MEAT QUALITY ATTRIBUTES OF LOCAL CHICKEN SOLD AT MAJOR ROASTS CHICKEN MEAT OUTLETS IN DODOMA MUNICIPALITY

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ABSTRACT

The objective of this study was to establish quality attributes of local chicken meat supplied in Dodoma roast meat outlets. A questionnaire and on site observations were used to collect data from randomly selected respondents that included live chicken suppliers, retail sellers, middlemen and managers of selected chicken roast meat outlets. Data collected include chicken live body weight, estimated age, ecotype, sex and source of origin. Random samples of fresh local chicken breast muscle were taken from a batch of the day sale from the outlets for analysis of tenderness, cooking loss and total lipid. Further, consumer satisfaction study was conducted by random selection of consumers who attended in the outlets and were given the meat to taste, followed by an interview. Data were analysed using general linear model procedure of Statistical Analysis System (SAS, 2000) and those derived from interview the Statistical Package of Social Science (SPSS, 2007) was used. The results indicated that most of the local chicken sold at the Dodoma local chicken roast meat outlets come from nearby Dodoma rural district (26%). Other sources include those from distant districts including Bahi (22%), Kondoa (16%) and Singida region (22%). Selected birds for slaughter were aged between 6 and 12 months averaging 1.3 kg. The results also revealed that the local chicken roast meats sold at the outlets were moderately tender (25.35N/m^2) with moderate total lipid (0.3±0.1%). It was also noted that 64% of the consumers were satisfied with the product. These findings have implications on selection of birds derived from scavenging mode of production for roasting. It is concluded from this study that tenderness is by large determined by a balance between slaughter age and weight, thus producer who wish to enter the market have to respond to this demand.

DECLARATION

I, **Anthony John Semali**, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and that it has neither been submitted nor being concurrently submitted in any other institution.

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_____ _____

Dr. Said H. Mbaga Date

(Supervisor)

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DEDICATIONS

I dedicate my research work to my late parents Mr. and Mrs. John Semali, my wife Mary and my children Irene, John, Goodluck and Janeth.

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LIST OF ABBREVIATIONS AND SYMBOLS

ANOVA	Analysis of Variance
cm	Centimetre
FAO	Food and Agriculture Organisation of the United Nations
Kg	Kilogram
LS Means	Least Square Means
MLFD	Ministry of Livestock and Fisheries Development
N/m^2	Newton per Square Metre
NBS	National Bureau of Statistics
NDV	Newcastle Disease Virus
RLDC	Rural Livelihood Development Company
SAS	Statistical Analysis System
SEM	Standard Error of the Means
SPSS	Statistical Package for Social Science
SUA	Sokoine University of Agriculture
URT	United Republic of Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Local chickens have high degree of environmental adaptability, and this is what makes them survive in many parts of the world, with considerable production of eggs and meat. Most of the local chickens are reared in rural areas worldwide (Steadman Group, 2009). Their meat accounts for more than 30% of global animal protein requirement (Tougan *et al.,* 2013). According to NBS (2012) the total number of chickens in Tanzania was estimated to be 43.7 million, of which 41.8 million (96%) were local chicken.

Local chickens and their products support rural and urban population directly in terms of food especially protein (Lwelamila *et al*., 2004). Improvement strategies are mentioned in the National Livestock Policy and more emphasised by the Ministry of Livestock and Fisheries Development (MLFD) on commercial and traditional systems. These include among others: improvement in disease control, feed quality and technical support (URT, 2006). The policy also demands inventory, characterization and evaluation of indigenous poultry with efforts to support and promote investment in production, processing and marketing.

FAO (2012) extrapolated that, by the year 2020 poultry meat will account for more than 40% of the world's protein needed for consumption. The reason behind is that there is a dramatic shift of preference from red meat to white meat (FAO, 2012). Keeping and consumption of chickens is widely accepted and less rejected based on traditions, life standards and even religious beliefs unlike in other livestock (Tadelle, 2003). As such trading and chicken consumption are increasing. It is interesting to note that even those

communities which traditionally undermined local chicken (e.g. pastoralists) have learned that chicken raising is a good source of both food and income earning (Lugendo and Mutayoba, 2010). Local chickens are usually raised under free range system and left to feed by themselves during the day and confined during the night periods for security purposes. These chickens mature late as compared to commercial exotic broilers, reaching market weight of about one kg in 4 – 5 months (Kingo'ri, 2004) whereas, commercial broilers reach market weight of 1.5 kg in 2 months, and their crosses (Broiler x Local chicken) reach 1.5kg in 3 months with intensive feeding and management (Theerachai *et al*., 2003).

Poultry meat consumers judge meat from its appearance, texture, juiciness, water holding capacity, firmness, tenderness, and flavour (Miele, 2011). Thus, the knowledge of yield and quality of poultry meat is important not only for comparison between production systems, but also marketing of its products i.e. meat and eggs which are supposed to have consistent and definable qualities (Tougan *et al.,* 2008). Local chicken meat when roasted has a unique flavour indicating one of the qualities in it. Besides, colour attract consumers, tenderness of the meat becomes an important factor in the whole process of quality assurance to consumer. Other poultry species other than chicken like turkey, duck, pigeon, and others have also a greater chance of competing in the roast meat industry (Dana, 2010). Similarly roast meat like mutton, goat, and beef have been competing well in the roast meat market but currently slowing down due to white meat preference (FAO, 2012).

1.2 Problem Statement and Justification

Poultry meat is currently increasing in popularity as many consumers shift from red meat to white meat (Cheng *et al.,* 2008). In Dodoma urban markets local chicken are assumed

to originate from different sources that may include sub-urban surroundings, the urban area, nearby districts and regions. The roast chicken business in Dodoma is very popular compared to other roast products such as beef or goat probably due to certain qualities that are unique in chicken. These qualities might be the functional attributes which make the poultry market to operate profitably.

Processed poultry meat offered to consumer could also vary in quality depending among others, the age at slaughter, the breed/ecotype, sex, source, mode of production and how the meat is processed before being offered to consumer (Boulianne and King, 1995). Other qualities include chemical attributes like total lipid and mechanical attributes like tenderness. Information regarding these quality and functional attributes of local chicken's meat supplied to customers is lacking in Tanzania.

At the moment there is limited information regarding poultry meat quality attributes preferred by consumers in Tanzania. Roast poultry meat is popular in various outlets such as bars and restaurants. These outlets are important in the whole value chain of local chicken markets in terms of economic by the chain actors and nutrition for the end user. This study intended to look upon the physical, chemical and mechanical attributes which drives consumer satisfaction from local chicken roast meat in Dodoma Municipality. These attributes are important for developing standards for poultry meat derived from local/indigenous chickens.

1.3 Objectives

1.3.1 General objective

To establish quality attributes of local chicken meat supplied in Dodoma roast meat outlets.

1.3.2 Specific objectives

i. To determine sources and physical quality attributes of purchased chicken sold at major roast chicken outlets.

ii. To determine meat tenderness and total lipid content in local chicken meat sold at major roast chicken outlets.

iii. To assess consumer satisfaction upon eating roasted local chicken meat from selected roast meat chicken outlet.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Role of Poultry Farming in Tanzania

Over 70% of poultry meat and egg produced in Tanzania are produced and consumed in rural areas, and the remaining 20% is consumed in urban areas (URT, 2010). Commercial poultry production is more practiced in urban and peri-urban areas with more of the exotic poultry breeds which have higher levels of productivity as compared to local chicken. However, productivity of local chicken remain low mainly due to diseases, poor feeding, inadequate technical and farmers assisted support system and low genetic potential (URT, 2010; Kaijage *et al.,* 2014). Disease incidences in local chicken can cause mortalities up to 80 – 100% (URT, 2010). Introduction of vaccination programmes, use of thermal stable vaccines and poultry management, housing and feeding, has reduced the mortalities and increased production (Mwalusanya, 2008a).

Despite the large number of chicken, per capital consumption of chicken meat and egg in Tanzania are only 0.7 kg and 75 eggs respectively. This level of consumption is very low as compared to 6.8 kg meat and 300 eggs per capita per year in some countries of Africa such as Egypt and South Africa (Stedman Group, 2009, URT, 2014).

Currently extension officers, some private organizations and government institutions are motivating poultry keeping as a source of protein and income in both rural and peri-urban areas (FAO and AGAL, 2005). Most chicken are sold directly within the village, local markets or through middlemen or taken further to regional and urban markets (Steadman Group, 2009).

2.2 Local Chicken Ecotypes

Local chicken population are a result of uncontrolled cross breeding between various lines of local and exotic breeds (Dare, 1977). Their names seem to follow phenotypic descriptions of the birds. For example names used to describe some common chicken phenotypes in East Africa include frizzled feathers, naked neck, barred feathers, feathered shanks, Dwarf size, Crest head, Kuchi and others (Nyaga, 2007, Lwelamira, 2004, Lyimo *et al*., 2013). They vary in size, plumage, colour, comb type and skin colour. There are also variation in comb type, length and colour of wattles earlobes and beaks. The head of cocks are larger whereas hens are smaller (Williamson and Payne, 1990). Chickens do differ in weights depending on sex, age or ecotypes. Cocks are heavier than hens at maturity. Also naked neck ecotypes are generally heavier than feathered chicken (Ndirangu *et al.,* 1991). Chemjor (1998) reported weights of local chicken by categorising them into heavy, medium, and light, where cocks had an average live weight of 2.02, 1.77, and 1.33 kg, respectively. While, hens had live weights of 1.84, 1.54, and 1.21 kg for each class respectively. Weight of birds differed depending on age at maturity. Kingo'ri (2004) reported that chicken with 4-6 months of age weighed 1.96 and 1.35 kg for cocks and hens respectively. While hens of over 7.5 months of age weighed of 1.54 kg. The range in weights are similar to what was reported by (Mwalusanya *et al*., 2001) i.e. 1.95 and 1.35 kg for cocks and hens respectively.

2.3 Poultry Meat Quality

Poultry meat quality can be defined from features like nutritional qualities, hygiene quality, technological qualities, and sensory qualities. Quality is a set of characteristics of an entity (chicken meat) that give that entity ability to satisfy the expressed and implied needs of its user or consumer (Tougan *et al.,* 2013). There are many fundamental and non-fundamental factors which include genotype, breed, age, rearing system, feeds,

chemical composition, structure, properties of muscle and processing conditions which can have influence on different quality characteristics of chicken meat (Fletcher, 2002). Nutritional quality is the ability of the meat to provide to consumer nutritional ingredients like protein, carbohydrate, lipid, plus other essential compounds like vitamins and minerals. Hygienically, the meat should preserve consumer's health and should be free of toxic residues and bacteria (Tougan *et al.,* 2013).Characteristics which contribute to the overall eating quality of chicken meat include taste, odour, texture, appearance and juiciness (Kyarisiima *et al.,* 2011). Among these characteristics, texture and appearance is probably considered to be the most important attributes by the average consumer (Zanetti *et al.,* 2010). Tenderness (Mechanical factor) and juiciness (succulence) contribute to different meat textures.

The tenderness of meat is the sum total of the mechanical strength of skeletal muscle tissue and it's weakening during the post-mortem aging of meat. Tenderness depends on species, breed, age, sex and individual skeletal muscle tissue of animals (Takahashi, 1996). Meat tenderness originates from the structural and biochemical properties of skeletal muscle fibres, especially myofibrils and intermediate filaments, and of the intramuscular connective tissue, the endomysium and perimysium, which are composed of collagen fibrils and fibres (Wattanachant, 2008).

2.4 Factors Affecting Poultry Meat Quality

2.4.1 Fatty acids and amino acids

Chicken meat contains several classes of nutrients but it is low in calorific value (Zanetti, 2010). Chicken lipids have essential fatty acids while proteins are good sources of essential amino acids (Wattanachant, 2004). The lipid content differs significantly between broiler and local chicken (Fletcher, 2002). Wattanachant *et al.,* (2002) reported

that indigenous chicken muscles contain more protein with less fat and ash when compared to broiler muscle. Farmer (1999) reported that glutamic acid have effect on the taste of the chicken meat. Glutamic acid is more in local chicken muscles than in broiler muscles and this may contribute to different flavours in different poultry meats.

2.4.2 Meat quality and rearing systems

Local chicken reared under semi-intensive or full free range, have higher breast percentage as compared to intensively reared birds. This has been explained by low stocking density and increased physical activities which reduce abdominal fat and increase the breast meat/muscle (Lewis *et al.,* 1997; Sanka and Mbaga 2014; Cheng *et al.,* 2008). Generally, extensive system of local chicken production is more preferred for producing local chicken by homesteads because its production costs are very low. However, this system cannot confirm or verify the quality of chicken especially in live body weight, carcass percentage, meat quality and meat safety (Wattanachant, 2008). In intensive system chicken are kept indoors and are provided with concentrated feeds plus supplements like maize and rice bran or herbaceous plants like succulent plants or banana chops. This system provides higher live body weights and carcass percentages in a shorter period (Wattanachant, 2008). Wattanachant and Wattanachant (2007) reported that when local chicken are raised in intensive system, they have higher percentage of breast muscle at higher ages (above 3.5 months). But, in both systems no significant changes were observed in proximate composition of the chicken muscle (Wattanachant, 2008).

2.4.3 Technological meat quality and colour

The technological qualities of chicken meat correspond to the ability of meat to undergo transformation, preservation and packing during industrial and artisan process (Boutten *et al.,* 2003). The technological quality of chicken meat is mainly acceptable from the

colour, water holding capacity and texture of the meat at its raw state (Tougan *et al.,* 2013). Colour of poultry meat is important because consumers associate it with the product's freshness, and make decision whether to buy the product or not basing on its appearance or attractiveness. Poultry is unique because it is sold with and without its skin. In addition, it is the only species know to have muscles that are in dramatic extremes of colour ranging from white to dark meat (Khan, 2014). Breast meat is expected to have a pale pink colour when it is raw, while thigh and leg meat are expected to be dark red when raw (Tougan *et al.,* 2013). Poultry meat colour is affected by factors such as bird age, sex, strain, diet, intramuscular fat, meat moisture content, pre-slaughter conditions and processing (Fletcher, 1999). Colour of meat depends upon the presence of the muscle pigments related to the amount of these pigments present in the meat and the chemical state of the pigments (Jaturasitha *et al.,* 2004, 2008).

2.4.4 Meat taste and safety

Taste is another quality attribute that consumers use to determine the acceptability of poultry meat. Both taste and smell contribute to the flavour of poultry, and it is generally difficult to distinguish between the two during consumption (Tougan *et al.,* 2013). Flavour develops from sugar and amino acid interactions, lipid thermal oxidation and thiamine degradation. These chemical changes are not distinctive to poultry, but the lipids and fats in poultry are distinctive and combine with smell to account for the characteristic chicken flavour (Tougan *et al.,* 2013). Mottram (1998) reported muscle fat as being the primary source of meat flavour, also lipid composition influences muscle firmness and shelf life (Wood *et al.,* 2004). However, poultry meat has higher proportion of unsaturated fatty acid than saturated fatty acids. These fatty acid ratios suggest that poultry meat is safer to eat than red meat (Salawu *et al.,* 2014).

2.4.5 Meat tenderness

Poultry meat texture can be obtained by testing the meat by eating (Tougan, 2008). The meat texture depends on the rate of the physical and chemical changes occurring in the muscle (Wattanachant, 2008). When an animal is slaughtered, blood stops running, hence no new supply of oxygen and nutrients to the muscles. Without oxygen and nutrients, muscles run out of energy; they shrink and become stiff. This stiffening is called rigor mortis (Northcutt, 2009). After a time, the muscles become soft again; i.e. they soften when cooked. If any interference occurs during the process of rigor it will also affect the meat tenderness (Wattanachant, 2008).

Texture is an important attribute that a consumer consider when purchasing chicken meat (Fanatico *et al.,* 2007). Commenting on meat tenderness Waskar *et al.* (2009) stated that tenderness depends on muscle type, therefore the tenderer the meat the more is accepted to consumer. Rearing systems has significant effect on meat tenderness (Table 1). Free range reared birds have higher values of shear force indicating that they are tougher than intensive reared birds. Also cocks have higher shear values than hens, which can be explained by the physiology of the cock to that of hen that cocks have more active body functions than hens i.e. courting, breeding, defend territory and fighting (Wattanachant, 2008).

Tenderness of boneless cuts of poultry meat is influenced by the time lapse post-mortem (Wattanachant and Wattanachant, 2007). Muscles that are deboned during early post-mortem still have energy available for contraction. When these muscles are removed from the carcass, they contract and become tough. To avoid this toughening, meat is usually 'aged' for 6 to 24 hours before deboning (Northcutt, 2009). However, this is costly for the processor (Northcutt, 2009).

Table 1: Shear force values of different chicken ecotypes breast meat muscle in different rearing systems

Rearing system	Chicken ecotype	Tenderness N/m^2	Author
Free Range	Black bone	41.7	Wattanachant (2008)
Free range	Thai chicken	51.2	Jaturasitha *et al.,* (2008)
Free range	Naked neck	38.0	Wattanachant (2008)
Semi-intensive	Morogoro medium	35.6 (cocks) 28.9 (hens)	Sanka and Mbaga (2014)
Semi intensive	Thai cross	19.9	Jaturasitha *et al.*(2008)
Intensive	Padovana	17.06	De-Marchi *et al.* (2005)
Intensive	Morogoro medium	34.8 (cocks) 28.5 (hens)	Sanka and Mbaga (2014)

2.4.6 Meat quality and age

Age is another critical attribute that affect meat quality including tenderness, cooking loss, flavour, and juiciness (Castellin *et al*., 2008). Lyon *et al.,* (2004) reported that myoglobin which is the primary muscle pigment; tend to increase with the age of chicken. The differences in tenderness values between ages are explained by differences in thickness of sarcolemma muscle fibres, where young birds have thinner fibres making its meat more tender (Bals, 2009). Other factors which affect meat quality attributes include: Chicken genotype/breed, pre-slaughter and post-mortem handling, meat pH and chemical composition of the muscle protein, myoglobin, haemoglobin and post-mortem aging process (Tougan *et al.,* 2013). These factors have also been reported in goats (Mushi *et al.,* 2008) and cattle (Mwilawa, 2012).

2.5 Local Chicken Business and Marketing

Marketing is finding out what customers want and supply it at a profit. This process is customer oriented. Profit provides the incentive to the business people to continue with the business (Nigro and Abbate, 2011). Free range poultry products fetch an increased

consumer demand for more of natural produced protein resources. Consumers demanding for local chicken are generally willing to pay more for the chicken produced in more natural basis and consider it as healthier and tastier (Higenyi *et al.,* 2014).

In Nigeria demand for free range local chickens is high in hotels, restaurants, canteens, roast meat outlets (roadside), families and recreational functions (NAERLS, 2000). Local chicken roast meat outlets can be sited as marketing place for local chicken. In many cities, towns and peri-urban settlements, these outlets are now prominent. They are strategically located where individuals come around for their evening recreational activities (NAERLS, 2000).

In Malawi, middlemen dominate the local chicken business all the way from village to the town markets (Gondwe *et al*., 2005). They sell local chicken of all phenotypes at the markets. Village/ward middlemen buy their chicken from farmers and trading centres surrounding villages and nearby countries like Mozambique, and resell them to urban middlemen who buy local chicken coming from rural and district markets. Bicycles are the main transport used in rural areas while public and private transport dominates town centres (Gondwe *et al*., 2005).

According to Kitalyi (1996), Dessie and Ogle (2001) and Mlozi *et al*. (2003) local chicken marketing is dominated by middlemen.Marketing at village level takes place through cash and direct barter transaction. The marketing channels for local chicken include selling of chickens and eggs at households within the villages, on roadside, during entertainment events, even in local and urban markets. Exchange between local chicken other materials (barter system) like food and livestock is also practiced (Aklilu *et al*. 2007).

Price of live local chicken is influenced by size of the chicken (Mailu *et al*., 2012). Prices vary with location and season, where in Malawi dry season prices are higher than wet seasons. On the other hand wet season purchasing prices are lower than dry season, though supply of local chicken was higher in wet season than in dry season (Gondwe *et al*., 2005).

Farmer earns more profit from selling local chicken in months of December and earns least profit in months of March. This could be due to the fact that at the end of March is a harvesting period, farmers have enough food and sale chicken on need basis. In December there is a short supply of local chicken in the market due to the fact that farmers have completed selling their chicken (sale for food, evade loss from diseases) hence creating demand for local chicken which result in increase in prices (Emuron *et al*., 2003).

Middlemen and farmers receive equal profit margins in months of March due to farmers selling fewer chickens as they have enough food, this increase bargain power of the farmer hence more profit. In months of July middlemen have low profit margins due to farmers selling too much of their chicken to evade losses due to diseases likes Newcastle and typhoid (Dana, 2010). Therefore too much supply lower the price hence low profit margins to middlemen. High profit margins are obtained by middlemen from September to December because farmers sell fewer chickens due to low numbers in farmers flocks (disease and food) hence creating shortage of chicken to the markets hence high demand of local chicken resulting to increase in prices of chicken (Mlozi *et al*., 2003). The same author reported middlemen profited 65% above what farmer gained from chicken sale.

2.6 Consumer Behaviour

This is the study of when, why, how and where people do or do not buy products (Cheverton, 2000). Consumer purchasing behaviour refers to the purchasing behaviour of the individuals and households who buy goods and services for personal consumption (Nyaga, 2007). Consumer behaviour involves the physiological processes that consumer go through in recognizing needs, finding ways to solve these needs, make purchase decisions, interpret information, make plans and implement these plans (Nyaga, 2008). Consumer behaviour is limited to specific periods of time, products and individual groups. Therefore, few products get success in particular period or in particular region (Donkor *et al.,* 2013). The manner in which consumers are buying is extremely important to marketers. It involves understanding a set of decisions (what, why, where, how much, how often) that consumer makes over the time (Donkor *et al.,* 2013).

Information about consumer's desire and how much they want of different items and services is of value to producer, seller and even consumers themselves (Norman, 2005). Consumer's preference enable producer and seller to gain in that they are able to sale more products and perhaps at higher prices (Salawu *et al.,* 2014). Significant factors that influence consumer preference for poultry meat types include age, education level, availability of substitute, sex, appearance of meat and taste (Salawu *et al.,* 2014). Other factors that have effect on demand for poultry meat include regional development differences, consumer income level, socio-economic and demographic factors, seasons, food safety and quality, personal taste and habits, product price and opinions regarding human health (Yilmaz *et al.,* 2013).

The effect of price on consumers buying behaviour has been considered as an information signal concerning products (Monroe and Lee, 1999). Buying a product is a complex

situation with a great variety of different stimuli to be taken into account before a decision is made. Often price is operational as a given component in order to get something (Rota *et al.*(2003). Quality assessment is inevitably connected to price information to some extent (Busacca and Padula 2005). Consumer price judgements are relative and further, both the use-value of the product and the value of money spent on that product are largely subjective in nature (Busacca and Padula, 2005). According to Donkor *et al.* (2013) price and quantity are the major determinants on purchasing decision of chicken products. However, the same study found that quality played less influence on purchasing decision.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study Area

The study was carried out in Dodoma Municipality. Dodoma is located at latitude 6.17^0S, and longitude 35.74^0E. Dodoma is the capital town of the country (Tanzania) and it is located more or less at the centre of the country (Fig 1 a, b, and c). The Municipal town has great interaction of people which allow all kinds of businesses, local chicken being one of them. The region ranks 11^{th} in chicken population in Tanzania (NBS 2012).

3.2 Objective 1 – Sources of Chickens and their Physical Qualities

3.2.1 Sampling

A questionnaire and physical measurement were used as tools to collect the data. Respondents were selected at random at their stations (market, collection centres or outlets). The interview was conducted at different locations, where local chicken are received from the rural areas (Table 2). These include markets where chicken are sold and outlets where chicken are roasted and consumed. Three market places, three outlets and three collection centres were involved in the survey (Table 2). Open and closed ended questionnaire was used in this survey (Appendix 6 and 7).

The chicken ecotypes were identified using characters identified by several authors (Mwalusanya *et al.,* 2001; Lyimo *et al.,* 2014 and Guni and Katule 2013). The ecotypes included Kuchi, Naked neck, Crest, Normal chickens, and Frizzled (Appendix 8).

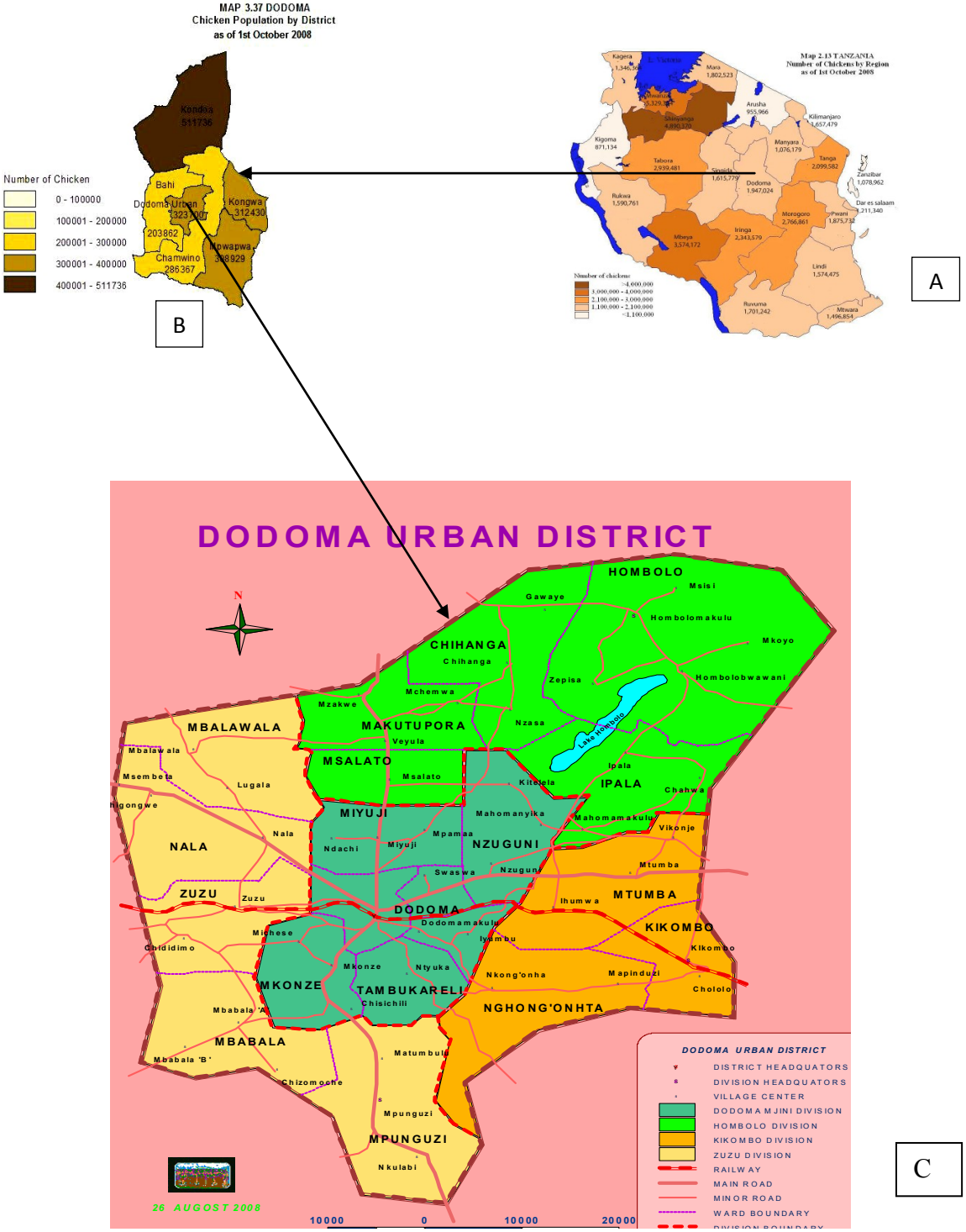

Figure 1: Location map of Dodoma Municipality – A Tanzania, B Dodoma Region, C – Dodoma Municipal

Table 2: Sampled markets, outlets and centres

Location	Sampled area
Markets- sales and purchase of live chickens	Main market
	Mwembetayari
	Chang'ombe
Outlets – sales of roast chicken	Chakonichako
	Maisha club
	Mwanga bar
Centers – collection and supply	Bahi road
	Veyula stand
	Jamhuri grounds

Age was estimated by at least three observers who were experienced or familiar with chickens using characters like size of last digit nail (spur), comb size and shank size. For example, a chicken was given age of about six months if the last digit nail (spur) is well visible in the shank but blunt. If the last digit nails (spur) start pointing or showing a nail, age was estimated to be about 8 months. If no sign of nail or spot on the shank, but the comb is also small, then age was below five months. A total of 538 birds were sampled after age assigning and weighed using a digital weighing balance. Sex was recorded and the source was given by interviewee or the owner.

3.3 Objective 2: Determination of total lipid, tenderness and cooking loss

From the three purposeful selected outlets, samples of 140 chickens were randomly selected in two batches prior to slaughter (Table 3). The chickens were sampled at two different periods from the same outlets with 80 birds and 60 birds' first and second period respectively. Birds were slaughtered and eviscerated followed by removal of head, shanks and the pluck. Dressed carcass weight was recorded. A sample of breast muscle from the right side of the carcass was taken, preserved in polythene bag and kept in a refrigerator at 4^0C for further laboratory analysis.

Table 3: Number of birds per outlets in two sampling periods

Outlets	Period 1		Period 2		Total
	Cocks	Hens	Cocks	Hens	
Chakonichako	15	15	14	6	50
Maisha Club	20	10	8	12	50
Mwanga Bar	20	-	7	13	40
Total	55	25	29	31	140

3.3.1 Total lipid determination

A part of breast muscle from each sample was cut and grounded separately. From the grounded meat a sample weighing ±6 grams was taken. The sample was used for total lipid determination using Soxtec extraction system 2055.

3.3.2 Meat tenderness and cooking loss

The breast muscle obtained was used for determination of meat tenderness using *Warner-Bratzler* shear force machine (*Zwick/Roell Z*2.5, *Germany*) where a sample of breast meat was weighed using a sensitive balance then placed in polythene bag and vacuum packed using *Komet plus vac 20: Germany* machine. It was then boiled in a hot water bath at 70^0C for 45 minutes there after it was cooled by running tap water for about two hours. The samples were weighed after drying excessive water in the polythene bag. Cooking loss was determined by difference between weights before and after cooking. The samples were further cooled in a refrigerator for 24 hours. The meat sample was cut into blocks of 1cm×1cm×4 cm lengths and sheared using *Warner-Bratzler* shear force machine. Each block was sheared twice or thrice and the shearing force in N/m^2 recorded.

3.4 Objective 3: Consumer satisfactions

In this objective, the study sought to understand customer's satisfaction on eating local chicken roast meat. A semi-structured questionnaire was administered to 73 randomly selected customers who were found in the roast meat outlets (Table 4). A well roasted chicken was made into pieces, where the cuts were made into two for each thigh and drum stick, and four pieces for the breast, and then served for taste. One chicken was shared by four to six customers who were instructed to taste both thigh/drum stick and breast meat. After eating, they were requested to fill questionnaire which was given to each panellist (Appendix 7).

Table 4: Number of participants in consumer satisfaction study

Outlets	Respondents (Total)	Men	Women
Chakonichako	28	20	8
Maisha club	18	11	7
Mwanga bar	22	16	6
Muungano pub	5	5	0
Total	73	52	21

3.5 Data Analysis

Data collected using questionnaires were processed and analysed using Statistical Package for Social Science Version 16.0 (SPSS 2007), where descriptive statistics: mean, frequency, percentage, standard deviation, variance, and standard error were obtained. Quantitative data such as live weight, carcass weight, cooking loss, shear force, and total lipid were analysed using General Linear Model procedure of Statistical Analysis System (SAS, 2006) to test the significant difference between response and effects using the model:

$Yijk = \mu+Si+Lj+Ek+\varepsilon ijk$

Where:

Y_{ijk} = Response (from i^{th} bird, j^{th} source and l^{th} ecotype)

μ = General mean,

Si = Effect of i^{th}sex (male or female),

Lj = Effect of j^{th} source, (Dodoma rural, Kondoa, Manyoni and Bahi)

Ek = Effect of k^{th} ecotype

εijk = Random error.

Data derived from study on consumer's satisfaction were analysed by Statistical Package for Social Science and level of satisfaction or agreement were analysed using Likert scale.

CHAPTER FOUR

4.0 RESULTS AND DISCUSION

4.1 Sources of Purchased Chicken

The study revealed that Dodoma rural district was the major source of purchased chicken in Dodoma Municipality (75%) followed by Singida region (22%) whilst, supply from Tabora accounted for only 3% (Fig. 2).

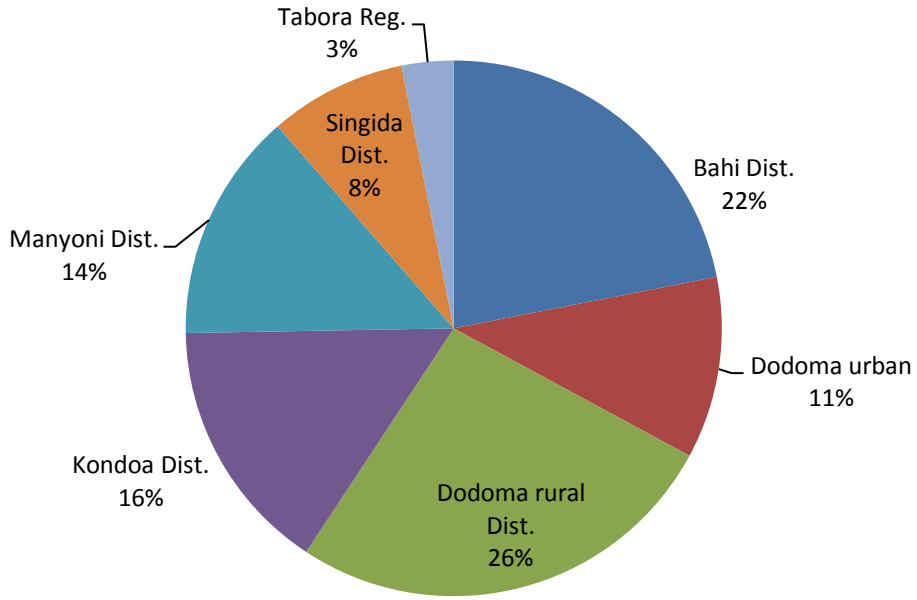

Figure 2: Proportion of chicken by source from sampled centres

It was noted that chicken are sold to middlemen in the village who in turn resell them to the village or ward markets commonly known as local auction markets (Minada). Bulk buyers buy these birds in large numbers and transport them to district markets or regional markets, where they resale them (Appendix 9). This observation is similar to what was reported by Kitalyi (1996); Mlozi *et al*. (2003) and Gondwe *et al.* (2005).

It was observed that in Dodoma there are several centres which receive these local chickens from rural areas and far distances. Some of these include Dodoma main market, Mwembetayari market, Chang'ombe market, Mshikamano centre, Barafu grounds and Jamhuri grounds. Other minor centres include some outlets which receive chicken directly from their agents. Such system of transferring chicken from rural areas to town with specific targeted market was also reported by Kitalyi (1996) and Gondwe *et al.* (2005).

The results also indicated that most of the respondents (74%) preferred to buy local chicken from Dodoma rural district. The major reasons for their choices was that birds had higher average weight and easiness of access, since it is close to the urban centre and the district had more chicken agents than others. Other reasons include high chicken population which ensure sustained availability at reduced cost. This observation conforms to those reported by NBS (2012) which showed that according to the livestock census, Dodoma district was second after Kondoa district in chicken number. The average chicken weights across districts (Table 5) were within range of those reported by Chemo, (1991) for light ecotypes and Mwalusanya (2001).Carcass weights have shown that chicken from Bahi, Dodoma and Manyoni Districts were heavier ($P<0.05$) than those from Kondoa District.

Table 5: LS Mean's ± SE for the effect of source on live body weight and carcass weight

Variables	Sources			
	Bahi	**Dodoma**	**Kondoa**	**Manyoni**
Live body weight (kg)	1.25±0.08	1.31±0.04	1.25±0.08	1.44±0.08
Carcass weight (kg)	$0.94±0.05^{b}$	$0.91±0.025^{b}$	$0.80±0.06^{a}$	$0.94±0.06^{b}$

NB: Means with the same letter in a row are not significantly different.

4.1.1 Seasonal effect on chicken supply

It was further revealed that there exist seasonal differences in supply of local chicken in Dodoma Municipality. In the dry season, chicken supply to the markets was higher than in wet season, where 97% of respondents were in agreement (Table 6).

Table 6: Attributes used to purchase local chicken in Dodoma municipality (outlets and market merchants)

Parameter	Response	Frequency	Percentage
Preference of source	Birds are of higher weight		
	Location of agents	7	22.6
	Close to market	7	22.6
	High chicken population	5	16.1
		4	12.9
Seasonal supply	Present (yes Dry & wet)	30	96.8
Most profitable period	Dry	22	71.0
	Wet	9	29.0
Why seasonal supply	Farmers are busy in fields during wet season.	17	54.8
	Disease incidences leading to high sales to reduce death risk	7	22.6
	Need of money for farm inputs	3	9.7

There are many reasons for these seasonal differences, where 55% mentioned that during wet season farmers are very busy in their fields and have less time to go to market to sell chicken. Disease incidences were also among the reasons for increased sales during dry season, where 23% of respondents mention diseases such as Newcastle, typhoid and coccidiosis which were endemic during the end of wet season. To reduce loses, farmer sales some of their chickens close to the end of wet season to avoid total loss of the flock. About 10% said that sales are more in dry season because farmers need extra income to

buy inputs for their farms and foods for their families. Such cases have also been reported by Minga *et al.* (2001); Mlozi *et al.* (2003) and Gondwe *et al.* (2005).

Seventy one percent of the respondents said that dry season was the most profitable period of the year for local chicken business in Dodoma, while 29% of the interviewee rated wet season as being the most profitable period of the year. Those who rated dry season as most profitable period reported that during this period there is influx of people coming to Dodoma during (Parliamentary Budget Session, National Agricultural shows (Table 7).

Table 7: Most profitable period of the year

Profitable season	Frequency	Percent
Dry	22	71.0
Wet	9	29.0
Reasons		
More people and guests	5	16.0
Events (Nanenane, Bunge) (dry)	6	19.4
High supply of chicken result to low price (dry)	7	22.6
Less chicken supply hence high price (wet)	7	22.6
Farmers are released from agricultural activities (dry)	3	39.7

These events bring together many people and the chicken roast meat outlets take advantage to do more business as demand tends to increases. This is also the time when farmers are cash strapped hence selling of chicken ensures supply of basic household needs. Similar observations were also reported by Gondwe *et al*. (2005) in Malawi. Traders also take advantage of seasonal market fluctuations of demand and supply of chicken in rural areas versus those in urban areas by buying cheap as farmers has less option hence making more profit.

This observation is very prominent in dry areas which often experience food shortage. Minga *et al*. (2001) and Gondwe *et al*. (2005) had similar observations in terms of season where traders get most profit through sale of chickens. The seasonal price fluctuations and market forces have also been reported in other stocks such in goats and cattle and sheep markets in Kenya (McPeak, 2014).

4.1.2 Preferred birds by traders and roast chicken meat outlets

There are several user categories with different preference to local chicken. They include sellers (live chicken), processors (outlets) and consumers. Each category has different interest or preference on local chicken. Such preferences include age, chicken sex, weight, quality, taste and price (Table 8). A seller (primary seller) of live birds prefers relatively young birds (6-12 months old) due to its demand by roast meat outlets and hotels. Higher ages of chicken are less preferred because they tend to be tough and often sold at high prices. Lower ages (<4 months) are least preferred due to small size and weight. While some customer prefer slightly older birds (12 and 18 months) probably driven by size rather than expected quality based on textural characteristics. Similar study was reported by Salawu *et al*. (2014) in consumer preference in poultry meat. Bigger birds are mostly purchased for home use as the size allows cutting into many portions to save a family (Table 9). Salawu *et al*. (2014) also reported that each consumer has different behaviour towards the food in hand and this is characterized by changing needs of individuals. As for the processors (secondary seller) similar age range (6-12 months old) preference were mentioned by the majority. A number of studies in local chicken have demonstrated that as birds grow older their meat become tough (Wattanachant, 2008; Bals, 2009; Sanka and Mbaga, 2014). Also age have effect on price and tend to increase as birds become heavier, but at the expense of quality. However, Wattanachant and Wattanachant (2007) reported that indigenous chicken for consumption or for further processing are suggested to be at

the age of 4-6 months for economical weight and high meat quality. The lower age will depend on the breed and management and whether at 4 month such a bird can be able to attain at least 1 kg live weight.

For businessmen and sellers (outlets) about 42% prefer cocks, while 36% prefer hens, and about 22% did not discriminate sex of birds (Table 8). Cocks chosen are those with relatively lower age compared to hens and this ensures that the quality of meat is tender, increasing consumer acceptability (Waskar *et al*., 2009). More so, it was observed that proportionally, more cocks were supplied in the market, since hens are retained for brooding. The suppliers had opinion that cocks resist stress during transport more than hens and they are abundant. While 16% preferred hens due to their tender meat (Table 9). Proportionality of cock to hen for a day business differ between outlets, 61.3% of respondents had more cocks in a batch while 35.5% had more hens. The difference could be explained by availability of cocks for market than hens which are retained for production. To the contrary Gondwe *et al*. (2005) in Malawi reported that more hens than cocks were available in most markets, with few presenting 50:50 ratio of hens to cocks. Consumer could also influence the difference (Table 8). However, selling price of

Table 8: Attributes used by outlets to purchase local chicken in Dodoma Municipality

Parameter	Response	Frequency	Percentage
	Male	13	41.9
Chicken sex preference	Female	11	35.5
	Both	7	22.6
Why male	Large in size vs females of same age	10	32.3
	Resist stress during transportation	1	3.2
	No reason	18	58.1
Why females	Tender meat	5	16.1
	More fat	3	9.7
	No reason	21	67.7
Why all	Capture all customers	4	12.9
	No reason-take what is available in the market	25	80.6
Proportion of male to female for a day business	More males in a batch	19	61.3
	More females in a batch	11	35.5
	Equal (50:50)	1	3.2
Proportion of birds age bought for sale	6-12 months	18	58
	6-18 months	5	16
	6-30 months	8	26
Why prefer that age range	Customer prefer tender meat		
	Low age range have low price	22	71
	Higher age range large size, more price, special for festivals and minor hotels	3	10
	Low purchase price for given	4	13
	smaller size	2	6

Chicken sold at the outlets had an average live weight of between 1-1.5 kg which corresponds to age of 6-12 months (Table 9). Buying chicken which are older or higher in weight implies having differential price and variability in quality of meat. Thus, given the purchase criteria the processor ensures that he/she maintain standards. Similar contentions

were reported by Tougan *et al.* (2013). Likewise, maintaining size implies that price became stable over a period of time as most consumers are price sensitive.

Table 9: Preference by category of seller, processor, and consumer in Dodoma municipality

Category	Preferences	Reasons
Seller (Live bird)	Age-6-12 months	6-12 months-highly preferred, many customers e.g. roast meat outlets and hotels. Higher ages less needed due to toughness and high price, low age least needed in markets
	Sex – Cocks	Cocks- high in supply, less tender
	Hens	Hen- less supplied as left for breeding and tender.
	Ecotype	No effect, any is acceptable
	Live weight	1-1.5kg – highly preferred, higher considered tough. 0.9kg or less too small and have less customers.
	Price	Reasonable
Processor	Age 6-12 months	Important as it determines tenderness and moderate price, higher ages too tough to process and cost is high so less profit. Lower age's size too small, less preferred by consumers.
	Sex	Cocks- most available, selection is important especially on age. Have less fat. Hens- less supplied, highly preferred as it is tender and tasty
Consumer	- Quality	Tender meat, juiciness, hygiene standards
	- Taste	Good aroma and colour
	- Price	Should be affordable

According to Yilmaz *et al.* (2013) product price is among the factors that have effect on demand for poultry meat others include regional development differences, consumer income level, socio-economic and demographic factors, seasons, food safety and quality, personal taste and habits and opinions regarding human health.

4.1.3 Consumer satisfaction

Seventy one percent male (men) respondents and 29% female (women) respondents in four outlets, of which 66% were residence of Dodoma and 34% non-residence gave qualitative information about consumer satisfaction upon eating roast chicken meat (Table 10). It was apparent that 37% of the respondents visit the outlets very often, while 41% often visit the outlets for roast chicken meat and 22% seldom or rarely visit the roast chicken meat outlets. There were variety of reasons as to why they chose particular outlet for roast meat, where by 64% were for quality and taste of the chicken meat, 11% for calmness, 8% for cleanliness and 14% which embrace other reasons that include the premise being spacious, meeting place, free parking, close to workplace or home, and general good services (Table 10).

It was also noted that, most of the respondents were highly satisfied (53%) and 41% were moderately satisfied with the taste of roasted local chicken meat. This is explained by the previous observation that most of the customers prefer quality and tasty local chicken meat as also been reported by Busacca and Padula (2005). In addition, about 80% of the consumers were satisfied with the price of chicken offered, with few complains (19%) of high price. This has also been noted by Monroe and Lee (1999) that price on consumers buying behaviour is considered as information signal concerning the roasted product. Regarding, quality of meat offered especially on tenderness and juiciness most of the

respondents (63%) rated the meat to be moderately tender and juicy and 34% rated very tender and juicy.

Table 10: Consumer satisfaction on chicken meat in Dodoma municipality

Parameter	Respondent	Frequency	Percent
Sex	Male	52	71.2
	Female	21	28.8
Outlets	Chakonichako	28	38.4
	Mwanga bar	22	30.1
	Muungano pub	5	6.8
	Maisha club	18	24.7
Residence of Dodoma	Yes	48	65.8
	No	25	34.2
Visit to outlet for chicken roast meat	Very often	27	37.0
	Often	30	41.1
	Rare	16	21.9
Why prefer particular outlet	Cleanliness	6	8.2
	Quality and taste	47	64..4
	Others	19	26.0
Satisfactions of meat quality	Highly satisfied	39	53.4
	Moderately satisfied	30	41.1
	Satisfied	4	5.5
Satisfied with price	Yes	59	80.8
	No	14	19.2
Tenderness	Very tender	25	34.2
	Moderately tender	46	63.0
	Tough	2	2.7

Only 3% rated the meat to be tough and dry, indicating that meat sold in most outlets has acceptable characteristics. The observed results are in agreement with Waskar *et al*. (2009) who reported tenderness as the fore most attribute in chicken meat when consumed. Tenderness has been reported to influence consumer's preference in other meat sources, such as those from goat meat (Priolo *et al.,* 2002), sheep meat (El-Masry *et al.,* 2012; Sun *et al.,* 2012) and in beef (Shija, 2012). Rizzi *et al.* (2007); Wattanachant

and Wattanachant (2007) and Sanka and Mbaga (2014) showed that hens on average have more fat than cocks, which may have increase the flavour hence more preferred. Wattanachant *et al*. (2004) reported that chemical composition of poultry meat is affected by among others factors by sex and age and in this regard, it is expected that hens will have tender meat with better aroma than cocks.

However, in any successful business usually minor problems do arise. When meat processors were asked whether there are any complaints encountered when doing business, 58% responded positively (Table 11). Such complaints arise when there is a shift or rise in purchase price of live birds (26%), some consumers saying that the meat is tough (13%), while others complained that the portions were small (13%). Other complaints were not related to chicken meat (48%). According to Richins and Verhage (1985) on consumer dissatisfaction and complaints, they suggested that producers and suppliers should consider consumers whose decision to buy or not determine the fate of the business. These complain were addressed by apologising (29%), reduce price, refund (13%) and follow up (13%). The results also revealed that 45% of the respondents said that some of the complaints were not addressed.

Such complaints mostly arise during dry season (32%), this is because the number of customers in the outlets is high at this period, rendering the outlets failing to meet the standards in terms of quality of products and timely serving the customers. Fewer complaints (26%) were reported during wet season.

The respondents claimed that chicken business trend is encouraging and over the past five years, majority (84%) of the processors said the business is growing, few (10%) rated slowing down and the remained (6%) maintain that no change has occurred (Table 12).

The main reasons for such an increase could probably be associated with an increased population of residence and non-residence.

Table 11: Complaints for the local chicken products sold at Dodoma municipality

Complaints	Frequency	Percent
Yes	18	58.1
No	13	41.9
Total	31	100.0

Others include those coming for special purposes like meetings, seminars and Parliament Sessions. This increase has also been reported by Mwalusanya *et al*. (2001) and Mlozi *et al.* (2003) that local chicken in Tanzania is increasing largely due to increase in demand of meat and eggs derived from these birds. Also Abdelqader *et al*. (2007) reported that increase in population accompanied by urbanization and increasing affluence is likely to increase the demand for high quality animal protein and poultry meat being white meat has been identified as best alternative compared to beef. Future predictions showed that there is likelihood that local chicken business will grow (65%) while 29% thought that it will decrease and 7% pinioned that it will remain stable (Table 12). The reason for this growth of local chicken business was presumably due to increase in demand due to increase in population (36%), infrastructure development which will draw more people to the town (23%) (Mlozi *et al*., 2003).

The reasons for decrease include inflation which will decrease money circulation affecting customers with low purchasing power. Increased competition i.e. new outlets were also mentioned as possible reason for reduction in individual outlet profit (Table 12).

Table 12: Business trend of local chicken in the past and next five years

Period	Trend						
	Increase	%	Stable	%	Decrease	%	Total
Past 5 years	26	83.9	2	6.5	3	9.7	31
Next 5 years	20	64.5	2	6.5	9	29.0	31

Though these provide challenges for improvement of services it will also provide positive signals to the producer (farmers) to increase production hence, increase supply to meet the demands.

4.1.4 Effects of source of chicken on total lipid and mechanical tests

The average value for total lipid was 0.31% (Table 13) and there was significant difference ($P<0.05$) were observed locations in terms of fat/lipid content of carcases. Chickens from Bahi district had the lowest value (0.2±0.1) compared to those from Dodoma rural, Kondoa and Manyoni districts and the level of stress once they leave the farm. If we assume that all birds have been equally managed under scavenging mode of production then difference in lipid level could at most arise from under feeding prior to sale, after sale and level of stress during bulking and transportation.

On tenderness, average shear force value was 25.35 N/m^2 (Table 13). Shear force was significantly ($P<0.05$) lower in Bahi chickens compared to those from Dodoma rural, Kondoa and Manyoni districts. The reason for the lower tenderness observed in chicken from Bahi district could be associated with age differences and sampling. However, the results are within range of 19.9 and 28.5 reported by Jaturasitha *et al.* (2004), Wattanachant (20008) and Sanka and Mbaga (2014) for local scavenging chickens.

Table 13: LS Means ±SE for the effect of source on live body weight, carcass weight, cooking loss, shear force and lipid

Variables	Sources				
	Bahi	**Dodoma rural**	**Kondoa**	**Manyoni**	**Average**
Cooking loss (%)	12.04±0.99	13.53±0.55	14.04±1.27	11.83±1.20	12.9
Shear force (N/m^2)	21.01±3.68[a]	29.99±2.04[b]	23.49±4.72[ab]	26.73±4.46[b]	25.4
Lipid (%)	0.2±0.11[a]	0.31±0.06[b]	0.31±0.14[b]	0.31±0.14[b]	0.3

[ab] Means with the same letter in each row are not significantly different. (p>0.05)

4.1.5 Effect of outlets on live weight, carcass weight, shear force, and total lipid

Table 14 shows the effects of outlets on live body weight, carcass weight cooking loss and total lipid. Live body weight and carcass weight was significantly (P<0.05) lower at Maisha club compared to those from Chako ni chako and Mwanga bar. Other variables like cooking loss, shear force and total lipid did not differ significantly (P>0.05). The observed results imply that outlets have similar attributes which they use when selecting local chicken for processing in their outlets.

Table 14: LS means ±SE for the effect of outlet on live weight, carcass weight, cooking loss, shear force and total lipid

	Outlets				
Variables	**Chako ni chako**	**Maisha club**	**Mwanga bar**	**Average**	**P-value**
Live body weight (kg)	1.36±0.04[b]	1.27±0.04[a]	1.31±0.04[b]	1.24	0.0326
Carcass weight (kg)	0.91±0.03[a]	0.84±0.03[b]	0.95±0.08[ca]	0.86	0.001
Cooking loss (%)	13.19±0.67	12.24±0.64	13.15±0.60	12.58	0.437
Shear force (N/m^2)	28.40±2.47	24.51±2.25	23.00±2.23	25.35	0.307
Total Lipid (%)	0.23±0.08	0.24±0.07	0.24±0.07	0.296	0.492

[a,b]*Means with the same letter in each row are not significantly different* (p>0.05)

In general the criterion or attributes used in selecting a chicken for processing are consumer driven which over time become used by the outlets and may brand the local chicken sold at that particular outlet The observed results are in agreement with those

reported by Wattanachant (2008) that the quality attributes of chicken meat are concordant with consumer demands for its unique taste, texture and nutritional status.

4.1.6 Effect of sex on cooking loss, shear force and total lipid

Table 15 shows that the total lipid was affected by sex (P<0.05). Hens had higher total lipid by0.1 unit (61.1%) compared to cocks. The difference in lipid content among the male chickens could be attributed to their different activities performed by each. It is well known that cocks uses more energy for courting, breeding, defend territory and fighting whilst hens tend deposit more lipids during laying period and lose great amount during brooding. Similar results were reported by Kumar *et al.*(2012) who reported higher fat content in females than males (cocks) in Vanaraja chicken from India. In this study total lipid is moderately affected by sex, where hens have more fat than cocks. However the results did not reveal significant difference between sex on cooking loss and tenderness (Sanka and Mbaga), this difference could be attributed to the fact that cocks are often sold at younger age compared to hens.

Table 15: LS Mean's ± SE for the effect of sex on live body weight, carcass weight, cooking loss, shear force and total lipid

Variable	Sex		
	Female	Male	P-value
Live body weight (kg)	1.30±0.04	1.32±0.04	0.56
Carcass weight (kg)	0.89±0.03	0.91±0.02	0.53
Cooking loss (%)	12.92±0.61	12.79±0.49	0.77
Shear force (N/m^2)	26.49±2.26	24.12±1.80	0.14
Total Lipid (%)	$0.29±0.07^b$	$0.18±0.55^a$	0.029*

[ab] Means with the same letter in each row are not significantly different (P>0.05)

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

i. Local chicken supplied in Dodoma chicken roast meat outlets originates mostly from the districts of Dodoma region and few from Singida and Tabora regions. Sales occur during the dry season.

ii. Selection of these chickens for sale at the outlets, depend most on physical attributes mostly live body weight, age and sex which determines size of cut, taste and tenderness. Use of these attributes to select chicken for roasting ensured that the meat is of acceptable quality especially tenderness.

iii. Slaughtered birds were those aged between 6–12 months with an average weight of 1.3 kg, and considered younger and tender to the consumers. The mean tenderness and fat/lipid content were 25.4N/m^2 and 0.3% respectively.

5.2 Recommendations

Further study on this work is also recommended especially on the seasonal effects on meat quality of local chicken and consumer's behavior when chicken meat is processed other than roasting and their effect on market influence.

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APPENDICES

Appendix 1: Dependent Variable: Live body weight

Source	DF	Sum of Squares	Mean Square	F Value	Pr> F
Model	13	2.80221704	0.21555516	11.16	<.0001
Error	126	2.43407921	0.01931809		
Corrected Total	139	5.23629625			

Appendix 2: Dependent Variable: Carcass weight

Source	DF	Sum of Squares	Mean Square	F Value	Pr> F
Model	13	1.81887020	0.13991309	14.42	<.0001
Error	126	1.22272694	0.00970418		
Corrected Total	139	3.0415971			

Appendix 3: Dependent Variable: Cooking loss

Source	DF	Sum of Squares	Mean Square	F Value	Pr> F
Model	13	1980.633353	152.356412	33.23	<.0001
Error	126	577.765907	4.585444		
Corrected Total	139	2558.399260			

Appendix 4: Dependent Variable: Shear force

Source	DF	Sum of Squares	Mean Square	F Value	Pr> F
Model	13	1997.334160	153.641089	2.44	0.0055
Error	126	7927.034682	62.912974		
Corrected Total	139	9924.36			

Appendix 5: Dependent Variable: Total lipid

Source	DF	Sum of Squares	Mean Square	F Value	Pr> F
Model	13	6.26199988	0.48169230	8.18	<.0001
Error	126	7.41568001	0.05885460		
Corrected Total	139	13.67767989			

Appendix 6: Questionnaire

1. What is your major source of chickens; Rank: 1)..... 2)..... 3).....
2. Why do you prefer source No.1. .....
3. Are there any seasonal differences in supply of chicken: Yes..... No.....
4. If yes why, explain.....
5. Which bird do you prefer most to buy for your business: 1) Males 2) Females (tick one)? Why do you prefer it? .....
6. In general what is the proportion of male to female in a batch bought for a day business (%)
7. On average, what is the approximate age for the birds you buy.....
8. Why do you prefer that age range.....
9. In which time of the year is business most profitable..... Why.....
10. Are there any complaint from your customers with regard to the products you sale? 1) Yes..... No.....

    If yes explain.....
11. How do you address the complaints? .....

    …….

13 Which season do you have more complaints 1) Wet season 2) Dry season

14 a) How do you see the business of local chicken in the past five year

1) Increasing 2) Stable 3) Decreasing (tick one)

Why? Give explanation.....

b) How do you see the business of local chicken in the next five years to come?

1) Increasing 2) Stable/stagnant 3) Decreasing (tick appropriate)

Why? .....

15. How many middle men are encountered before reaching the consumer? .....

16. How many chickens are sold per day per outlet (at the pick sale season).....

17. Is there any changes in sales during Bunge sessions? Yes..... No.....

If yes Why.....

18. Give other public gatherings which increases chicken meat sales

(Rank) ……

19. What are the major constraints of the roast chicken meat business? (Rank)

a)..... b)..... c).....

20. What was the price of chicken meat at the outlet last season? .....

This season..... Expected price for the next season.....

21. The level of business a) increasing..... Decreasing..... (Tick one)

THANK YOU FOR YOUR TIME AND CO-OPERATION

Appendix 7: Consumer Satisfaction Questionnaire

1) Sex of the respondent: a) Male b) Female

2) Name of outlet…….

3) Are you a residence of Dodoma Municipality? a) Yes b) No

4) How often do you visit this place for chicken meat?

a) Very often b) Often c) seldom

5) Why do you prefer this place with so many joints?

a) Cleanness b) Quality and taste chicken meat c) Low price of chicken meat

d) Others (mention)…….

6) How satisfied are you with the quality of chicken meat you have taken

a) Highly satisfied

b) Moderately satisfied

c) Satisfied

d) Not satisfied

7) Are you satisfied with the price offered for the chicken based on size/portion?

a) Yes b) No, If no why? .....

8) Relating on chicken meat you ate what is your comment on tenderness

a) Very tender

b) Moderately tender

c) Tough

d) Very tough

9) Do you have any comment regarding the local chicken meat industry?

……

Appendix 8: Some chicken ecotypes found in Dodoma

Kuchi

Naked neck

Crest

Normal

Appendix 9: Bulk buyer reaching chickens in town market