

**CONTRIBUTION OF LIVESTOCK TO THE LIVELIHOODS OF URBAN AND PERI-  
URBAN HOUSEHOLDS IN EMBAKASI CONSTITUENCY, NAIROBI COUNTY**

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**BSc. Agricultural Education and Extension**



**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
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FACULTY OF AGRICULTURE.**

**UNIVERSITY OF NAIROBI**

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## LIST OF ABBREVIATIONS AND ACRONYMS

ASK	Agricultural Society of Kenya
FAO	Food and Agriculture Organization of the United Nations
CBO	Community Based Organisation
GDP	Gross Domestic Product
GOK	Government of Kenya
IDRC	International Development Research Centre
ISBN	International Standard Book Number
KBP	Kenya Biogas Programme
Kg	Kilogram
KNDBP	Kenya National Domestic Programme
KSh	Kenya Shillings
L	Litre
LPO	Livestock Production Officer
M	Metre
Max	Maximum
MDG	Millennium Development Goal
Min	Minimum
MUFPP	Milan Urban Food Policy Pact
NGO	Non-Governmental Organization
No.	Number
SDG	Sustainable Development Goals
SMS	Short Messaging Service
SP	Selling Price



T/H Trays per household

UNDP United Nation Development Programme

UPA Urban and Peri-urban Agriculture

UPAP Urban Peri Urban Agriculture Project

USh Ugandan Shilling

VOL Volume

Respondent Farmers that were interviewed

Farmer a person involved in agricultural activities in this case livestock keeping

## ABSTRACT

Urban Livestock keeping contributes to food security, income generation, employment creation, insurance and improved social status. Despite the above benefits, rapid urbanization and high population in developing cities has led to high rates of urban food insecurity and malnutrition. Thus, a study was conducted to evaluate the contribution of livestock production to the livelihood of urban and peri urban households in Embakasi Constituency in Nairobi County. The objectives of the study were to assess the influence of livestock farming on the livelihood of the respondents, the institutional influence on livestock production and the challenges faced by respondents in Embakasi constituency. The study targeted 780 livestock keeping population in Embakasi constituency. A sample size of 160 respondents was sampled purposefully selecting 40 from each Sub County. Structured questionnaire was used to collect primary and secondary data from respondents. Data was analyzed using SPSS version 20. The results showed 47.5% of the household heads were aged between 36 and 50 years while 22.5% of livestock keepers had acquired post-secondary education although 87.5% were not in formal employment. 30% of respondents kept chicken, 11% goats and 25% cattle. 45% respondents sold their produce at the farm-gate and roadside stores, while 88% faced challenges in accessing feed thus relied on open market food left-overs. The age of the farmer and leadership of the household influencing livestock keeping technology adoption reflected a correlation of ( $r=0.74$ ) and ( $r=0.80$ ) respectively. Also, farmers used mobile smart phones ( $\chi^2=28.9$ ), visiting ASK shows ( $\chi^2= 41.8$ ) and radio/television presentations at ( $\chi^2=61.6$ ) which influenced marketing of livestock produce by ( $p=0.01$ ,  $p=0.00$ ,  $p=0.00$ ). In conclusion, livestock kept in Embakasi constituency were cattle, poultry, pigs, rabbits and shoats. The high protein sources, contribute to food security and reduced malnutrition. The study recommends that Nairobi county government should improve

provision of extension services and feed accessibility for future increased production and thus access to safe and nutritious animal proteins.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background Information

Agricultural production contributes directly or indirectly to the economy of Kenya. The sector contributes about 26% of the Kenya's Gross Domestic Product (GDP) and creates employment to over 40% of the workers in the formal and informal sectors of production and development (GoK, 2010, GOK 2017a). Agriculture provides one of the basic needs required to sustain human life to the people and animals both in the rural areas and urban centers worldwide. It was recorded clearly by the government of Kenya that around 60% of the total earnings of the people living in the urban areas are spent to meet their daily food requirements (GOK 2017b).

To substitute on their efforts to meet this important requirement of human life, quite a number of people living in the urban centers relied on UPA. This is an important source of providing for their daily household food requirements, in addition to that sourced from the rural areas to the urban centers (GoK, 2012). It is a response in the farming industry to the crisis of malnutrition and lack of sufficient accessible food to the entire population. UPA also provides the alternatives to the search for good returns from many enterprises, while providing the demand for balanced nutritious food products from investors in the food production value chain (Mugisa *et al.*, 2016).

Urban and Peri Urban Agriculture (UPA) was defined, as a form of activity which involved people living in cities and their surroundings, engaging in crop and livestock production and related activities. The farmers kept livestock which included beef cattle, dairy cattle, dairy goats, meat goats, rabbits, sheep, pigs and several types of poultry. They grow crops which include

maize, beans, wide varieties of legumes and a much wider range of horticultural crops. Some of the farmers also bred fish in constructed ponds, while some minority kept bees for honey production and and/or carrying out some value addition technologies for improved returns on their investment ( FAO, 2007; Kang'ethe *et al.*, 2008 and GoK, 2017a).These products are produced, consumed or traded in both local and international markets. The county government of Nairobi, contributes to food security by developing the agriculture sector through promoting increased access to agricultural extension, supporting and guiding the producers, and regulating access of land and water for production, while promoting food safety through the public health department at County and Sub-County level (NCC, 2015).

According to the UN global urban population estimates, 9.6 billion people will be living in the urban centers with the major growth expected to occur in the under-developed and developing countries (United Nations, 2013). It was noted that Sub-Saharan Africa will have the largest portion of the population growth for the under-developed and developing nations. This population growth in the Sub-Saharan Africa is expected to double between the year 2010 and 2030 (FAO, 2012). This population increase will mean that the urban centers will be expanding into the rural areas and agricultural production. Therefore, in order to meet the high demand for food by the surging population, agricultural production systems will need to be intensified. This will in-turn ensure people will be able meet their daily food requirements and obligations thus improved access and availability of food.

Currently there is a challenge in ensuring food security, food safety and food accessibility for the existing urban peri urban population. This is due to the population rapidly increasing and agricultural production slowly being hindered by competing urban commercial land uses like residential buildings to cater for accommodation (FAO, 2013). These challenges have made

people living in the urban and peri-urban areas to diversify their income generating activities including agricultural production, to meet their daily demands. UPA, which was reported as the most practiced, enables the provision of highly nutritious food within agricultural production systems in the urban and peri-urban areas. These important urban and peri-urban agricultural production systems, supplement food supplies from rural food production systems in order to provide sufficient and accessible food and also provide a source of livelihood for the farmers (Angelo *et al.*, 2016).

Both crops such as horticultural varieties, maize and beans are produced and domesticated animals such as dairy cows, beef cattle and goats, poultry, pigs and rabbits which require small spaces to raise, feed and keep in confined structures are kept (Alarcon *et al.*, 2017). Some farmers partly house the livestock more so for the night for security and during the daytime they are left roaming around scavenging for feed in some cases. From the livestock production initiatives, the households are able to get eggs, milk, dairy products, and meat for food while the skins and hides were being used to make shoes and hand bags, wool and fur to make clothes. This makes livestock production a good source of livelihood as farmers are self-employed and generate income from surplus produce. It also creates employment to those involved in the food production chain outside the farms such as the transporters and food processing industries (GoK, 2008; Alarcon *et al.*, 2017) involved in the food production chain.

In neighboring country, Uganda, crop and livestock production was ranked first and second respectively as the best livelihood sources options among the residents of Kampala which is majorly an urban centre. UPA contributed up to 70% of the income in the households where it was practiced in (Mugisa *et al.*, 2016). Urban agricultural production raised most of the food requirements in the households that practiced UPA. This resulted in a good and healthy

generation of the children raised in the households. This is mainly because they consumed fresh products produced from their farms. The surplus production provided for trade and exchange of produce where sales and exchanged products catered for household expenses that included payment of school fees.

The belief that white collar jobs are available in the urban centers has encouraged the migration of people from rural areas to the urban areas in search of employment to feed their families. This has drastically reduced agricultural production in the rural areas by the younger generation and thus affecting food supply chains to the urban population, increasing demand for food which in turn, hikes up the food prices. The increase in food prices makes poor households work very hard only to spend most of their earnings on food. Little or nothing is spent on development activities. Eventually saving on resources for investments and wealth creation remained low as family expenses remained on the rise. That situation made most people, resort to cheap living conditions and illegal means of earning and acquiring of resources (Thys *et al.*, 2005; Magnusson and Kristin, 2014).

Many initiatives have been put in place to curb these problems, with the aim of reducing poverty and achieving food security and food accessibility, for all including the old and the young. Some of these initiatives include, Vision 2030 and Millennium Development Goals that resulted into the currently, Sustainable Development Goals commonly known as SDGs. The government also introduced the devolution of agricultural production functions as entailed by the constitution to the county level. This was mainly to ensure the creation of initiatives and projects best suited for the county needs and priorities. FAO has also developed strong interest in the urban food systems that led to the signing of the Milan urban food policy pact (MUFPP) with most cities around the world. With these initiatives promoting food security and food accessibility, which

provides for development of initiatives in the keeping of livestock in the urban and peri-urban areas, there is need to account for its contribution to the livelihood of the households. This will be achieved by assessing the situation in urban livestock keeping areas. The general objective of this study was therefore to assess the contribution of urban and peri urban livestock production to the food security of the livestock keepers in Nairobi County.

## **1.2 Statement of the Problem**

Urban Livestock keeping is among the leading farming activities in urban/peri urban regions, with several types of livestock such as cattle (for dairy and beef), goats, pigs, poultry, rabbits and emerging livestock like the crocodiles kept to sustain livelihood (Onim, 2002). Urban Livestock keeping contributes to food and nutritional security, income generation, employment creation, insurance and improved social status. It provides easily convertible assets to meet family expenses such as school fees and medical expenses for the family. Urban livestock keeping also records higher returns per unit of land utilized if management is done well (Foeneken and Mwangi, 2006). This provides a better land utilization option in cities as the returns on investment per unit of land utilized may be higher, thus favoring urban livestock production. The flexibility in terms of land use by livestock keeping cannot be underestimated in that livestock can be shifted easily to pave way for other purposes within the shortest time with minimum damage and losses. Furthermore, market development and organization is highly developed in urban areas and the high demand for food and nutrition highly propels the importance of urban livestock keeping (Lee-Smith *et al.*, 2007).

Despite the above benefits, rapid increase in population and urbanization, has increased urban poverty and urban food insecurity in the urban centres. The complexity of urban life with high poverty levels makes life unbearable for the residents thus leading to creation of livelihood



strategies for survival, with urban agriculture being among the most affordable and accessible to many. In Nairobi, 44% of households are undernourished with up to 20% being hungry (Popkin, 1999; GOK 2017b). This thus raises the question of food security to the rising urban population and thus the high demand for food, through food purchasing from the rural-urban supplies. To help meet the increasing demand for animal source protein, urban peri-urban livestock production comes in handy to provide the safe healthy and accessible nutritious food required to greatly improve food security and nutritional status for the affected farmers.

Most of the existing Peri-Urban Agriculture studies have focused on crop production in urban peri-urban areas while neglecting to one side the role of urban livestock keeping. Others have emphasized the overall importance of Peri-Urban Agriculture without distinguishing between crop and livestock production. Thus its contribution to the households' food security in urban and peri-urban is not well documented (FAO, 2013 and Megan *et al.*, 2015). This is the reason why there was need to undertake a research "To assess the contribution of livestock to the livelihood of farmers living in the urban and peri-urban areas of Nairobi County". The information can also be used as a point of reference in making policy decisions in investments and priorities in the sector being planned for urban agricultural production.

### **1.3 Study Justification**

According to County Integrated Development Plan of 2018-2022 (GoK, 2017a), in modernizing agriculture, the Nairobi County government would create an enabling environment for urban agricultural development. This will be achieved by increasing dissemination of agricultural information, promoting agricultural output and productivity and investing in value chain development of crops, livestock and fisheries. In this regard, thus this study aimed at creating

space for a full range of actors to discuss raised issues and find solutions suitable for urban settings with regards to livestock keeping.

Positively, this would contribute to planning and policy making through designing and implementing interventions with strong possibilities of successful interventions through understanding the contribution of livestock keeping to the livelihood of the urban and peri-urban households. This would in turn, guide on areas that need specific interventions in order to assist those involved in livestock production in these regions, produce high quality products, safe for human consumption; and so was the need to evaluate and understand the challenges faced by the livestock keepers thus find solutions to the problems facing the farmers.

By evaluating the influence of livestock farming on the livelihood of urban and peri urban farmers in Nairobi County, the study will contribute positively to available literature on livestock production in the urban peri urban areas. Data and information collected on institutional influence on investment, marketing and consumption will be documented and thus available for referencing. This will act as a guide in developing county plans, policies and strategy papers towards propelling the sector into achieving one of the county objectives of creating an enabling environment for urban agricultural development. This is in line with the constitution and thus increasing livestock output and value addition while promoting food and nutrition security for all involved in the livestock production sector in Embakasi constituency.

Finally, the study would lead to the production of a thesis report submitted for the award of a degree in Masters of Science in Agricultural Resource Management. One article was also published on a peer reviewed journal and the abstract published in the book of abstract from the

Agro-Conference held at University of Nairobi thus increasing the availability of research data on livestock production in the urban peri-urban Embakasi Constituency.

#### **1.4 General objective**

The objective of this study was to assess the contribution of urban peri-urban livestock production to the food security of the respondents in Embakasi constituency, Nairobi County.

#### **1.5 Specific objectives**

- i. To identify the socio-demographic characteristics in urban and peri urban livestock keepers in Embakasi constituency, Nairobi County.
- ii. To evaluate the institutional influence on livestock investments, marketing and consumption in Embakasi constituency, Nairobi County.
- iii. To assess the challenges faced by urban peri-urban livestock keepers in Embakasi Constituency, Nairobi County.

#### **1.6 Research Questions**

- i. What are the socio demographic characteristics of urban peri urban livestock keepers in Embakasi Constituency, Nairobi County
- ii. How do the various institutions influence investments, marketing and consumption of livestock products in Embakasi constituency in Nairobi County?
- iii. What are the most important challenges affecting livestock keepers in Embakasi constituency in Nairobi County?

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter presents literature review on the trends of urban and peri-urban agriculture from the perspective of various writers and researchers, creating the understanding of the rationale for its practice, its social value and its contribution to the urban peri-urban households practicing it. The chapter also seeks to understand the role played by urban agriculture and its contribution to the larger economy and more importantly it also covers the challenges that are faced by the livestock keepers in the urban and peri-urban areas. The chapter also describes in detail urban livestock production trends mainly in Africa and more so in Kenya, feeding and feed resource access and availability. The review also focuses in brief, on waste management issues which were highlighted and discussed mostly in the Kenyan context. Finally issues on marketing, preservation and processing of livestock products and the general marketing of produce in the urban and peri-urban areas were also presented in the chapter as this is a major component of agricultural production in any setting.

#### **2.2 Trends in urban peri-urban agriculture**

Urban and peri-urban Agriculture refers to cultivation of crops, raising of animals, processing and marketing of food within urban areas commonly referred to as cities (intra urban agriculture) and their surrounding or the fringes of the urban areas (peri-urban agriculture) as defined (NCC, 2015). This is in response to the daily demands of consumers within the town, city or metropolis on land and water resources. They apply intensive agricultural production methods and recycling most of its organic degradable urban waste to yield diversity of crops and livestock products

(FAO, 2007; Kang'ethe *et al.*, 2008 and GoK, 2017a). It was noted that the increase in human population has led to the expansion of towns as more people are migrating from the rural areas to the urban areas to seek greener pastures in the urban areas. This expansion has led to the connection between towns and areas that were slightly further away from towns. The situation arose due to the increase in population size and thus multiple effects of the increase in residential buildings and the required systems or amenities to sustain the population. These regions that interact economically with the urban centers form the rural-peri-urban-urban continuum and will most likely expand the regions to be referred as urban in the future (Roessler *et al.*, 2016).

The major problems caused by such dynamics where people move from rural areas to the urban centers are over-population and thus high demand for limited resources which may in turn increase the poverty levels, food insecurity or increased malnutrition. This dire situation is compounded by the need to create homes where the people can be accommodated. To sustain these livelihoods people have divergent land uses as options of dealing with food malnutrition, need for accommodation and the food insecurity situation. The urban peri-urban agriculture being the production of crops, fisheries, beekeeping, livestock and related activities has therefore acted as one of the major sources of food supply for poor households and the middle class in search of the extra income to meet their needs. Since most people living in the urban areas spend around 60% to 80% of their income on food and are highly vulnerable to price exploitation and fluctuations (Balphethi *et al.*, 2009 ; Cohen *et al.*, 2010) this acts as a way to cushion their resources and meet their daily food requirements.

Currently there are about 800 million people estimated to be living in the current urban areas in the world and are majorly dependent on the urban and peri-urban agricultural production for their food sources (FAO, 2012). This population is expected to increase to 1.26 billion by 2050

(United Nations, 2013) and thus increase in demand for healthy and safe nutritious food for each person. This will continue to put pressure on food sources and may cause food scarcity which may lead to food insecurity and malnutrition among the population (Magnusson and Kristin, 2014), especially among those earning less than one dollar per day. With this trend in population increase in the urban areas, it may not be easy to curb the problem of rising urban poverty even with the existing current forms of technology or resources as most may be in the hands of the few who would afford its maintenance and cost involved. Most people living in these urban areas still survive with less than \$2 dollar per day and have settled in dilapidated neighborhoods with poor access to basic necessities (FAO, 2012).

Several studies have shown that agricultural production in urban and peri-urban areas has continued to thrive in most cities around the world over the years. For example, (Onyatta *et al*, 2004) notes that three out of five families are involved in urban peri-urban agriculture in Nairobi. It was also estimated that 30% of its residents are engaged in UPA either as producers, processors, transporters or traders of agricultural produce as they work towards satisfying the rising demand for safe, healthy and nutritious food products (FAO, 2012). Although some government documents show that urban and peri-urban agricultural production has declined due to rising competition on other land uses, particularly residential home construction and other lucrative ventures. These are believed to fetch higher returns on investment as compared to agricultural production (GoK, 2017b) although this has not wiped out its engagement among the residents of the urban areas. For example; in Cairo, London and USA; they recorded 20, 40 and 25% respectively, of households practicing urban peri-urban agricultural production (Onyatta *et al.*, 2004). In Kisumu, urban peri-urban farming practices included small scale mixed farming enterprises, free range livestock keeping and various crop production ventures which have

remained on the rise due to the high demand experienced at the urban markets (Kang'ethe *et al*, 2008) as the urban population increases. Two thirds of the Nakuru residents, practice urban farming in which, they integrate crops and livestock production enterprises through the utilization of organic waste/manure from urban raised livestock to fertilize crops on urban and peri urban plots which promotes good qualities of the soil. This is achieved by supporting the flora and fauna in the micro environment in the soil which decompose the complex compounds in the organic waste/manure into simple compounds for absorption by plants. In Mombasa, production of fruits and vegetables is widely practiced on balconies for household consumption and local markets, as a means of curbing the high cost of fruits in the region and affordably providing safe and nutritious food (FAO, 2012). The products are also sold at roadside stands and farm gates creating a source of income and livelihood.

### **2.3 Why urban peri-urban agriculture?**

Urban and peri-urban areas as defined by the urban and peri-urban cities Act of Kenya (ROK, 2012), face challenges of high malnutrition cases, high poverty index, food insecurity or lack of food accessibility, ever up surging populations and high competition for resources pushing people to extreme levels of hunger and suffering (FAO, 2007). Urban and peri-urban agriculture is important because it provides a solution to the lack of food and high malnutrition cases to the people that practice it or are able to access the produce in order to cater for their daily food requirements in the households (Zizza *et al.*, 2010). Depending on prevailing conditions in any country, primarily economic, social, cultural or political environment, the opportunity to grow or acquire locally produced food is a critical component of the ability to live and co-exist in the urban, rural or peri-urban environment. Some of the produce realized from urban farming systems is sold at the formal markets while some is bartered, given away as gifts and presents or mainly

consumed by the family members. This provides adequate nutrition to the households' consuming the products from their farms. Urban agriculture is also one of the major means of income generation to the farmers in these areas through employment and trade (Cohen *et al.*, 2010). This agricultural activity in the urban area and its surroundings also has advantages such as readily available and well-structured markets, creating source of employment for the farmers and those involved in the food production value chain. This creates a solution to the problem of price exploitation by middlemen who transport, store and to some extent value add on the produce for higher prices of the same commodity at the expense of the primary producer (Brown *et al.*, 2000; Slater, 2001).

Accessibility to the urban areas by the peri-urban households makes entrepreneurship methods such as processing, packaging and marketing quite a very lucrative venture (Slater, 2001) as most equipment required are easily accessible and some can even be manufactured according to ones' demands from the industrial areas in the neighborhood. The value addition on some products to prolong the shelf life also raises the final price of commodities and thus the profit margin earned is in most cases higher than the primary product. The readily available market and better purchasing power in urban peri-urban regions reduces the cost of transport on inputs and produce and thus prices remain affordable. Thus, there is increased access to home-made food that is affordable both to the low and middle income class in the urban and peri-urban areas. When there are conflicts and droughts affecting the rural urban food links, urban and peri-urban agriculture still provides the major supplies of food to the farmers and their neighbors, (Mougeot, 2005; FAO, 2007). Fresh food supply that is acceptable for consumption is also encouraged by UPA since the food is available to the consumer when it is still in fresh condition with little or no additives for preservation purposes (Murithi, *et al.*, 2007). This is mainly due to the short



distances that are covered and the availability of good road network and market infrastructure, besides the improved communication channels for example; mobile network coverage and internet accessibility being available and at its best performance in these regions.

#### **2.4 Factors influencing urban peri-urban agriculture**

Socially, the UPA relieves stress levels and encourages physical activities which improve the mental health of the farmers, the entire household and everyone involved in the agricultural production value chain. This is because such people have better access to food, employment opportunities and most importantly, the money involved. In addition, the physical work that they do in these farms and the effort made to ensure products reach the consumer, make them physically fit. They also breathe in fresh air in the gardens due to the presence of plants, and generally the farms also form a good place to relax and reflect or just taking a rest. This increases their self-actualization, they also feel relaxed, which in turn minimizes crime rates among the population and suicide cases are also kept at bay. The farmers and those involved in the food production chain feel empowered and hence gain the self-esteem to even work harder. The people who cannot get formal employment also feel secured as the form some form of engagement when working in the farms thus providing for the needs of their own households. This also makes it easy for them to educate their children and meet their basic family requirements and obligations (Nugent, 2000) and thus making them self-sufficient.

The presence of agriculture in the urban and peri-urban setting also affects the local economy, the natural environment, social relations and the household economic behavior. It contributes positively to the lives of the city dwellers, adding diversity and a safe food basket. It also contributes negatively by creating health risks and use of scarce resources such as water and land which could have been put to other uses if well managed. Some environmentalists also believe

that UPA may not be beneficial as it may give rise to environmental pollution caused by improper waste disposal and management thus emitting bad odors. This thus reduces the chance of maintaining a clean environment for human and livestock co-existence. UPA also causes competition for the scarce water resource, as it relies on water that maybe required for sustaining households in the homes to maintain clean and healthy lifestyles for the family. Such misconceptions have led to reduced production and thus limiting the chances of ensuring food security and nutrition at poor household levels due to the observed decreased agricultural production rate in the urban and peri-urban areas (Mougeot, 2005; Kang'ethe *et al.*, 2008).

The current legal and policy framework for UPA at the municipal and county levels is also mixed with a tendency towards suspicion towards its uncontrolled nature and inadequate policy provisions. Livestock production is more restricted in most places because of the waste and noise generated which interferes with the neighbors comfort; but rarely on the zoonotic diseases which may have more serious consequences on the health of human beings (Brown *et al.*, 2000). In cities like Kampala and Lusaka, the law prohibits all kinds of agricultural production while in Harare farmers require some special permits and some restrictions are employed to curb on some farming methods practiced well in other areas. Whether official regulations prohibit, restrict or ignore urban agriculture, municipal officials treats the agricultural production activity as a nuisance, more recently in Lusaka and Nairobi as noted by (Bryd, 2003) before the devolution of the county government took place in Kenya.

Nairobi city county by-laws have at times caused collision between the city county law enforcers and the farmers involved in keeping of livestock, thus limiting UPA in the city in the past years. However, with the development of urban agriculture promotion and regulation Act, 2015 there is a slight relief for the farmers and all actors within Nairobi, since agricultural production will be

promoted and implemented at the County and Sub county levels (NCC, 2015). But of importance to note is that more policies and strategies need to be developed to guide on zones and areas that can be utilized for agricultural production and ways to ensure maximum production as County governments adopt on devolved functions of agriculture, (NCC, 2017a). This development needs to be done without compromising on environmental and public health management issues. Agricultural production is therefore practiced in diverse areas that include; private land, road sides and a long river banks, under power lines where every farmer designing his/her own farming methods (Mougeot, 2005; Kang'ethe *et al.*, 2008). This differentiates between the middle income farmers driven by urban demand for better standards, some of whom owning the land they farm on and poor households, mainly driven by the need to provide food for themselves and which in most cases practice farming in public spaces.

## **2.5 Urban livestock keeping**

Urban livestock keeping focuses more on the production of livestock for food and nutrition done within the confines of an urban and peri-urban areas. Also from these enterprises, farmers utilize various parts of the animals not utilized as food to generate further income; for example hides and skin used to make shoes, bags and belts or urine from rabbit production supplied for manufacture of fertilizers (Karikari and Asare, 2009). Despite competition for resources, pollution, city county by-laws or fear of increase in zoonotic diseases in UPA, farmers practicing agricultural production have continued to provide food and nutrition to their families and to some extent, the entire urban and the peri-urban households.

The livestock reared in these areas include dairy cows, beef cattle, dairy goats, poultry, pigs, rabbits and emerging livestock species such as crocodiles (GoK, 2017b). The land under cultivation is about 1,900 hectares with the average land farm sizes of 0.53 acres in urban areas

and 1.44 acres in peri-urban areas (GoK, 2012). The County Integrated Development Plan (2018-2022), records urban agriculture as an important land use type which takes up 13.9% cover of the possible 696.3 Km<sup>2</sup> total area covered by Nairobi City County. The farmers employ innovative urban peri-urban production technologies which include; utilizing all available spaces such as vertical space, roof-tops for small animals and maximizing on feed by-products, for example feed bulking from off-farm resources.

Some farmers carry out integrated farming methods, for example raising of poultry above fish ponds to maximize on production output per unit area (NCC, 2017) as the fish utilize poultry waste for feed. Urban farmers include the poor populations in the informal sector, vulnerable groups such as female-headed households, children, retired civil servants and people with limited formal education and no formal employment (Megan *et al.*, 2015).

Generally, there has been an increase in livestock production in Kenyan urban and peri-urban areas from 1992 and 1994. There were 443,500 livestock animals in Kenyan urban and peri-urban areas in 1992 and the number had increased to 1.4 heads of livestock in 1994 (Memon and Lee-Smith, 2003)). Currently Nairobi county alone has a livestock population of over five hundred thousand animals raised in the county (GoK, 2017b). Fourteen different livestock species which included cattle, dairy cows, dairy goats, meat goats, sheep, chicken, pigs and rabbits were kept by around 700 households in Kisumu and Nairobi. This provided a safe net which provided food, income and livelihood source of the farmers and the people involved in the food production chain (Onim, 2002; GoK, 2017b).

About 4.5 small ruminant animals were also kept in the urban and peri-urban areas in Ghana and provided the livelihood for over 500 farmers in the area (Baah, 1994). In Nigeria, about 80% of

the farmers kept livestock to supplement their daily income in the household (Gefu, 1992). Most of urban and peri-urban agriculture is done on small scale farming and most of the farmers kept one species of animals rather than two or more. About 50% of the farmers in Nairobi kept one species of livestock in 2008, while 33% of the farmers in Addis Ababa kept one species of domesticated animal and 20% kept multiple species in the same year. The trend was the same in Kisumu with majority of the farmers keeping one type of livestock (Memon and Lee-Smith, 2003).

Poultry production is usually preferred by most UPA farmers, because it is easy to manage through selling chicken or their eggs to the readily available buyers. This enables the farmers raise money quickly for emergency needs and supplementing the family income. Farmers also kept indigenous chicken as its meat is preferred due to its taste and nutritional value as compared to the exotic breeds. The farmers thus fetch great prices ranging from Ksh 800 to 2,500 per bird thus assured of good returns from their investments (GoK, 2010) and for quick income generation. Exotic birds are regarded as delicate to keep since they need electricity to survive harsh weather conditions in the earlier period of life. They also thrive under commercially intensive systems, thus farmers need to ensure there is sufficient resources to maximize their production. Though if well kept, the returns from investments made are good and the system makes it easy to collect manure for integrated crop and fish farming (Karolien *et al.*, 2013) in addition to collection of eggs or ready broilers for slaughter.

Rabbit production in 1997, was a new agricultural enterprise and rabbits were kept in small structures mainly by the youth for their own consumption (Owen *et al.*, 1997). Due to the increased population and increased nutritious-conscious enlightened community, rabbit production supplied affordable alternative source of proteins to curb the rising demand for white

meat (Karikari and Asare, 2009). In 2010, an increase in the production of rabbit was reported (GoK, 2010). Rabbit production was preferred because it required small capital and space to keep and generates quick returns due to its rapid multiplication rate, while its urine was being collected for use in the industrial production of fertilizers (Payne and Wilson, 1999).

The growth in the livestock kept, shows that livestock production in the urban and peri-urban areas is important to the economic development of the country as it has enormous benefits to food security and nutrition status of a country. In 2008, it was estimated that livestock production contributed around 40% of world's agricultural needs, and by the year 2020, there will be a demand of meat of up to 320 metric tonnes per year due to increased urbanization and the rise in population. Apart from the meat and milk and other dairy products, livestock provides hides and skins used to make shoes, bags and various apparels; while wool and fur was utilized to make clothes and beddings, (GoK, 2008). This creates another avenue for income generation and asset diversification while creating employment for those with minimal education and preferred to be involved in livestock farming and value addition.

Some notable challenges, which affect livestock keeping in the UPA systems, may include increase in zoonotic diseases and increased waste from livestock which may pose a threat to the lives and health of livestock producers and their neighborhoods. In order to minimize on production costs and maximize on profits, some farmers ended up constructing inadequate structures to hold all the animals raised. This attracted the attention of public health and veterinary health officials which has raised concerns over the entire agricultural production systems in the urban and peri-urban areas (Kang'ethe *et al.*, 2008). Land ownership also remains a challenge, as most suffer landlessness; a situation being fueled by historical land injustices,

land grabbing and influx of unskilled and semi-skilled job seekers from rural areas (GoK, 2017a).

## **2.6 Feeding and feed resources**

Most animals kept were fed on market by-products and kitchen left-overs in the urban and peri-urban areas as a cheap and accessible feed source because there is an enormous waste generated in the markets and homes. The commercial crop farmers in neighboring farms also provided a good source of feed to these livestock in addition to the local producers (Roessler *et al.*, 2016). The small plots that contained grass and legumes were used to graze the livestock in addition to what was produced along the riverine, running along the cities. Some farmers who could afford purchasing feed also relied on commercial feeds in addition to outside sourcing to boost on production. But due to the perception of high cost of commercial feeds, they were supplemented with the naturally available feed types. The natural feed types included; hay and silage materials transported from neighboring counties to the major cities. Some are also sold along the highways in the outskirts of the Nairobi City County.

Another critical component of production is the availability of water. Livestock production enterprises, especially dairy cows require large quantities of water for drinking and maintaining a hygienic environment for milk and meat production. This has made most livestock keepers to rely on water supplied for home use, shared for both the human and livestock kept. This has created high demand for water and high competition for the water supplied. Most of the roaming animals used stagnated water or any water resources available by the road sides, which risked the access of contaminated waste water from industries (Kang'ethe *et al.*, 2008).

## 2.7 Waste Management

Organic waste is referred to as organic materials which include food, crops, and animal waste including degradable carbon. Urban waste generally ends up in major dumping sites within and outside the urban and peri-urban regions in developing countries or in incineration and land filling facilities in the more developed areas. For example, in some countries like New Zealand and Canada, organic waste is either sorted and composited for agricultural production or used for incineration and land filling, although the later leads to loss of reusable nutrients (Smit and Nasr, 1992). Livestock keeping waste is not easy to manage more so in the urban peri-urban areas where land parcels are relatively smaller. Their smell is obvious and becomes intense and a nuisance to both the farmer and the neighbor when it rains.

In spite of the nuisance and smell, it is paramount to see this waste as a resource and not a problem that needs to be shoved and disposed; for sustainable development. Open cycle systems have been applied in some cases, where inflow of resources and outflow of waste has helped in the management of waste in municipalities around the world. To ensure its success, urban agriculture is a clear example that offers the possibility to convert the consume-dispose open cycle into the consume-process-re use and closed cycle by embracing technologies such as prevention, recovery, recycling and treatment of organic waste. The use of organic waste for making compost manure for planting of urban crops and fodder trees has been applied in several household and community levels (Crecchio *et al.*, 2004).

Biogas utilization has also provided another avenue, where livestock waste is managed through biogas production systems consisting of digesters, mixing (inlet) and expulsion (outlet) chambers. The system produces gas used for lighting, cooking and heating in the household offering the benefits of being environmentally friendly as it minimizes the cutting down of trees.



The system also reduces air pollution by removing the bad odor or pests relating to decomposition organic livestock-related waste in UPA (Bartomiej *et al.*, 2015). In Chile, residues from pig and cattle production are used to generate electricity that power generators for various uses; In China, two biogas patterns are developed, one that is household-scaled, where a small digester is used for different scattered farmers and second, a large biogas plant for centralized biogas production (Ling *et al.*, 2012). In Kenya, the ministry is committed to the production of biogas technology, through both the private and the public sector stakeholders, for example, Taita biogas production, pine power digester in Kilifi, Dagoretti slaughter house in Nairobi and Keekonyoike, with the later packaging the surplus gas produced. In addition 17,000 digesters were constructed in 36 Counties through Kenya Biogas Programme (KBP) and to offer training and support on biogas technology, institutions of higher learning were involved for example, Kaimosi TTC in Vihiga, College of Agriculture and Veterinary Science (CAVS) in Kiambu County and Jomo Kenyatta University of Agriculture and Technology (JKUAT) among others (KNDBP, 2013).

Household levels have reported cases of success through the use of effective microorganisms for complete decomposition of cattle waste into odorless compost manure. In Community level, also it has shown success in utilizing the economies of scale by carrying out large scale operations to manage waste from several livestock producers. Urban farms can be organized to collect and process as much of urban organic waste as possible which can then in turn be handled at community stations. Composts have been used to maintain long-term productivity of agro-systems and protect the soil environment from nutrient depletion, climate change effects and inadequate management thus reducing waste disposal costs incurred by the tax payer and

municipalities or counties. In most instances the waste is used as manure for crop farmers and tree planting either fodder trees or land regeneration (Crecchio *et al.*, 2004).

In Addis Ababa and India, cow dung has been used to make dung cakes for fuel and also for plastering mud houses over the years. This has reduced the cow dung waste drastically as most of it is utilized to produce heat energy with minimal odor utilized for various uses by the household. This kind of management though in some urban centers, is difficult to implement because there is either little or no demand for cow dung to provide heat for cooking or heating purposes. In most urban areas also, nearly all houses are either made of stones, wood or iron sheets, therefore no demand for cow dung-plastered houses (Kang'ethe *et al.*, 2008).

## **2.8 Urban Market and Marketing**

Most farmers in urban and peri-urban areas keep livestock mainly for food, more so, the poor households and also to sell part of the produce when there is surplus, mainly to the middle income farmers. Only a small portion of the produce is sold at the formal markets while a larger part of the produce is sold usually at the farm gates due to the readily available market. This is due to lack of resources and skills among small scale farmers impeding their access to the formal markets or producing for these markets, even if it is lucrative to do so. During the festive seasons, the prices of livestock products rise and the farmers fetch good prices for their produce. In some major urban centers like Dar-es-Salaam, Addis-Ababa and Nairobi, case studies have shown that farmers form co-operatives and self-help groups to aid the sale of their products and ease the work of sales to the individual farmer. Co-operatives also help in control of the prices, quality and increased safety of the products where production is high especially as noted in Kisumu and Nairobi regions. However, in most cases, it was noted that value addition has

remained relatively low due to the high demand of the raw products and readily available market observed in the UPA areas (Onim, 2002; Onyatta *et al.*, 2004; Rossler *et al.*, 2016).

Livestock production and value addition is a component of urban agriculture in Nairobi that addresses food and nutrition challenges in addition to supplementing household incomes. Most of the livestock production systems are mainly small scale, market oriented and subsistence in nature. Livestock products included eggs, meat and milk in its raw form. Most of these are highly perishable products due to their low acidity nature and thus good media for bacterial development. Therefore, farmers have to work extra hard to either sell the products at the farm immediately after milking/slaughter or incur the costs of preservation for longer shelf life. Maintaining the products fresh helps increase the sale of these products as most people prefer consuming them in their fresh state. Where it is not possible, trained farmer groups and individuals are adding value to the milk into fermented products such as yoghurt, mala, lala and ice cream; broiler and rabbit meat into sausages, samosas, prime cuts among others (GoK, 2017b) although these practices among the farmers have remained low for reasons explained earlier.

Nairobi is the major market for livestock and livestock products from other counties where large scale production is conducive and highly practiced. To take advantage of the proximity of the urban market, value addition of livestock products is promoted through urban livestock extension methodologies although the adoption by the farmers has generally remained low (GoK, 2017a; GoK, 2017b). The farmers try as much as possible to sell their produce quickly at the farm gate to avoid spoilage or incurring the risk and cost of preservation. Since in most of the times, there is ready market, most farmers manage to sell the products on time and rarely do they suffer from post-harvest wastage or losses. The products are sold directly to the market or indirectly through

brokers in the marketing channels. The intermediaries in the production chain also do direct sales or use the products as ingredients to manufacture other products with longer shelf life and convert the produce into processed products that can be preserved for longer periods without getting spoilt (Don, 2008).

## **CHAPTER THREE**

### **MATERIALS AND METHOD**

#### **3.1 Study area**

The study was conducted in Nairobi County, in Embakasi Constituency located in Nairobi East region. The study was conducted in Embakasi East, South, Central and North Sub Counties. The sub Counties are characterized by undulating, hilly topography with an elevation in a range of 1460 to 1920 m above sea level and the lowest elevation occurs at the Eastern boundary and highest at the Western rim. There are several streams which have steep-sided valleys covered with green vegetation flowing through the region. It has a fairly cool and conducive climate with a mean annual rainfall ranging from 786 to 1050 mm and temperature ranging from 10<sup>0</sup> C to 29<sup>0</sup>C (Ng'ang'a, 1992; Rakodi, 1992; GOK 2017b). Several species of mammals live in the region, with a record of 100 species of mammals and 527 species of birds. Therefore it is a County suitable for supporting both livestock and crop production (GoK, 2012). The study targeted a random sample of livestock farmers (Min of 4 dairy cows, 100 chicken, and 10 shoats) in Embakasi constituency in Nairobi County (2015). Livestock farmers that met the criteria from the following Sub Counties of Embakasi North (40), South (40), East (40) and Central (40) were interviewed using a semi structured questionnaire. Data on the accessibility and contact for the farmers was provided by the Sub County Livestock Officers in Embakasi. Descriptive survey design was adopted for this study to collect farmer's information, perceptions and observations on urban peri-urban livestock farming practices (Mugenda and Mugenda 2003; Chimoita *et al.*, 2017).

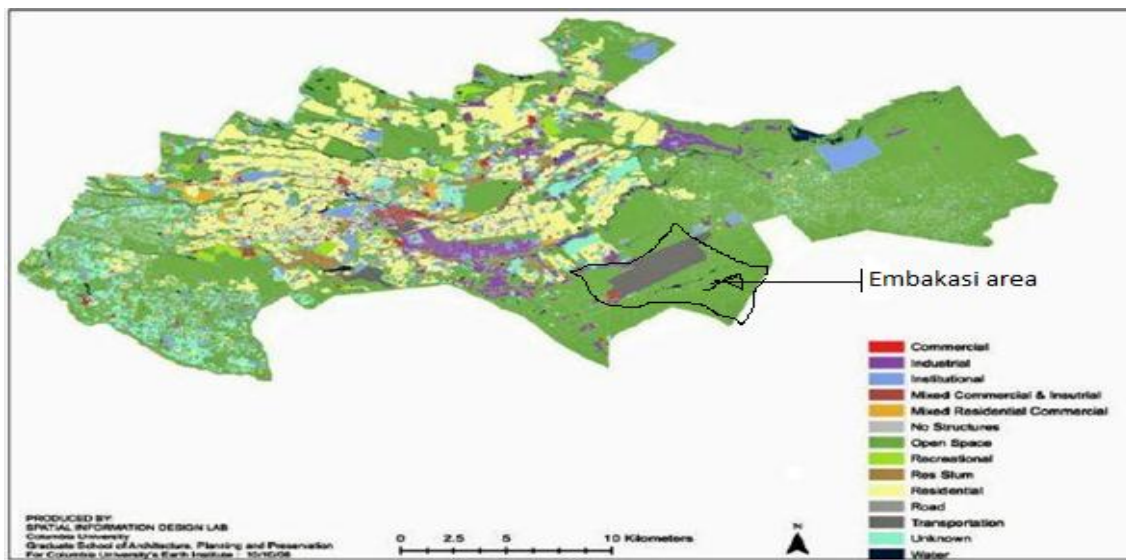


Figure 3.1: The land use system in Nairobi County showing the open space areas that are currently used for farming, Source: (GoK, 2017a)

### 3.2 Conceptual framework for sustainable livelihood

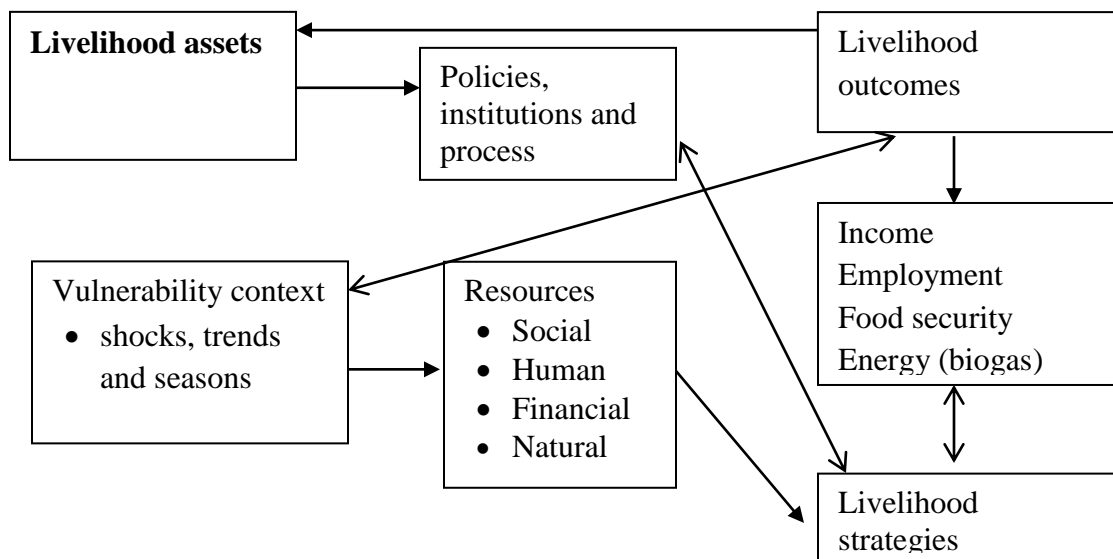


Figure 3.2: A conceptual model of contribution of livestock production to urban peri-urban livelihood.

### 3.2 Study design, sampling procedure and sample size

The study targeted a random sample of livestock keepers in Embakasi constituency. The target population in Embakasi constituency was obtained from Embakais Sub County Livestock office. A total of 780 livestock keepers (GoK, 2017b) were active at the time of study and a list of these farmers (with contacts) was obtained from Embakasi Sub County Livestock Offices situated at

the Deputy County Commissioner Headquarters in Embakasi. This number was then used in calculating the sample size using the Cochran's sample size calculation formula.

Cochran's sample size calculation has been consistent in yielding consistent results over time and thus reliable to give credible result (Mugenda and Mugenda 2003; Alreck and Settle 1995).The researchers also measured the reliability of the questionnaire as a data collection tool by testing and retesting to measure its reliability thus its' adoption.

$$n = \frac{Z^2 pq}{d^2}$$

Where;

**n** = the desired sample size for N>10,000,

**Z** = constant associated with the required confidence level which in this study was 95%, z value= 1.96,

**p** = the proportion of the population that possessed the target characteristics.

Since this was not known, it was estimated to be 50%= 0.5, **q** = 1-p= 0.5 and **d** = the level of precision estimated to be 10%= 0.1.

$$n = [1.96^2 * 0.5 * 0.5] / 0.1^2 = 96.04$$

However, since the target population was 780 livestock farmers which is less than 10,000 (N<10,000) and hence the sample size was adjusted as follows;

$$nf = \frac{n}{1 + (n/N)}$$

Where;

**nf** = the adjusted sample size (N<10,000),

**n** = sample size when N>10,000 and

N = the population size.

Therefore,  $Nf = 160 / [1 + (160/780)] = 160$  (rounded to the nearest whole number); The 160 respondents were selected for the study using stratified purposive sampling.

A determined sample size of 160 peri-urban livestock farmers was thus achieved from the sampling frame and 40 keepers were further and purposefully selected from each of Embakasi North, Embakasi East, Embakasi Central and Embakasi South sub counties (Otieno *et al.*, 2015). Both open ended and multiple choice questions were used in this study in order to generate credible data for analysis. Simple-random sampling method to ensure every farmer had a possibility of representation was used to generate the sample size from the list of farmers obtained (Mugenda and Mugenda 2003; Chimoita *et al.*, 2017).

### **3.3 Pre-test survey**

Ten questionnaires were given to be administered in Kasarani Sub County in order to assess whether the questionnaires would give the same meaning to the different participants and also confirm whether it was simple enough and easy to understand in order to capture the data required from the respondents. This was also done to evaluate the reliability and credibility of the questionnaire. Kasarani Sub County was chosen for the test due to its closeness to Embakasi and its' conducive environment for livestock production. It also represents the urban peri-urban region.

### **3.4 Data collection**

Semi structured questionnaires with both open ended and multiple choice questions were used to collect data from the livestock keepers (respondents) in Embakasi constituency, Nairobi County. Data was obtained on socio demographic characteristics of the respondents, the species and breeds of livestock kept, production figures, extension education information, the institutions



supporting livestock keeping projects and their influence in supporting livestock keeping as a livelihood option in Embakasi constituency, marketing strategies applied and the challenges affecting the livestock farmers were also recorded. Finally the data was also analyzed for the relationships between the characteristics of the household and respondents in Embakasi constituency and also the associations between marketing techniques and livestock keepers' experiences.

### **3.5 Data analysis**

Data collected was cleaned, sorted and entered into the computer program, Microsoft Excel of windows 10 professional and exported to the software, Statistical Package for Social Sciences (SPSS) version 20 for further analysis. The survey data was analyzed using SPSS software version 20 as it was the most current thus up to date. This generated descriptive statistics which included mean, frequencies, maximum, minimum values, correlations and ranges that facilitated inferential analysis using t test to compare variables in the data set.

## CHAPTER FOUR

### RESULTS

#### **4.1: The distribution of socio-demographic characteristics of the sampled households in Embakasi constituency in Nairobi County**

The following are the socio-demographic characteristics of the sampled livestock keepers (households) in Embakasi constituency in Nairobi County as recorded by the respondents as captured. Most of the interviewed households had a family size of 4 - 10 individual members of varying ages. A total of 57.5% of the people who were interviewed (respondents) reported household sizes of 4-6 members, 30% had 1-3 members and 12.5% had 7-10 members. The composition of the respondents as reported and observed were 45% being male and 55% being female. Majority of the respondents were of ages ranging from 36 to 50 years old at 47.5%; those who were above 50 years of age were recorded at 30% while those between the ages of 18 to 35 years of age were recorded at 20%; only 2.5% of the farmers were aged less than 18 years of age mainly inheriting farming from their parents or just helping their parents in managing the farming enterprises. Most of the farmers interviewed were educated since 50% of the respondents had attained secondary school level of education; 27.5% of which had attained primary education level of certification and 22.5% of them had attained post-secondary education, some of them being degree holders who were in the process of searching for employment in their areas of qualification. Most of the respondents said they were in stable marital relationships as 87.5% of the respondents said they were married while 7.5% of them responded to being single with only 5% of the respondents being widows/widowers. Most respondents were not formally employed by any institution since 87.5% had reported to have no white collar jobs other than farming and/or casual labourers offering their services within the

region, only 12.5% of the respondents were employed by governmental and non-governmental institutions and companies operating within Nairobi region. Out of the employed, 4.7% of the respondents were retired civil servants/ government officers owning some land and properties within and/or around the city and their ancestral homes thus good investments and only a handful of 7.5% of respondents were reported to being involved in various businesses within and around the city and invested part of their profits and earnings in livestock keeping projects for their spouses and children to manage; most of these respondents also owned the land they were farming on (Table 4.1).

**Table 4.1 : The distribution of socio-demographic characteristics of sampled households in Embakasi constituency, Nairobi County.**

Parameter	Description	Number of respondents	Percentage (%)
Household size	1 -3	48	30
	4-6	92	57.5
	7-10	20	12.5
Gender	Male	72	45
	Female	88	55
Age of respondents (years)	< 18	4	2.5
	18-35	32	20
	36-50	76	47.5
	> 50	48	30
Education level	Primary school	44	27.5
	Secondary school	80	50
	Post-secondary school	36	22.5
Marital status	Single	12	7.5
	Married	140	87.5
	Widowed	8	5
Employment	Yes	20	12.5*
	No	140	87.5

N=160,\* the percentage rep 7.8% civil servants & 4.5% business owners

#### **4.2: The types of livestock kept by the sampled households in Embakasi constituency,**

##### **Nairobi County**

The species of the livestock kept by the farmers in Embakasi constituency were reported as shown below; 30% of the respondents kept poultry mainly chicken, 25% reared dairy cattle in zero grazing units or beef cattle mainly by Maasai in peri urban areas and 11% of them raised dairy goats and/or meat goats respectively. The other remaining 20% of the respondents kept rabbits, while a small percentage of 10% kept pigs and 5% were keeping sheep (Table 4.2) in their homestead.

**Table 4.2 : The types of livestock kept by the sampled households in Embakasi constituency in Nairobi County**

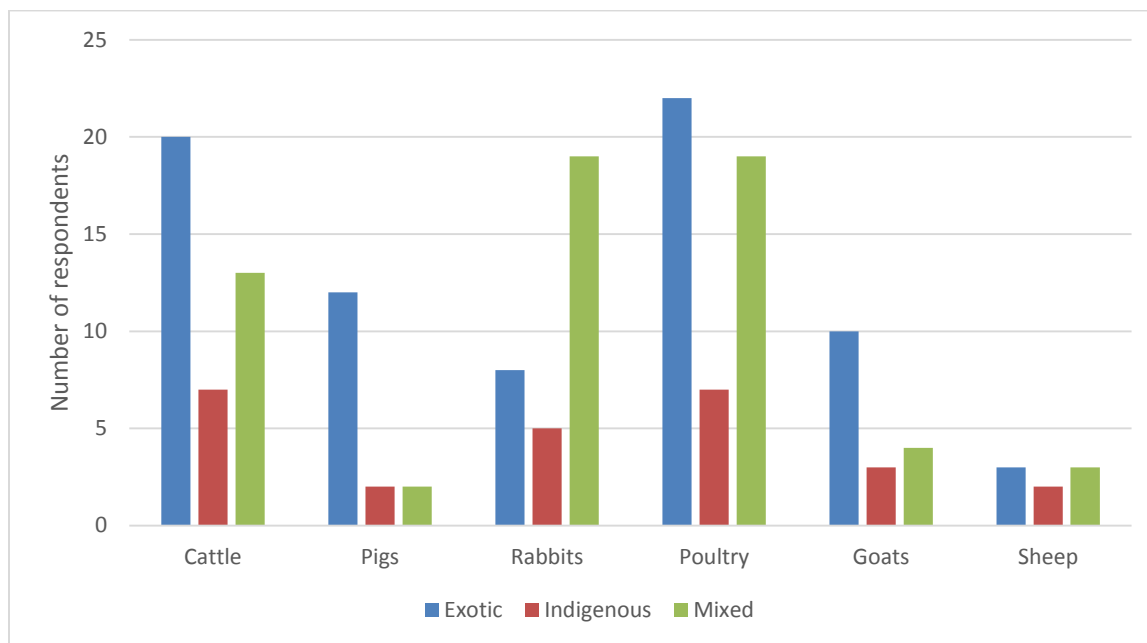
Parameter	Embakasi North	Embakasi East	Embakasi South	Embakasi Central	Total (No.)	Percentage (%)
Poultry	12	14	15	7	48	30
Cattle	8	12	9	11	40	25
Rabbits	6	9	7	10	32	20
Goats	5	6	2	4	17	11
Pigs	3	6	4	3	16	10
Sheep	2	3	1	1	7	4

N=160, No. is the total number of respondents that kept the particular livestock

#### **4.3: Breeds of livestock kept by the sampled households in Embakasi constituency, Nairobi County**

Majority of the livestock keepers interviewed kept exotic breeds as shown in the figure below; 20 kept exotic cattle breeds, 7 reared indigenous breeds and 13 respondents had kept mixed breeds of cattle, some being the Maasai in the peri-urban areas. A total of 48 respondents kept chicken, 7 of which, kept indigenous chicken breeds and 22 of them, were keeping exotic chicken breeds mainly layers and broilers while 19 respondents kept mixed breeds of exotic and indigenous chicken breeds. Most of the interviewed farmers, 19 of the respondents kept mixed

rabbit breeds, 8 kept exotic rabbit breeds while 5 of them kept indigenous rabbit breeds. Most pig farmers reared exotic breeds as 12 respondents said they kept them, while 2 kept indigenous breeds and another 2 respondents kept mixed pig breeds. A portion of the sampled households reared sheep and goats; 17 keeping goats and 7 kept sheep (Figure 4.1).



**Figure 4.1: Different breeds kept by sampled households in Embakasi constituency in Nairobi County**

#### **4.4: Rabbit meat produced and sold in the previous month and the price per kg by sampled households in Embakasi constituency in Nairobi County**

The information obtained on rabbit meat production was collected in Embakasi Central and Embakasi East, purposefully selected for this study. This was necessitated by the recorded numbers of rabbit data in these areas which were collaborated by the figures recorded in the livestock offices. There was a higher rabbit meat produced per month in Embakasi Central at 40 Kg per household with some farmers producing to as high as 45 Kg. The average amount of

rabbit meat sold was 5 Kg with maximum sales of 42 Kg per month in some households in the area; the selling price was KSh 400 per Kg in both areas (Table 4.3).

**Table 4.3: Rabbit meat produced and sold per month in sampled households in Embakasi constituency in Nairobi County**

Sub-County	Produced (kg/household)			Sold (kg/household)			S.P* (KSh /Kg)	
	Total	Min	Max	Mean	Min	Max	Min	Max
Embakasi Central	12	2	10	4	2	8	400	400
Embakasi East	40	8	45	5	2	42	400	400

N=160, Average dressed weight of rabbit was 2 kg, \*-selling price

#### **4.5: Poultry meat produced and sold per month and price per kg in sampled households in Embakasi constituency in Nairobi County**

Most of the chicken meat that was produced in Embakasi East sub-county was from the indigenous improved chicken (IC) famously known as *kienyeji*, broilers and culled layers. Data was collected in Embakasi Central and Embakasi East which was reflective of the poultry population range of above 100 chicken kept per household. The minimum production was 15 Kg per household per month, with a maximum production of 280 Kg recorded by one household in a month in Embakasi Central. The average amount sold was 142 Kg with some farmers selling up to 240.8 Kg of chicken meat with selling price ranging from KSh 400 to a maximum of KSh. 500 per Kilogram of chicken meat produced. In Embakasi East, the production of chicken meat was recorded at a total of 470Kg produced per household, with the lowest producing 24 Kg per household and a maximum of 264 Kg of chicken meat. The amount sold ranged between 0-145 Kg per household and the selling price for a Kilogram of chicken meat ranged between KSh 300-400 (Table 4.4).

**Table 4.4: Chicken meat produced and sold per month in Embakasi Central and East**

Sub-County	Produced (Kg/household)			Sold (Kg/household)			S.P* (KSh/kg)	
	Total	Min	Max	Mean	Min	Max	Min	Max
Embakasi Central	400	15	280	142	0	240.8	400	500
Embakasi East	470	24	264	124	0	145	300	400

N=160, Dressed weight was 1.5kg per bird,\*-Selling Price

#### **4.6: Indigenous chicken egg produced and sold per month and average price per tray in sampled households in Embakasi constituency, Nairobi County**

The production of indigenous chicken eggs was expressed per total number of trays produced per household purposively selected in Embakasi Central, South and East for this study. The total production per household in Embakasi Central was recorded at 540 trays of eggs with some farmers producing as high as 580 trays of eggs in a month. The amount that was sold was ranging from 25 trays of eggs to a maximum of 390 trays of eggs within one month for the various respondents with an average of 207 trays of eggs sold in a month; the price was at a minimum of KSh 400 and a maximum KSh 600 per tray thus an average price of KSh 500 per tray was obtained. The egg production in Embakasi East was also impressive with a total production of 300 trays of eggs per household, while some farmers producing up to 150 trays of eggs in a month, the amount that was sold was at a mean of 125 trays of eggs per household and a range of 50 to a maximum of 200 trays of eggs sold per household; the price was at the range of a minimum of KSh 400 and a maximum of KSh 600 per tray thus an average of KSh 500 per tray was noted. The respondents in Embakasi south produced 250 trays of eggs in a month and recorded a minimum of 20 trays of eggs produced by one household and a maximum of 100 trays of eggs produced, the amount that was sold was an average of 20 trays of eggs and a maximum of 90 trays of eggs sold per household in one month; the price of the eggs were at a

minimum of KSh 400 and a maximum of KSh 600 per tray thus a tray of eggs sold at an average of KSh 500 (Table 4.5).

**Table 4.5: Indigenous chicken eggs produced and sold per month by sampled households in Embakasi constituency, Nairobi County**

Parameter	Produced (T/H)*			Sold (T/H)*			S.P (KSh/tray)		
	Total	Min	Max	Mean	Min	Max	Min	Max	Mean
Embakasi Central	540	13	580	207	25	390	400	600	500
Embakasi South	250	20	100	55	20	90	400	600	500
Embakasi East	300	14	150	125	50	200	400	600	500

N=160, T/H-trays per household, S.P-Selling Price

#### **4.7: Layer eggs produced and sold per month in sampled households in Embakasi constituency, Nairobi County**

The egg production from layers was studied and recorded in Embakasi East, South and Central sub counties as recorded in the table. The results show that layer egg production per month was highest in Embakasi East at a total production of 8,000 trays produced by the sampled household in the region. It was also noted that some farmers produced up to a maximum of 100 trays of eggs per month. The total number of trays sold per month was noted at 6,400 trays of eggs sold within the areas of production, and the maximum number of trays sold per household was 50 trays of eggs, with the selling price at the farm gate being KSh 300 per tray sold. On the other hand, In Embakasi Central, the total layer eggs produced were also 6,400 trays and a maximum production of 50 trays of eggs. The total number of trays that were sold was an average of 40 trays per household with the selling price being KSh 300 per tray of eggs sold. In Embakasi North, there was a total production of 6,400 trays of eggs with some farmers producing up to a maximum of 60 trays of eggs per household per month, the amount sold was at an average of 30



trays of eggs and a maximum number of 30 trays of eggs sold per household; the price was KSh 285 per tray at a farm gate price which was a little lower than the other two regions (Table 4.6).

**Table 4.6: Layer chicken eggs production per month in Embakasi constituency, Nairobi County**

Parameters	Produced (T/H)			Sold (T/H)			S. P (KSh/tray)	
	Total	Mean	Max	Total	Mean	Max	Min	Max
Embakasi Central	6,400	40	50	6,400	40	60	300	300
Embakasi North	6,400	40	60	4,800	30	30	285	285
Embakasi East	8,000	50	100	6,400	40	50	300	300

N=160, T/H-trays per household, S.P-selling price 1 tray = 2.5 dozen.

**4.8: The estimated values of livestock kept in Embakasi constituency, Nairobi County at the time of study by the sampled households.**

The results for the values of livestock in Embakasi were reported as shown in the following table. The results showed that, the value for the rabbits was higher in Embakasi South at an estimated mean value of KSh 16, 270 with the highest value reported to be KSh 30, 000 and minimum KSh 2,000; which was followed by Embakasi East region following closely at an estimated mean value of KSh 9, 555; with the highest owner valuing the stock at KSh 16,000. Embakasi Central was third in range for the value of kept rabbit was estimated at a mean value of KSh 1, 937 while the highest farmer valued the stock at KSh. 16,000 and a minimum value of KSh 2,000. For Embakasi North, the mean value of rabbit was estimated to be at KSh 2,500 and the best earning rabbit kept valued at KSh. 3, 000 and a minimum of KSh 2,000. Poultry production had an estimated mean which was highest, in Embakasi North at KSh 81, 000 raised per household in the area and maximum value of stock being KSh 315, 000 of chicken kept and a minimum of KSh 20,000. This was closely followed by Embakasi South at an estimated mean

value of KSh 70,960 for chicken stock kept with a maximum of KSh 120,000 per household and a minimum value of KSh 20,000. Embakasi East was third at an estimated mean value of KSh 16,500 with a maximum value estimated at KSh. 23, 000 and minimum of KSh 10,000 per household for chicken stocks raised in the area. Sheep production was reported in Embakasi South with an estimated mean value of KSh 14,000 for sheep kept and a maximum amount valued at KSh 20,000 and minimum of 10,000 for each household involved in sheep production. In Embakasi East, the sheep was valued at a minimum of KSh 20, 000, maximum of KSh 40,000 and a mean of KSh 30,000 per household. Goat production was reported with the highest values at Embakasi South with a maximum of KSh 175,000, minimum of KSh. 10,000 and a mean value of KSh 92,500. Embakasi North was second at an estimated mean value of KSh 25,000 and an estimated maximum of KSh 30,000 for goats kept while Embakasi Central had an estimated mean value of KSh 15,000 for animals kept with a maximum of KSh 30,000 and a minimum of 10,000 per household raising goats. Pig production was reported in Embakasi North region at an estimated mean value of KSh 46,000 and estimated maximum value of KSh. 60, 000 and a minimum of KSh 30,000 per household for pigs kept. In Embakasi south, the mean was KSh 235,000, minimum of KSh 120,000 and a maximum of KSh 350,000 while Embakasi Central had a minimum of KSh 40,000; maximum of KSh 60,000 and a mean of KSh 50,000. Embakasi South had an estimated mean value of KSh 235,000 with an estimated maximum valued at KSh 350,000 and a minimum of KSh 120,000 for pigs kept. Cattle production was highest in Embakasi North at an estimated mean value of KSh 865,000 for a household raising a cattle herd with six heifers with an estimated maximum value of KSh. 1, 650, 000 and a minimum of KSh 80,000 from the respondents. An estimated mean value of KSh 130, 000, minimum of KSh 80,000 and maximum value of KSh 180,000 in Embakasi Central was noted for the cattle stocks kept in the constituency and a mean value of KSh 320,000;

minimum and maximum value of KSh 120,000 and KSh 520,000 respectively were recorded in Embakasi South for the same (Table 4.7).

**Table 4.7: The estimated values (KSh) of livestock/household kept by respondents in Embakasi constituency, Nairobi County at the time of study.**

Parameter		Rabbit	Poultry	Sheep	Goat	Pig	Cattle
Embakasi Central	Min	2,000	20,000	10,000	10,000	40,000	80,000
	Max	16,000	200,000	30,000	30,000	60,000	180,000
	Mean	1,937	4,508	20,000	15,000	50,000	130,000
Embakasi North	Min	2,000	20,000	10,000	20,000	30,000	80,000
	Max	3,000	315,000	30,000	30,000	60,000	1,650,000
	Mean	2,500	81,000	15,000	25,000	46,000	865,000
Embakasi South	Min	2,000	20,000	10,000	10,000	120,000	120,000
	Max	30,000	120,000	20,000	175,000	350,000	350,000
	Mean	16,270	70,960	14,000	92,500	235,000	230,000
Embakasi East	Min	2,000	10,000	20,000	10,000	60,000	120,000
	Max	16,000	23,000	40,000	50,000	160,000	520,000
	Mean	9,555	16,500	30,000	30,000	110,000	320,000

N=160, All values expressed in KSh.

**4.9: The average monthly milk production per household in the sampled households in Embakasi constituency, Nairobi County.**

The average monthly cattle milk production for the previous month was recorded as reported by the sampled households as indicated below. The average milk production per cow in Embakasi region was 8L of milk per day on average and 3L of milk per day for dairy goats in the region. There was a higher average milk production per household in Embakasi North area with an average of 950L of milk; the best household milk producer recorded a maximum of 1,350L per month in the region. Embakasi Central Sub County produced an average milk production of 1490.8L per household in one month and a maximum of 2,500 L and a minimum of 480L per month of production was recorded by the households in the region. Embakasi South was 3<sup>rd</sup> at an

average of 370L of milk recorded in the month and a maximum of 480L and a minimum of 250L of milk produced per month in some households in the region. In Embakasi East region, the range of production of dairy cow milk was from 480L to 2,400L; with an average of 1,440 L produced and sold. It was noted that most respondents keeping dairy cows, supplemented their milk production from cows with that of dairy goats both for consumption and for sale. Therefore records on dairy goat production were recorded as follows; the monthly average goat milk produced in Embakasi North and Central Sub Counties was recorded as 495L and 990L of goat milk respectively. The minimum amount was 180L and maximum of 1800L of goat milk was obtained from figures in Embakasi Central. Embakasi North recorded a range of 90L to 900L of goat milk produced per household. Embakasi East Sub County recorded monthly mean production of 860L of milk produced and sold per household, being 3<sup>rd</sup> in dairy goat milk production, after Embakasi South and Central (Table 4.8).

**Table 4.8: The monthly average milk production per household recorded by sampled households in Embakasi constituency, Nairobi County at the time of study**

Sub-County		Cattle milk (L)/month/household	Goat milk (L)/month/ household
Embakasi Central	Min	480	180
	Max	2,500	1800
	Mean	1490.8	990
Embakasi North	Min	480	90
	Max	1350	900
	Mean	950	495
Embakasi South	Min	250	180
	Max	480	2400
	Mean	370	1290
Embakasi East	Min	480	180
	Max	2400	2400
	Mean	1440	860

N=160, Average daily milk production is 3L goat and 8L/Cow per household

#### **4.10: The major livestock housing methods in Embakasi constituency, Nairobi County**

The following are the various types of housing structures used by the respondents to house the livestock kept in the study area. The study shows that, 65% of the farmers had constructed semi-permanent houses mainly made of mud, wood and iron sheets for roofing with some metal reinforcements on the structures. 22% of the respondents, had constructed long lasting structures with concrete, iron sheets and metal rods with complete areas for storage for the livestock kept while a small percentage of 3% of the livestock keepers had temporary housing structures which could easily be dismantled if need arises to shelter the animals kept. The livestock production systems reported in the study area included; zero-grazing units for dairy cattle, deep litter production systems for poultry kept and multistoried rabbit production hutches and structures were commonly observed as shown below. These housing structures varied between the peri urban regions of the constituency and the urban areas, where there were large pieces of land fewer or no upper floors for livestock housing were observed. 2% of the respondents did not indicate the livestock housing methods and structures used which in most cases, meant the particular farming households were interviewed in their workplaces and not necessarily in the places they carry out their livestock keeping practices. Also to note were 8% of the households who responded to having no housing structures at all for the livestock kept. Most of them, had the animals roaming freely in and out of their compound, thus providing security and shelter within their houses, only so, during the harsh weather conditions in the cold season or only for the delicate young stock reared. Livestock housing is a critical component of urban and peri urban livestock production as it enables the farming community to adhere to the county by-laws which suggests confining the animals to minimize disturbance and improve waste management for the urban farmers in addition to providing security and protection from the harsh weather elements (Table 4.9 and plates 4.2, 4.3, 4.4 and 4.5).

**Table 4.9: Major livestock housing methods recorded by the sampled households in**

**Embakasi constituency, Nairobi County**

Parameter	Embakasi North	Embakasi East	Embakasi South	Embakasi Central	Frequency (No.)	Percentage (%)
Semi-permanent	14	36	22	32	104	65
Permanent	6	13	5	12	36	22
Temporary	2	0	0	2	4	3
None	4	0	6	2	12	8
Not indicated	1	1	1	1	4	2

N=160

**4.11 Plates 4.1, 4.2, 4.3, 4.4 showing the various types of housing structures taken in**

**Embakasi constituency, Nairobi County**



**Plate 4. 1:** Temporary cattle house holding a herd of cattle in one of the households in Embakasi North sub-county



**Plate 4. 2:** Rabbit hutch holding rabbits in one of the households in Embakasi East sub-county



**Plate 4. 3:** Permanent cattle house holding cattle in one of the households in Embakasi Central sub-county



**Plate 4. 4:** Deep litter system holding chicken in one of the households in Embakasi South sub-county

#### **4.12: Institutional influence on livestock enterprises in Embakasi constituency, Nairobi**

##### **County**

Institutions that supported farmers in Embakasi Constituency were various and ranged from Churches, Universities, NGOs, and CBOs. They supported the farming community in various ways that included; offering and/or funding of capacity building sessions, boosting livestock production enterprises and projects by giving a number of livestock breeds. They also gave out construction materials to groups and individual farmers, or bought the final products from the farmers for commercial and individual use of the products. This enhanced livestock production initiatives which in turn created food access and food security to the households. These institutions have supported livestock production in the urban and peri urban regions in Embakasi constituency by supporting training to 64 respondents. They also invested in buying of construction materials for the structures, feeds and livestock breeds to 10 of the respondents in Embakasi constituency. For a further 10 of the respondents, they were assisted in marketing of the produce by creating awareness of the products through online marketing, word of mouth and developing marketing brochures for the products for wider access. Actually, most of the respondents, 76, reported that institutions were the most important segment of their consumers for their produce. A further analysis showed that, 26% of the respondents were supported by the Church. 12 of them were supported through capacity building and training, 2 were supported in investments of structures and breeding stock, 2 through marketing of produce and a further 25, sold their produce to the Church congregation. A section of 24% of the respondents were supported by Universities and higher learning institutions, 21% supported by NGOs and 15% and 14% were given support by CBOs and GOK respectively (Table 4.10).

**Table 4.10: Institutional influence on livestock enterprises as reported by sampled households in Embakasi constituency in Nairobi County**

Institution	Parameters(No. of respondents)				Frequency	Percentage (%)
	Capacity building	Investment	Marketing	Consumption		
Church	12	2	2	25	41	26
Higher learning institutions*	16	1	0	22	39	24
NGOs	11	2	3	18	34	21
CBOs	10	3	2	9	24	15
GoK	15	2	3	2	22	14
Total	64	10	10	76	160	

N=160, \* rep Universities and colleges

**4.13: Extension services received by sampled households in Embakasi constituency, Nairobi County in the previous year**

It was reported that, 23% of the respondents had been visited by extension service officers within the previous year and a larger portion of 75% of respondents, had not received any form of extension service and therefore practiced livestock keeping from their own knowledge. It was also noted that, 67% of extension service received was from the public sector extension officers and 33%, was received from other institutions which included NGOs, CBOs and Churches. It was further noted that, 10% of the farmers attended trainings on poultry production value chain while 8% of respondents were trained on dairy cattle management skills. These trainings were conducted through the broiler and dairy cow value chain trainings which were carried out by the Nairobi County government Livestock Production Officers in the region. Also to note was a larger portion of 58% of respondents, who attended other trainings that were not listed in the questionnaire which included; cross cutting issues, for example, drug substance abuse, and safety at the work place, group marketing and value addition which were partially offered by local Churches and NGOs in the region (Table 4.11).



**Table 4.11: Extension services received by sampled households in Embakasi constituency, Nairobi County in the previous month**

<b>Parameter</b>	<b>Frequency (No.)</b>	<b>Percentage (%)</b>
<b>Received extension services</b>		
Yes	36	23
No	120	75
No response	4	2
<b>Type of extension service received</b>		
Public Sector e.g. GOK	108	67
Others *	52	33
<b>Types of training attended</b>		
Poultry housing	8	10
At show ground	4	2
Cow milk value chain	4	2
Group dynamics	4	2
Rabbit production husbandry	4	2
Dairy cattle management	12	8
Rabbit/dairy goat management	8	5
Dairy cattle/goat management	8	5
Table banking	8	5
Others **	92	58

N=160, \* Non-government organizations example churches, CBOs.

\*\* Trainings not mentioned in the Questionnaire

**4.14: The marketing outlets used by sampled households in Embakasi constituency, Nairobi County**

Most of the farmers, 40% of them, sold their produce at the farm gate, 15% of which, sold either at the farm-gates or delivered their produce to the nearest market. 10% of them delivered their products directly to the neighbouring markets and another 10% had specific order deliveries while the other 10% of them did not respond to the marketing outlet they used to ensure their products reached the market in fresh state. Approximately 5% of respondents owned roadside stores where they sold their produce, while another 5% combined three outlets to market their produce. They sold at the farm-gate, delivered some of the products to the market or acquired specific orders where they supplied the surplus produce. The last 10% of the respondents sold

their produce at either the farm gate or used roadside stores to market and sell their products. (Table 4.12).

**Table 4.12: Marketing outlets used by sampled households to sell their livestock products in Embakasi constituency, Nairobi County.**

<b>Marketing techniques</b>	<b>Frequency (No.)</b>	<b>Percentage (%)</b>
Home consumption	16	10
Sell at the gate	64	40
Deliver to the market	16	10
Roadside store	8	5
Specific order delivery	16	10
Sell at gate/ deliver to market	24	10
Sell at gate/ roadside store	4	5
Sell at gate/deliver to market /specific order delivery	8	5

N=160

**4.15: The major production challenges experienced by sampled households in Embakasi constituency, Nairobi County**

The major challenges encountered as reported by the respondents were reported as follows: the results showed that the most important challenge that affected them was lack of feeds as noted by 88% of the respondents. This was due to the high cost of feeds and accessibility, as the cost of bringing feeds from outside Nairobi region was noted to be quite high for most small-scale livestock keepers. The lack of extension services availed to the farming households, was reported to be second, by 77% of the respondents mainly since there were few numbers of Extension Officers and the service was mainly demand-driven, determining factor being the farmer seeking for the information. Environmental management (waste, noise) was reported by 67% of respondents being important as the waste is mainly drained through flowing rivers raising the concern of the Sub County administration. Since the Nairobi County by-laws prohibit among other things disturbance and noise, it was noted as a constraint by the respondents.

The lack of market information was reported at 65% as most important as there were no initiatives by the governments to link the farmers to the markets. Furthermore, the distribution of pamphlets and brochures containing market information was minimal and in most cases there was none. Over half (53%) of the respondents reported that County-council by-laws, have to some extent, caused strained relationship between the respondents and the city-council law enforcement officers. The officers have at some point, confiscated their livestock, mainly for disposing livestock production waste in the rivers (poor livestock waste management) or causing noise pollution in the past years. Lack of access to market was reported as the most important by only 45% of respondents as most, sold the entire produce at farm gates. Other challenges which were reported included; diseases, poor access to veterinary services and high feed prices which were noted by the respondents as important aspects of livestock production in Embakasi constituency (Table 4.13).

**Table 4.13: Major challenges reported by the sampled households in Embakasi**

Parameters	Lack of market access (%)	Environmental management, (%)	Lack of market information (%)	County council by-laws (%)	Lack of feeds (%)	Lack of extension services (%)
No response	15	5	8	15	5	10
Least important	40	28	27	32	7	13
Most important	45	67	65	53	88	77

**constituency in Nairobi County.**

N=160, **Note:** Most important-Major challenge and least important-not a major issue to the respondents

**4.16: The relationship between household characteristics and livestock keeping in the sampled households in Embakasi constituency in Nairobi County.**

The study results showed that the age of the farmers and the adoption of urban livestock keeping technologies had reflected a positive correlation of ( $r = 0.74$ ). Also, they showed that, the farmers who were advanced in age, significantly ( $P = 0.02$ ) had more access to information and actively invested more in livestock keeping initiatives more than the youthful farmers in the area who had lesser resources invested. There was also recorded a positive correlation of ( $r = 0.82$ ) in the urban peri-urban livestock keeping practices and the sex of the respondents in Embakasi constituency, with the female gender on the higher side significantly ( $P = 0.01$ ) involving themselves more in the livestock keeping initiatives in relation to the men. Additionally, it was also observed that there was a positive correlation of ( $r = 0.80$ ) among the leadership of the households and the adoption and involvement in livestock rearing initiatives with a significance of ( $P = 0.05$ ) that led to the leadership of the household influencing the decisions made in relation to livestock keeping initiatives among the respondents. There was also a positive correlation of ( $r = 0.72$ ) in the level of education of the respondents in relation to being involved in livestock keeping that had a significance of ( $P = 0.04$ ). The occupation of the farmer showed a weak correlation of ( $r = 0.076$ ) and a significance of ( $P = 0.51$ ) in relation to being involved in livestock keeping (Table 4.14).

**Table 4.14: The relationship between socio-demographic characteristics and livestock keeping among the sampled livestock keepers (Respondents) in Embakasi constituency in Nairobi County**

Variables	Sex (Female)	Farmers age	Leadership of household	Level of education	Farmer occupation
Correlation (r)	0.82	0.74	0.80	0.72	0.076
P=Value	0.01**	0.02*	0.05*	0.04	0.51

Statistical significance levels \*\* $P < 0.01$ ; \* $p < 0.05$ ;

**4.17: The association between access of information and livestock keeping by sampled households in Embakasi constituency, Nairobi County**

The study results showed that there was an association in the ways of accessing information the respondents used to improve their production and to market their produce to the consumers in relation to their livestock keeping experiences in Embakasi constituency. Additionally, there was high use of mobile phones for agricultural text and WhatsApp messaging applications ( $\chi^2=28.9$ ) to share extension information messages, pamphlets, notes, Agricultural Society of Kenya (ASK) visits and agricultural learning exhibitions organized in the area showed ( $\chi^2= 41.8$ ) while the usage of agricultural radio and TV presentations ( $\chi^2=61.6$ ) had significantly positive P-values ( $p=0.01$ ,  $p=0.00$ ,  $p=0.00$ ) influenced urban and peri-urban livestock production information access and use for production and marketing of their livestock products. Information was easily shared and circulated. Farmer group forums and individual farm visits had chi-square values of 8.3 and 7.9 and P-values of 0.27 and 0.25 respectively (Table 4.15).

**Table 4.15: The association between information access and livestock keepers experience in sampled households in Embakasi constituency, Nairobi County**

<b>Access to information</b>	<b>Chi-Square (<math>\chi^2</math>) Association Livestock experience</b>	<b>P≤ Value Significance</b>
Individual farm visits	7.9	0.25
Radio /TV programmes	61.6	0.00**
Mobile phone SMS/WhatsApp	28.9	0.01**
Farmers group forums	8.3	0.27
Agricultural exhibition/Shows	41.8	0.00**

Statistical significance levels \*\*P<0.01; \*p<0.05

## CHAPTER FIVE

### DISCUSSION

#### **5.1 The distribution of socio-demographic characteristics of respondents sampled in Embakasi constituency, Nairobi County**

The family size in Embakasi constituency in Nairobi County for the livestock keeping households ranged between 1-10 members as shown in (Table 4.1). This means that livestock production had to a larger extent, provided for the food requirements for these family members as livestock produce was readily available. With over 70% of the households having between 4-10 members, livestock keeping improved their living standards and their access to nutritious food sources which in turn reduced malnutrition among household members. Similar results were recorded by (Otieno *et al.*, 2015) who found out that dairy goat production contributed to the incomes and food sources of family sizes of between two to ten individuals in the neighbouring, Kajiado County. This also meant that in both peri-urban and urban centers, livestock keeping has contributed to the needs of the family unit through the provision of fresh produce and nutrients to the family members and contributed to income generating options of the household. From the enterprises, employment was created and sales of various products were made although this was not quantified in monetary terms in some cases as reported and observed (Alarcon *et al.*, 2017).

Majority of the farmers interviewed were females at 55% and males at 45%. This meant that more women among the sampled households in Embakasi constituency currently associated themselves with livestock production activities to provide food for their households. Although it was noted most of them were not the owners of the livestock that they reared more so, the large size species such as cattle, as compared to the male family members. It was also observed that most of the male counterparts were reported to be in casual employment within the urban and peri-urban regions among the low income earners. This was also noted by (Alarcon *et al.*, 2017)

thus livestock keeping was mainly a second income stream, (the first being employment) for the family which provided easily convertible assets for emergencies and family nutrition. Alarcon *et al.*, (2017) further suggested that this was an important factor as women are perceived to be better managers of food resources benefiting the entire household as compared to their male counterparts. This ensured the access and provision of safe, healthy and nutritious food for the entire household. This was contrary to Otieno *et al.*, 2015); they noted that in the agro-pastoral regions in the Arid and semi-arid lands of Kajiado and Makueni Counties, the male family members associated themselves more with livestock production than the females.

This may suggest that there are disparities in women and men's involvement in the livestock production sector in major urban centres like Nairobi or Mombasa, as compared to other smaller towns as in cases of Kajiado or Machakos Counties. This is explained by the industrial employment opportunities and high income earners (middle and upper classes) which increases the purchasing power in the cities and thus the need of assistance in management of their households (Foeken and Mwangi, 2006). Also peri-urban areas may be majorly, be characterized with large livestock species, mainly more cattle and goats raised on free range or large paddocking systems which are associated more with the male gender (Otieno *et al.*, 2015) due to availability of grazing areas and pasture lands.

## **5.2 The types of livestock kept by households sampled in Embakasi constituency, Nairobi County**

Poultry production was the most dominant type of livestock kept in the urban and peri-urban areas of Embakasi constituency in Nairobi, County (Table 4.2). More than half, 65% of the interviewed farmers kept poultry as compared to the other livestock types and breeds. This was mainly because poultry required fairly small space to raise and since Nairobi is faced with high

competing land use options other than livestock production, poultry production was more viable. The results are in agreement with those reported by Mosha, (2015) and Alarcon *et al.* (2017), as they also noted that poultry farming was among major livestock production activities in the urban and peri-urban centers in Botswana and Nairobi respectively. This was necessitated by the high demand for chicken and eggs products which has kept increasing with the preference for white meat consumption among the healthy conscious population in Nairobi. Among the ruminant species, goat meat and milk production was also dominant as 30% of the farmers kept goats, while 25% of the farmers kept cattle which were raised in zero grazing units, mainly for meat and milk while a mere 5% of the farmers kept sheep. The sale or consumption of eggs, meat, milk and by-products from the livestock keeping enterprises shows a positive impact on the livelihoods and the households involved in the production of livestock.

The results also showed that dairy goat and cow milk production was higher, (55%) due to the ready and accessible market observed in Nairobi catapulted by its high population and high purchasing power. Nairobi County was noted among the fastest growing cities in Africa, with increasing demand for animal source proteins for the nutrition of its larger portion of its population (Karolien *et al.*, 2013). Due to these encouraging factors, livestock keeping households became more innovative in ensuring they met the increasing demand for livestock products without compromising on health and environmental issues as it's a balance between sustenance of their livelihood and livestock waste management. These results were supported by Iyayi *et al.*, (2003) whose observations showed that the peri-urban areas of Nigeria were dominated by cattle at (77%), (15%) keeping goats and (8 %) sheep as compared to other urban regions which mainly had more poultry production initiatives than goats and sheep. These results were also in tandem with those of Megan *et al.*, (2015) who noted that, in Graham's town, South Africa, cattle and goats were dominant with over 80% and sheep merely contributing to 10%.



(Grace *et al.*, 2015) also reported that in the urban areas small stocks (poultry, sheep, pigs) were dominant but dairying was highly practiced in the cities with access to feed and land; thus raising their animals in zero grazing units and selling their produce at the farm-gates. A small percentage of the farmers, who engaged more on livestock production, had a few members of the household in other employment options other than livestock production to supplement their income. This was especially noted for larger households, where one or two persons would be in formal employment. A mere 12.5% of the respondents had their family members in other employment, while 5% were retired mainly from the public civil service (Table 4.1). This meant that most of the household practicing livestock production in Embakasi constituency in Nairobi County considered it as their main source of livelihood and a major source of food thus being assured of food accessibility and livelihood. Angelo *et al.* (2016) also noted the same low percentage of farmers in employment practicing livestock keeping in Dar-es-salaam and Mwanza in Tanzania as they no time to focus on livestock keeping ventures in spite of their access to resources. He reported that only 14% of those who practiced livestock farming in Dar-es-salaam, and 12% in Mwanza, had other sources of employment to supplement their income. Not only in households in Embakasi constituency, even other urban and peri-urban areas have households deriving their source of livelihood by being employed or involved in the livestock production sector.

### **5.3 Farmers' breed preference by interviewed households in Embakasi constituency, Nairobi County**

Most farmers preferred keeping more than one type of livestock in the same farm or household, a system known as mixed/integrated farming system (Figure 4.1) and in some cases, different breeds of a particular type of livestock that was kept. For example, of the 48 households that kept poultry in the area, showed that 7 of the households had kept indigenous poultry breeds, 22 of them kept exotic breeds and 19 kept mixed indigenous and exotic breeds. This same trend was

shown across all the livestock kept by the sampled household in Embakasi constituency. The reason for this was to reduce the chances of being affected by calamities such as diseases; in any case not all the chicken or animals will be dead in case of a disease outbreak. Again indigenous chicken are known to be more tolerant to viral and bacterial diseases, (Grace *et al.*, 2015) hence the high preference for the mixed indigenous and exotic chicken breeds in Embakasi constituency. Another major reason on why farmers preferred integrated farming was to maximize on production while minimizing on the cost of production so as to remain viable and economical in the long run. Similar results were recorded by Roessler *et al.* (2016), where it was noted that, farmers in the West African Cities owned more than one species of livestock raised on the same piece of land by the households. They stated that 87.8% of households across Ouagadougou (Burkina Faso) owned more than one livestock type and breed, raised in the same household. They also recorded that sheep were the most frequent species in this city, followed by chicken at 69%, cattle and goats were at 61.4% of each, suggesting that there was high preference for more than one types of livestock kept.

Keeping more than one breed or species ensures diversification of the risk posed by investment in the sector, for example in case of disease outbreaks some of the breeds may be less vulnerable thus chances of survival. This will in turn provide the much needed provisions for the family in terms of access to nutritious and safe food thus supporting the high demand posed by the increasing urban population.

#### **5.4 The value of livestock kept by sampled households in Embakasi constituency, Nairobi County**

The value of livestock kept was one of the key reasons for people preferring to keep these animals for easy conversion to cash when need arises (Table 4.7). Farmers earned quite some

amount of money from the sale of animals kept which at most times would come handy at their disposal in times of emergencies which may include money for medical fees or education costs for their children and relatives. For example, the mean estimated value of cattle was reported to be KSh 865,000 and some of the farmers had kept cattle worth of KSh 1, 650, 000 at the time of study in Embakasi North. The mean value of poultry in the same Sub-County was reported to be KSh 81, 000 per household and a case of one of the farmers keeping chicken with the value of KSh 315,000 at the time of study, was reported from sale of chicken products through the rearing of 1,000 layers. These results are clear evidence that livestock keeping can be a good and reliable source of income to supplement the households' sources of income in the urban and peri-urban areas of Embakasi constituency in Nairobi County. Grace *et al*, 2015 also reported that farmers in urban areas could earn up to KSh. 100,000 per month by just rearing 3,000 doves or 50 breeding sows. Although Berg *et al.*, 2014 reported that a very low profit for the Ugandan urban and peri-urban areas was noted therefore one needed to be prudent in the investment made. The author noted that poultry production system run by one family consisted of 400 layers in an urban setting in Kampala, Uganda. The profitability was estimated at average US\$ 700 (or 0.3 USD) per month when spread out throughout the life of the hen. Layers were kept from October 2012 to Sept 2013 and sold at 10,000 US\$ (0r 3.9 USD) which is equivalent to KSh 333.33 a conversion rate of KSh 1 for 30 Ugandan Shilling at the end of the production period.

The mean monthly cattle production of milk was reported to be 1,490.8 L in Embakasi Central, 950L liters in Embakasi North sub-County, 390L in Embakasi South Sub-County and the selling price per L was at an average of KSh 90 across the areas (Table 4.8). An almost similar result was reported by Nkya in Morogoro, Tanzania whereby, the average monthly milk production for a small holder dairy cattle unit was 308 L $\pm$  6, for those animals that were kept under zero grazing

units and  $258 \pm 36$  L for those animals that were partially grazed and supplemented with some home rations (Nkya *et al.*, 2002).

This shows clearly that keeping of livestock will assure households have access to milk, eggs and meat which can be sold or consumed in the household. The sale of the surplus produce would ensure the households are able to meet their needs and provide for emergencies that may include the cost of accessing treatment in cases of ailments in the family or the cost of education for the younger members of the household. In some cases also, for example the Maasai in Embakasi East Sub-county, keep several cattle as a source of wealth which may be used in future to meet the family expenses.

### **5.5 Livestock housing methods used by sampled households in Embakasi constituency, Nairobi County**

Most of the households interviewed, (65%) constructed semi- permanent housing structures, and 22.5% of the farmers had durable housing structures made of concrete, metal rods and iron roofing (Table 4.9). The major production systems were mostly zero-grazing units for dairy cattle, deep litter and slatted systems for chicken and multistory housing cages for rabbit production and some extent of free-ranging in the larger Embakasi East Sub County. This ensured that the livestock were shielded from harsh weather conditions in the constituency and also provided security for the animals kept while curbing movement of the animals' thus minimal disturbance to neighborhoods. The housing structures also provided comfortable places where the animals could rest at night. Alarcon *et al.*, 2017 also made similar observation, as this was meant to keep the animals away from the cold weather elements in Nairobi County during the cold season and also to ensure adherence to the county by-laws by curbing livestock movement's thus creating minimal disturbance for the neighborhoods. Also, of important to note

is the easy management of livestock waste as all of it will be collected from the housing and thus easy to manage and dispose as required. Angello *et al.*, 2016 and Nkya *et al.*, 2002 reported a different scenario where there was poor housing for the livestock in the urban areas of Morogoro in Tanzania. The animals were roaming around the city, causing environmental pollution and arising conflict in the urban centers. This was mostly noted due inadequate staff employed by the government and thus minimal sensitization and poor adoption of proper structures for livestock housing mainly heightened by lack of extension information for farmers use. The provision of safe and durable housing structures for livestock kept in the urban areas would ensure a safe net for the households and thus ensuring the safekeeping of livestock which could be utilized in cases of emergencies or as need arises.

## **5.6 The marketing techniques applied by farmers in Embakasi constituency, Nairobi**

### **County**

Most of the farmers, 40% sold their produce at the farm-gate, 15% sold either at the farm-gate or delivered to the nearest available market to sell their produce due to ready and available customers. 10% of which delivered directly to the market and another 10% had specific order deliveries either daily or periodically for slightly larger orders for institutions and restaurants in the area. Another portion of 10% did not respond to the method they used to ensure their products accessed the market in good time mainly because they did not want to share their business secrets but generally all had sufficient market for their produce. A small proportion of 5% used roadside stores, while a similar portion of 5% combined the use of 3 outlets which include; selling at the farm-gate, delivering to nearby farmer-markets or had specific-order deliveries for their produce. Another 10% of the farmers sold at the gate or sold their products at roadside stores as was shown (Table 4.11). Alarcon *et al.*, 2017 also noted that, dairy farmers in Nairobi County sold their milk directly to consumers due to lack of trust in informal outlets and

through this avenue, they were also able to obtain higher profit for their produce. They also noted that, broiler and pig rearing farmers sell directly to middlemen in the marketing chains or to the few large processing companies operating in the area. Some also replace their stock through specific orders given to major companies and contracts to sustain their productivity. It was not that there was no farmer who was involved in processing and value addition processes in order to fetch better prices or increase the shelf-life for their produce. This suggests that there was minimal post-harvest losses incurred due to spoilage and the close access to readily available market is an opportunity that when explored further could ensure sustainability of livestock in the urban and peri-urban areas.

### **5.7 Institutional influence on livestock enterprises in Embakasi constituency, Nairobi County**

As reported in Table 4.10, various institutions that include Churches, Universities and higher learning institution, NGO, CBO and GoK are involved in supporting livestock production in the urban peri-urban region in Embakasi constituency. They offered training of farmer groups, investment in terms of structures, feeds and livestock breeds and also supported the respondents in marketing of their produce. Moreover, most of the respondents reported that institutions were the most of their consumers. This has helped in the development of the sector as the farmers are enlightened on livestock management practices, marketing, and value addition among other things. Also since institutions buy produce in bulk, due to number of people to be fed, they offer ready market thus minimizing post-harvest losses. This was also noted by Bryd, (2003) and Lee-Smith *et al.*, (2007); they also reported that institutions which included Churches and NGOs have positively affected urban agriculture by supporting livestock production through funding trainings and field days in good agricultural practices. The trainings were conducted by agriculture and livestock production officers to ensure credibility for shared information. They

also gave organized groups funds for start-ups and feeds or construction materials for the structures to support income generating activities in livestock production. It was also noted some humanitarian organizations for example, World Vision Kenya organized competitions in writing of proposals in agribusiness, where the best groups were supported financially. The support given whether in monetary terms, capacity-building or of tangible items donated contributed positively to the development of livestock production sector and thus improved livelihoods of the households involved. Local and international institutions thus played a vital role in upholding communities and societies at the family level through supporting livestock keeping initiatives.

### **5.8 Challenges affecting livestock keepers in Embakasi constituency in Nairobi County**

The major problem in livestock production in UPA areas of Embakasi constituency was lack of extension services as it was reported by 77% of the respondents. This means that most farmers were not taught on the good agricultural practices in livestock production in the UPA regions of Nairobi. This was exacerbated by understaffing in the entire agricultural production sector, also noted by Alarcon *et al.*, 2017. This hindrance is one of the causes of low livestock production in Nairobi County and its environs as most animals kept end up performing poorly; for example the average milk yield per animal was 8L per day in Nairobi region in the year 2017 (GoK, 2017b). Similar observations were also made by Mosha, (2015); He found out that extension services and training was only confined to the rural areas or commercial farmers in Botswana since it was considered that increased rural production meant food availability to the urban consumer. There were no urban agricultural officers or urban agricultural demonstrators to support the farmers in the urban and peri-urban areas in Botswana. Another major challenge to livestock production in the Embakasi constituency, Nairobi County was poor waste management; 67.5% of the respondents reported to dispose of the waste along the river and sewer lines within the area causing conflicts with county law enforcement officers. Furthermore, the disposal of

organophosphates which are used in acaricides for the livestock especially cattle, they later end up in the food chain and may cause contamination and even end up in human bodies, causing serious toxicity problems. The organophosphates are known to be carcinogenic and therefore, one of the causes of cancer which is a major life threat to human health. Mosha, (2015) also noted that environmental waste management issues were a major concern in the urban and peri-urban centers of Botswana. He added that, the major threat to human life and the environment from agricultural production in urban and peri-urban areas came from unsafe-use of agricultural inputs such as fertilizers, pesticides, fumigants and herbicides, in addition to improper disposal of waste generated from agricultural production enterprises. In contrary, it was noted that composting as a way to recycle organic waste can restore contaminated soils and the biodiversity of soil-organisms. Furthermore, the use of waste-water for recirculation and dung for biogas production and slurry used as manure does enhance proliferation of microorganisms for example heterotrophic bacteria in the soils and environmentally-friendly-produced energy for various uses as noted by Kihila *et al.*, (2014). This enhanced the production of safe and healthy nutritious food with minimal negative impact on the environment.

Marketing of livestock and their products was not a major problem as it was recorded as most important challenge by only 45% of the respondents (Table 4.13). This is because Nairobi is one of the fastest growing cities in Africa, with a population of over 3.4 million with increasing demand for land, with a wide range of alternative uses and high demand for animal protein sources (GoK, 2017a). These phenomena also decreased the farmers cost of production and also ensured a higher profit margin was achieved. This was also explained by the prevalent access of modern technology and the internet to relay information on their products and/or farming enterprises. This was in contrast to observations made by Mosha, (2015); who reported that in Botswana, marketing can sometimes be complicated as people do not trust informal channels of



food distribution, to handle the food products hygienically. It was noted that, 92% of the people preferred shopping from the formal food distribution channels and thus bought their products from the supermarkets where most products were well packaged and labeled. Mosha, (2015) also noted that 71% of the population living in the urban areas, do not get food from informal distribution channels for the same reasons of contamination and lack of trust.

### **5.9: The relationship between household characteristics and livestock keepers in Embakasi constituency, Nairobi County.**

The study showed that there was a positive correlation ( $r = 0.74$ ) between the age of the farmer and the adoption of technology relating to urban and peri-urban livestock keeping initiatives. There were older people involved in farming at a significance level of ( $P=0.02$ ) and had access to livestock keeping and marketing information and thus kept livestock more than the younger generation (Table 4.14). The study findings also, simply implied that as the people grew older, their access to resources and thus, their resource base, was also expanding in correspondence, and thus higher investment made in livestock production initiatives and technology. A positive correlation ( $r=0.82$ ) was also noted in the sex of the farmer in relation to being involved in the urban livestock keeping initiatives for the male gender with a significance of ( $P=0.01$ ) being involved more in livestock keeping initiatives. Additionally, there was a correlation of ( $r=0.8$ ) between the leadership of the household making the decisions relating to livestock keeping initiatives with a significance of ( $p=0.05$ ) which led to the leadership of the households influencing the making of crucial decisions towards the livestock keeping initiatives among farming households. Almost similar relationships were reported in the uptake of sorghum as influenced by extension agents in Embu County (Chimoita *et al.*, 2017). The results simply implied that as the farmers' grew older in the number of years living, there was a corresponding increase in the resources the households accumulated, and this made it easier for these farmers to

access and invest the resources accumulated over time in the livestock production initiatives. This led to increasing the available resources for improved household food security and food nutrition.

#### **5.10: The association between information access and livestock keepers experience in Embakasi constituency, Nairobi County.**

The study results noted an association between the techniques' applied in marketing of produce and the livestock keepers' knowledge and experience (Table 4.15). Additionally, the use of mobile phones for SMS and WhatsApp messaging ( $\chi^2=28.9$ ), Agricultural exhibitions and Shows visits ( $\chi^2= 41.8$ ) and the frequent use of radio and TV presentations and Shows at ( $\chi^2=61.6$ ) had a positive significance of (P=0.01, P=0.00, P=0.00). The channels of sharing of information above, made it better for household to get production and marketing information easily, and thus positively influencing information and technology access and use, for access of inputs and marketing of the livestock products. This was in agreement with Zezza *et al.*, 2010 and Chimoita *et al.*, 2017 who concluded that the use of radio shows and presentations, face to face chats, use of mobile phones, farm visits, agricultural show and exhibition visits, were among the most common ways of agricultural extension service delivery. These technologies were used to improve the access and consumption of agricultural information in the country which also complemented extension agents in disseminating information on improved sorghum marketing technologies in Embu County, Kenya. Additionally Nairobi County government employed the same techniques as noted above for improved agricultural production in the agriculture, livestock and Forestry sector in Nairobi County (GoK, 2017b).

## CHAPTER SIX

### CONCLUSIONS AND RECOMMENDATIONS

#### 6.1. General Conclusions

1. There were a lot of livestock production activities that were observed in the urban and peri-urban areas of Embakasi Constituency in Nairobi County. The production may not be enough to feed the entire population in Nairobi County due to the high human population in the city and thus high demand for livestock products. There was also a higher demand for animal protein sources, which improves consumption of protein among the poor households in the capital city of Kenya, and the entire population and therefore, general improved nutrition for the households. There is also the middle and upper class segment of the society that have a high purchasing power for the pricy-high nutritious foods such as livestock products and thus the need to uplift and develop the livestock sector in Nairobi County to improve access to safe, nutritious food for entire population and thus meet the demand.
2. The challenges identified as major obstacles to improved livestock production in UPA of Nairobi included the lack of access to clean feed for the livestock and inadequate provision of extension services. Therefore, to improve livestock production, there is need to provide subsidized prices for livestock feeds and if possible set aside reserved areas/land to be used for production of pastures and fodder like forages, legumes and grasses, while improving coverage in the delivery of extension services. This will enable the farmers to be trained on the best livestock management practices, food safety issues and on how to maximize on the production of livestock to feed a greater city population

with safe nutritious food. This will enable households' access to better nutrition and thus better health for them.

## **6.2 General Recommendations**

1. The need for organized agricultural waste management systems involving the collection and processing of UPA waste as soon as possible to as to maintain a healthy environment between livestock and the human population. This will be ideal for farming households in the urban and peri-urban areas. This may include simple measures of integrating crop, livestock and biogas production systems for better livestock keeping management.
2. The need to improve the access to information consisting of both production and marketing, to UPA farming technologies so as to enhance the economic output expected by the farming households in UPA through the use of mobile phone SMS and internet usage.
3. Nairobi County government should improve provision of extension services by increasing the number of Livestock Extension Officers and feed accessibility for future increased production and sustainable food security.

## REFERENCES

- Angello C., Jangawe M., Matovelo D., (2016):** Assessing the Information Needs and Information Sources of Urban and Peri-urban Livestock Keepers in Kinondoni and Morogoro Urban Districts, Tanzania. University of Nebraska, Lincoln Digital Commons at University of Nebraska, Lincoln. Retrieved from <http://digitalcommons.unl.edu/libphilprac>
- Alarcon, P., Fevre, E.M, Muinde, P., Murungi, M.K., Kiambi, S., Akoko, J. and Rushton, J., (2017):** Urban livestock keeping in the city of Nairobi: Diversity of production systems, supply chains and their disease management and risks. *Frontiers in Veterinary Science* 4:171. Retrieved from <https://dx.doi.org/10.3389/fvets.2017.00171>
- Alreck, P. L., Settle, R.B, (1995):** The survey Research Handbook, Social Science. Second edition, Irwin Professional Publishing, Burr Ridge, Illinois pp. 62.
- Baah, J. (1994):** Selection and evaluation of feedstuffs for urban and peri urban small ruminants production systems in Ghana-A systems approach. *PhD Thesis, University of British Columbia, Vancouver, British Columbia, Canada.*
- Balpheti, M.N., and Jacobs, P.T., (2009):** The Contribution of Subsistence Farming to Food Security in South Africa. *Agrekon*, 48(4), 459-482.
- Bartomiej I., Roman B. and Marcin C., (2015):** Biogas production in Poland; Current state, potential and perspectives. *Journal of renewable and sustainable energy reviews*, 50, 686-695.
- Berg M., Kokas I., Claes F., (2014):** Poultry – a major source of protein for the poor. Urban and peri urban agriculture for food security in low income countries-SLU, Retrieved from <https://www.slu.se/global/rapporter>.

- Brown K. H., and Jameton A.L., (2000):** Public health implications for urban agriculture. *Journal of Public Health Policy*, **21**, 20-39.
- Bryd E. (2003):** Potentials, problems and policy implications for urban agriculture in developing countries. *Journal of Agriculture and Human values*, **20**, 79-86.
- Chimoita, E. L., Cecillia, M. O., John, W. K., and Joseph P. G.O. (2017):** The agricultural extension agenda influence on the uptake of improved sorghum technologies in Embu County, Kenya. *Universal Journal of Agricultural Research*, **5**, 219-225.
- Cohen, M. and Gareth, J. (2010):** The food price crisis and urban food insecurity. *Journal of Environmental and Urbanization*, **22** (2), 467-482.
- Crecchio, C., Curci, M., Pizzigallo, M., and Ruggiero, P., (2004):** Effects of Municipal solid waste compost amendments on soil enzyme activities and bacterial genetic diversity. *Soil biology and Biochemistry*, **36**(10), 1595-1605.
- Don, H., (2008):** Marketing Strategies, A natural information resource centre for value added Agriculture. Retrieved from [www.agmrc.org/site\\_map.cfm](http://www.agmrc.org/site_map.cfm).
- FAO, (2007):** Technology and management for livestock farming in Africa. Available from [www.iaea.org/inis/collection/NCLCollectionStore/\\_Public/30/042/30042864.pdf](http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/30/042/30042864.pdf).
- FAO, (2012):** Growing greener cities in Africa. First status report on urban and Peri Urban horticulture in Africa. Rome, Italy. Retrieved on 15<sup>th</sup>, July, 2016 from [www.fao.org/ag/agp/greenercities/pdf/GGC-Africa.pdf](http://www.fao.org/ag/agp/greenercities/pdf/GGC-Africa.pdf)
- FAO, (2013):** The state of food and agriculture: Food systems for better nutrition. Rome, Italy: Food and Agriculture Organization of the United Nations, Rome, Italy, pp 114.
- Foeken, D., and Mwangi, A.M. (2006):** Increasing food security through urban farming in Nairobi City. The Case Study of Nairobi County.

- Gefu, J.O., (1992):** Part time farming as an urban survival strategy: Nigerian case study. *In the rural interface in Africa; Expansion and adaption*. Baker J. and Pederson, P.O (Eds.) Scandinavian Institute of African Studies, Stockholm, Sweden, pp 295-302
- GOK, (2008):** Sessional Paper Number 2 of 2008 on National Livestock Policy. Ministry of Livestock Production, Kenya Government press, pp 5.
- GOK, (2010):** First Annual Progress report on the implementation of the 1<sup>st</sup> medium term plan, 2008-2012 of Kenya Vision 2030, Government of Kenya.
- GOK, (2012):** Ministry of Agriculture, Livestock and Fisheries Development. Department of Livestock Production. Strategic Plan 2012-2015, Government of Kenya.
- GOK, (2017a):** County Integrated Development Plan. Nairobi City County. Government of Kenya, pp.86.
- GOK, (2017b):** Nairobi City County Livestock Production, Annual Report, Government of Kenya, pp 11-49.
- Grace, D., Lindahl, J., Correa, M. and Kakkar, M. (2015):** Urban Livestock Keeping in: Cities and Agriculture: Developing Resilient Urban Food Systems, Zeeuw, H. and Drechsel, P. (Eds.). Oxford, UK: Routledge: pp 255-284.
- Iyayi, E.A., Okoruwa, V.O., Babayemi, O.J., Busari, A.A., and Peters, O.F. (2003):** Livestock production pattern of agro pastoralists in peri-urban centers of south-west Nigeria. *Nigerian Journal of Animal Production*. Retrieved from [Http://dx.doi.org/10.4314/njap.v30i1.3318](http://dx.doi.org/10.4314/njap.v30i1.3318)
- Karolien, V. B., Adiyia, M., Loopmans, F., Tumwine, R., and Rampoey, A. V. (2013):** Will urban farming survive the growth of African cities? *Journal of Land Use Policy*, **35**, pp 40-49.

- Kang'ethe, E.K., Grace, D., and Randolph, T.F., (2008):** Overview on Urban and Peri Urban Agriculture: Definition, Impact on Human Health, Constraints and Policy issues. *East African Medical Journal*, **84**, pp 48-56.
- Karikari, D.K., and Asare, K. (2009):** An economic analysis of small-holder rabbit meat production-systems. *Journal of Applied Sciences Research*, **5**, pp 969-973.
- Kihila, J., Mtei, K. and Njau, K.N. (2014):** Waste water treatment for re-use in urban agriculture: The case of Moshi Municipality, Tanzania. *Physics and chemistry of the earth*, **114**, pp 64-72
- KNDBP, (2013):** Kenya National Domestic Biogas Programme; An initiative under the Africa Biogas Partnership, Annual Report, Nairobi, Kenya.
- Lee-Smith, D., Manundu, M., Lamba, D. and Gathuru, P.K., (2007):** Urban Food Production and the Fuel Situation in urban Kenya; National report, Nairobi. Mazingira Institute, **10**, pp 255-260.
- Ling C., Lixin Z., Changshan R. and Fei W., (2012):** The prospects and progress of rural biogas production in China. *Journal of energy policy, Elsevier* **51**, pp 58-63.
- Magnusson, U. and Kristin, F. B., (2014):** Urban and Peri-urban Agriculture for Food Security in Low-income Countries. Challenges and Knowledge Gaps. ISBN: 978-91-576-9229-0 (print), 978-91-576-9230-6 (electronic) Series: SLU-Global Report 2014:4
- Megan, S.D., Andrew, K., Scorer, C., Bulunga, A., Sean, K. and Ridwaan, I., (2015):** Challenges faced by livestock owners in an urban setting: the case of Grahamstown, South Africa. Department of Environmental Science, Rhodes University, South Africa
- Memon, P.A. and Lee-Smith, D., (2003):** Urban Agriculture in Kenya. *Canadian Journal of African Studies*, **27**, pp 25-42.



- Mouget, L., (2005):** Agropolis-The Social, Political and Environmental Dimension of Urban Agriculture. Ottawa: International Development Research Centre (IDRC), Canada. ISBN 1-84407-2320.
- Mosha, A. C., (2015):** Urban agriculture in Botswana. University of Botswana. *Commonwealth Journal of local Governance*.18, pp 65.
- Mugenda, O. N. and Mugenda, A. G., (2003):** Research methods. Quantitative and Qualitative approach. Nairobi. ACT press.
- Mugisa, I. O., Fungo, B., Adur, S. O., Ssemalulu, O., Molly, A.1., Atim, J., Nakyagaba, W., Kizza, T., Kabanyoro, R., Sseruwu, G. and Akello, B. O., (2016):** Urban and peri-urban crop farming in Central Uganda: Characteristics, constraints and opportunities for household food security and income. *African Journal of Plant Science*, 11, pp. 264-275.
- Murithi, E., Nyangawara, M. K., Onyatta, J.O., Kaburu, P. K. and Macharia, J.M., (2007):** Urban and Peri-Urban Agriculture: Towards a better understanding of low income producers organization: Nairobi case study. FAO publication, Rome, Italy.
- NCC, (2015):** The Nairobi City County urban agriculture promotion and regulation Act, 2015, Nairobi City County. *Government Printers*, 4, pp 5-6
- NCC, (2017):** County Integrated Development Plan 2018-2022: Regenerating the city for sustainable socio-economic development, Nairobi City County, 2, pp 18-20
- Ng'ang'a, J.K. (1992):** The climate and meteorology of Nairobi region, Kenya. *African Urban Harvest, Quarterly*, 7, pp 1-2
- Nkya, R., Aboud A. A. and Kessy, B. M., (2002):** Improving the productivity of smallholder dairy cattle in peri-urban Morogoro, United Republic of Tanzania. *Tanzania Journal of Agricultural Sciences*, 5, pp 95-102

- Onim, M. (2002):** Scoping study of urban and peri-urban livestock keepers in Kisumu City. Lagrotech, Kisumu, Kenya, pp 462
- Onyatta, J.O. and Omoto W.O., (2004):** Potential for Urban and peri-urban agriculture to create employment and reduce poverty, Nairobi: Kenya Agricultural Research Institute (KARI), Urban Harvest.
- Otieno, O., Jung'a, J., Badamana, M. and Amimo, J., (2015):** Indigenous knowledge used in breeding and management of *Capra hircus* populations in Kajiado and Makueni Counties, Kenya. *Open Journal of Genetics*, 5, pp 111-135.
- Owen, J. E., Morgan, D. J. and Barlow, M., (1997):** The rabbit as a producer of meat and skin in developing countries. The Rabbit Report of the Tropical Development And Research Institute, retrieved from [www.smallstock.info/reference/NRI/TDRI/G108/rabbit/5/10/15](http://www.smallstock.info/reference/NRI/TDRI/G108/rabbit/5/10/15).
- Payne, A. and Wilson, T. (1999):** Micro-livestock in an introduction to animal husbandry in the tropics. Blackwell publishing company, Osheay Mead, United Kingdom, pp 687-692.
- Popkin, B.M. (1999):** Urbanization, Lifestyle Changes and the Nutrition Transition. *World Development*, 27, pp 1905-1916.
- Rachel, N. (2000):** The impact of urban agriculture on the household and local economies: Thematic paper 3, pp 67-97.
- Rakodi, C. (1992):** Housing markets in third world cities: Research and Policy in the 1990's *World development*, 20, pp 39-55
- Roessler, R., Serge, E. M., Muchemwa, T. and Schlecht, E. (2016):** Emerging Development Pathways of Urban Livestock Production in Rapidly Growing West Africa Cities. *Sustainability Article*, 8, pp 1199: Retrieved from doi: [10.3390/su8111199](https://doi.org/10.3390/su8111199); 2015

- ROK, (2012):** Urban Areas and Cities Act, Laws of Kenya. Revised Edition 2012(2011),  
Republic of Kenya, Government press **13**, pp 5-6
- Slater, R., (2001):** Urban Agriculture, gender and empowerment: An alternative view in  
development: Southern Africa. **18**, pp 635-650
- Smit, J. and Nasr, J. (1992):** Urban agriculture for sustainable cities: Using waste and idle land  
and water bodies as resources. *Environment and Urbanization*, **4**, pp 141-152.
- Thys, E., Ouea D.M., Speybroeck, N. and Geerts, S. (2005):** Socio Economic Determinants of  
Urban Households Livestock Keeping in Semi-Arid Western Africa. *Journal of Arid  
Environmental*, **63**, pp 475-496.
- U. N, (2013):** World population prospects: The 2012 revision, Vol II, Demographic Profiles:  
Department of Economic and Social Affairs, Population Division, United Nations.  
[www.iaea.org/inis/collection/NCLCollectionStore/ Public/30/042/30042864.pdf](http://www.iaea.org/inis/collection/NCLCollectionStore/Public/30/042/30042864.pdf)
- Zeza, A. and Tasciotti, L. (2010):** Urban Agriculture, Poverty and Food Security: Empirical  
evidence from a sample of developing countries: *Food Policy*, **35**, pp 265-273.

## APPENDICES

### APPENDIX1: QUESTIONNAIRE

#### Background/General information

1. Sub County.....
2. Division.....
3. Ward/Location.....
4. Name of Respondent.....

5. Is the farmer the head of household? Answer with Yes or No

6. What is the Gender of the farmer? .....

Male.....

Female.....

7. What is the Age of Respondent? (Tick where appropriate)

Under 18yrs.....

18-35yrs .....

36-50yrs.....

Over 50 years.....

8. What is the Level of Education of respondent?

None.....

Primary level.....

Secondary level .....

Post-secondary level.....

Other, specify.....

9. What is the size of the household (number of family members)?

.....

10. What is the marital status of the farmer?

Single

Married

Widow

Widower

11. Is the respondent employed? Yes  No

12. What is the ownership of the farm?

Own property

Rental property

Others (specify).....

12(b) What is the size of the farm in acreages? .....

13. Do you keep any of these domestic animals in the farm? (tick the ones kept)

• Pigs

• Cattle

• Rabbits

• Poultry

• Goats

- Sheep
- Others, specify.....

14. If yes in any of the above; show breed, number kept and their estimated values?

	Animal type	Breed	Number		Estimated Value
			Males	Females	
1	Rabbits				
2	Poultry				
3	Sheep				
4	Goats				
5	Pigs				
6	Cattle				
	Estimated Total value				

15. How much milk did you get from the named enterprises in the previous year in Kshs?

		Milk produced in Liters			Amount consumed in Liters			Amount sold in Liters			Selling Price per Liter
		Per day	Per month	Annual	Per day	Per month	Annual	Per day	Per month	Annual	
1.	Cattle										
2.	Goats										
3.	Sheep										
4.	Specify others										

16. How much meat did you get from the named enterprises, amount consumed and sold?

	Meat produced in Kg			Amount consumed			Amount sold			Selling Price per KG
	Per day	Per month	Annual	Per day	Per month	Annual	Per day	Per month	Annual	
Cattle										
Goats										
Sheep										
Rabbits										
Poultry										
Pigs										
Other specify										

17. How many eggs were produced from the poultry enterprises kept this year, sold and consumed?

		No. of eggs produced in trays			Amount consumed in trays			Amount sold in trays			Selling Price per tray/egg
		Per day	Per month	Annual	Per day	Per month	Annual	Per day	Per month	Annual	
1	Indigenou s chicken										
2	Layers										
3	Quails										
4	Goose										
5	Others, specify										

18. What are challenges faced in urban peri urban livestock production? rate from 1 to 5

where,

1-Most Important, 3-Average Importance and 5-Least Importance

Access to the markets(Distance)	
Environmental management-waste, pollution ventilation, noise	
Lack of market information	
Disturbances by the city council bylaws	
Lack of feeds for livestock/accessibility	
Lack of extension services	
Others, specify	

19. What marketing Strategies do you use to market your produce? Tick where appropriate



Sell at the gate-farm gate	
Deliver to the farmers market	
Road side stores	
Hawking	
Specific order and delivery	
Others, specify.....	

20. Did any extension staff visit your farm within the last one month? Yes  No

G.O.K  N.G.O  CHURCH  C.B.O

Others (specify).....

21. Were the above named organizations involved in any other aspects of production apart from training? Tick appropriately

Yes  No

If yes above, please specify categorize level/area of involvement and how beneficial to your enterprise.

- Investment  (breeds, inputs and information)
- Training
- Marketing
- Consumption
- Others

Please specify.....

22. Are you a member of any farmers group? Yes  No

23. Have you received any group trainings within the last year? Yes  No

If Yes give details of the

training.....

24. In your area how many kilometers(Estimate) are you based away from the main market? 0-5Km  6-10Km  11-20KM

25. Are there any cottage industries-(preservation) that do value addition in order to increase the shelf life of raw farm products? Yes.  No.

26. If Yes above, are you involved in any value addition of your products, please give details on products, amount value added and the sales made

Product	Kg	Selling Price of raw product@Kg	Amount value added in Kg	Selling Price of value added product@Kg
Meat				
Eggs				
Milk				
Skin				
Fur				
Honey				
Others,specify				

26. What has been the major benefits in urban peri urban livestock farming, rate them from highest (1 to represent The Most Beneficial and 10 The Least Important).

Creating employment	
Source of fresh food products	
Biogas production	
Compositing for manure	
Creates income for the family	
Others, Specify	

27. Name the housing systems found in the farm (Tick where appropriate)

- Zero Grazing
- Deep Litter
- Rabbit Cages
- Cow Sheds
- Stores
- Others Specify.....

28. What is the housing structure found on the farm like? Tick where appropriate

- Permanent
- Semi-Permanent
- Specify Others.....

29. Identify the feed resources as identified by the farmer and the conservation methods used and tick where appropriate. Indicate where there is No conservation.

<b>Feed resource</b>	<b>Conservation method</b>
Homemade feed rations	
Commercial	
Crop by products	
Napier and Grasses	
Legumes	
Others, specify	