

**CONTRIBUTION OF LIVESTOCK TO FOOD SECURITY IN KIHUURA
SUB-COUNTY, KYENJOJO DISTRICT**

BY

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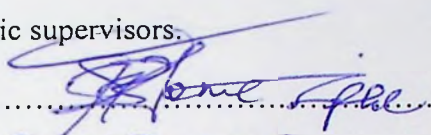
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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF
SCIENCE IN LIVESTOCK DEVELOPMENT, PLANNING AND
MANAGEMENT OF MAKERERE UNIVERSITY.**

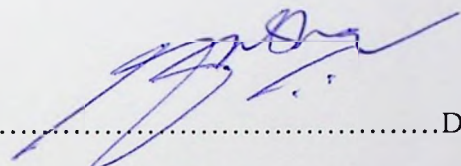
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DECLARATION

I, Paul Boma declare that this dissertation has never been submitted to any university for the award of any Master of Science degree and it has been submitted with the approval of my academic supervisors.

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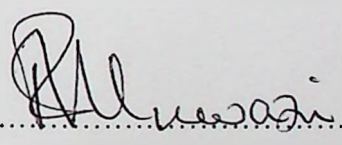
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DEDICATION

I dedicate this work to the people of Kihuura Sub-County who continue to live in conditions not so dignifying yet they continue to struggle to change for the better. I further dedicate it to Mr. Sande Kyomya Christopher who against all odds enabled me go for further studies.

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TABLE OF CONTENTS

DECLARATION.....	i
DEDICATION.....	ii
ACKNOWLEDGEMENT.....	iii
TABLE OF CONTENTS	iv
ABBREVIATIONS.....	viii
LIST OF FIGURES	ix
LIST OF TABLES.....	xi
ABSTRACT	xii
CHAPTER ONE.....	1
INTRODUCTION	1
1.1 Background.....	1
1.2 Statement of the Problem	3
1.3 Objectives of the Study.....	3
1.3.1. Broad Objective.....	3
1.3.2 Specific Objectives of the Study	4
1.4 Significance/Justification of the Study	4
1.5 Conceptual Framework.....	5
CHAPTER TWO.....	7
LITERATURE REVIEW	7
2.1 Introduction	7

2.2 Livestock as a Direct Source of Food.....	7
2.3 Livestock as a Source of Income	11
2.3.1 Direct Sales.....	12
2.3.2 Credit and insurance	14
2.3.3 Labour saving and service income	16
2.4 Livestock as a Supplier of Production Inputs.....	20
CHAPTER THREE.....	23
MATERIALS AND METHODS.....	23
3.1 Introduction	23
3.2 The Study area	23
3.3 Study design	23
3.4 Study units/subjects	23
3.5 Sampling.....	25
3.5.1 Sample size determination.....	25
3.5.2 Sampling technique	26
3.6 Data Collection.....	26
3.7 Statistical Analysis	27
3.7.1 Quantitative Data Analysis.....	27
CHAPTER FOUR	28
RESULTS.....	28
4.1 Demographic characteristics of households	28

4.1.1 Average size of households	28
4.1.2 Average Number of Children in Households	29
4.1.3 Number of School Going Children.....	30
4.1.4 Animal species kept by households.....	31
4.1.5 Average Number of Livestock Units by Households	32
4.1.6 Household Ownership of Livestock	33
4.1.7 Means of Acquisition of Livestock by Households.....	34
4.2 Section Two: Roles of Livestock.....	35
4.2.1 Roles of Livestock to Households.....	35
4.3 Section Three: Accessibility to Food.....	36
4.3.1 Number of Meals Taken in a Day by Households.....	36
4.3.2 Origin of Food Eaten At Breakfast the Day before the Interview	37
4.3.3 Origin of Food Eaten at Lunch the Day before the Interview	38
4.3.4 Origin of Food Eaten at Supper the Day before the Interview	39
4.4 Section Four: Coping Mechanisms during Times of Food Scarcity	40
4.4.1 Main source of Food for Households	40
4.4.2 Reliability of Food Produced By Households during the Year	41
4.4.3 How Households Handle Surplus Food in Bumper Harvests.....	42
4.4.4 The Main Source of Income for the Households.....	43
4.4.5 Periods of the Year and the Level of Food Scarcity.....	44
4.4.6 Reasons Why There Is Food Scarcity during July- Sept Period.....	45

4.4.7 Sources of Food in Times of Scarcity	46
4.4.8 Rate of Sale of Livestock by Households by Season	47
CHAPTER FIVE	49
DISCUSSION.....	49
5.1 Introduction	49
5.2 Discussion.....	49
5.2.1 The role of livestock in enhancing household food security and incomes	49
5.2.1.1 Livestock as a direct source of food	49
5.2.1.2 Livestock as a source of income.....	51
5.2.1.3 Livestock as a supplier of production inputs	53
5.2.2 Accessibility to adequate food by members of different households	54
5.2.3 Household coping mechanisms during times of food scarcity	58
CHAPTER SIX.....	63
CONCLUSSION AND RECOMMENDATIONS	63
6.1 CONCLUSION	63
6.2 RECOMMENDATIONS.....	63
REFERENCES	64
APPENDIX I: LIST OF VILLAGES THAT WERE VISITED BY PARISH.....	69
APPENDIX II: QUESTIONNAIRE USED DURING THE STUDY	71
APPENDIX III: CHECKLIST FOR FOCUSSED GROUP DISCUSSIONS.....	78

ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
HH	Household
HIV	Human Immunodeficiency Virus
HLS	Household Livelihood Security
TLU	Tropical Livestock Unit
NAADS	National Agricultural Advisory Services
UDHS	Uganda Demographic and Health Survey
GDP	Gross Domestic Product
NDP	National Development Plan
UBOS	Uganda Bureau Of Statistics
NPHC	National Population and Housing Census
SPSS	Statistical Package for Social Scientists
LU	Livestock Unit
UNDP	United Nations Development Fund
FAO	Food and Agricultural Organization
WFS	World Food Security
WHO	World Health Organization
TCP	Technical Cooperation Programme

LIST OF FIGURES

Figure 1.1: Conceptual framework on household food security	5
Figure 4.1: Average Size of Households	29
Figure 4.2: Average Number of Children in Households.....	30
Figure 4.3: Number of school going children.....	31
Figure 4.4: Number of Animal species Kept by Households	32
Figure 4.5: Average Number of Livestock kept by Households	33
Figure 4.6: Household Ownership of Livestock.....	34
Figure 4.7: Means of Acquisition of Livestock by Households	35
Figure 4.8: Roles of Livestock to Households	36
Figure 4.9: Number of Meals Taken in a Day by Households	37
Figure 4.10: Origin of Food Eaten At Breakfast the Day before the Interview	38
Figure 4.11: Origin of Food Eaten at Lunch the Day before the Interview	39
Figure 4.12: Origin of Food Eaten at Supper the Day before the Interview	40
Figure 4.13: Main source of Food for Households.....	41
Figure 4.14: Reliability of Food Produced By Households during the Year	42
Figure 4.15: How Households Handle Surplus Food in Bumper Harvests	43
Figure 4.16: The Main Source of Income for the Households	44
Figure 4.17: Periods of the Year and the Level of Food Scarcity	45
Figure 4.18: Reasons Why There Is Food Scarcity during July- Sept Period	46
Figure 4.19: Sources of Food in Times of Scarcity.....	47

Figure 4.20: Rate of Sale of Livestock by Households by Season.....48

LIST OF TABLES

Table 3.1: Number of livestock and the corresponding TLUs	24
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ABSTRACT

Household food security is defined as the access by the household to sufficient food to provide all members with good health and an active life. It should also cater for the members' confidence that adequate food will be available at all times. The study was carried out to assess the contribution of livestock to food security in Kihuura Sub County, Kyenjojo district. The specific objectives of the study were to: document the roles of livestock in enhancing household food security and incomes in Kihuura sub-county, study the accessibility to adequate food by members of the different households in Kihuura sub-county and document household coping mechanisms during times of food scarcity in Kihuura sub-county. There were three methods used for data collection namely; face-to-face interviews using a standard questionnaire, focused group discussion following a checklist and observation. Data analysis was done using SPSS where descriptive statistics generated as per the research objectives were analyzed using cross tabulations and means where applicable. In Kihuura Sub County, thirty four percent (34.1%) households kept livestock for food and twenty three percent (22.7%) households kept livestock for income. The majority (93.3%) households had three meals per day and twenty and a half percent (20.6%) households got their food from sale of livestock during times of food scarcity. Livestock contributes to household food security directly as a source of food but also as a source of income which is used to purchase food in times of scarcity. The study recommends households in rural areas to be encouraged to frequently include livestock products on their menu to integrate livestock in their farming systems.

CHAPTER ONE

INTRODUCTION

1.1 Background

The concept of food security should start at the household level in any community. This is because the household is the basic production, consumption, earning and decision-making unit on which the most nutritionally vulnerable people namely infants and children, pregnant and nursing mothers depend. Household food security is defined as the access by the household to sufficient food to provide all members with good health and an active life (Von Braun, *et al.*, 1996). It should also cater for the members' confidence that adequate food will be available at all times. A food secure household is one with access to the food needed for a healthy life for all its members (adequate in terms of nutritional quality, quantity, safety and cultural acceptability), and when it is not at undue risk of losing such access (Von Braun, *et al.*, 1996). Most of the rural households in developing countries, Uganda inclusive earn their living from agriculture which is predominantly crop farming commonly integrated with livestock under smallholdings.

World over, the main focus when addressing world food security is the rapid growth in agricultural production in respect to production of enough food to provide every person with the required caloric intake. However, even with this increase in production, 20% of the 800 million people in the rural developing world still suffered chronic malnutrition (Bahiigwa, 1999). According to Bahiigwa (1999) in 1970, Uganda's total crop output was 14.1 million metric tons which increased to 16.5 million metric tons in 1997.

Most of the documented data on the subject of food security is based on the capacity for a household to grow their own food crops in terms of the quantity of crops produced and the seasonal fluctuations as some of the reasons for the lack of food hence food insecurity. Bahiigwa, (1999) stated that in 1991, 89% of Uganda's population lived in rural areas and more than 80% were employed in agriculture. He further stated that 80% of the farm households in Uganda were cultivators who contributed 70% of the total agricultural production. The total estimate was that 50% of the total household production was consumed domestically which impacted on the food security of the households. Despite these figures, by 1998, 41% of all households in Uganda were still food insecure. Livestock (UBOS, 2011) contributed 1.7% of the 22.8% agriculture contribution to the Gross domestic product of Uganda. There is evidence to the effect that many rural households are engaging in livestock rearing alongside crop cultivation as documented by Ashley and Nanyeenya, (2002). Given that majority of the poor households are rural based, with low income and low value crops, traditional technologies and practices, whenever their own food production fails; they are grossly exposed to food insecurity. Uganda's rural agriculture is predominantly semi-subsistence and largely rain-fed making food supplies susceptible to rainfall fluctuations. There are little, if any, drought reserves, which makes it difficult for rural households to go through off-season periods and times of poor crop harvests (Bahiigwa, 1999). The role of livestock in household food security in Uganda directly or indirectly is appreciated though not extensively documented (Bahiigwa, 1999).

This lack of documentary evidence about the real contribution of livestock to household food security prompted this study to assess the livestock contribution to household food security in Kihuura sub county, Kyenjojo district. This will provide information on the actual direct importance of livestock and will form a basis for more in depth studies to document the many ways in which livestock can be harnessed to boost efforts to improve the food security levels in rural households in Uganda.

1.2 Statement of the Problem

The food security situation in Uganda has been improving over the years from 52% in July 1997 to 59% in January 1998 where of households were food secure (Bahiigwa, 1999). This is a positive trend but it still presents a problem where by 41% of households are still food insecure. There is therefore need for more concerted effort in Uganda to further reduce food insecurity from households as much as possible so as to have a nourished population for an increased holistic development. Both cash and food crops have been documented to contribute to food security through provision of income and direct food to many households in low income countries such as Uganda (Achterbosch, *et al.*, 2014).

However, the contribution of livestock to food security has not been documented. It is on this note that this study was done to assess the contribution of livestock to food security in Kihuura Sub County, Kyenjojo District.

1.3 Objectives of the Study

1.3.1. Broad Objective

To assess the contribution of livestock production contributes food security in Kihuura sub-county.

1.3.2 Specific Objectives of the Study

1. To document the roles of livestock in enhancing household food security and incomes in Kihuura sub-county.
2. To study the accessibility to adequate food by members of the different households in Kihuura sub-county.
3. To document household coping mechanisms during times of food scarcity in Kihuura sub-county.

1.4 Significance/Justification of the Study

This study has documented the contribution of livestock to household food security in Kihuura Sub County, Kyenjojo District. This information will act as a basis for further research into more detailed aspects of livestock and household food security interactions. This should form a platform to inform policy geared towards improvement of household livelihoods hinged on livestock production.

1.5 Conceptual Framework

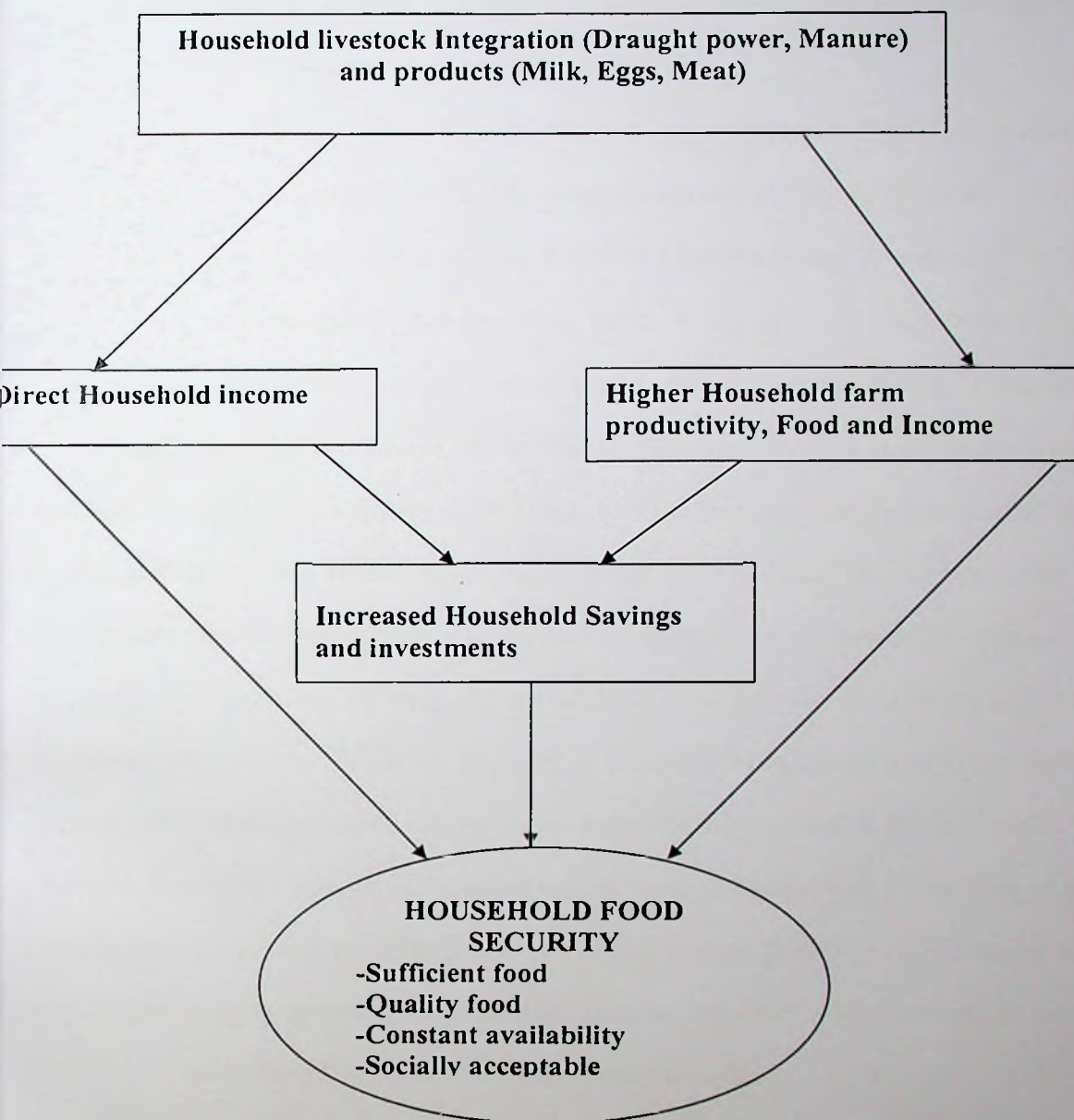


Figure 1.1: Conceptual framework on household food security

The research topic was developed from the above concept showing how various factors accruing from livestock interact to enhance household livelihood through ensuring food security. Livestock as an asset are extremely versatile:

They provide income in kind or in cash, inputs to agriculture and capital appreciation, providing protection against inflation. The chart above represents a complex interplay of several key issues, which include but not limited to the following; Household livestock integration through draught power, manure and the provision of direct food sources such as milk, eggs and meat which accrue from livestock all combine to provide higher farm productivity, food and incomes for the household. With enough food to eat by household members through having a variety of foodstuff from the farm, the surplus is converted into savings and investments for the household. With all these in place, they then combine to provide the entire household with a sound food security where reliable supply of socially acceptable food providing all the necessary nutrients needed by the body for the health of all household members is not in question. It highlights availability and consumption patterns and addresses seasonal fluctuation in the availability of food to the households as shown by increased production and productivity at the household farms. It also hints on the households coping mechanisms in time of food scarcity through setting aside reserves and accumulated household savings. For example families use their hidden savings or assets (mostly land and livestock in Uganda's case) to procure food.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of literature on the contribution of livestock to various aspects of the population and its livelihood. It covers; livestock as a direct source of food, as a source of income to the household and livestock as a supplier of production inputs for sustainable agricultural development

2.2 Livestock as a Direct Source of Food

Livestock act as a direct source of food in rural Households. This is through provision of livestock products such as eggs and meat from chicken, meat from goats, sheep and pigs and milk from goats and cattle. There are other foods derived from livestock such as meat from heads of livestock, skins and hides and hooves from ungulates mainly pigs, goats and cattle. Cattle also provide beef to households. FAO, (2009) noted that a population that has access to adequate food contributes meaningfully to the economic development of a nation. But achieving this requires the national and sectoral development policies and programs are complemented by effective community based action aimed at improving household food security. These actions, FAO, (2009) emphasized needed to occur within a framework of promoting sustainable livelihoods aimed at addressing a variety of locally relevant issues leading to various forms of malnutrition such as chronic and seasonal food shortages, lack of dietary diversity, inadequate family care, feeding practices and poor living conditions in the developing world.

Bainempaka, *et al.*, (1994) also found out that feeding on inadequate food especially in children resulted in progressive deterioration of body condition. This mal-nutrition led to poor growth and such a person contributed little to national development. They further noted that the mal-nutrition was a result of consuming very little or no animal protein hence the importance of livestock in providing this much needed protein in form of meat and milk.

In Uganda, the Food Security situation has been unsatisfactory since 1992. The country's average caloric intake per person per day improved from 1,494 in 1992 to 2,193 in 1999 but declined to 2,066 in 2002 and to 1,971 in 2005. Although the decline is marginal, the average intake is still less than the WHO recommended daily intake of 2,300 per adult per day (NDP, 2010). With regard to milk, over the period 1995 to 2006, milk production increased at an annual growth rate of 4.8 per cent, resulting in an increase of average domestic milk consumption from 20.1kg per capita per year in 2001 to 25.4 kg per capita per year in 2006 (Agriculture Sector Development Strategy and Investment Plan, 2010). This is a good step forward but still below the recommended 50kg per capita milk consumption per individual by WHO. This is an average figure for the case of Uganda but the individual consumption and how much of this contributes to the total amount of food consumed is not documented. For beef, Mbabazi and Ahmed, (2012) noted that livestock production constitutes an important sub-sector of Uganda's agriculture contributing about 9% GDP and 17% of agricultural GDP and is a source of livelihood to about 4.5 million people in Uganda.

The noted that the per capita availability of meat in Uganda was low estimated at 12.1kg, of which beef constituted 6.3kg compared to 50kg recommended by FAO and WHO.

According to Gopalakrishnam and Lal, (1985), the importance of goats in the rural economy is showed by its unparalleled economic traits, ability to get acclimatized under diversified agro climatic Conditions, fastidious type in choosing of available forage, high fertility and short generation interval. (A goat kids twice in 14 months and is capable of producing 7 female kids in eight years). There are practically no religious restrictions for goats and their products among the diversified religious people in rural areas. Economically the goat is suitable for the poor because of its low cost maintenance, short-term return on capital with low risk capital investment. There is no involvement of extraneous labor, and as such the entire rural family members especially woman folk and children are involved in their rearing.

The health status of the family is bound to improve with availability of animal protein through goat milk and mutton (Gopalakrishnam and Lal, 1985). The greatest value is consistent contribution of milk and meat towards household health and nutrition. The value is significant to the vulnerable groups, the pregnant and nursing mothers and the young. Quite often, the supply makes the differences between adequate nutrition and malnutrition to many of these farmers, who cannot afford to buy these products or alternatively, are unable to produce these by rearing cattle (Gopalakrishnam and Lal, 1985).

Sansoucy, (2009) noted that even though milk production is seasonal and surpluses cannot be stored as easily as cereals, there are simple technologies that allow herders to keep milk products for weeks or months in the form of clarified butter, curds or various types of cheese. Animals, particularly small livestock, are slaughtered as the need arises. Meat preserved by drying, salting, curing and smoking can be used when other food sources are scarce.

Recent increases in livestock products in the world appear to be even more spectacular than those achieved for cereals during the green revolution according to FAO, (1992). Most notably, egg production has increased by 331% over the last two decades, compared with 127% for meat production, 78% for cereals and 113% for fish (equivalent to 58% of that of meat production).

On the contrary in Uganda's case, Mohiuddin and Poonam, (1991) found out that families resort to neglecting livestock instead of selling them, infants and children in order to cope with the situation and in extreme cases the households break up in difficult times.

Instead households fall back on food stocks earmarked for such emergencies either at home or in the village although last practiced in most of Uganda's communities in the 1950s and 60s. They further noted that extended families or occupational groups also shared stocks, as do food-sharing networks. The problem is that emergency stocks and seed for following seasons are indistinguishable, with the result that under pressure, seed is eaten, opening up the possibility of greater hardship the following year. Families used their hidden savings or assets especially land in Uganda's case to procure food.

Rural-urban migration, wondering, begging, prostitution, thieving, and resorting to “famine food” became commonplace. Finally households adopt diversification strategies, be they multiple sources of income, alternative crops such as cash crops, quick maturing varieties and perennial crops like cassava that are capable of being stored in the ground seasonal hunting and gathering or off farm income –generation to survive this period (Mohiuddin and Poonam 1991).

2.3 Livestock as a Source of Income

Livestock and their products not only represent a source of food, but are a source of income for many small farmers in developing countries. There are a range of products commonly sold by the livestock owners along the value chain. These include whole animals depending on the need, which either dictates the sale of small or large stocks. Products also include milk from goats and cattle, milk products such as ghee, meat, eggs, hides and skins, manure, and hire of animal traction services. They play a key role in raising incomes of households besides providing a source of protein to many families.

It is apparent that households that include livestock in their enterprise mix tend to be generally less poor (Agriculture Sector Development Strategy and Investment Plan, 2010). The incomes realized can be quantified or none quantified. They can also be used as insurance against seasonal risks and as security to access credit facilities.

The food security role of livestock in remote rural areas was taken to be critical, because of people’s income dependence on livestock. Livestock were relatively drought-resistant and acquiring them was often the main means by which poorer people could escape food insecurity. Livestock as an asset were extremely versatile:

They provided income in kind or in cash (meat, milk, blood, and fish), inputs to agriculture (draught power, manure), and capital appreciation (they grow, multiply, and their prices trend upwards over time, providing protection against inflation). They are mobile and they absorb very little high-cost labor (they can be looked after most of the time by old people and children). It is essential that the rural manager in remote areas understood the role of livestock and as far as possible enables livestock to play a positive role in promoting food security (Hubbard, 1995).

2.3.1 Direct Sales

Households with livestock resort to selling off animals in times of scarcity such as during long dry spells and use the proceeds to access food from markets. Mbabazi and Ahmed, (2012) noted that there seemed to be increased informal and formal exports of meat products and live animals from Uganda to regional markets but Uganda's performance of exports of livestock and livestock products was still dismal. For milk, Uganda was estimated to have a total of 1.52 million milked cows forming 32.8% of all adult cows in 2008 (Balikoowa, 2011). These produced a total of 1.08 billion litres of which 64.8% of this getting to the market leaving 35.2% at the farm. This is either consumed, fed to the calves, offered as gift, processed into traditional dairy products for home consumption or wasted due to spoilage. The later accounting for 5.8% (Balikoowa, 2011).

Watkins, (1995) noted that in the Masvingo province of Zimbabwe, most of women headed poor families typically had less than two hectares of land, and no irrigation nor cattle for draught power. This restricted the area of land they were able to plough and the amount of crops they could produce.

Most could not afford fertilizer, which explained why their maize stocks were smaller and paler than those of richer farmers. Few had savings or other assets, except a few goats, which they could sell to get through times of stress.

Small stocks including sheep and goats were sold as a coping strategy the very poor to realize cash in smaller lumps. This was then used in the purchase of grain that acted as a widespread defense against the food shortages of the hungry season, even though they would fetch far lower prices at such times (Chambers, 1983). Most of the poor rural people in the world live in areas of marked tropical seasons. For the majority whose livelihoods depended on cultivation, the most difficult time of the year is usually the wet season especially before the first harvest. It is the season when poverty effects are felt, which also lead to a down ward movement into further poverty through the sell or mortgaging of assets, the time when poor people are most likely to become poorer. Vulnerability to poverty ratchets was heightened when the assets to be disposed of were big, indivisible and productive. This applied to both land and animals (Chambers, 1983).

In the developing world, Sansoucy in 2009 stated that the money got from the sale of livestock products is used for purchasing food and agricultural inputs such as seed, fertilizers and pesticides. In India at national level, livestock food products represent 27% of the total agricultural output. This sub sector in the developing world has achieved the greatest growth in production over the last three decades, and it is expected to continue to grow faster than all agricultural sub sectors in the next 20 years.

Livestock sales provide regular income unlike crops.

For example, in India at farm level, Sansoucy, (2009) documented that cash was generated regularly from direct sales of livestock products, such as milk, eggs, and manure, occasionally from the sale of live animals, wool, meat and hides and from fees for draught power or transport services. A daily income was also realized by farmers who were part of a Dairy Development Program called Operation Flood. This created cooperatives that paid daily for the milk delivered, thereby providing regular income to thousands of poor farmers. In Mexico's hilly areas where farm families have very small pieces of land with poor soils, milk production has proved to be a reliable activity which has offered large benefits to farm families and communities through the generation of daily earnings, and given its large demand for labour it has also enabled farming families to remain in their villages without the need to migrate to cities in search of employment (Carlos, *et al.*, 2009).

2.3.2 Credit and insurance

Livestock in the developing world provide increased economic stability to the farm or household, the small stock acting as a cash buffer and the large stock as a capital reserve as well as a deterrent against inflation. In mixed-farming systems, livestock reduce the risks associated with crop production. They also represent liquid assets that can be realized at any time, adding further stability to the production system. They are sold during emergencies as Sansoucy, (2009) noted that in the rural India financial services such as credit and insurance are virtually non-existent. In these areas, livestock play an important role as a means of saving and capital investment, and they often provide a substantially higher return than alternative investments.

A combination of small and large livestock that can be sold to meet petty-cash requirements to cover seasonal consumption deficits or to finance larger expenditures represents a valuable asset for the farmer.

As security for loans for example in Bangladesh, livestock act as a source of income for the poor farmers where the Grameen Bank worked with the poorest segment of the population and provided about 50% of its loans for the purchase of livestock, mainly large ruminants for milk production and draught power (Sansoucy, 2009). This is also common with banks and microfinance institutions in Uganda.

Livestock also serve as a major source of saving as showed in Mexico by Carlos, *et al.*, (2009), when they noted that livestock was a major source of savings. It was also used as a throughput for value addition to less valuable resources that could not otherwise be utilized by the farming family, like the fed biomass of weeds, straw, cultivated forages, common grazing areas and surplus grain. These were transformed into valuable products such as meat, milk, eggs or services such as draught and park power. With low margins from maize grain production due to limited irrigation, the farm family systems of Mexico changed the farming systems towards a greater importance of livestock production, particularly small scale dairy farming as noted by the same authors. A diversity of animal species enabled the utilization of different resources, such that competition was minimized among the different animal species majorly cattle and equids that provided most economic benefit in cash or in kind while the sheep provided the means for midterm savings. These provided the resources to purchase cattle, the main provider of economic benefits.

These aspects resulted in a more intensive use of the limited resource endowments of Mazahua farm families, which provided incomes in cash, as well as savings and the provision of food, three aspects of maximal importance for farm family communities on the hill-slopes given the poverty conditions that they faced (Carlos *et al.*, 2009).

In Uganda, a study conducted in three districts of Mbale, Kamuli and Mubende revealed that livestock were commonly purchased with money that did not need to be spent immediately and therefore served as a place in which savings could be kept until they were needed in similar ways to which others used banks (Ashley and Nanyeenya, 2002). Livestock keepers often argued that investing in livestock was better than putting money in a bank. First, this is because banks were perceived to be bureaucratic and livestock could be turned into cash more easily than it is to withdraw money from a bank. Secondly livestock continued to grow and breed, so that all being well their value appreciated quicker than did money in a bank (Ashley and Nanyeenya, 2002). Thirdly, due to their multiple functions livestock provided many useful products while they were being accumulated, whereas money in a bank did not. Livestock were also felt to be a better form of savings than land. Land was neither so readily available nor so liquid, which is important because a key role of livestock was to be turned into cash in an emergency. Land ownership has many advantages, but providing access to accessible savings is not one of them (Ashley and Nanyeenya, 2002).

2.3.3 Labour saving and service income

Livestock fetch income for households by providing manure which is sold to farmers that use it to replenish soil nutrients and hence increase crop production.

The livestock owners can also use the manure to boost their own crop production. Livestock in Uganda are also valued by some for the products they provide directly including draught power from cattle and manure (Ashley and Nanyeenya, 2002). A common strategy for manure application is kraal shifting to boost crop production (IIRR, 1998). Kraal shifting involves keeping livestock in a crop field during the fallow season, and moving the livestock enclosure from time to time to spread manure around the field. This improves the fertility, structure and water retention ability of the soil in the field. In much of eastern and southern Africa, cattle graze freely on the range during the day, and are herded into enclosures called kraals or bomas at night. Manure builds up in the kraal. Some farmers carry the manure out of the kraal to spread it on the field (IIRR, 1998). An alternative, is to build the kraal in a crop field during the fallow (dry) season, and then to shift the kraal periodically around the field. This ensures that the crop is fertilized and the manure is spread evenly around the field. With the fertilized crop come higher yields hence food security for the household involved. Shifting the kraal regularly also avoids soil compaction in one place, and keeps the animals clean. A study in southern Zambia by IIRR, (1998), revealed that one farmer who grew maize and kept 100 cattle on a very sandy soil in between 1988 and 1998 while practicing kraal shifting throughout a 1-ha field in one year harvested 1350 kg/ha from his field. This was compared to other farmers' fields without such manure which yielded only 720 kg/ha. His yields were so good that he had food left over for his neighbours, who had suffered from the prolonged drought that affected their area.

Increase in earnings to a household with all household members participating in day to day work saves labour which would have been provided by them in others places for the same amount of income. For example in Burkina Faso, an FAO/United Nations Development Program (UNDP) dairy project assisted 100 families in increasing their monthly income by about US\$80, which is equivalent to an extra labour unit per family. Another example is in Mexico where upon introducing dairy farming in the valleys, small scale dairy farming provided margins for each member of the family tending the small herds per day of family labour that were at least two times higher than the wages farm families obtained as unskilled labour in the cities, with efficient farm family dairy farmers obtaining margins seven times higher than the opportunity cost of their labour. The results provided evidence on the beneficial contribution of livestock towards improving Mexican farm family livelihoods through a better use of limited land and other productive resources and alleviating poverty (Carlos *et al.*, 2009).

Draught power is one source of income for rural households that offer the services for cultivation, transportation and the pumping of irrigation water to other community members.

This is a common practice in the eastern parts of Uganda and hilly places such as Kapchorwa where bulls are used to open land for crop cultivation and donkeys are used to carry heavy loads of harvests downhill although its documentation is not extensively covered. Gifford, (1992) stated that in the developing world, bovines, equines, camels and elephants are all used as sources of draught power for a variety of purposes, such as pulling agricultural implements, pumping irrigation water and skidding in forests.

The number of animals used for draught purposes then was estimated at 400 million. Fifty-two percent of the cultivated area in developing countries excluding China was farmed using only draught animals with 26% using only hand tools. The acreage of arable land that was opened for planting both food and cash crops was bigger when using draught power as compared to when using hand tools. This therefore resulted in more crops grown and much more yield harvested. This directly impacted on the food security status of those households using draught power which became more secure compared to those using hand tools. Draught animals remained the most cost-effective power source for small and medium-scale farmers. It was expected that draught animal power would decline slightly by the year 2000 (FAO, 1987) as would the dependency on human power, but the contribution of draught animals will remain much more important than that of mechanical traction. Given their importance as major contributors to food crop production, as a risk-avoidance mechanism and as a source of income, greater efforts need to be developed to promote the wider and more efficient use of draught animals. By bringing in income to the households through sale of skins and hides in rural areas, these byproducts of livestock also contribute greatly to household food security whereby the accrued income can be used to buy food or contribute to the household savings and investments that are called up on during times of food shortage.

Sansoucy, (2009) noted that the yield of hides and skins in relation to the overall weight of the slaughtered animal is approximately 6.5% for cattle and 10% for small ruminants.

World production of hides and skins increased significantly between the 1960s and the 1980s, with bovine hides reaching 1.8 million tons (55% increase) and sheep and goats up to 220,000 tons (5% increase). Over the same period, however, production in developing countries fell; bovine hides dropped by 50% (down to 47,000 tons) and sheep and goat skins were reduced by 25% (down to 68,000 tons). Since the number of cattle and small ruminants slaughtered steadily increased in developing countries, it was concluded then that hides and skins were not being fully utilized. FAO initiated efforts to improve flaying techniques to increase hide and skin quality. The world market price for cattle varied between US\$1.50 and \$2 per kilogram of better quality raw hides and skins in 2009 as a result of this initiative.

2.4 Livestock as a Supplier of Production Inputs

Livestock supplies a number of production inputs. These can be in form of manure for soil fertility improvement or biogas production, farm/draught power and control or contain disproportionate plant species through browsing. Bainempaka, *et al.*, (1994) noted that the importance of animals in the improvement of soil fertility is obvious when he analyzed the nutrient recycling among plants, livestock and soil. He said that a mutual relationship exists between animals, plants and the soil. Animals depend on plants for their sustenance while their manure restores nutrients to the soil that supports plant life. The replenishment of the soil nutrients increases the yields of the food crops that will subsequently be grown. This directly impacts on the food security of the household involved in this recycling by providing the food required and the surplus can be sold and the income used to provide what may be missing for the wellbeing of the household.

Biogas production has not taken root in Uganda mainly because of the high costs of setting up the system and so it's mostly in urban areas where it has been piloted through projects such as Heifer project international in Mukono and Mityana districts which has employed mainly concrete bio digesters and is expensive to establish. Working with Kulika Uganda through its sustainable organic agriculture project in 2002, we encouraged much cheaper plastic tube bio digesters but still the adoption rate has been slow. However, elsewhere in the world, Kumar and Biswas, (1982) stated that production of biogas from manure was documented to be an excellent substitute for fossil fuel or fuel wood for farmers in tropical countries. They documented the best manure for these purposes to come from (in descending order) pigs, cattle, horses, camels and poultry. For example twenty-five kilograms of fresh cow dung was documented to produce 1 cubic meter of biogas. Simple low-cost plastic bio digesters were developed in Cambodia, Tanzania and Viet Nam through a number of FAO/Technical Cooperation Program (TCP) projects. It was noted that on farm biogas production reduces the workload of women by eliminating wood collection or fuel purchasing. This increases the time allocated to food production hence increased yields and saved cash which would otherwise be used to purchase fuel which can be channeled to food purchase thereby ensuring a more stable food supply to the household. It is person-friendly because of its convenience and increased hygiene, and it also provides a number of services such as lighting, warm water and heating.

Biogas can also be used to drive machinery such as water pumps. Talukder, *et al.*, (1988) noted that effluent from bio digesters can be recycled as fertilizer-with better results than the original manure used, it can also be used as a fish feed or to grow azolla and duckweed.

Marchaim, (1992) also stated that biogas technology has been successfully adopted by millions of farmers in developing countries with about 25 million people using it in China alone. However, new simple technology needs to be promoted to extend biogas development. In China again, Zhin and Pan, (1983) noted that bio digestion has positive public-health aspects, particularly where toilets are coupled with the bio digester, and the anaerobic conditions therein killed pathogenic organisms as well as digested toxins, for example, botulinum. The biogas from dung is also used to control insects in stored grains using the anaerobic reaction, without adverse effects on grain germination. These and other beneficial technologies can be harnessed to better the livelihoods of rural households if adopted in our setting. Sansoucy, (2009) also noted that in many countries of Asia, Africa and Latin America, cow dung is highly valued as fuel for cooking and heating, reducing expenditures for fuel wood or fossil fuels. It represents the major fuel supply for households use by millions of farmers. He further noted that in India, 300 million tons of dung has been documented to be used for fuel every year. The collection and drying of dung for cooking generates income for women. It is also used directly as plaster and other building materials, while its ash could be used as fertilizer to boost crop production and acaricide in the control of livestock disease vectors among pastoralist communities.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Introduction

This section provides the description of how the study was conducted. It brings out the study area, study design, study units/subjects, Sampling, Sample size determination, sampling technique, data collection and statistical analysis.

3.2 The Study area

The study was conducted in two of the nine parishes of Kihuura Sub County, Kyenjojo District namely Kihuura and Kanyinya. This was done to compare two population clusters; one that is mainly made up of cultivators in Kanyinya parish and the other made up of both cultivators and livestock keepers in Kihuura parish. This area is located in the southwestern part of Uganda. It experiences two rain seasons; the main rain season is between March and June and the minor rain season is in August and October every year. It also has some tropical rain forests forest reserves. The major economic activities are tea growing, lumbering, potato growing and livestock keeping.

3.3 Study design

The study design was a cross sectional survey which was carried out for a short period of time to take a snapshot of events as they exist. It was mainly quantitative in nature.

3.4 Study units/subjects

The study units were households that had at least one livestock unit and above from any of the listed livestock in table 1.

Every household provided one person for interview and this person was required to be taking part in the day to day household activities that contribute to food production and hence food security in one way or another. The livestock that were considered in this research were cattle, goats, sheep, chicken and pigs (Jahnke, 1982). The accepted number equivalents of a TLU for all livestock are as shown in table 1:

Table 3.1: Number of livestock and the corresponding TLUs

Livestock	Number
Camels	1
Horses	1.25
Bovine (Cattle/Buffaloes)	1.43
Donkeys	2
Pigs	5
Shoats	10
Poultry	100

Going by the level of livestock ownership in the rural setting, the study considered half of the standard number of each livestock to represent a TLU. This enabled the incorporation of more households into the selected sample because most of them have relatively fewer numbers than documented in Table 1. A TLU was thus equivalent to the following; Bovine (cattle), 1; Pigs, 2.5; Sheep and or Goats, 5; and Poultry (chicken) 50.

3.5 Sampling

3.5.1 Sample size determination

The accessible population was all farmers from Kanyinya and Kihuura parishes. The sample size was calculated using the following formula:

$$n = 4PQ / e^2 \dots\dots\dots (i)$$

Where n is the sample size representing the number of respondents.

P is the proportion in the target population estimated to have characteristics being measured i.e. 0.5 or representing a 95% confidence interval.

Q is 1-P

e is the level of statistical significance set i.e. 0.1 or 10%

From the above formula, with the population figures of Kanyinya and Kihuura parishes being 6493 and 4887 persons respectively, (NPHC 2002),

$$n = 4 \times 0.5 \times 0.5 / 0.1 \times 0.1$$

$$n = 100$$

The n=100 is for an infinite population where the target population is not known, so,

n adjusted (na) for each parish was calculated using the formula

$$na = N \times n / N + n \dots\dots\dots (ii)$$

where N is the known population and

n is 100 from (i) above.

$$na_{Kanyinya} = 6439 \times 100 / 6439 + 100$$

$$na_{Kanyinya} = 98$$

$$na_{Kihuura} = 4887 \times 100 / 4887 + 100$$

na, Kihuura=97

Kanyinya parish therefore had 98 respondents and Kihuura parish had 97 respondents from the above calculation.

3.5.2 Sampling technique

The Study employed a systematic random sampling technique as described by Mugenda *et al.*, (1999). Here, the first respondent was the first household which the interviewer encountered on arrival in the selected parish. Thereafter, the next household was every tenth household from the last one sampled. In this way, the respondents were distributed in the entire parish.

3.6 Data Collection

There were three methods of data collection. Primary data collection was interviewing one member of the household directly involved in food production for the household using a standard questionnaire (Appendix II). Qualitative data were generated through Focus Group Discussions (FGDs). In this study, two Focus Group Discussions (FGDs) were held. The FDGs were held with opinion leaders with the aid of a checklist (Appendix III) mainly with the aim of validating some of the information provided by some respondents which was either sensitive but also to capture that which may have been missed or deliberately left out by the respondents.. The third method was participant observation as the data collection exercise went on. This mainly looked at the nutritional state of the children such as using malnutrition signs in cases of kwashiorkor in case a respondent was not comfortable answering certain questions like how often the household consumed animal protein and food storage facilities and methods in the households that were sampled.

3.7 Statistical Analysis

3.7.1 Quantitative Data Analysis

Data analysis was done using Statistical Package for Social Scientists (SPSS) as described by Schneider (2005). At the end of data collection, all the data collected was coded and reviewed by the researcher so as to have the required quality, accuracy, consistency and completeness. Data from the structured questionnaire was entered in a computer and analyzed using the Statistical Package for Social Scientists (SPSS) software. After this descriptive statistics were generated as per the research objectives. Cross tabulations and means where applicable were used to analyze the data.

CHAPTER FOUR

RESULTS

4.1 Demographic characteristics of households

4.1.1 Average size of households

In Kihuura Sub County, the mean household size is 6 people. The mean household size in Kanyinya parish is 8 people and Kihuura parish is 4 people. However, most (48.2%) households had 6-10 members, forty three percent (43.6%) of the households had 1-5 members, about eight percent (7.7%) of the households had 11-15 members and the least (0.5%) households had 16-20 members. Most (88.2%) households in Kihuura Sub County who had 1-5 people were from Kihuura parish and about twelve percent (11.8%) households were from Kanyinya parish. Over Seventy six percent (76.6%) households of all that had 6-10 people were from Kanyinya parish while about twenty three percent (23.4%) households with the same number of people were from Kihuura parish. All the households that had 11 people and above only came from Kanyinya parish at about fifteen percent (15.3%) households with 11-15 people and one percent (1%) households with 16-20 people. Within parishes, Kihuura had the majority (77.3%) households with 1-5 people and Kanyinya had slightly over ten percent (10.2%) households with 1-5 people. Kanyinya, however, had more (73.5%) households with 6-10 people while Kihuura had close to twenty three percent (22.7%) households with 6-10 people.

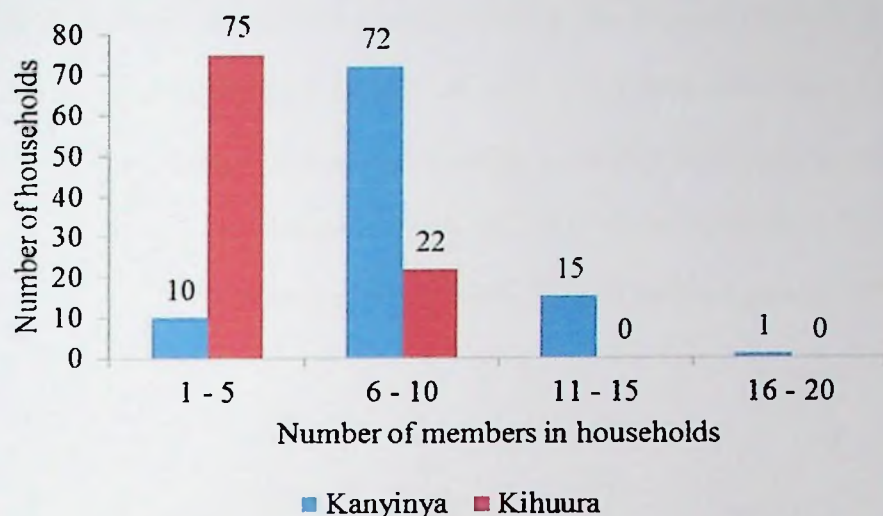


Figure 4.1: Average Size of Households

4.1.2 Average Number of Children in Households

In Kihuura Sub County, the majority (63.1%) households have 1-5 children. However, twenty two percent (22.6%) households have 6-10 children; about thirteen percent (13.3%) households do not have children and only one percent (1%) households have 11 or more children and this is only in Kanyinya parish. Majority (96.2%) households in Kihuura Sub County who had no children were from Kihuura parish and only about four percent (3.8%) households without children were from Kanyinya parish. Fifty five percent (55.3%) households of all that had 1-5 children were from Kihuura parish and about forty five percent (44.7%) households were from Kanyinya parish. Close to ninety one percent (90.9%) households that had 6-10 children were from Kanyinya while only nine percent (9.1%) households with 6-10 children were from Kihuura parish. All the households that had 11 children or more were from Kanyinya parish.

Within parishes, Kihuura had about twenty six percent (25.8%) households with no children, majority (70.1%) households with 1-5 children and the rest (4.1%) households with 6-10 children. Kanyinya on the other hand had only one percent (1%) households with no children, fifty six percent (56.1%) with households with 1-5 children, about forty one percent (40.8%) households with 6-10 children and two percent (2%) households with 11 or more children.

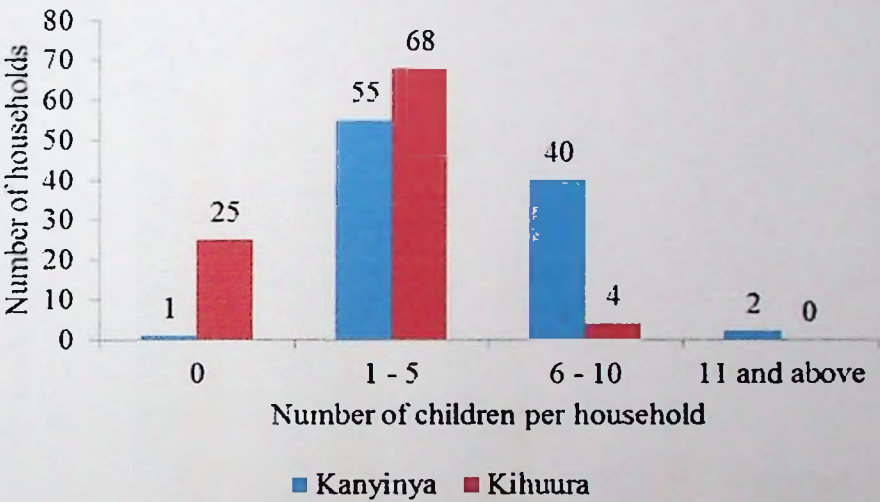


Figure 4.2: Average Number of Children in Households

4.1.3 Number of School Going Children

The majority (46.2%) households have all their children going to school. About twenty eight percent (27.7%) households have 1-2 children going to school. About thirteen percent (13.3%) households have three children going to school, about eight percent (7.7%) households have four children going to school and just above five percent (5.1%) households have five children going to school. Within parishes, in Kanyinya, majority (48%) households have all their children in school. Twenty four and a half percent (24.5%)

households have 1-2 children in school, about fourteen percent (14.3%) households have three children in school. About eight percent (8.2%) households have four children in school and about five (5.1%) have five children in school. Kihuura has a similar trend with majority (44.3%), about thirty one percent (30.1%), about twelve and a half (12.4%), seven percent (7.2%) and just above five percent (5.2%) households having all, 1-2, 3, 4 and 5 of their children going to school.

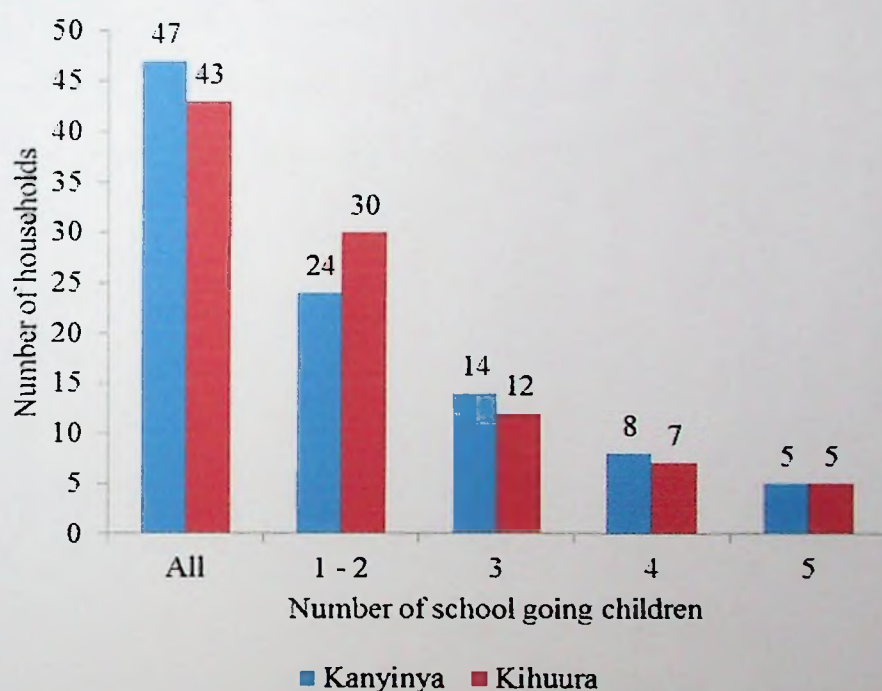


Figure 4.3: Number of school going children

4.1.4 Animal species kept by households

The average number of animal species kept by households in Kihuura Sub County is two (2). The highest number (41%) of households kept two animal species. This was followed by about thirty two percent (32.3%) households that kept only one animal species. Twenty

one percent (21%) households kept three animal species while three (3.1%) and about three percent (2.6%) households kept four and five animal species respectively. Within parishes, the majority (40.8%) of households in Kanyinya kept only one animal species, close to thirty seven percent (36.7%) kept two animal species, close to eighteen and a half (18.4%) kept three animal species, about three percent (3.1%) kept four animal species and only one percent (1%) households kept five animal species. In Kihuura, however, the majority (45.4%) households kept two animal species, about twenty four percent (23.7%) households kept one and two animal species each, about three percent (3.1%) kept four animal species and slightly over four percent (4.1%) kept five animal species.

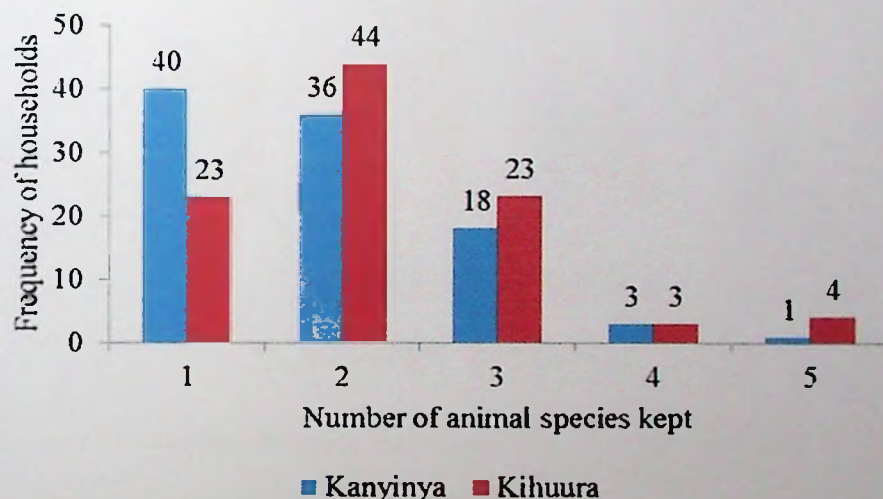


Figure 4.4: Number of Animal species Kept by Households

4.1.5 Average Number of Livestock Units by Households

In Kihuura Sub County, the average number of livestock kept by households is 8. The majority (42.1%) households kept 6-10 livestock while about thirty one percent (31.3%) kept 1-5 livestock. About eighteen percent (17.9%) households kept 11-20 livestock. Only

about nine percent (8.7%) households kept 21 or more livestock. Within parishes, the majority (50.5%) households in Kihuura kept 6-10 livestock, about twenty nine percent (28.9%) households kept 1-5 livestock, about fourteen and a half percent (14.4%) households kept 11-20 livestock and about six (6.2%) households kept 21 or more livestock. In Kanyinya, close to forty percent (33.7%) households kept 1-5 and 6-10 livestock. About twenty one and a half percent (21.4%) kept 11-20 livestock and about eleven percent (11.2%) households kept 21 or more livestock.

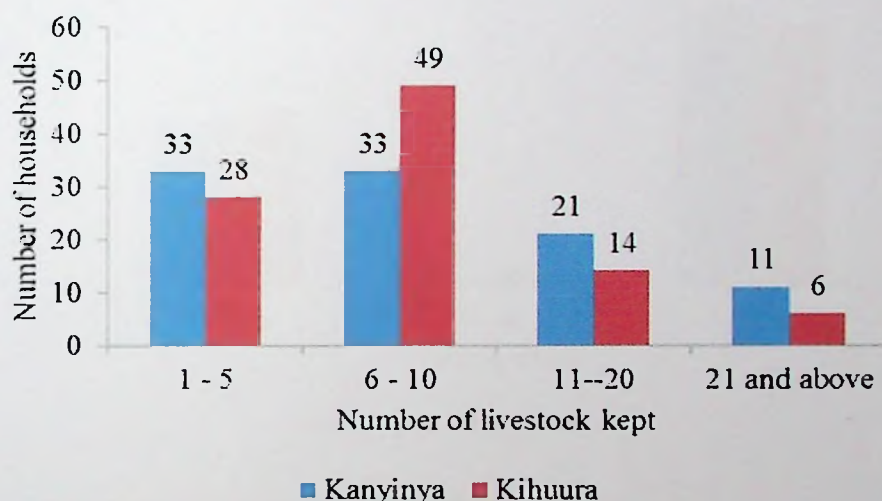


Figure 4.5: Average Number of Livestock kept by Households

4.1.6 Household Ownership of Livestock

In Kihuura Sub County, majority (59%) livestock ownership is by family. This is followed by close to thirty eight percent (37.9%) livestock owned by the husband and only slightly over three percent (3.1%) livestock owned by the wife in households.

Within parishes, majority (60.2%) livestock is owned by the family, about thirty seven percent (36.7%) livestock is owned by the husband and only slightly over three percent (3.1%) livestock owned by the wife in households in Kanyinya. In Kihuura, majority (57.7%) livestock ownership is by family; about thirty nine percent (39.2%) livestock ownership is by the husband and only slightly over three percent (3.1%) livestock owned by the wife in households.

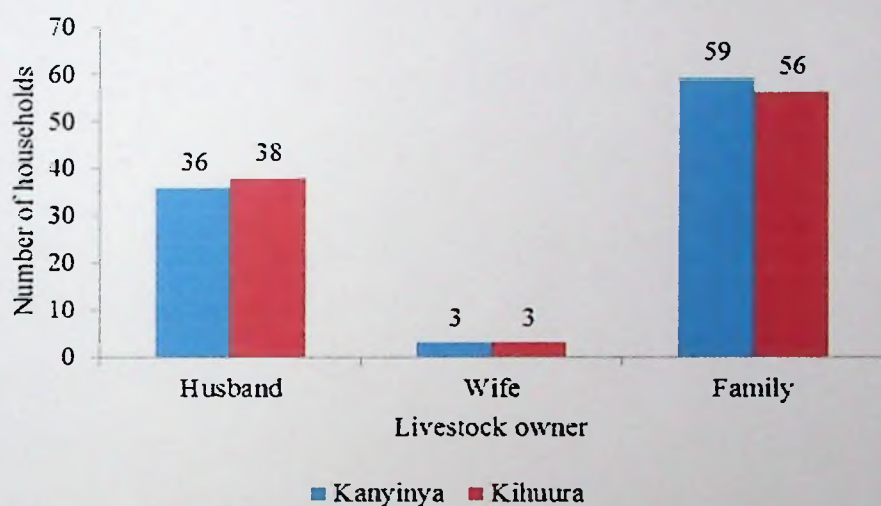


Figure 4.6: Household Ownership of Livestock

4.1.7 Means of Acquisition of Livestock by Households

Majority (91.8%) of households that own livestock in Kihuura Sub County acquired them through buying. The rest (8.2%) inherited them. In Kanyinya parish, majority (95.9%) households acquired livestock through buying and the rest (4.1%) inherited them. In Kihuura parish, majority (87.6%) households who own livestock acquired them through buying and the rest (12.4%) inherited them.

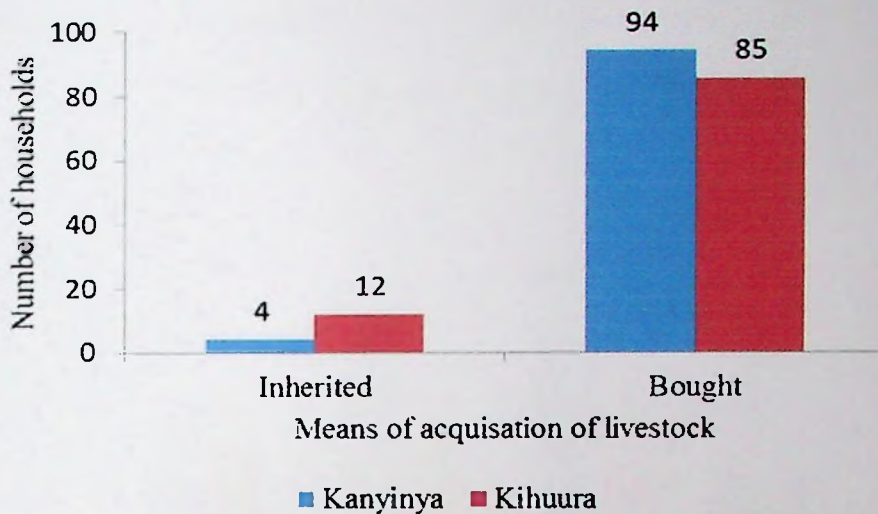


Figure 4.7: Means of Acquisition of Livestock by Households

4.2 Section Two: Roles of Livestock

4.2.1 Roles of Livestock to Households

In Kihuura Sub County, majority (47.6%) households keep livestock for both food and income. Thirty four percent (34.1%) households keep livestock for food, about twenty three percent (22.7%) households keep livestock for solely income and a small number (1.6%) keep livestock for other roles. Within parishes, majority (42.8%) households kept livestock for both food and income, about thirty five percent (35.3%) households kept livestock for food, close to twenty percent (19.7%) households kept livestock for solely income and only a small number (2.3%) household kept livestock for other roles in Kanyinya.

In Kihuura, however, majority (39%) households kept livestock for food and income, about thirty two percent (31.7%) households kept livestock for food and about twenty nine (29.3%) households kept livestock for solely income. No household in Kihuura kept livestock for other roles.

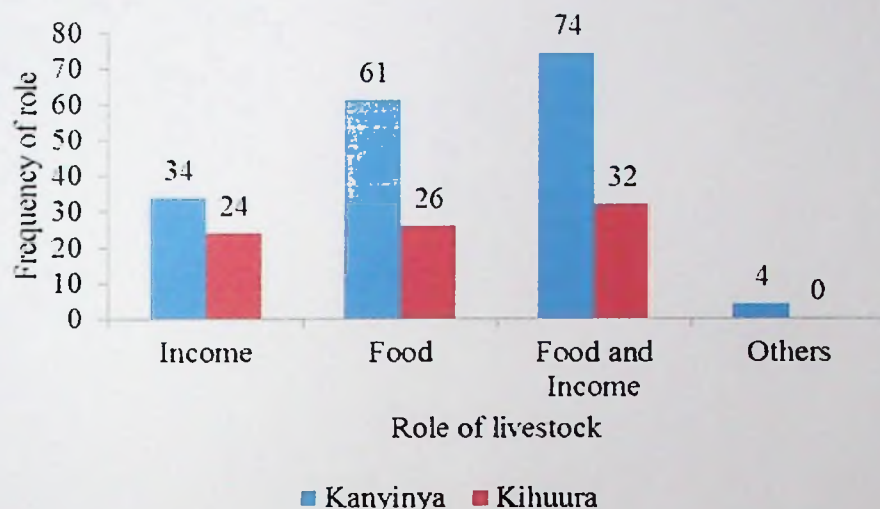


Figure 4.8: Roles of Livestock to Households

4.3 Section Three: Accessibility to Food

4.3.1 Number of Meals Taken in a Day by Households

In Kihuura Sub County, the average number of meals eaten per household is 3. The majority (93.3%) households had three meals per day. Just above five percent (5.1%) households had four meals per day and a small number (1.5%) of households had two meals per day. Within parishes, majority (93.9%) households had three meals, slightly above four percent (4.1%) households had four meals per day and only two percent (2%) households had two meals per day in Kanyinya.

In Kihuura, majority (92.8%) households had three meals, about six percent (6.2%) households had four meals per day and only one percent (1%) households had two meals per day.

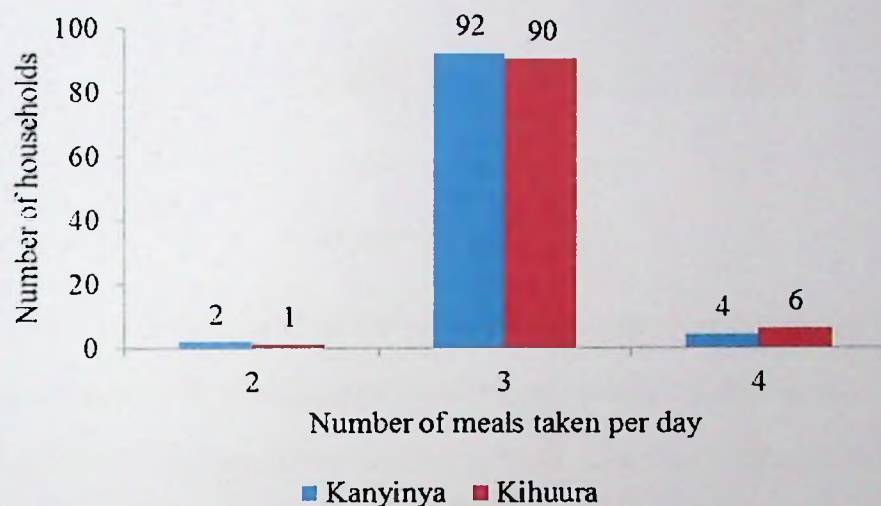


Figure 4.9: Number of Meals Taken in a Day by Households

4.3.2 Origin of Food Eaten At Breakfast the Day before the Interview

Majority (84.5%) households in Kihuura Sub County had food of animal origin forming part of breakfast the day before the interview and only fifteen and a half percent (15.5%) households had only food of plant origin. In Kanyinya parish, majority (85.1%) households had food of animal origin forming part of breakfast and close to fifteen percent (14.9%) households had only food of plant origin for breakfast. In Kihuura, majority (83.9%) households had food of animal origin forming part of breakfast and slightly over sixteen percent (16.1%) households had only food of plant origin for breakfast the day before the interview.

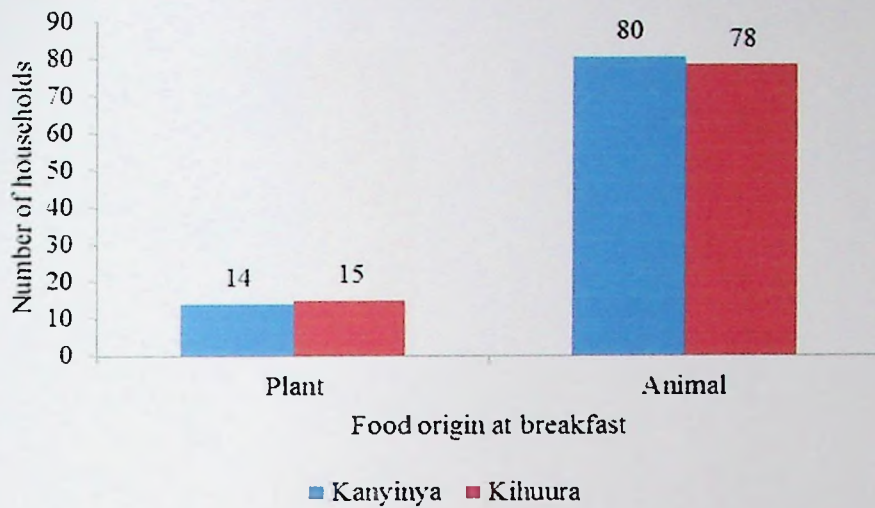


Figure 4.10: Origin of Food Eaten At Breakfast the Day before the Interview

4.3.3 Origin of Food Eaten at Lunch the Day before the Interview

Majority (93.7%) households in Kihuura Sub County had food of plant origin for lunch the day before the interview and slightly over six percent (6.2%) households had food of animal origin forming part of lunch the day before the interview. In Kanyinya parish, majority (93.9%) households had food of plant origin for lunch and slightly over six percent (6.1%) households had food of animal origin forming part of their lunch the day before the interview. In Kihuura, majority (93.8%) households had food of plant origin for lunch and slightly over six percent (6.2%) households had food of animal origin forming part of their lunch the day before the interview.

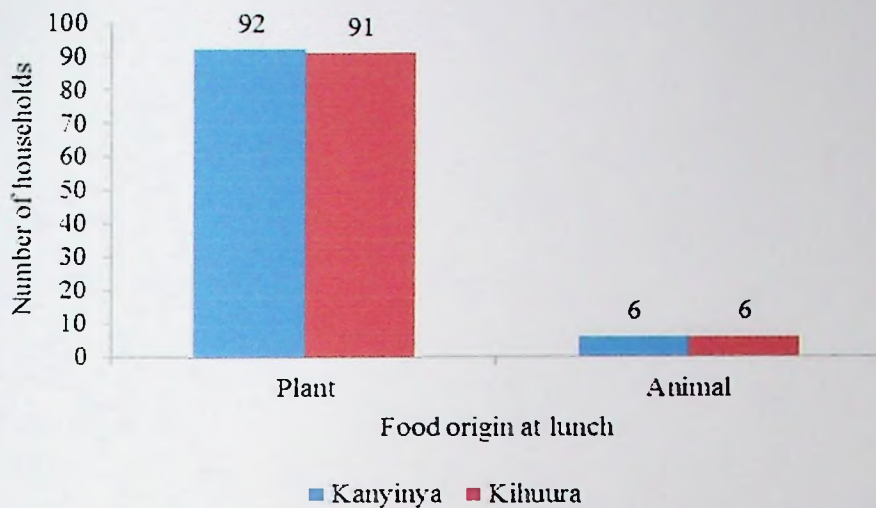


Figure 4.11: Origin of Food Eaten at Lunch the Day before the Interview

4.3.4 Origin of Food Eaten at Supper the Day before the Interview

Majority (89.7%) households in Kihuura Sub County had only food of plant origin for supper the day before the interview and slightly over ten percent (10.3%) households had food of animal origin forming part of supper the day before the interview. In Kanyinya parish, majority (89.8%) households had only food of plant origin for supper and slightly over ten percent (10.2%) households had food of animal origin forming part of their lunch the day before the interview. In Kihuura, majority (89.7%) households had only food of plant origin for supper and slightly over ten percent (10.3%) households had food of animal origin forming part of their supper the day before the interview.

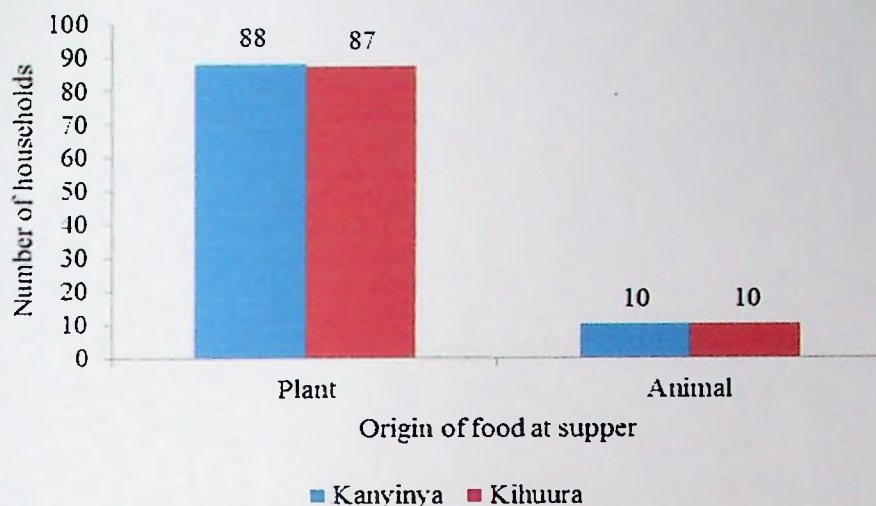


Figure 4.12: Origin of Food Eaten at Supper the Day before the Interview

4.4 Section Four: Coping Mechanisms during Times of Food Scarcity

4.4.1 Main source of Food for Households

In Kihuura Sub County, majority (91.3%) households get their food from household gardens and only a few (5.1%) households buy from the market. Slightly more than three percent (3.6%) households ask from their neighbors as the main source of food. Within parishes, majority (92.9%) households get their food from household gardens, more than four percent (4.1%) households buy from the market and more than three percent (3.1%) households get their food from their neighbors in Kanyinya. In Kihuura, majority (89.7%) households get their food from household gardens, more than six percent (6.2%) households buy from the market and more than four percent (4.1%) households get their food from their neighbors.

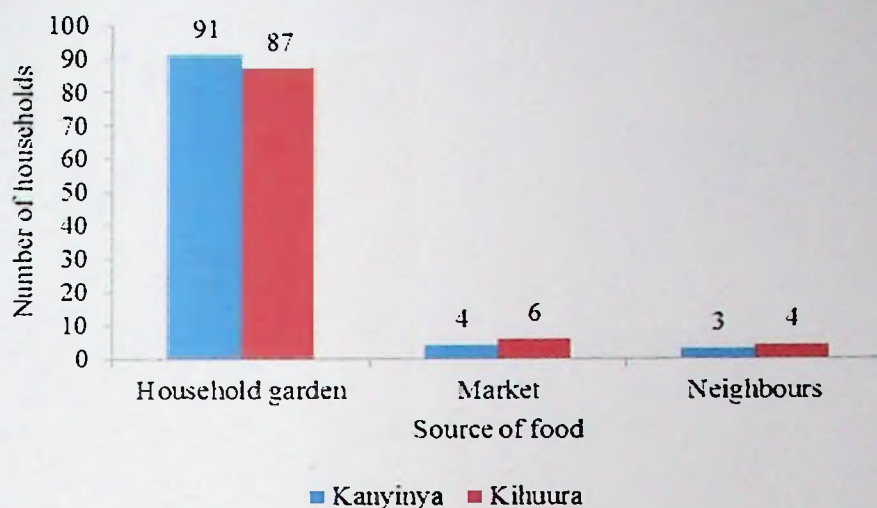


Figure 4.13: Main source of Food for Households

4.4.2 Reliability of Food Produced By Households during the Year

On average, majority (93.3%) households produce enough food throughout the year and the rest (6.7%) do not produce or have enough food during the year. In Kanyinya parish, majority (91.8%) had enough food throughout the year while just more than eight percent (8.2%) did not have enough food during the year. In Kihuura parish, majority (94.8%) had enough food throughout the year while just more than five percent (5.2%) did not have enough food during the year.

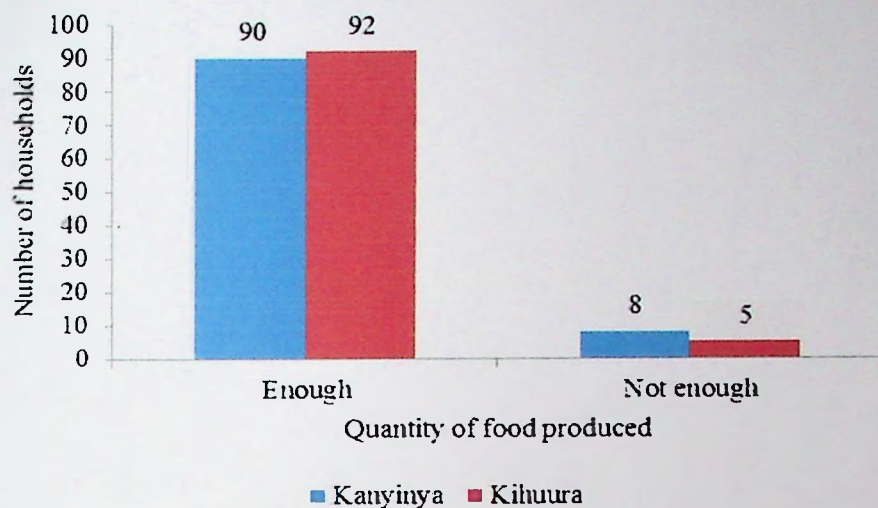


Figure 4.14: Reliability of Food Produced By Households during the Year

4.4.3 How Households Handle Surplus Food in Bumper Harvests

In Kihuura Sub County, most (89.2%) households store the surplus food they produce in their gardens. Only about eleven percent (10.8%) sells off the surplus food after harvest. In Kanyinya parish, most (95.9%) households store their surplus food while a small (4.1%) number of households sell off the surplus food. In Kihuura parish, most (82.5%) households store their surplus food while seventeen and a half percent (17.5%) households sell off the surplus food after harvest in bumper harvests.

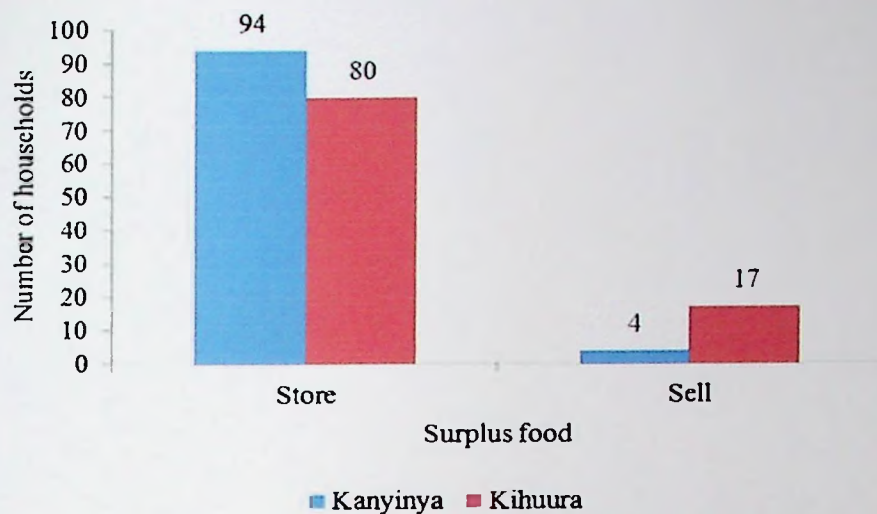


Figure 4.15: How Households Handle Surplus Food in Bumper Harvests

4.4.4 The Main Source of Income for the Households

The main source of income in Kihuura Sub County is sale of crops (82.6%). This followed by sale of livestock (16.4%). The other sources of income represent only one percent (1%) of all households. Within parishes, majority (84.7%) households in Kanyinya had their main source of income from sale of crops, slightly more than thirteen percent (13.3%) households had their main source of income from sale of livestock and two percent (2%) households had their main source of income from other sources other than crops or livestock. In Kihuura, there were only two main sources of income with the majority (80.4%) households from sale of crops and the rest (19.6%) households from sale of livestock.

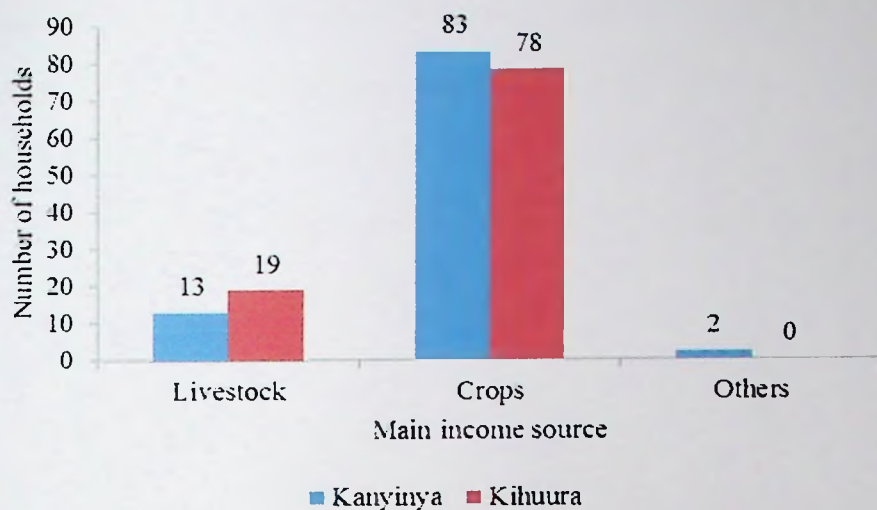


Figure 4.16: The Main Source of Income for the Households

4.4.5 Periods of the Year and the Level of Food Scarcity

In Kihuura Sub County, most (60%) households experience food scarcity during the period between July and September during the year. This is followed by the period between October and December where more than thirty percent (30.8%) households experience food scarcity. A few (7.2%) households experience food scarcity during the period between April and June while only a small number of households (2.1%) experience food scarcity during the period between January and March during the year. Within parishes, majority (61.9%) households in Kihuura experienced food scarcity between July and September, thirty two percent (32%) households experienced food scarcity between October and December, only one (1%) households experienced food scarcity between January and March while the rest (5.2%) households experienced food scarcity between April and June during the year.

Majority (58.2%) households in Kanyinya experienced food scarcity between July and September, about thirty percent (29.6%) households experienced food scarcity between October and December, only about three (3.1%) households experienced food scarcity between January and March while the rest (9.2%) households experienced food scarcity between April and June during the year.

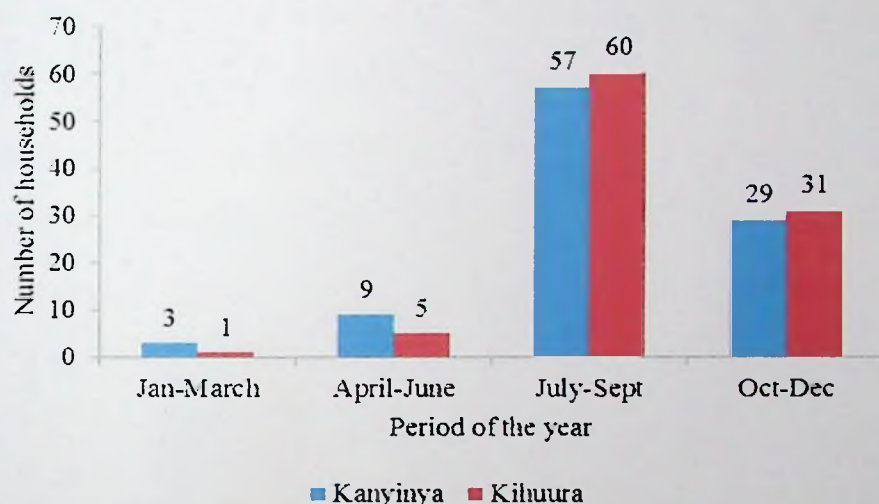


Figure 4.17: Periods of the Year and the Level of Food Scarcity

4.4.6 Reasons Why There Is Food Scarcity during July- Sept Period

Most (91.9%) households in Kihuura Sub County experience food scarcity between July and September because it's the planting season. Another close to six (5.8%) households experience food scarcity during the same period because there is a general scarcity of money. The rest (2.3%) experience food scarcity during the same period because food is scarce.

In the parishes, most (93%) households experienced food scarcity between July and September because it coincided with the planting season, close to five percent (4.7%) households experienced food scarcity within the same period due to scarcity of money and the rest (2.3%) of the households experienced food scarcity during this period due to food scarcity in Kanyinya. In Kihuura, most (90.7%) households experienced food scarcity between July and September because it coincided with the planting season, seven percent (7%) households experienced food scarcity within the same period due to scarcity of money and the rest (2.3%) of the households experienced food scarcity during this period due to food scarcity.

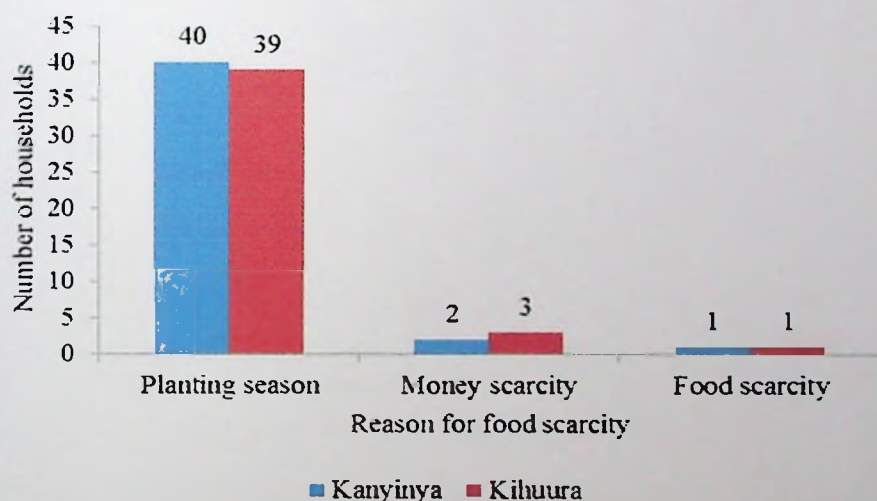


Figure 4.18: Reasons Why There Is Food Scarcity during July- Sept Period

4.4.7 Sources of Food in Times of Scarcity

In times of food scarcity, majority (80%) households in Kihuura Sub County buy their food, close to twelve percent (11.8%) households sell their livestock to get food, slightly more than three percent (3.1%) get their food from household food reserves.

The rest (5.1%) households get their food from other sources other than the three mentioned earlier. In the parishes, majority (91.8%) households in Kanyinya bought their food, slightly more than three percent (3.1%) households got their food from sale of livestock, about four percent (4.1%) households got their food from household food reserves and only one percent (1%) households got theirs from other sources. In Kihuura parish, majority (68%) households bought their food, about twenty and a half percent (20.6%) households got their food from sale of livestock, slightly more than two percent (2.1%) households got their food from household food reserves and more than nine percent (9.3%) households got theirs from other sources.

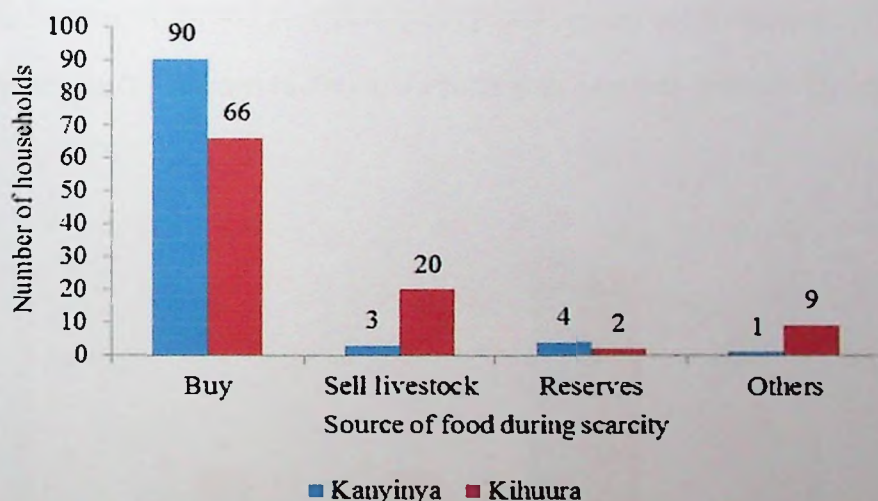


Figure 4.19: Sources of Food in Times of Scarcity

4.4.8 Rate of Sale of Livestock by Households by Season

Most (64.6%) households in Kihuura Sub County sell their livestock between July and September.

The rate of livestock sale between January and March and between April and June during the year is the same at just more than fourteen and a half percent (14.6%) households. The least sale of livestock is between October and December standing at just above six percent (6.3%) households. Within parishes, most (68.1%) households in Kanyinya sold their livestock between July and September. This was followed by the two periods of January and March and between April and June during the year where an equal number of households (12.8%) sold livestock. The rest (6.4%) households sold livestock between October and December. In Kihhura parish, most (61.2%) households sold their livestock between July and September. This was followed by the two periods of January and March and between April and June during the year where an equal number of households (16.3%) sold livestock. The rest (6.1%) households sold livestock between October and December.

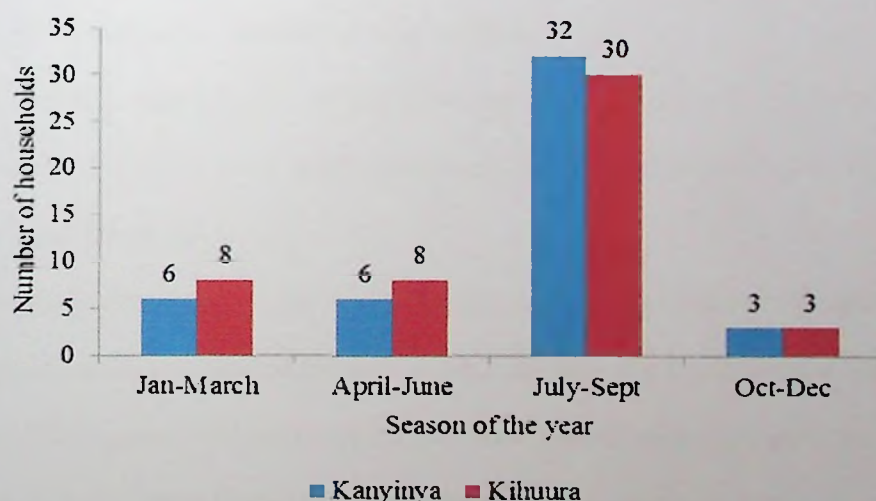


Figure 4.20: Rate of Sale of Livestock by Households by Season

CHAPTER FIVE

DISCUSSION

5.1 Introduction

The results in chapter four were discussed in three sections following the objectives of the study. These were (a) the roles of livestock in enhancing household food security and incomes, (b) accessibility to adequate food by members of different households and (c) household coping mechanisms during times of food scarcity. Further, section (a) was discussed in three sub sections as follows; (i) livestock as a direct source of food, (ii) as a source of income and (iii) as a supplier of production inputs for sustainable agricultural development.

5.2 Discussion

5.2.1 The role of livestock in enhancing household food security and incomes

5.2.1.1 Livestock as a direct source of food

The results showed that in Kihuura Sub County, majority (47.6%) households keep livestock for both food and income and thirty four percent (34.1%) households keep livestock for food.

The study documented that first two roles of keeping livestock by households in the two parishes were in order of priority to provide both food and income and to provide food only. They provided food in the form of meat, which came in during festive seasons and in times where the households hosted visitors, milk and eggs which were mainly given to children and the sick members of the households. The later was got from the focused group discussions.

This finding was in agreement with Bainempaka *et al.*, (1994) who found out that livestock are a direct source of food noting the importance of livestock in providing the much needed animal protein in the form of meat and milk in order to fight malnutrition in children. It was also in agreement with Gopalakrishnam and Lal, (1985) who stated that the health status of the rural women and children was bound to improve with the availability of animal protein through goat milk and mutton. This further concurs with Ashely and Nanyeenya, (2002) who found out that in addition to other roles played by livestock, they are valued by some for the products they provide directly, including draught power, from cattle, manure, and meat, milk and eggs. The livestock that were kept to provide both food and income at the same time were mainly the small stock including chicken which was majorly indigenous. This provided food in form of eggs but also meat. This was usually when the household hosted a guest but also to the family. This is because the small stock was easy to dispose without the danger or luxury of the meat turning out to be too much for the family or household to consume. So in case the decision was taken for the chicken to be slaughtered, there will be no case of wastage. The other small stock that would serve as food was goats and pigs. These though were always slaughtered during festivities in the household or from where the household could get a few kilograms for home consumption leaving the rest to be sold for an income. This was made possible because an average indigenous goat weighs between 9-18 kilograms. This made it easy for the entire carcass to be sold out since it only requires a few individual buyers to buy out all the available meat. This hence made it easy for the households to rear these small stocks for both food and income.

For those households that kept big stock majorly cattle, these usually provided some milk for household consumption but the bulk of the milk was channeled to provide an income. The finding from the results where the average number of livestock kept by each household in Kihuura was two attests to the fact that subconsciously, these households are always positioning themselves for provision of food and or income. Usually, one species is smaller and easy to dispose of than the other so that should there be a need to get money and there is no other source, the smaller stock is put to the market to fill in this gap. The income may not necessarily be for buying food only but for other small but essential needs of the house hold such as hospital bills, scholastic materials or school fees for the school going children or even for household items that are not grown or produced locally by the household they are essential to the wellbeing of the household such as salt yet. These are needs that will not wait for the harvesting season of a given crop. So livestock here plays a very crucial role in ensuring that even where there seem to be little hope for cash to provide for any eventuality, this is catered for by turning one or two stock in the needed cash to provide what is required. This ensures that there is no stagnation in the smooth running of the household.

5.2.1.2 Livestock as a source of income

The study showed that 22.7% households keep livestock for solely income. It also further showed that 11.8% households sell their livestock to buy food in times of food shortage. Source of income can be in form of direct sales in markets or credit and insurance from financial institutions.

This finding concurs with Chambers, (1983) who stated that sale of sheep and goats and the purchase of grain with the proceeds were a wide spread defense against the food shortages of the hungry season, even though they could fetch far lower prices at such times. It was also in agreement with Watkins, (1995) who stated that in that few of the poor families in Katule, Masvingo province in the semiarid southern part of Zimbabwe had savings or other assets except a few goats, which they could sell to get through times of stress. The finding was also in agreement with Sansoucy, (2009) who noted that incomes to famers' households in India where a dairy development program was initiated were realized on a daily basis from sale of milk. He further stated that in other developing countries world over, there was use of money got from sale of livestock products to buy food and agricultural inputs. This was also reported in Mexico by Carlos *et al.*, 2009 and Hubbard, (1995). The finding also agrees with Ashley and Nanyeenya, (2002) who found out that livestock are a key source of funds for expenditures in rural areas. Regular or small expenditures such as for medicines, food, seed, fertilizer are financed by selling a chicken or a goat. Larger expenditures such as purchasing land, a boat, some new fishing gear, a house, starting a small business, paying school fees, or making a dowry payment can be made through sale of larger numbers of smaller animals or a few larger animals such as cattle. In essence, livestock provide security in terms of savings for the households keeping them. These are always turned to when something goes wrong and when money is required urgently for example to pay for a visit to hospital.

Where people do not have access to cash savings, the essential role played by livestock in contributing to the sustainability of people's livelihoods, by making available lump sums of money is essential. This therefore is a crucial role played by livestock in households.

5.2.1.3 Livestock as a supplier of production inputs

The study through observation during data collection showed that 75% households that kept livestock, there was none utilization of animal manure most especially from goats. This was often seen heaped around the goat shelter. However, in those households (25%) that were utilizing the manure, there was evidence of very fertile soils as seen from the vigor of the crops in the nearby gardens. This is in tandem with findings of Bainempaka *et al.*, (1994). He stated that the importance of animals in the improvement of soil fertility was obvious in that livestock manure restores nutrients to the soil that supports plant life. This replenishment of the soil nutrients increased the yields of the food crops that were subsequently grown. This directly impacted on the food security of the household involved in this recycling by providing the food required and the surplus could be sold and the income used to provide what may be missing for the wellbeing of the household. The finding also agreed with a case study done in southern Zambia which revealed that one farmer who grew maize and kept 100 cattle on a very sandy soil between 1988 and 1998 while practicing kraal shifting throughout a 1-ha field in one year harvested 1350 kg/ha from his field compared to other farmers' fields without such manure which yielded only 720 kg/ha (IIRR, 1998).

The livestock owners can also use the manure to boost their own crop production as documented that livestock in Uganda were by some for the products they provided directly including draught power from cattle and manure (Ashley and Nanyeenya, 2002).

By supplying production inputs for sustainable agricultural development, livestock directly influence the yield of both food and cash crops grown by various households. In so doing they impact on the amount of food that a household will harvest and hence contribute to the food security of that household. These inputs are mainly in the form of urine and dung which when added to the soil as organic manure replenish the soil with depleted nutrients mainly nitrogen hence restoring its fertility resulting in higher yields. The dung also improves the soil structure through adding solids which improve the water percolation, growth of soil organisms, root penetration and hence facilitates nutrient absorption by plants. This directly impacts food security in households by increasing the yield of crops.

5.2.2 Accessibility to adequate food by members of different households

The findings from the study were as follows: majority (91.3%) households got their food from household gardens, majority (93.3%) households in Kihuura Sub County produced enough food throughout the year and majority (93.3%) households had three meals per day. Majority (84.5%) households had food of animal origin forming part of breakfast the day before the interview and only fifteen and a half percent (15.5%) households had only food of plant origin. Majority (93.7%) households had food of plant origin for lunch the day before the interview. Majority (89.7%) households had only food of plant origin for supper the day before the interview. Most (89.2%) households store the surplus food they produce in their gardens.

The findings were in agreement with Zakari *et al.*, (2014) who found out that the primary source of food consumed by households in Southern Niger was from their own production with 80% of the population depending on crop production and livestock rearing. The market was reported to be the second source of households' food supply. Although households produced their food, it was also revealed by Zakari *et al.*, (2014) that most of the households did not produce sufficient quantities to cover the consumption needs over the season with some selling part of their produce to cover production expenses and other needs such as weddings and children school fees. This could be the main reason why the market came in second as the next most important source of food. There is need to ensure measures are put in place for sustainable household food production such as proper storage facilities for surplus food and other postharvest technologies. This would reduce food spoilage and or wastage.

On the number of meals eaten daily, the results differed with the findings of Zakari, *et al.*, (2014) who showed that the average daily meal number in Niger was 2.57 which was less than the normal three meals per day that the households in Kihuura Sub County had. However, on the amount of animal products eaten by the households the day before the interview, the findings seem to agree with Zakari, *et al.*, (2014) who revealed that in Niger the average meat and fish intake was two to three times a week. To them, this pointed to poor quality of the diet of the households. Much as the results showed majority of households having eaten livestock products for breakfast, this does not reflect in the subsequent meals in the course of the day where majority had carbohydrates forming the bulk of lunch and supper.

Revelations from the focused group discussions that were conducted further revealed that generally, livestock products especially meat were a preserve for festive seasons and on rare occasions when the household hosted a guest. These discussions further revealed that it was only to special cases such as when children fell sick that foods such as milk and eggs were provided. This, the participants revealed is often on the advice of a health worker for those who visit the health facilities in their locality. This was cited by FAO, 2009 as one of the locally relevant issues that lead to various forms of malnutrition which needed to be addressed to ensure the promotion of sustainable livelihoods in the developing world. It could therefore have been the cause of some cases of malnutrition as observed in some households that were sampled during the data collection exercise. They showed 32 out of the 99 children observed in kanyinya had signs of kwashiorkor. The picture was not very different in Kihuura parish with 37 out of the 97 households visited had a child with the same signs. This observation contradicted the study finding on the question of the composition of breakfast where 84.5% of the respondents on average said they had food composed of livestock products. Otherwise, this malnutrition level would not be this much. This is because if the households had animal protein this often, the individual members would not show signs of lack of it in form of kwarshiakor. The above scenario was in line with the NDP, 2010, that stated that the food security situation had been unsatisfactory since 1992.

This showed that much as the meals had good energy sources from cereals, bananas and root tubers and protein from pulses mainly beans, there was little or no animal protein forming part of the diet for the most part of the year hence a lack of dietary diversity which meant that their diets lacked some nutrients needed for proper growth and functioning of the body more so in the most vulnerable group of pregnant and suckling mothers and children below five years. It was reported that the country's average caloric intake per person per day improved from 1,494 in then to 2,193 in 1999 but declined to 2,066 in 2002 and to 1,971 in 2005. Although the decline is marginal, the average intake was still less than the WHO recommended daily intake of 2,300 per adult per day. This finding in this study is in line with the acknowledgement of the existence of food insecurity in Uganda by Bainempaka *et al.*, 1994, who noted that feeding on inadequate food especially in children, resulted in progressive deterioration of body condition. This mal-nutrition led to poor growth and such a person contributed little to national development. They further noted that the mal-nutrition was a result of consuming very little or no animal protein hence the importance of livestock in providing this much needed protein in form of meat and milk (Bainempaka *et al.*, 1994). It was also in agreement with the Uganda Human Development Report (2005) which noted that feeding practices had a direct influence on the nutritional status of children and that malnutrition as a result reflects stunting, wasting or a combination of the two. This affected 23% of the children under five in Uganda. The percentage of affected children was 32.3 in Kanyinya parish and 38.1 in Kihuura parish respectively and this was above that quoted by the UHDR (2005).

It also was in agreement with UDHS, (2001) which noted that lack of adequate food (with the required nutrients) or acute food shortages and the limited means to acquire enough food were some of the causes of underweight among children under five, and accounted for undernourishment of children. The importance of proteins in the diet of humans cannot be understated. This is more so among children under five years whose brain development is still going on and the pregnant and nursing mothers who need extra nutrients to take care of the needs of the developing fetus and the new born baby for proper growth and also the nutritional needs of the mother. Much as we saw increased food production in households, emphasis should be put on the composition of the food consumed to ensure that households get nutritionally balanced diets. This will lead to households being food secure both in terms of quality of food to provide all the required nutrients for good health but also quantity to satisfy the body energy needs of all members in the affected households.

5.2.3 Household coping mechanisms during times of food scarcity

In Kihuru Sub County, most (89.2%) households store the surplus food they produce from their gardens. Only about eleven percent (10.8%) sells off the surplus food after harvest. This is in agreement with Makalle, (2012) who in his study; Post Harvest storage as a rural household food security strategy in Tanzania revealed that there had been efforts taken by the district of Morogoro in collaboration with non-governmental organizations to build improved food storage facilities in some villages with the aim of improving the existing techniques of food storage. For improved maize storage, a study was conducted in China where biogas from dung was used to control insects in stored grains using the anaerobic reaction, without adverse effects on grain germination by Zhin and Pan, (1983).

This could increase the shelf life of the grain and hence reduce on postharvest losses. From the observation during the data collection exercise, only 8 households had storage structures purposely constructed for food storage. This represented 4.1% of the total households sampled during the study. Therefore, there was clear lack of storage facilities in Kihuura Sub County. The other 95.9% stored the produce in their houses usually in the sitting rooms during harvesting periods caused by lack of proper storage facilities and space. Through experience, this kind of storage only lasted for a short while for two reasons as discussed with opinion leaders in the two focused group discussions; (a) the household members who had their produce stored in their sitting rooms in their houses, most often on the floor, worked so hard to clear their sitting rooms for their designated function. This could only be so by selling off the produce which was mainly maize and potatoes. (b) That postharvest losses incurred were so heavy that in the end the household loses close to half of the harvest if they decided to store the produce for some time. This was due to the way the produce was handled usually spread on the floor which was most often made of rammed earth. This kind of floor released large amounts of moisture which caused rotting in maize and shoots growing in potatoes. There is need for increased awareness of the households to acquire storage facilities for food storage. This will reduce on the rate of sale of produce due to lack of storage space and increase on the time which households can hold onto their food to ensure food security.

The main source of income for the households is sale of crops (82.6%). This followed by sale of livestock (16.4%). This finding agreed with Ashley and Nanyeenya, (2002) who found out in their study that livestock income was 6th most important source of income.

This represented a small proportion of the wider livelihood portfolio across the three districts of Mbale, Kamuli and Mubende. It also agrees with Kyaw Dolly, (2009) who in her study; Rural Households' food security status and coping strategies to food insecurity in Myanmar found out that about 81% and 11% of the households' income came from crop production and fixed salary in the small farm household. Unsurprisingly, about 92% and 96% of the income are received from crop production only in medium and large farm households. Much as livestock does not come as number one household income earner, there is a clear agreement that it contributes a given amount and increasingly so in many households in the world. This is in terms of direct sales which do not take into account the different livestock products directly consumed. Should this be computed in monetary terms, the total contribution would be significant hence the need to emphasize livestock importance in household food security.

Most (60%) households experienced food scarcity between July and September during the year and of these, 91.9% households reasoned that this is due to the fact that the period coincides with the planting season. This is followed by the period between October and December where more than thirty percent (30.8%) households experienced food scarcity. In times of food scarcity, majority (80%) households bought their food while nearly to twelve percent (11.8%) households sold their livestock to get food. Most (64.6%) households sold their livestock between July and September, while the rate of livestock sale between January and March and between April and June during the year is the same at just more than fourteen and a half percent (14.6%) households. The peak sale of livestock coincided with the peak food scarcity period during the year.

The findings on sale of livestock to purchase food was in agreement with Chambers, (1983) who stated that sale of sheep and goats and the purchase of grain with the proceeds were a wide spread defense against the food shortages of the hungry season, even though they would fetch far lower prices at such times. This finding also concurred with Watkins, (1995) when he stated that few of the poor families in Katule, Masvingo province in the semiarid southern part of Zimbabwe had savings or other assets except a few goats, which they could sell to get through times of stress. The findings also concurred with other authors including Sansoucy, (2009), Hubbard, (1995) and Carlos, *et al.*, (2009), who documented in their studies that the sale of livestock and their products was often used to generate income to purchase food in times of stress.

One could explain the food scarcity from the point of view that most farmers would be in dire need of seed for planting. For those who kept some seed from the previous season, this is the time to get it out and plant. For those who sold off everything, this could be the time to convert their savings from livestock to cash in order for them to buy the much needed seed for planting and also the food to keep the household going. It was not uncommon for farmers in this area to grow maize, beans and potatoes and sell the harvest to buy livestock. This practice shows how the people of Kihuura sub county knowingly or otherwise rely on livestock to cope in times of food scarcity and hence their contribution to their households' food security. There was a clear response to lack of food by selling livestock for those households that kept them.

This shows one of the reasons why households kept livestock and indicates the strategic importance of livestock to households given the timing of the sale and the easiness of conversion of them to cash to respond to household needs wherever required.

CHAPTER SIX

CONCLUSSION AND RECOMMENDATIONS

6.1 CONCLUSION

1. Livestock contributes to household food security directly as a source of food but also as a source of income which is used to purchase food in times of scarcity. It is also used as a springboard to livelihood diversification by providing investment funds which are frequently not available from any other source.
2. Different members of households in Kihuura Sub County had access to adequate amounts of food.
3. The household coping mechanisms during times of food scarcity in terms of priority are as follows:
 - (i) Buying from the market
 - (ii) Sale of livestock to buy food
 - (iii) Household food reserves
 - (iv) Other sources

6.2 RECOMMENDATIONS

1. Households in rural areas should be encouraged to frequently include livestock products on their menu. These include eggs, milk and meat were available.
2. Farmers should be encouraged to integrate livestock in their farming systems. These can be turned to as a fallback position in times of scarcity or dire need of cash for day to day household needs.

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APPENDIX I: LIST OF VILLAGES THAT WERE VISITED BY PARISH

KANYINYA

1. Kanyinya A
2. Kanyinya B
3. Kabirizi
4. Mateete
5. Mugali
6. Nyabubale
7. Nyakarambi
8. Nyakatoma
9. Rugorra A
10. Rugorra B
11. Rugorra C

KIHUURA

1. Bisa
2. Bukora
3. Buramba
4. Kasaali
5. Kicwamba
6. Kihuura
7. Kiregesa
8. Kikukuuru

9. Kisakara

10. Kisiita

11. Murongo

12. Ngombe

13. Nyakahama

APPENDIX II: QUESTIONNAIRE USED DURING THE STUDY

A. HOUSEHOLD GENERAL DATA

- (i) Number of respondent:.....
.....sex.....Age.....
- (ii) Position held in household.....
- (iii) Parish.....Village.....
1. How many members make up your household?
(a) 0-5 (b) 6-10 (c) 10-15 (d) 16-20
 2. How many children do you have in your household?
(a) 0 (b) 1-5 (c) 6-10 (d) 11 and above
 3. How many are going to school?
(a) All (b) a few state numbers.....
 4. If 3(b) above, why? (a) Still too young (b) handicapped (c) no school fees (d)
Others, state.....
 5. Does your household have any member who is physically handicapped or any
disease, which renders them handicapped?
(a) Yes (b) no
 6. If 5(a) above how many? (a) 1 (b) 2 (c) 3 (d) 4 and above
 7. How many members of your household participate in its day-to-day activities that
help bring food to the household?
(a) All (b) a few, state numbers.....

8. If 7(b) above why? (a) Still very young (b) handicapped (c) don't want to work (d) others, state.....

B LIVESTOCK INFORMATION

1. How many types of livestock do you keep in your household? (a) 5 (b) 4 (c) 3 (d) 2 (e) 1

List them.....

2. What product(s) do you get from each of the livestock you keep?

Livestock type	Product

3. What is the purpose of keeping the livestock above?

Livestock type	Purpose

4. How much of the livestock product(s) is eaten and sold by the household?

Product	Quantity consumed	Quantity sold

5. Is the spouse consulted when selling the livestock and or their products in your household? (a) Yes (b) no

6. If 6 (b) above,

why?.....

.....

7. Who owns the livestock in your household?

(a) Husband (b) wife (c) siblings (d) raise them for other people (e) family

8. How did you acquire the livestock in your household?

(a) Inherited (b) bought (c) gift (d) exchanged for other commodities

9. How many animals do you have as a household?

(a) 1-5 (b) 6-10 (c) 11-20 (d) 21 and above

10. How many animals on average do you sell as a household in a year?

(a) <5 (b) 5-10 (c) >10 (d) none

11. When do you find the household selling the livestock during the year?

(a) January-March (b) April June (c) July September (d) October-December

12. Why this period?.....

13. List the roles of livestock in your household

.....

C CROP INFORMATION

1. List the main crops that are grown every season by your household

(a).....(b).....

2. What is the purpose of growing these particular crops?

CROP	PURPOSE

3. When do you experience food scarcity during the year in your household?

(a) January-March (b) April -June (c) July -September (d) October-December

4. Why this

period?.....

5. In times of plenty how do you handle the surplus food in the household?

(a) Preserve and store (b) sell (c) used as animal feed (d) give out (e)

others.....

D HOUSEHOLD INCOME

1. What is the main source of income in your household (a) selling livestock (b) selling crops (c) off farm labor (d) remittances

2. Do you think the income from livestock is worth the effort put in rearing them by the household? (a) Yes (b) no

3. If 2(b) above,

why?.....

4. What season is the income highest during the year? (a) Jan-mar (b) apr-jun (c) jul-sept (d) oct-dec

5. Why this

period?.....

6. Where do you sell the produce? (a) from home (b) market (c) trading center (d) by the road side (e) others.....

7. Is the woman in the household consulted when selling produce? (a) Yes (b) no

8. If 7 (b) above, why?.....

9. How much on average do you earn for each of the above sources of income?

Source of income	Amount earned

10. What do you need to increase income from your livestock?

.....

.....

.....

E HOUSEHOLD EXPENDITURE

1. What item makes the main household expenditure? (a) Food (b) school fees (c) medical bills (d) livestock health (e) others.....

2. What type of food do you find your household buying most times?.....

3. Why?.....
4. Of all the above, which item in your opinion takes most of the expenditure?
.....
.....
5. In your household, do you make consultations with your wife before deciding what to spend on? (a) Yes (b) no
6. If 5 (b) above,
why?.....

F HOUSEHOLD NUTRITION

1. How many meals do you have in your household on average in a day?
(a) 5 (b) 4 (c) 3 (d) 2 (e) 1
2. Where does the food you have in your household come from?
(a) Household garden (b) buy from market
(c) From neighbors (d) other, state
3. Does your household produce enough food to sustain it throughout the year?
(a) Yes (b) No
4. If 3 (b) which period do you find your household without food during the year?
(a) January-March (b) April -June (c) July -September (d) October-December
5. How many different types of food do you eat on average in a week?
(a) 1 (b) 2 (c) 3 (d) 4. List
them.....

6. How many meals did you have yesterday in your household? (a) 5 (b) 4
(c) 3 (d) 2 (e) 1

7. Please list the different types of food you ate in the last twenty four (24) hours in
your household according to meal time

- (a) Break fast
.....
- (b) Lunch.....
.....
- (c) Supper.....
.....

8. What do you do in your household to get food to cover up during the period of
scarcity? (a) Buy (b) sell livestock to buy crops (c) get from reserves (d) others, state
.....

9. When do you find your household eating any of the livestock products and why?.....

G ANY OTHER INFORMATION

- 1. Is there a specific reason (s) why some households in your village lack food
during some periods of the year in your opinion? Explain.....
- 2. In your opinion, is there any way that you think livestock production can be
boosted to play an even bigger role than it is currently to ensure household
food security? Explain.....

END, THANK YOU

APPENDIX III: CHECKLIST FOR FOCUSED GROUP DISCUSSIONS

ASK ABOUT

1. The types of livestock kept in the area. (Hint- list the ten most important, score and rank them from most to least important).
2. What role do livestock play in your community? (Score and rank them)
3. The purpose of each of the listed livestock. (Follow as above)
4. What are the major sources of income in the area? (Hint- list the ten most important, score and rank them from most to least important).
5. What is the pattern of eating livestock products in your area?
6. What role do women play decision making in your area?
7. What do you do in times of food shortages in your area?