1.13	0.26
Market price	0.00	0.00	0.00	0.30
Transport mode	-0.04	0.12	-0.33	0.75
Type of IC	0.62	0.27	2.30	0.02**
Experience selling IC	0.54	0.22	2.45	0.01***
CONS	0.74	0.74	1.00	0.00***
Mills				
Lambda	0.46	0.23	2.03	0.04**
Rho	0.96			
Sigma	0.48			

Source: Own computation from Field survey (2013) *significant at 10%, ** significant at 5%, ***significant at 1%; N=130

The number of IC owned, as shown in Table 17, had a positive effect on the number of IC sold to the high value market. It was statistically significant at 5% level. The coefficient implied that, holding all other variables constant, an increase in the number of IC owned by one IC increased the number of IC sold to the high value market by 11 percent.

The type of IC as shown in Table 17 had a positive effect on the number of IC sold to the high value market. This was at 5% level of significance. The coefficient implied that holding all other variables constant, those producers who got their IC from research institute increased the number of IC sold to high value market by 62 percent.

The results in Table 17 showed that experience in selling IC had a positive effect on the number of IC sold to the high value market. It was statistically significant at 5% level of significance. This may have implied that holding all other variables constant an increase in the selling experience by one year increases the number of IC sold by 54 percent.

Since the Inverse Mills Ratio (IMR) is positive and significant, this indicate there was a positive selection bias and therefore it was suitable to use the heckman two stage model instead of estimating the two models separately.

CHAPTER FIVE: DISCUSSION

5.0 Introduction

This section discusses the results obtained after analysis in the previous sections. The results included are those of the structure, conduct, performance of the market, which lead to the marketing efficiency. The profitability of IC to the producers and finally the determinants of participation in the high value market are discussed.

5.1 Structure, Conduct, Performance of indigenous chicken market

5.1.1Socio economic characteristics of Traders

The average age of the traders was 37 years, with the minimum age of traders sampled being 22 years while the maximum was 60 years as shown in Table 4. These traders had an average family size of 4 members (Table 4). The maximum number of members in these families was 9, while the minimum was 1.These traders had an average experience of 9 years and attended market an average of 5 days per week (Table 4). As shown in Appendix 7 the age of traders had a significant correlation with the experience and family size. These results are consistent with what Muendo and Tschirley (2004) found in the study of Horticultural export markets in Kenya, which showed a positive relationship between age and experience.

The result in Table 4 shows that there were only 20% of the traders who belonged to trader organisations. These informal organisations were found at Burma market and Kariokor markets. Despite this, they were not registered with

the relevant ministries and had voluntary membership. There was a positive and significant correlation between being a member of this organization, the amount of capital and the number of suppliers (Appendix 7). However there was a negative and insignificant correlation between being a member of the organistation and advertisement. This contradicts (Adisa and Akinkunmi, 2012) who found that such groups are used for collective marketing and access to market information. The result of this study could have been due to some of the traders in Makueni and Nairobi, who did not belong to these groups and therefore did not receive such services.

The average distance that the traders travelled to the nearest market was 22 Km (Table 4). The maximum distance was 250 Km while the minimum was 0.5 Km. There was a negative and significant correlation between the distance to the market and the number of days that a trader was found in the market (Appendix 7). A few of the traders travelled to distant markets in Nairobi, while a majority (60%) relied on the local market for their inputs (Table 7). These traders bought their IC from villages such as Kathonzweni, Matiliku, Kilala and Kitise (Table 7). The distance covered by traders changed depending on the availability of IC, the transportation costs and seasons of the year. These movement patterns helped some traders who were constrained by inconsistent supply (Table 5). A study by Dessalegn (1998) showed that traders faced inconsistent supply in grain markets of Ethiopia due to long distances from producers. However no coping strategy was mentioned since the producers utilized 79% of their produce at home.

The results in Table 4 show that 25% of traders had a primary level of education, 63% had a secondary level of education, and 12% had a tertiary level of education. There was a positive and significant correlation between education and the amount of capital that the traders had invested in the IC business (Appendix 7). This meant that the more educated traders had higher capital levels in their business compared to the other traders. This therefore is consistent with Bett *et al.* (2012) who found that there was a positive influence of education on marketing activities. However these results contradicted the expectation that IC was dominated by traders with low education levels, who used it as an alternative for income generation (Kimani, 2006; Meseret *et al.*, 2010).

5.1.2 Market channels

The marketing channels for IC were of different length as shown in Figure 2. Channel 1 was a short and direct marketing channel, which had producers and consumers, who purchased IC at the farm gate in Makueni. The IC that did not satisfy the requirements for the distant markets in Nairobi was sold through this channel. Therefore as shown in Table 5, prices varied depending on urgency of raising money and negotiating skills of the buyers, which concurs with the findings of a study by (Okitoi *et al.,* 2006). As shown in Table 8, there were 21% of the producers that used the channel. This channel had few actors which contradict a study by USAID (2010) that found that IC had long supply chains with several actors. This difference was due to the convenience of this channel for the producers that did not need intermediaries.

The figure 2 shows that channel 2 was made of producer, retailer1 and consumers. This channel was used at the local markets at Makueni. These retailers at Makueni performed bulking of IC, which made them available and affordable to consumers (Table 8). These activities represented some form of vertical integration, which is similar to the activities that were reported in a study by Olufemi and Adeolu, (2010) in poultry processing in Nigeria. According to Owuor and Bebe (2009) retailers and distant traders compete for the IC at farm gate. However, in the current, study the retailers found at Makueni had few competitors from distant traders in Nairobi at this level.

The Figure 2 shows that channel 3 had the producer, retailer1, retailer2 and the consumer. This channel was common in Nairobi and Makueni and included the local market, butcheries, supermarkets, hotels and guest houses. This channel therefore distinguished the two market levels based on value addition or processing (Table 7). These markets have specific requirements and consumer preferences as shown by (Gamba et al., 2005).The traders in Nairobi were conscious of the quality of IC and prevailing market specifications. However, few (45%) of these traders were involved in the processing activities (Table 7).

According to Weerahewa (2004) the IC markets have minimal processing. Therefore the results of this study agree with the findings of Weerahewa (2004) but contradict it in terms of organization in processing of IC. There was organized processing and inspection of the meat in Makueni and Nairobi IC markets, which

lead to a difference in the marketing costs (Table 11). Some professional processors were observed despite challenges of inconsistent supply of IC and the credit access (Table 5). A study by Zeberga, (2010) identified challenges of inconsistent supply and capital shortage in Ethiopian poultry markets but did not relate it to the processing of IC, unlike what the current study did. The, slaughter houses and slabs were set up at Kariokor and Burma in Nairobi to compensate for this shortage in processing facilities. The dressed IC carcass was then sold to supermarkets, butcheries, hotels and supermarket after packaging. This situation revealed low value addition which may exclude producers from potential high value markets. A study by (Martin and Lorena, 2007).noted that low value addition impacted on performance of industries.

The fourth channel as shown in Figure 2 consisted of producers, assemblers; retailer 1 and the consumers. The assemblers and retailers at Makueni had a complementary relationship that ensured IC from farm gate reached local markets at Makueni. This relationship can change depending on demand, seasons and prices offered by other traders (Table 7).These are common occurrence in livestock markets as reported by (Barrette, 2007). These results contradict those of Afolabi (2007) which showed monopolistic tendencies and dominance of some traders in some trading channels. Consequently these results revealed retailers and assemblers as performing an additional role of linking producers to consumers and providing market information (Table 14).

The producers, assemblers and consumers constituted the fifth channel as shown in Figure 6. This channel was used in cases where the assemblers at Makueni found better prices from traders at Nairobi, based on negotiation, demand for IC and season (Table 7). However, the other factors that determine the choice of channel included availability of storage space and attraction of customers (Table 7). These results contradict those of a study by Ngigi (2012) that showed that producer may select channels on the basis of reducing costs, price and transactional risks that were associated with a market channel. Another factor that influenced the choice of a channel was the trust, which was based on the number of years that the traders had transacted with each other (Table 4). This reason gave emergence to the sixth, seventh and eight channels respectively, which showed the different shopping options that the consumers in the high value markets used when obtaining IC from retailer2. Therefore like the study by Hanekom *et al.* (2010) this study found that trust among the market participants had an influence on the performance.

5.1.3 Constraints in the indigenous chicken market

The results in Table 5 show that 28% of the traders in Makueni and Nairobi were constrained by fluctuation in prices. These fluctuations were seasonal changes in prices due to the prevailing conditions at the time of sale e.g. festivals, emergencies and weather conditions (Table 7). However a study by William *et al.* (2006) attributed distortion in the price to collusion between traders in livestock markets. According to a study by Owuor and Bebe (2009) changes in IC prices are

due to addition of costs and passing it forward to consumers or backwards to producers. Zeberga (2010) on the other hand found that price volatility in poultry markets were related to diseases and unstable demand for poultry.

The traders were constrained from marketing of IC by inadequate access to credit (see Table 5). Most of these traders in Makueni and Nairobi used their own funds for capital (Table 7). There were few institutions that offered loans to these traders at affordable rates, since they did not feature as a main source of funding (Table, 7). Some of these institutions included ABD and KWFT. These traders therefore obtained their loans from common interest groups on rotational basis (Table 7). These results are consistent with those of Zeberga (2010) and Takele (2010) which showed that capital constrained traders that were found in markets to selling only live birds. However, these studies did not identify common interest groups as an alternative source of funding for IC traders.

The results in Table 5 show that 16% of the traders did not have adequate access to market information. The traders from Nairobi shared information on the current prices and markets to among themselves due to the linkages shown in figure 2. However, those in Makueni did not have a reliable source of information and relied on mobile assemblers in Makueni, who conveyed information to retailers regarding sources of IC and market days along the channels shown in figure 2. Market information has a significant effect on participation and quantity sold at the market (Dessalegn, 1998; Takele, 2010). The result of the present study

showed that traders provided an alternative source of market information as compared to organizations alone, which was what a study by Markelova *et al.* (2009) found. However the results did not indicate high use of electronic and print media for market information as shown in a study by Hanekom *et al.* (2010).

The results showed that theft and storage were problems faced by traders (Table 5). This was a barrier to the entry into IC market for 20% of the traders in Makueni and Nairobi. The traders had different solutions to cope with this storage problem (Table 7). A storage fee of Ksh.20 per bird constituted the prices shown in Table 9 was charged on a daily basis at Burma and Kariokor markets in Nairobi. The birds were stored in cages, which were few and thus contributed to storage problems (Table 5). A study by Afolabi (2007) showed that the storage costs significantly affect the production in the poultry enterprise. However, the traders at Makueni and Nairobi had developed coping strategies for storage problem unlike the traders in a study by Dessalegn (1998) who faced similar challenges in grain markets.

5.1.4 Market Concentration Ratio

The results in Table 6 show that IC markets in Makueni and Nairobi were found to be oligopolistic, with a 42% market concentration ratio. This implies that there were few traders who sold a large number of indigenous chickens (see Table 6). However the traders operated under some competition in the markets in Makueni and Nairobi as shown by the need for advertising of products, negotiation of prices and diversification of products (Table 7). A study by Afolabi (2007)

showed high levels of inequality in the poultry markets with traders receiving more benefits than producers, which contrasts with the results of the present study (Table 6). Olufemi and Adeolu (2010) found that the broiler processing industry in Nigeria had high degree of concentration, with the larger processing firms controlling markets and receiving higher returns on investments. The results of this study showed that the IC markets were weak oligopoly, which contrasts with findings of a study by Zeberga (2010) that showed that poultry markets were strong oligopoly.

The markets in Nairobi and Makueni also had a HHI of 1,087 which indicated that they were not concentrated. According to (Lipsey and Chrystal, 1995) the formation of groups is a viable strategy for making more profits in an oligopolistic market. However, as shown in Table 4 there was a low membership in such organisations. This therefore meant that there was an opportunity for the traders who sold small amounts of IC to form groups and compete with those that sold large amounts of IC. Mussema (2006) also recommended for the formation of cooperatives in an oligopolistic market to increase the bargain power.

5.2 Market Conduct

The market conduct refers to the strategies that traders adopt in a competitive market (Zeberga, 2010). These include pricing strategy, promotion strategy and production strategy (Greer, 1992). As shown by the results in Table 7 prices were mainly determined through negotiations, the availability of IC, seasons

and other factors such as market segments. This was contrary to the results of a study by Okati *et al.* (2009) that showed traders to be the main price setters.

As shown in Table 7, few traders (20%) advertised their IC, while 45% performed value addition in Makueni and Nairobi markets. This was because both activities required money and depended on the size of the business (Table 4). However, most traders relied on offering good prices and fair treatment of customers (Table 7).This shows that advertising is still unexploited by the traders of IC in Makueni and Nairobi. These results are consistent with those of a study by Mailu *et al.* (2009).that showed low formal organistation of marketing activities in IC markets in Kenya. The results of this study like those of Mussema (2006) show prevalence of poor market information through advertising in an oligopolistic market. Therefore the current study show that the promotion strategies used relied on traders along channels (Figure 2) and years of trading (Table 4).

The average price at which the traders bought their indigenous chicken was Ksh 471 for a cock, Ksh 328 for a hen and Ksh 146 for a pullet. However, the prices change depending on the seasons, holidays and the marketing channel (Table 7). Most of the traders however did not buy the birds on the basis of weight but mainly relied on the negotiations (Table 7). However, a study by Bebe and Owuor (2009) that showed that the IC markets lack formal procedures in determining prices and that price were mainly determined by turnover and losses. However they contradict results of a study by Adisa and Akinkunmi (2012) that

showed that women mainly priced their IC in Nigeria based on information from friends, local markets and poultry associations.

The results in Table 8 show that few producers (3%) in Makueni had any formal agreement or sold through groups (6%). This is because despite many producers belonging to common interest groups, when it came to selling of IC they preferred to sell as individuals. The inconsistency in supplying IC was another reason for not using groups and engaging in contracts (Table 5). These results confirm the findings by Mathuva (2005) that there were few formal arrangements between the producers and buyers of IC in Kenya. However for sustainable contracts the constraints of inconsistent supply and diseases must be addressed among the traders and producers respectively (Table 5).

5.3 Market performance and Efficiency

The results in Table 9 show that the 8 marketing channels had GMMp of between 69%, for channel 1 and a GMMp of 39% for channel 8. This indicated that the producers had a good share in the final consumer prices in channel 1 compared to channel 8. This situation may have been due to the use of direct marketing in channel 1 as compared to channel 8 (Table 8). The results of this study are consistent with those of Kumar (2002), which found higher producer shares in the shorter marketing channels and group marketing.

The TGGM of the marketing channels was between 31% in Channel 1 and 61% in channel 8 (Table 9). This meant that the difference between the producer

selling prices and consumer prices were lower in channel1 compared to the other channels (2-8). The differences in prices were due to the methods used in setting of prices, some of which rose costs (Table 7).A study by Harigan *et al.* (1992) showed that there were higher marketing margins when the transport costs were high and there was poor storage infrastructure. A study by Emam (2011) established an inverse relationship between large marketing margins and marketing efficiency of retailers and wholesalers in Tomato markets in Khartoum.

The results in Table 10 show that the IC markets were efficient with an overall marketing efficiency of 2.29.There was a marketing efficiency of 1.94 in channel 8,channel 1 had a marketing efficiency of 5.29 while channel 3 had a marketing efficiency of 1.48 (Table 10). As shown by the results in Table 10 the related marketing costs for channel 8, channel 1 and channel 7 were, Ksh 207, Ksh 115 and Ksh 581 respectively. The large marketing costs in channel 7 were due to the large number of intermediaries in the channel (Figure 2). The marketing efficiency had a negative and statistically significant correlation with the marketing cost and number of intermediaries in the marketing channel (Appendix 8). The results are consistent with those of Massoud and Srinivasa (2012) that found the marketing channels, that had higher marketing costs had lower marketing efficiency, and thus recommended the use of cooperatives to reduce the costs and increase the marketing efficiency.

Therefore this could justify reduction of many intermediaries and use of direct channels e.g. Channel 1 (Figure 2). The finding of this results are consistent with those of Massoud and Srinivasa (2012) that found an increase in marketing efficiency of Saffron in Iran through direct marketing. Emam (2011) argued that marketing efficiency could be increased by reducing costs, which shows that there is an inverse relationship between costs and marketing efficiency. The present study therefore found that the marketing efficiency of channels increased when there were reduced marketing costs and gross margins.

5.4 Profitability of indigenous chicken

The rearing of indigenous chicken in Makueni was found to be profitable as shown in Table 12. These results showed a profit of Ksh 53 per bird. The gross margin of Ksh 8,455 shown in Table 11, gave a gross margin of Ksh 85 per bird. These results unlike those of Sumy *et al.* (2010) did not apply a Benefit Cost Ratio (BCR) but similar to it showed that rearing of IC was a profitable enterprise; however the same approach used by Sumy *et al.* (2010) in analysing profitability of local chicken was adopted.

The annual cost of feeds for a flock size of 100 birds was Ksh 35053 and made up 33% of the Total variable costs (Table 11). Those feeds were mainly obtained from the agro vet shops and local markets as shown in Table 7. The free range feeding was used by producers in Makueni to supplement the other sources. The IC feed on locally available feeds from local markets (Table 8). Therefore, the result of this study confirm the earlier findings by Kingori *et al.* (2007) that

indicated that IC mainly feed through free range ,however unlike that study it quantified the costs of this feeds. However the result of this study contradicts those of Kumar Dutta *et al.* (2013) that found that feeds were the main component (54%) of the variable costs.

The amount used in a year for Labour for 100 birds was Ksh 4430 (Table 11). The free range system and even for those that are confined there is minimal labour requirements which is mainly obtained from family (Table 8). According to Menge *et al.* (2005) labour costs in IC production can be calculated on the basis of man hours as per the stipulated national guidelines. This study by Menge *et al.* (2005) reported that labour constituted between 34 to 28% of the variable cost, compared to the current study where labour constituted 4% of the total variable costs (Table 11). The difference may have been due to the fact that the study by Menge *et al.* (2005) considered semi confined system and confined systems alongside the free range system. The results of the present study were consistent with those of Okitoi *et al.* (2006) which indicated that rearing of IC needed minimal external inputs such as labour.

The cost of medication was 15% of the total variable costs equivalent to Ksh 16692 (Table11). This cost of medication included the vaccination costs, the cost of medication purchased at agro vets and consultancy fees that were paid to livestock officers during their visits. The results of this study are consistent to those of Kumar Dutta *et al.* (2013) that showed medication as constituting a low

component of the total variable costs. However, the study by Menge *et al.* (2005) assumed medication costs, due to the challenges of costing the herbs for free range system, however the veterinary cost for confined ration system was reported. The study also assumed fixed costs like housing since most IC were housed in Kitchen or improvised mud structures for free range system (Menge *et al.*, 2005).

The producers made a profit of Ksh 5347 form a flock size of 100 birds (Table12).However, these producers had an average flock size of 13 birds as shown in (Table 5), that were small for sustainable production and supply of IC on commercial basis .A study Olasunkanmi (2008) showed that commercial poultry production in Nigeria required flock sizes of at least 1000 birds and that increasing the scale of production increased the gross margins. The study by Hanekom et al.(2010) showed that there was a relationship between profit margins and quantity processed in the potato industries in South Africa. Therefore the small flock sizes had a relationship with the profits that producers got from IC in Makueni.

5.5 Determinants of decision to participate in IC high value market

The age of household heads had a negative effect on the decision to participate in the IC high value market as shown in Table 16. As shown by the results in Table 14 most of the household heads were between 41 and 51 years. Therefore, as age increased beyond this class the ability of the household head to engage in physically demanding activities, such as walking to markets and providing labour, as shown in Table 8 was reduced. The results of this study are consistent with those of Berhanu *et al.* (2011) that reported a negative relationship

between age of household head and decision to participate in milk value addition by dairy farmers in Ethiopia. However the results contradict those of Bellemare and Barrett (2006) that showed a positive relationship between age and participation in the livestock markets in Ethiopia.

The household head education had a positive effect on the decision to participate in high value market as shown in Table 16. The literate household head had exposure on the benefits of participating in IC high value market through interactions and attendance of other markets as shown in Table 8. They were also able to make informed decisions after analyzing different information sources through negotiating (Table 8). This study results are consistent with those of Bett *et al.* (2012) found education of household head had a positive influence on decision by household head to participate in IC market in Kenya.

The flock size had a positive effect on the decision to participate as shown by the results in Table 16. The households that had large flock size made the decision to participate easily than those with smaller flock sizes. However, the households with the small flock sizes used them for financial security and sold them at selected periods due to challenges in credit access as shown in Table 13. The results in this study support those of Zeberga (2010) that showed that the flock size positively influence participation in IC market. However, Adisa and Akinkunmi (2012) indicated that there was a significant and negative relationship

between the flock size and the participation of women in poultry activities in Nigeria due to the low number of women involved in rearing of IC.

The producers that belong to farmer groups had a positive effect on the decision to participate in IC high value market as shown in Table 16. Farmer groups offered a possible solution to address the challenge of accessing marketing information as shown in (Table 14). The results of this study are consistent with those of a study by Jagwe *et al.* (2010) showed that farmers who belonged to farmer groups were likely to participate in the banana markets in Burundi, Rwanda and Democratic republic of Congo. However the producers in this study have not fully embraced the concept of contacts and group selling (Table 12).

The IC processing had a positive effect on the decision to participate in the IC high value market as shown in Table 16. There were segments of the markets that need the IC to be delivered as dressed carcass (Table 7). Therefore, the producers with links to slaughter houses had access to these IC high value markets, while the others did not have this access (Table 8). The results of this study are consistent with those of Agbogo *et al.* (2011) that showed a positive relationship between processing and participation by women in cassava markets in Nigeria. A study by Nguyen *et al.* (2005) also emphasized the importance of processing in the performance of the Cassava value chains in Vietnam. Olufemi and Adeolu (2010) found a positive relationship between the scale of processing broilers and the

returns in Nigeria. Therefore processing is an important aspect in poultry marketing.

The region had a positive effect on the decision to participate as shown in Table 16. These results mean that producers from Wote were more likely to participate in high value market than those from Kee and Kaiti. The results of this study are therefore consistent with those of Jagwe *et al.* (2010) showed that region positively influenced participation of smallholder farmers in the great lakes region of Burundi, Rwanda and Democratic Republic of Congo in marketing of bananas. However, the results of this study contradict with those of Gebregziabher (2010) found that region negatively affected participation in poultry market through sales.

5.6 Determinants of number of IC sold to high value market

The age of the household head had a negative effect on the number of IC sold to the high value market as shown in Table 17. The number of household heads began to decline after 51 years as shown in Table 14.This reduction in number of household heads and their reduced ability to engage in physically demanding activities like walking and providing labour as shown in Table 8, could explain the negative effect of age on number of IC sold (Table 17). The results are consistent with those of Bellemere and Barrette (2006) that established a negative relationship between the age of household head and the number of livestock sold.

The family size had a positive effect on the number of IC sold to high value market as shown in Table 17. As shown in Table 8, the family members provided

labour which enhanced the production of IC and then increased the number of IC. These family members provided a means of transport to markets by carrying the IC and walking (Table 8). These results were consistent with the results of Alene *et al.* (2008) that showed that there was a positive relationship between the number of family members and the quantity of produce sold.

The flock size had a positive effect on the number of IC sold as shown by the results in Table 17. The average flock size was 13 birds while the average family size was 6 members (Table 13).Therefore there was an average surplus of 7 birds which could have been sold at the market or consumed at home through the outlets shown in Table 8. The producers also had IC to sell during periods of rainfall failure (Table 7). These results were consistent with a study by Bellemere and Barrette (2006) that showed a positive relationship between the herd size and the quantity sold in the livestock market. However the average flock sizes in the current study (Table 13) were small for sustainable commercial activities.

The type of IC had a positive effect on the number of IC sold to high value market as shown by results on Table 17. The improved IC breeds had desirable characteristics for markets and some producers preferred them as shown in Table 8. Therefore, using this improved IC breeds was likely to improve on their average flock size (Table 13) and generate surplus for marketing. These results were consistent with those of Bett *et al.* (2012) that established a positive relationship

between the number of IC sold and type of IC. Despite the results showing a positive effect the number of producers using this source remained low (Table 8).

The experience in selling of indigenous chicken had a positive effect on the number of IC sold as shown in Table 17. This may imply producers who had an extra year of experience sold 54% more IC to high value market. The producers who had sold IC for a longer time period received market information from traders, extension agents and therefore had access to market information (Table 13). The results were consistent with those of Zelalem *et al.* (2012) showed a positive relationship between the experience and the number of sheep sold in Ethiopia. This may have been due to access to market information and networks.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This section presents the conclusions based on the results of this study and also gives recommendations for policy interventions. The aim therefore is to provide options that can help producers to participate in the high value IC market in Nairobi and Makueni. This was done by focusing on the variables that were identified as significantly affecting participation in the IC high value market and proposing strategies that would help the producers cope in an oligopolistic market.

6.1 Conclusion

The study showed that the traders, in the Nairobi and Makueni IC markets, had an average of 37 years, an average of 4 family members, travelled an average of 22 Km to markets, an experience of 9 years, sold in the market for an average of 5 days per week and the majority (75%) were male. There were only 20% of these traders that belonged to trader organizations. The IC markets, in which they were found, were not concentrated and weakly oligopolistic with a market concentration ratio of 42% and HHI of 1,087. Therefore it was concluded that these IC markets were not concentrated and therefore allowed for competition.

A total of eight marketing channels, were identified for IC in Makueni by this study. These channels had two levels of traders who linked the IC producers to the consumers. The first level of traders was found at the local markets at Wote, while the other level of traders was mainly found at the urban markets at Nairobi. These two levels of traders were linked by assemblers and retailers. These

assemblers rarely slaughtered the IC and purchased them on the basis of negotiations from producers. However the retailers slaughtered the IC and sold it on the basis of weight. These differences between the assemblers and the retailers resulted in pricing difference along the eight channels. There was a variation in the marketing efficiency between 5.29 and 1.81 in the 8 marketing channels that were identified in this study; however the overall marketing efficiency was 2.29 which indicated that the IC markets were efficient. The channels that had no intermediaries had higher marketing efficiency compared to those that had intermediaries. Those channels with lower marketing costs were found to have higher marketing efficiency. It was concluded that intermediaries raised marketing costs and reduced the marketing efficiency in some channels.

A few of the traders in Nairobi and Makueni were constrained in some areas of marketing. There were a few traders in Nairobi and Makueni that offered credit services, added value to the IC, advertised their products and used loans as their source of capital. In addition some of the traders sold their unsold IC at a lower price. On the other hand, there were few producers in Makueni, who had formal contracts with the traders, sold through groups to traders, and received receipts from traders. These producers mainly used motorcycles and motor vehicles to transport their IC to markets. There were additional challenges in the form of price fluctuations, inadequate access to credit and information on markets. The other challenges included inconsistent IC supply, theft and lack of storage

space. Hence it was concluded that a few of the traders faced some barriers to entry and exit of the markets.

The IC was found to be profitable to the producers in Makueni. Although the producers made a profit from IC they did not attain the optimum profits. This situation was due to the small flock sizes that the individual producers owned which had an effect on consistent supply and the revenue that were received. It was therefore concluded that the small flock sizes were affecting the profitability of IC to the producers.

The decision to participate in high value markets by producers in Makueni was significantly influenced by the form in which IC is sold, age of household heads, education level of household heads, farmer group membership, flock sizes and Region where producer was found operating. On the other hand the number of IC sold to the high value markets was significantly influenced by family size, source of IC, experience, age of household heads and flock size. Therefore this meant that the socioeconomic characteristics were partially able to explain participation of producers in the high value markets.

6.2 Recommendations

The following recommendations were made based on the conclusions made from the study:-

There is a need to use centralized contract models for marketing of IC, the reduction of the current marketing costs and to increase producers' share in the

final consumer price. The adoption of this model will increase competitiveness, address the marketing constraints, barriers to entry and exit of markets. The contract model will ensure improved market conduct (pricing, promotion and production).Therefore by reducing marketing costs the contract model will enhance the marketing efficiency.

IC rearing was found to be profitable in Makueni but the average flock sizes were small .Therefore it is recommended that, in order to enhance this profitability, the use of collective marketing should be adopted. The collective marketing should be done through farmer groups which will assemble IC from the producers and channel it to the high value markets.

The study concluded that high value markets participation was partly explained by some socioeconomic characteristics. Therefore Government Policy framework and other stakeholders' innovations in the IC value chain must consider these socioeconomic characteristics. Since there are various stakeholders that were involved in the process one of the possible ways to address these significant socioeconomic characteristics would be through an innovation platform.

The innovation platforms will constituted of the following:

i) The producers,

ii) Input suppliers and traders,

iii) Extension service providers,

iv) The Regulatory bodies and

v) Research Institutions

The innovation platform will have a local level to enhance linkages between the IC producers. The same innovation platforms will also offer linkages to other stakeholders involved in the IC value chain and subsequently to higher levels. These linkages within the innovation platforms will address policy issues at the regional and national level.

The flock size significantly affected the producer participation in IC high value market. Therefore, to enhance the flock size and ensure consistency in supply of IC, the producer and research institutions linkages should be enhanced. This will ensure quality and improved breeds are used by producers. In addition, producers will be trained on using a staggered production schedule that will ensure no disruption in supply of IC. Therefore the Government must invest in research and training institutions.

Region was a factor that significantly affected participation in IC high value market. Therefore, it is recommended that Government improves on market infrastructure in Kee and Kaiti. Some of the infrastructure include roads, markets and slaughter house to enhance value addition.

Experience in selling IC significantly affects the participation of producers in IC high value market. Therefore it is recommended that more producers be

encouraged to participate in the selling of IC. This can be done by establishing mobile purchasing centers for the producers located far from markets.

The study also recommends that further study be done to analyse the participation of producers in IC marketing groups to identify the factors that may constrain this participation. This is based on the potential that indigenous chicken have on poverty alleviation and improved livelihoods.

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Appendix 1: The Household Questionnaire
Purpose

This questionnaire is prepared with the aim of collecting data pertaining to participation of producers in high value markets of indigenous chicken in Makueni and the constraints to their participation. The information will be useful in recommending of policy and will be treated with confidentiality hence respondents are asked to give accurate information.

Date..... Name of Enumerator.....

District.....Division..... .....

Village.....

A. Household Characteristics

1. Position of Respondent in Household (*Tick as appropriate*)

Household Head	1
Household Spouse	2
Brother	3
Sister	4
Son	5
Daughter	6
Other (Specify).....	7

2. Marital Status

Single/Widow	1
Single/Widower	2
Male headed	3
Child headed	4
Female headed	5

3. Religion of household..... 1=Protestant 2=Catholic 3=Muslim 4= others (Specify).....

4. Age of farmers in years (*Tick as appropriate*)

1.<=20	**2**.21-30	**3**.31-40	**4**.41-50	**5**.51-60	**6**.>60

5. What is the highest level of education attained by the farmer?

☐ ☐ ☐ ☐ ☐

1. =illiterate **2**. =primary education **3**. =Secondary education **4**. =advanced/tertiary **5**.Other

B. Farmer Groups

6. a)Are you a member of a social group? ☐ 1=Yes ☐ 0=No

b) If yes, why did you join the group?

.....

7. a)What type of group do you belong to? **1**=.Women Group **2**=.Men Group **3**=.Farmer Groups **4**=.Youth Group **5**=.CIGS **6**=.WUAs **7**=.Credit Groups **8**=.Others (Specify)

b) What is the total membership of your group? Men..... Women.....

8. a) How long have you been a member of the group? .....

b) What challenges have you experienced in the group?

.....

9. What activities does your group involve itself in? **1**IC production **2** IC marketing **3** Merry Go Round **4**Crop Farming **5** Dairy Farming **6** Processing of crops/Livestock (specify)

10. What is the main source of income for household?

Source of Income	Amount	Rank
Crops		
Indigenous Chicken		
Business(specify)		
Exotic Chicken		
Wages		
Shoats		
Cattle		
Formal Employment		
Remittance		
Other		

sources(specify)		

C. Livestock Ownership

11. What is the type of indigenous chicken do you keep?

Type of IC	Source of Indigenous Chicken	Problems of using IC from source	Future plan
1=Local 2=Improved	1=Agricultural Research Institute(KARI) 2=Market 3=NGOs 4=Own Stock 5=Other Farmers 6=Gifts	1=Availability 2=Low Quality 3=High Price 4=Unknown origin 5=Others(specify)	1=Increase 2=Reduce 3=Remain same

12. What type of livestock do you own?

Type	Cattle	Sheep	Goats	Indigenous Chicken	Other Poultry Spp	Other livestock	
Number							

13. a) Do you own land? 1=Yes 0=No

b) If yes, who owns land your land? ☐**1**Husband☐ **2**Wif☐ **3** S☐ **4** Daugh☐r **5** Other (specify).....

c) What is the size of your land☐ 0 acre ☐<=10 acre ☐ >10 acre

D. INDIGENOUS CHICKEN PRODUCTION

14. If rearing indigenous Chicken fill in the table below using the codes indicated:

		Purpose
	1	Home Consumption
	2	Income Generation
	3	Cultural Factors
	4	Prestige
	5	Others

15. What is the source of your labour? 1=Family 2=Hired Labour 3=Labour exchange 4=Cooperative labour 5=others (specify)

16. Where do you get money for your indigenous chicken production?

		Source	Amount
	1	Personal Income	
	2	Cooperatives	
	3	Money Lender	
	4	Bank	
	5	Family/Friends	
	6	Others(specify)	

17. List the costs do you incur in producing IC?

Item	**Hatching(Ksh)**	**Pullet(Ksh)**	**Cock (Ksh)**	**Hen(Ksh)**
Stock cost				
Equipments Costs				
Feed cost				
Labor Cost				
Hatchability Loss				
Death Loss				
Revenue				
Housing Cost				
Veterinary Cost				
Total				

18. How long have you been keeping indigenous Chicken? **1**=< 2 years **2**=2-5 years **3**=5-10 years **4**=>10 years

19. Which of the following do you spend your money on? **1**=Purchase of feeds **2**=Purchase of IC **3**=Purchase of Veterinary Products **4**=None

20. How much indigenous chicken did you have in the year 2012?

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cock												
Hen												
Chicks												

Total												

21. Which Problems do you face in production of indigenous chicken? **1**=. Diseases **2**=.Predators **3**=.Inputs **4**=.Lack of information **5**=.Capital **6**=Labour **7**=Theft

E. INDIGENOUS CHICKEN MARKETING

22. a) Do you sell your indigenous chicken? 1=Yes 0=No

b) How long have you been selling indigenous chicken? **1**=< 2 years **2**=2-5 years **3**=5-10 years **4**=>10 years

23. How much did you sell in the past one year?

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cock												
Hen												
Chicks												
Total												

24. How do you sell your IC? ☐1=Live, ☐2= dressed carcasses

25. a) Where do you sell your live chicken?☐ 1=farm gate, ☐2= Primary Market, ☐3=Secondary market ☐4=Terminal Market

b) If you sell dressed carcasses, where do you sell your dressed carcasses?☐ 1=farm gate, ☐2= Primary Market, ☐3=Secondary market ☐4=Terminal Market

26. At what age and weight do you sell you IC? Age.....Weight.....

27. a) Who are the main buyers of your live IC?☐1=Local bulkers, ☐2=Mobile bulkers, ☐3=Individual consumers, ☐4=Institutional consumers, ☐ 5= others (specify)

b) If you sell dressed carcasses, who are the main buyers of your dressed IC?☐1=Local bulkers, ☐2=Mobile bulkers, ☐3=Individual consumers, ☐4=Institutional consumers, ☐ 5= others (specify)

28. If selling at market, how do you transport your IC? ☐1=Carried by hands, walking ☐2=Carried in a basket walking ☐3=Carried tied to bicycles ☐4=others (Specify)

29. If sold as dressed carcasses, where is the slaughter done?☐1=In the farm, ☐=2 In a slaughter house; ☐3=Others (Specify)

F. CONTRACT FARMING

30. a) Do you sell your IC through a group ?☐1=Yes, ☐2=No

b) If No, why don't you sell through a group?

.....

c)If Yes, why do you prefer selling through the group?.....

31. a)Do you have formal agreements with specific buyers of IC? ☐1=Yes, ☐2=No

Item	Yes=1	No=0
Location of the Final Market		
Channels to the Final market		
Promotion Strategies in markets		
Weight required at the market		
Age required at the market		
Quantity required at market		

Form chicken is required at Final Market(Dressed/Alive)		
Highest Demand Period		
Lowest Demand period		

b) If no, why are you not involved in formal agreements?

.....

c)If yes, why are you involved in the formal agreements?.....

G.SUPPLY OF INDIGENOUS CHICKEN

32. Are you aware of the following elements regarding the marketing of indigenous chicken ?

33. Is there a difference in the price of indigenous and exotic poultry?☐1=Yes, ☐2=No.

34. If Yes to the above, which is more valued and why?☐1=Indigenous chicken, ☐2=Exotic chicken

IC	**Price**				**Terms of Payment**
	Male bird	**Female bird**	**Chicks/growers**	**Eggs**	**1=Cash 2=Credit 3=Advance payment**
Indigenous chicken(Dressed carcasses)					
Period of highest sale*					
Period of lowest					

sale					
Indigenous chicken(Live)					
Period of highest sale*					
Period of lowest sale					

.....

.....

35. What is the price paid for the following (that you sell)? By local markets traders?

*1=Christian festivals; 2=Muslim festivals; 3=traditional festivals; 4=all the year round

36. What is the price paid for the following (that you sell) by DISTANT markets traders?

37. How much cess do you pay at the local chicken trading centre?
Ksh/bird.....

38. Any other levies paid during selling of IC?

.....

39. How long do you travel to your most important buyer/market *(distance in Kms)*.....

40. How do you transport your indigenous chicken to the market? 0=Individually 1=Coordinated Transport

41. Who would you rate your road access to the market? 0=Poor 1=Good

42.a)Do you experience any loss during delivery of indigenous chicken to the market?1=Yes 0=No

b) If Yes, Who many indigenous chicken are lost during delivery of indigenous chicken to market? .....

43. Do you negotiate on price? 1=Yes 0=No

44. Have you experienced problems with brokers in sales at the markets? 1=Yes 0=No

a) If Yes, what are the causes of problems?**1**=Cheating of scales **2**=Wrong price(market) information **3**=Charged high fees **4**=Others

45. Have you ever failed to sell your indigenous chicken at the market in the last one year? **1**=Yes **2**=No

a)If Yes, what was the reason? **1**=Prices too low **2**=too few/no buyers available **3**=Indigenous Chicken Quality Rejected **4**=Sale Postponed **5**=Others (specify)

46. Do your buyers recognize the quality of indigenous chicken? 1=Yes 0=No

47. Do your buyers give you receipts for the sale of indigenous chicken?1=Yes 0=No

a) If No why?
.....

48. How confident are you in the buyers that of your indigenous chicken? 1=High 0=Low

a) If low
explain.....
.....

49. Which are the major sources of cost that you incur in selling your grain?

1=Transport 2=Slaughtering 3=Packaging 4=Costs while waiting at the market e.g food, accommodation 5=Others (specify).....

50. Have you ever had a contract arrangement for production/marketing of indigenous chicken with any organisation in the last 3 years? 1=Yes 2=No

a)If Yes, describe your
arrangement.....

b)If No, why not?

.....

51. Have you ever had a marketing relationship with a processor or buyer of indigenous chicken since you began selling indigenous chicken? 1=Yes 2=No

a) If Yes, what was it about.....

52. What is the main reason for not selling indigenous chicken?

		Problem
	1	No Transport
	2	Open Market prices too low
	3	High transport cost
	4	No buyer
	5	Market too far
	6	Farmer association problems
	7	Government regulation problem
	8	Lack of market information
	9	Others (specify)

53. Who sets the selling price of indigenous chicken? 1=You 2=Buyers 3=Set by Demand and Supply 4=Negotiations 5=others (specify)

H.ACCESS TO SERVICES

54. Did you have extension contact with regards to indigenous chicken production in the year 2012? 1=Yes 0=No

55. a)Which of the following means do you use in accessing information on indigenous chicken production and marketing?

b) Why do you prefer the means stated above?

Means of accessing information	**Frequency of use Yes=1 No=1**	**Reliable Yes=1 No=0**	**Reason preferred**
Government/Extension services			
Radio			

Mobile Phones			
Traders/middlemen			
Neighbours			
Television			
Others(Specify)			

THANK YOU FOR YOUR COOPERATION

Appendix 2: Traders Checklist

To the Enumerators

- *Please introduce yourself to the traders*
- *Avoid using technical terms not understood by traders*
- *Be brief and precise*
- *Be patient and use local units*

Objectives

- To identify the marketing channels for indigenous chicken in Makueni
- To quantify costs, margins of indigenous chicken (Live and dressed carcasses)
- To identify factors affecting the supply of indigenous chicken (Live and dressed carcasses) in Makueni and Nairobi

Socio Demographic Characteristics

1. Age..... Education level.....

2. Family size.....

3. Area..... Name of Market.....

4. Distance of residence from Market.....

5. Main Occupation 1=Wholesaler 2=Retailer 3=Processor 4=Farmer trader (Village assembler) 5=Urban Assemblers 6= others (Specify)

6. Are you operating alone or as a group? 1=Yes 0=No

7. Do you do indigenous chicken trade all year round? 1=Yes 0=No

8. If No, which periods do you participate? 1=Year round 2=When prices are low 3= During high supply 4=Other (specify)

9. How many years have you been doing indigenous chicken trade? ..... years

10. Do you practice trading other than indigenous chicken? 1=Yes 0=No

11. Number of market days a week.....

12. What percentage of produce is sold in local market? .....%

13. What was your initial working capital when you started this business? Ksh .....

14. What is your current working capital for the year 2013? Ksh.....

15. What is the source of your working capital? 1=Own 2=Loan 3=Gift 3=Shares 4=Others

16. If it was loan, from whom did you borrow? 1=Relative 2=others traders 3=Private Lenders 4=NGOs 5=Friends 6=Banks 7=Micro Finance Institutions 7=others

17. How much was the rate of interest? Formal ..... % Informal ..... %

18. What was the reason behind the loan? 1=To extend indigenous chicken trading 2=To purchase vehicles for transporting indigenous chicken 3= Others (specify)

19. How was the repayment schedule? 1=Monthly 2=Quarterly 3=Annually 4=When you get money

Purchasing

20. Who will buy indigenous chicken from you in 2013? 1=Wholesaler 2=Retailer 3=House hold consumers 4= others

21. From where did you buy your indigenous chicken? From Village (*Specify*) ..... From Market ..... (*Specify*)

22. For whom did you buy your indigenous chicken? 1= Yourself 2= Others

23. Who did you sell your purchase to? 1=Direct to purchaser 2= Through broker 3= Other (*specify)*

24. Who set price in 2013? 1= Myself 2=Set by Demand and Supply 3=Buyers 4= others

25. How did you set price? 1=Advance time 2=At Delivery Time 3=Negotiated at delivery 4=At time of Delivery 4= Others

26. If price was set at an advance time, how did you agree? 1=Orally 2= Written 3=Others

27. Do you carry out any physical treatment to improve the value of your product? 1=Yes 0=No

28. What do you do if indigenous chicken is not sold on time? 1=Take back home 2=Take to another market 3= Sell at lower price 4= Sold on another market day

29. How do you attract suppliers? 1=By better price offer 2=Advertising 3=Fair treatment 4= Other

30.Assets

Purchasing

31.

Purchased From	Quantity purchased on market day (Kg)/Number of chicken	Average price per kg/Number of chicken	% of indigenous chicken purchased from specified source	Terms of payments 1=Credit 2=Cash 3=Advanced Payment
1.Farmers				
2.Retailers				
3.Wholesalers				
4.Collectors				
5.Unknown				

32. Is getting sufficient volume of indigenous chicken a problem? 1=Yes 0=No

33. From which market do you prefer to buy from? .....

34. Why do you prefer this market? 1=Better Quality 2=Better Prices 3=Short Distance 4=Others

35. Which are the months of the year when the prices are lowest? .....

36. Which are the months of the year when the prices are highest? .....

37. Is your purchasing price higher than your competitors? 1=Yes 0=No

38. If yes, what are the reasons? 1=To attract suppliers 2=To buy more 3=To get better quality 4=To defeat competitor 5=Others

39. How many regular suppliers do you have? 1. Producers..... 2. Assemblers ..... 3. Wholesalers ..... 4. Retailers ..... 5. Others .....

40. What are the reasons for low prices?

Reason for low price	Yes	No
Poor production	1= ☐	0= ☐
Trade Regulation	1= ☐	0= ☐
Increase in price of	1= ☐	0= ☐

substitute		
Others	1=	0=

41.To which market do you sell?

Sold to (Location Name)	Sold to buyer	Quantity purchased on market day (Kg)/	Average price per kg/	% share of buyer	Terms of payments 1=Credit 2=Cash 3=Advanced Payment
	1Farmers				
	2.Retailers				
	3.Wholesalers				
	4.Collectors				
	5.Unknown				

42. How do you attract your buyers? 1=By giving better prices 2=By using fair treatment 3=Advertising 4=Others

43. How many regular buyers do you have? 1. Wholesalers .... 2. Assemblers.....

3. Retailers ..... 4 .Processors ..... 5.Others(specify) .....

44. Do you know the prices of indigenous chicken in other markets? 1= Yes 0= No

45. If yes, what is your source of information? .....

46. Would you be willing to pay for information? 1=Yes 0= No

47. Are the markets easily accessible by road during rainy periods? 1=Yes 0= No

48. Do you have any branches to sell your indigenous chicken? 1=Yes 0= No

49. What are the opportunities to expand indigenous chicken trade? .....

50. What are the problems in indigenous chicken marketing and what are the possible solutions?

	1=Yes 0=No	Solution
Credit		
Theft		
Price Setting		
Shortage of supply		
Storage problem		
Lack of Demand		
Information flow		
Natural		
Government policy		
No government support		
Others		

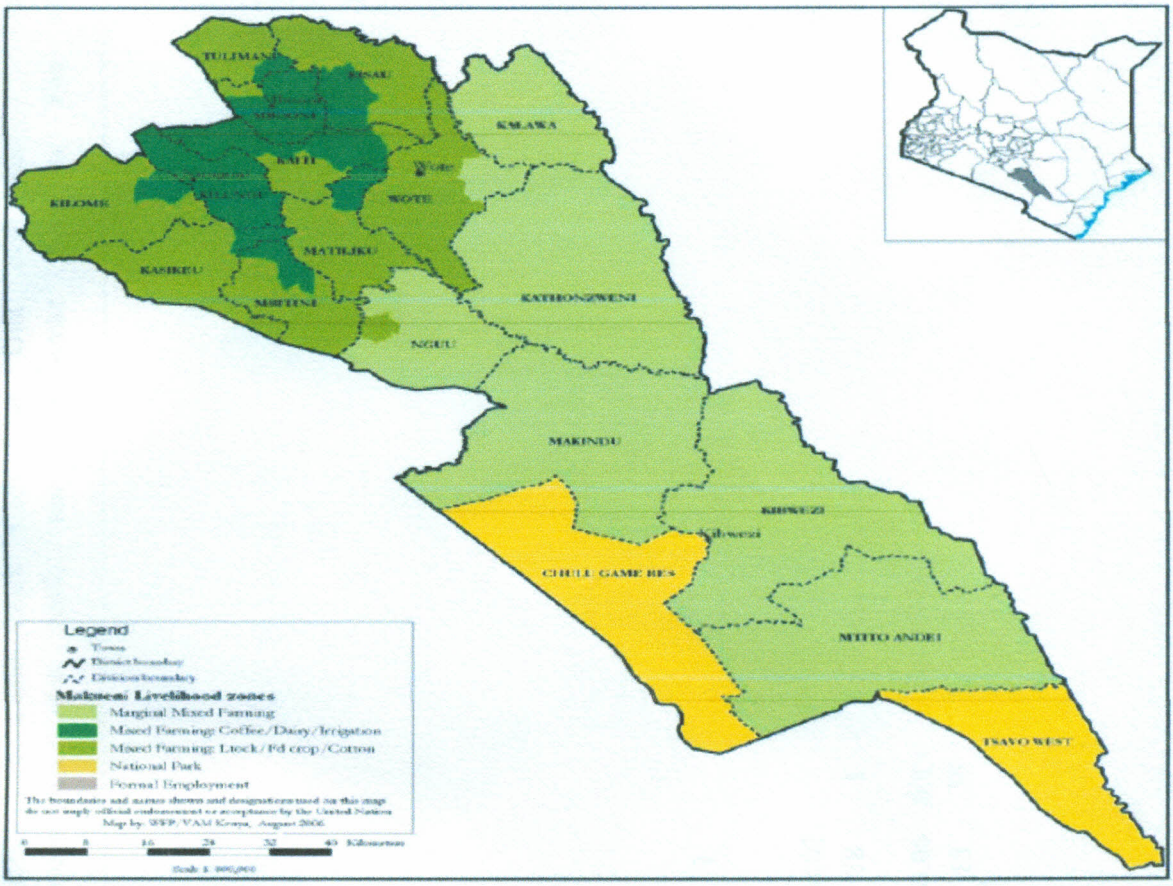
51. Are there restrictions imposed on unlicensed traders? 1=Yes 0=No

52. Indicate the average cost incurred per bird in trading of indigenous chicken.

Cost of Marketing	Ksh/Kg
Purchase price per bird	
Slaughter charge	
Load/Unloading	
Transportation: Vehicle	
Grading	
Storage cost	
Storage loss	
Taxes	
Communication	
Others	
Total cost	
Selling price/Kg	

53. Are you a member of any traders' organisation? 1=Yes 0= No

Appendix 3:Map of the study area



Source: RoK (2005)

Appendix 4: Correlation matrix of variables

	Agh h	Seh h	Edh h	Fa msz	ichk own	Lan dsz	Othli stck	Mark tinfo	Crdt use	Dist awr	Dist omkt	msh grp	mkt prc	Fics	exp riec	Sof ic	W od
Aghh	1																
Sehh	-0.055	1															
Edhh	0.0472	0.0593	1														
Famsz	0.3195	0.0014	0.1978	1													
Ichkown	0.0903	-0.0698	0.1316	-0.023	1												
Landsz	0.0547	0.0656	0.0144	-0.0771	0.0278	1											
Othlistck	0.0441	0.027	0.0588	0.1651	0.0615	0.1775	1										

Marktinfo	0.0105	-0.0221	0.0617	-0.0007	0.1862	-0.0274	0.0972	1						
Crdtuse	0.096	-0.0579	0.0429	0.109	0.1594	0.0832	0.0508	-0.1694	1					
Distawr	0.0501	0.0393	-0.0479	0.0746	0.0554	0.1635	0.0341	-0.1497	-0.0008	1				
Distomkt	0.026	-0.1149	-0.0399	0.0799	-0.0912	0.0396	0.0276	-0.0458	0.1161	0.2687	1			
Mshgrp	0.0488	0.0341	0.0356	0.1292	-0.1093	-0.0195	-0.066	-0.1163	0.1189	-0.0064	-0.0682	1		
Mktprc	-0.0217	-0.0493	0.0672	-0.021	0.0863	-0.0488	-0.0425	0.1305	-0.0421	-0.0696	-0.1191	-0.0023	1	
Fics	-0.0499	-0.0158	0.0456	-0.0775	-0.1094	-0.1334	-0.1671	0.0118	-0.065	-0.0461	-0.031	-0.0764	-0.0416	1

Appendix 5: Results of the heteroscedasicity test

Variable	Chi2	Prob>Chi2
Number of Indigenous chicken sold	0.23	0.63
Age of household head	0.50	0.48
Sex of Household head	0.05	0.83
Education of Household head	0.34	0.56
Family size	2.41	0.12
Flock size	1.03	0.31
Land size	0.23	0.63
Number of other livestock	0.96	0.33
Access to market information	0.34	0.56
Distance to motor able road	2.25	0.13
Distance to market	1.77	0.18
Market price	0.01	0.93
Frequency of extension use	0.14	0.70
Region dummy	0.11	0.74
Participation in high value market	2.48	0.12
Form IC sold	0.17	0.68
Experience selling IC	0.19	0.66
Source of IC	1.85	0.17

Appendix 6: Results of multicollinearity test

Variable	VIF (Variance Inflation Factor)
Age of household head	1.17
Gender of household head	1.11
Education level of household head	1.21
Family size	1.22
Flock size	1.14
Land size owned by household	1.17
Number of other livestock owned by household	1.19
Market information access	1.20
Distance to all weather road	1.18
Distance to market	1.32
Average market price	1.28
Frequency of extension services use	1.64
Wote dummy	1.98
Access to credit	1.19
Form IC sold	1.07
Experience selling IC	1.28
Source of IC	1.07

Appendix 7: Partial correlation and semi partial correlation
Correlation of age of traders and other variables

	Partial Corr	semi partial Corr	Partial Corr ^2	Semi partial Corr ^2	Significance value
Years of Experience	0.3879	0.3568	0.1505	0.1273	0.0015***
Market days	0.08	0.0681	0.0064	0.0046	0.5296
Family size	0.2125	0.1844	0.0452	0.034	0.0918*

Correlation of education of traders and other variables

Variable	Partial Corr.	Semi partial Corr.	Partial Corr.^2	Semi partial Corr.^2	Significance Value
Main occupation	0.1067	0.0986	0.0114	0.0097	0.4054
Groups	-0.0444	-0.0408	0.002	0.0017	0.7298
Years of experience	-0.0662	-0.0609	0.0044	0.0037	0.6064
Amount of Capital	0.3648	0.36	0.1331	0.1296	0.0033***

Correlation of traders Organization membership and other variables

Variable	Partial Corr.	Semi partial Corr.	Partial Corr.^2	Semi partial Corr.^2	Significance Value
Amount of Capital	0.3791	0.3612	0.1437	0.1304	0.0022***
Age	0.0471	0.0415	0.0022	0.0017	0.7141
Advertisement	-0.0161	-0.0142	0.0003	0.0002	0.9005
Number of suppliers	0.34	0.3187	0.1156	0.1016	0.0064***

Partial correlation of Producer profits, marketing efficiency and participation decision

Variable	Partial Corr.	Semi partial Corr.	Partial Corr.^2	Semi partial Corr.^2	Significance Value
Marketing efficiency	0.4962	0.3014	0.2463	0.0908	0***
Participation	0.7163	0.5412	0.513	0.2929	0***
Number of IC sold	0.7057	0.3721	0.4981	0.1385	0***

Appendix 8: Anova for marketing channels

Table a: ANOVA for marketing efficiency

Source	SS	Df	MS	F	Prob > F
Between groups	8.70802312	3	2.90267437	2.91	0.0412
Within groups	61.7482463	62	0.995939457		
Total	70.4562694	65	1.08394261		

Bartlett's test for equal variance: chi2(3)=5.1113 Prob >chi2=0.164

Column Mean	Row Mean		
	0	1	2
1	-3.40667 0***		
2	-3.645 0***	-0.23833 1	
3	-3.235 0.001***	0.171667 1	0.41 0.425

Table b: The correlation of marketing channel efficiency and other variables

	Partial	Semi partial	Partial	Semi partial	Significance
Variable	Corr.	Corr.	Corr.^2	Corr.^2	Value
Intermediaries	-0.2654	-0.0538	0.0705	0.0029	0.0371**
Marketing margin	0.3126	0.0644	0.0977	0.0041	0.0134**
Consumer price	0.9777	0.91	0.9559	0.8281	0.0000***
Profit	0.2793	0.0569	0.078	0.0032	0.0279**
Marketing cost	-0.825	-0.2855	0.6807	0.0815	0.0000***
Group member	0.2481	0.2429	0.0616	0.059	0.0560*
Age	-0.2101	-0.0412	0.0442	0.0017	0.1167
Education	0.153	0.0297	0.0234	0.0009	0.2557

JOURNAL PAPERS PUBLISHED FROM THESIS

1) **An analysis of the efficiency of Indigenous Chicken marketing channels in Makueni County, Kenya**

Authors: David .M.O.Ayieko*., Eric .K.Bett., Lucy.W.Kabuage.,

Published in Journal of Economics and Development

Available online at http://academeresearchjournals.org/journals/jaed

2) **Profitability of Indigenous chicken: The case of producers in Makueni County, Kenya**

Authors: David .M.O.Ayieko*., Eric .K.Bett and Lucy.W.Kabuage.,

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Available online at http:// www.iiste.org/Journals/index.php/JEDS/index

3) **Analysis of collective action: The case of indigenous chicken farmers from Makueni County, Kenya**

Authors: David .M.O.Ayieko*., Eric .K.Bett and Lucy.W.Kabuage.,

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