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**PASTURE MANAGEMENT PRACTICES ON INDIVIDUALLY OWNED GRAZING  
LAND**

**CASE STUDY: KAKUUTO COUNTY, KYOTERA DISTRICT -UGANDA**

A dissertation presented to

**FACULTY OF AGRICULTURE**

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**Master of Science in Agro-ecology**

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## **DEDICATION**

I dedicate this study to my father Eliphaz Ssekatta (RIP), my mother Nante Margret-Kakoolo and my grandmothers Georgina Nakatoogo and Najjumba Minsa (Aka) Tezigatwa (RIP)

May God Bless You

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## TABLE OF CONTENTS

DECLARATION .....	ii
DEDICATION .....	iii
ACKNOWLEDGEMENT .....	iv
LIST OF TABLES .....	x
LIST OF FIGURES .....	xi
LIST OF ACRONYMS .....	xii
ABSTRACT.....	xiii
CHAPTER ONE .....	1
INTRODUCTION AND BACKGROUND .....	1
1.0 Introduction and Background .....	1
1.1 Population Growth Effect .....	2
1.2 Livestock and Environment .....	3
1.4 Problem Statement .....	5
1.5 Objectives .....	6
1.5.1 General objective .....	6
1.5.2 Specific objectives .....	6
1.6 Research Questions .....	6
1.7 Scope of the Study .....	6
1.7.1 Geographical scope .....	6
1.7.2 Content scope.....	7
1.7.3 Time scope .....	7
1.8 Justification of the Study .....	7
1.9 Significance of the Study .....	8
1.10 Definition of key terms .....	9
1.11 Conceptual Framework.....	10
CHAPTER TWO .....	11

LITERATURE REVIEW .....	11
2.0 Introduction.....	11
2.1 General milk production in Uganda and implications .....	11
2.2 Over view of the challenges facing cattle farming in Uganda.....	12
2.3 Grazing land Management history .....	13
2.3.1 Pre-colonial time.....	13
2.3.2 Grazing land management- colonial era .....	13
2.3.3 Grazing land management post-colonial era.....	14
2.4. Individualization of Former Communal land and implications.....	15
2.5 The effects of fire and grazing on plant species diversity in grazing land .....	16
2.6 Agro Forestry practices in grazing Land .....	17
2.7 Pasture management .....	18
2.8 Reproductive efficiency .....	19
CHAPTER THREE .....	21
METHODOLOGY .....	21
3.1 Study Area .....	21
3.1.1 Location .....	21
3.2 Vegetation.....	21
3.3 Water bodies .....	21
3.4 Climatic Conditions .....	22
3.4.1 Temperature .....	22
3.4.2 Rain seasons.....	22
3.4.3 Population. ....	22
3.5 Sample size determination. ....	23
3.6 Sample selection criteria.....	23
3.7 Sampling Design.....	25
3.8 Data collection methods and Instruments .....	26

3.8.1 Interview Method.....	26
3.8.2 Observation Method.....	26
3.9 Data Collection and Analysis.....	27
3.9.1 Objectives 1 and 2.....	27
3.9.2 Objective 3.....	27
3.10 Ethical Considerations.....	28
CHAPTER FOUR.....	29
PRESENTATION, ANALYSIS AND INTERPRETRATION OF RESULTS.....	29
4.0 Introduction.....	29
4.1 Response rate.....	29
4.2 Demographic Characteristics.....	30
4.3 Descriptive Statistics of the Respondents Farm Characteristics.....	32
4.3.1 The period within which the farm was acquired.....	32
4.3.2 Description of the respondents farm characteristics.....	33
4.4 The existing Management Practices on former communal land owned individually.....	36
4.4.1 Cross tabulation between socio- demographic characteristics and Pasture Management Practices.....	36
4.4.2 Grazing Methods.....	37
4.4.3 Pasture Improvement.....	38
4.5 The milk production and reproductive efficiency of cows.....	44
4.5.2 Assessment of reproductive efficiency.....	53
4.6 The abundance of common legume pasture/fodder plant species in grazing land.....	60
CHAPTER FIVE.....	65
SUMMARY, CONCLUSION & RECOMMENDATIONS.....	65
5.1 Introduction.....	65
5.2 Summary of findings.....	65
5.3 Conclusion of the Findings.....	66

5.4 Recommendations.....	67
5.5 Areas for Further Studies .....	70
REFERENCES .....	71
APPENDICES .....	i
Appendix I: Interview Guide .....	i
Appendix II: Map showing the location the study area .....	iv
Appendix III: Budget for the entire research .....	v
Appendix IV: The research work plan.....	vi
Appendix IV: Surveyed Farmers .....	vii
Appendix V: Observation Checklist .....	viii
Appendix VI: Photographic Documentation .....	ix

## LIST OF TABLES

Table 4.1: Response rate .....	29
Table 4.2: Demographic characteristics of respondents .....	31
Table 4.3: Descriptive Statistics of the Respondents Farm Characteristics.....	35
Table 4.4 socio- demographic characteristics and Pasture Management Practices .....	36
Table 4.5: Illustration of the existing grazing methods .....	38
Table 4.6: Pasture management practices .....	42
Table 4.7: Socio- demographic characteristics and Milk production .....	44
Table 4.8: Descriptive statistics of assessment of milk production .....	47
Table 4.9: Cross-tabulation between Pasture Management Practices and Milk Production ...	48
Table 4.10: Cross-tabulation between socio- demographic characteristics and Reproductive Efficiency of Cows .....	53
Table 4.11: Cross-tabulation between Pasture Management Practices and Reproductive efficiency.....	57
Table 4.12: Results from the observed farms .....	60

## LIST OF FIGURES

Figure 4.1: Illustration of the period within which the farm was acquired.....	33
Figure 4.2: Illustration of the number of cows milked on the farm.....	51
Figure 4.3: Illustration of the number of liters of milk got per day in a wet season.....	52
Figure 4.4: Illustration of the number of adult cows on a farm .....	55
Figure 4.5: Illustration of the number of calves got from adult cows per year.....	56

## LIST OF ACRONYMS

FAO	Food and Agricultural Organisation
GDP	Gross Domestic Product
GPS	Global Positioning System
ICRAF	International Centre For Research In Agroforestry
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries
NEMA	National Environmental Management Authority
OWC	Operation Wealth Creation
UBOS	Uganda Bureau of Statistics
UMU	Uganda Martyrs University
UNHS	Uganda National Household Survey

## ABSTRACT

This study examined pasture management practices on individually owned grazing land in Kakuuto county - Kyotera district –Uganda. The general objective was to establish pasture management practices and cattle productivity in terms of milk production and reproductive efficiency on individually owned grazing land while as the specific objectives of the study were to assess the current pasture management Practices applied on individually owned grazing land, to assess the current milk production and reproductive efficiency under the current management practices and to establish the abundance of common legume pasture/fodder plant species in grazing land. The targeted and actual sample was 60 respondents for interviews as all the 60 responded while as 18 observations were scheduled for 18 quadrants and all the quadrants were visited and observed, the resultant response rate of 100%. The study findings indicated that 47 farmers representing 78.3% of the total number of respondents did not have paddocks on their farm, most of the respondents 66.7% of the total number of respondents had not cultivated trees/shrubs/pasture on their farm. Most of the respondents 53 (88.3%) of the total number of respondents agreed with the experience of pasture scarcity on their farms. The findings showed the highest milk production in wet season was 1-30 litres(85%) while in dry condition 1-30 litres was the highest with 53% of respondents. The findings also showed that number of calves got from adult cows in range of 1-10 was the highest with (63.33%) respondents yet respondents owning 1-21 cows was 61.7%. The study concluded that many adult cows cannot give a calf every year. This study concluded that the commonly observed pasture grass was *Hyperrhenia rufa* and *Bracharia* spp at average percentage cover of 10.47% and 22.1% respectively. The most abundant pasture legume plant species was *Centrocema pubescens* with average percentage cover of 1.07%. *Hyperthelia dissoluta*, *Eragrostis mild braedii*, *Ocimum suave*, *Lantana camara* and *Sporobolus pyramidalis* as common non targeted plant species.

## CHAPTER ONE

### INTRODUCTION AND BACKGROUND

#### 1.0 Introduction and Background

Majority of livestock in Uganda depends on natural pastures and in the hand of small holder farmers. The small holder cattle farmers are known to own over 90% of Uganda's Cattle population (UBOS, 2008, Gachague, 2015). Again majority grazed in fragile land referred to as rangelands. Rangelands do support 80% of the total livestock population and 90% of the cattle population (Byakagaba et al, 2018 basing on Government of Uganda, 2014). Therefore, a small population follows under other production systems such as ranches, zero grazing. Further, there is a growing concern over the low productivity of cattle grazing on natural pasture due to poor quality and yet associated with a lot of environment degradation. Low productivity of cattle has translated into food insecurity and abject poverty among small holder cattle farmers. Population pressure continues to cause dwindling of grazing land available for cattle production. Vagaries of climate change continue to further stress resources already scarce. (Balikowa, 2011 Cited in Agriterra, 2012). Cattle farming, like other agro-activities in the recent past has therefore gone through a number of changes. Such changes mainly driven by some of the factor given above. For example, Pastoralist once known to exhibit nomadism moving with cattle have become sedentary with adoption of cultivation.

Government policies encouraging individual ownership of land indirectly driving them being ranchers rather than nomadic. Ranches are known to have management practices that never exist on communal land. The view held is that individual owner is an incentive to drive them into better land management practices (Kisamba, and Kato, 2006 Mugamba 2007, Byenkya, 2014). This view is met with mixed reactions. Some citing that pastoral cattle farming it's

self-adaptive in nature to environmental to changes. Others argue that land tenure is not only the factor that limits good management practices. Indeed research on some of the good management practices such as agroforestry, has shown a range of factors that come into play including knowledge on appropriate tree species, level of education, poverty among small holder farmer to mention a few (Ssebyukyu et al, 2012,Mfitukumiza et al,2017 ). Other reasons cited that may result in increased environment degradation even under individual ownership is the fact that whereas government policies tend to focus on economic and environment aspects, animals are kept for reasons beyond those. Socio-cultural reasons still may drive cattle farmers into having big numbers beyond the carrying capacity thus again leading to degradation (Kisamba and Kato, 2006). Consequently, management practices on farms individually owned need to be studied continuously other than, getting contented with mere changes of policies and laws. Enactment of policies and laws is one thing and meeting the objective is another.

### **1.1 Population Growth Effect**

Uganda's population growth rate, currently stands at 3.3 per annum one of the highest in the world. (UBOS, 2014, World Population Barometer 2018). The consequence of this rapid population growth is the definite reduction in land holding and pressure on a number of ecosystems throughout the country. For example, the last livestock census in the country showed that, mean land holding in Uganda for people engaged in livestock stands at 2.2 hectares. Data available for Rakai District before Kyotera became an independent district shows that land holding is at 2.5 slightly higher than the national average excluding the communal land. Nevertheless, this is also small. Again, majority of livestock fed on natural pasture. At national level, 2.4% is under planted pasture, 43.2% is under natural pasture. Information available for Rakai including Kyotera as it had not become an independent district shows that, the area under planted pasture is 1.5% less than the national average; the

biggest percentage is again under natural pasture (UBOS, 2008). Thus, the management practices of grazing land whether individually owned or communally used will play a significant role in the determination of the productivity of the livestock sector particularly cattle as already shown. Thus, efforts to improve production lies in improving productivity of unit area rather than size of the grazing land. Individual ownership is envisaged to enhance adoption of good management practices due to the incentive embedded in the type of tenure ships. However, available information from different authors shows that most grazing land in most parts of the country are degraded as result of either overgrazing or being dominated by non-palatable plant species some invasive in nature including ranches. According to Welts Mark, Spaeth Ken (2012), W, S Richard, (2012), the quality of grazing land particularly in rangeland and other communal areas in terms of grasses/pasture are part from the edaphic factor, greatly depend on grazing style, fire use. This points out how management practices are important, but the management practices greatly vary and therefore there is need to establish them.

## **1.2 Livestock and Environment**

Over the years, the livestock production systems have been changing ranging from communal where animals graze on free range as a collection of herds from different members to more intensive one where animals are restricted in small areas such as zero grazing units. Intermediary systems also exist where animals are grazed in large managed units such as ranches. Globally, the effects of livestock on environment vary according to numbers and management systems adopted. Communal grazing is known to lead to overgrazing and resultant effects such as erosion due to overstocking and lack of proper management .The absence of proper management in communal grazing areas being attributed to absence of a single person responsible for their management a phenomenon described as Tragedy of commons. Further, Livestock and in particular, the ruminants have been documented for

contributing to the current climate change through emission of greenhouse gases. Enteric methane, nitrous oxide as the most outstanding ones. The two gases above relate to nature of feeds and manure management. (FAO, 2010). Attempt to reverse the status quo has been made through various interventions such as policies and laws that favour individual ownership over communal. It is envisaged that individual ownership motivates farmers as to take responsible management of these vital ecosystems (Kisamba W. 1995, Kisamba W, Kato E. 2006, Mugambwa J. 2007). Sensitizing farmers on proper feeding of ruminant animals has also been emphasized (FAO, 2010).

The case for Kyotera district, communal grazing accounts 62.2%, pastoral stands at 22 %, semi-extensive 37%, semi- intensive 1.48 and zero-grazing/peri-urban 5.7%. (Rakai District Development Plan, 2011/2012 – 2013/2014).

In Kyotera district, the effects of cattle on environment has been manifested significantly in degradation of grazing land including wetlands and hilly areas due to overgrazing and consequential effects of soil erosion. This is verified by the fact that cattle is grazed on natural pastures communally. The other degrading factor is the dominance of non-palatable plant species especially those invasive in nature. That has been persistently documented for a long time by several stake holder in Rakai (NEMA, 1997, Kiyingi Jamil, 2013). But according to Kimbugwe (2013), pastoral and communal areas are gradually decreasing and other livestock management systems taking over under individual ownership due to increasing population pressure.

Leasing of formally communal lands to individuals or groups and or converting them to free hold has been observed in various parts Kakuuto County. The question that deserved an answer was whether the individual ownership has ignited adoption of good management practices looking at Kakuuto County, for example as envisioned.

## **1.4 Problem Statement**

Uganda's population has exponentially grown in the past few decades. This exponential population growth has resulted into pressure and ignition of a number of changes in social life, policies and management practices. One area that has been a victim is the Livestock sector. The grazing land has continued to shrink and with serious degradation. In Kakuuto County, like in most parts of country where population has grown tremendously without proper management systems coupled with reduction in grazing land, communal grazing land have been degraded as a result of overgrazing. Today, many former pastoralists in Kakuuto County have been driven into sedentary life both by natural circumstances and government land reforms that promote individual ownership of former communal land. It was hoped that individual ownership would lead to better management practices that would result into better environmental conditions and improved cattle productivity. But aware that most of the cattle farmers today depended on communal land where management practices are less stringent and knowledge of modern farm management is limited, there was a need to establish the current management practices and current cattle productivity in terms of milk production and reproductive efficiency. Therefore, the Purpose of this research was to establish the current pasture management practices, current cattle productivity in terms milk production and reproductive efficiency of cows and abundance of common pasture plant species in grazing Land of Kakuuto County to ascertain whether individual ownership had resulted into the highly needed changes.

## **1.5 Objectives**

### **1.5.1 General objective**

The general objective was to establish pasture management practices and cattle productivity in terms of milk production and reproductive efficiency on individually owned.

### **1.5.2 Specific objectives**

- i. To establish the current pasture management practices applied on individually owned grazing land.
- ii. To assess the relationship between pasture management and cattle productivity in terms of milk production and reproductive efficiency.
- iii. To establish the abundance of common legume pasture/fodder plant species in grazing land.

## **1.6 Research Questions**

- i. What were the existing pasture Management Practices on former communal land owned individually?
- ii. What was the milk production and reproductive efficiency of cows under the prevailing pastures management practices?
- iii. Did grazing land under individual ownership possess sufficient common pastures (legume and grass) forage plant species?

## **1.7 Scope of the Study**

### **1.7.1 Geographical scope**

The research study geographically was limited to Kakuuto County in the sub- counties of Kakuuto and Kasasa and in particular in six parishes as representative samples equally

distributed. The parishes were Kakuuto, Kyebisagazi and Mayanja in Kakuuto Sub County and Kijonjo, Mityebiri and Kimukunda in Kasasa SubCounty. Those parishes were purposively chosen because had a lot of grazing land that was previously communally used and many cattle farmers used to exhibit nomadic pastoralism. It targeted individuals who owned grazing land on former communal land.

### **1.7.2 Content scope**

In terms of information sought, the study confined itself on establishing the existing management practices, assessing cattle productivity in terms of milk production and reproductive efficiency and abundance of common Pasture (legume, plus grasses) forage plants species in terms of species percentage cover and frequency. Specifically the study focused on these species: *Desmodium intortum* (green Leaf desmodium), *Desmodium uncinatum* (Sliver Leaf desmodium), *Glycine wightii*, *Centrocema pubescens*, *Panicum maximum*(Guinea grass),*Hyperrenia rufa*., *Bracharia spp* , *Setaria anceps* (Nandi grass), *Chloris gayana* (Rhode grass), *Penisetum clandestinum* (Kikuyu). These species were chosen because at least fulfilled to greater extent the following criteria, had ecological suitability, palatable to cattle, could coexist with natural pasture hence could be over sown, could establish themselves after disturbance, enhance milk production and improve soil fertility

### **1.7.3 Time scope**

This study was conducted for a period of six months between February of 2019 and July of 2019. Data collection and analysis were all done within this period plus part of the proposal writing.

## **1.8 Justification of the Study**

Kakuuto County has a wide range of ecosystems ranging from forests, grassland, swamps to rangelands most of which for long have been communally used for grazing. Today, many

former communal land in Kakuuto have been leased to individuals and in some cases lease turned to free hold by some individuals. Furthermore, Part of Kakuuto County is found in the cattle corridor with such fragile ecosystems. Further, Sango Bay forest and its wetlands constitute the Sango Bay Ramsar site and part of it is located in Kakuuto County in Kyebe Sub County which is adjacent to Kakuuto Sub-county. A wide section of people in Kakuuto earn a living as cattle farmers. However, Productivity of cattle for long has been low and yet associated with a lot of environment degradation. Environment degradation and low productivity to a greater extent relate directly to management practices and pasture quality. Legume plants play a vital role in both aspects.

Thus, establishment of current management practices and cattle productivity and common plant legume species existing was very important. Therefore, study had to establish abundance of common legume plant species/ pasture/fodder plants. The findings obtained are to help improve environment protection and support cattle productivity. Thus research findings are to play key role to inform policy makers, environment activists, extension workers among others on the status and necessary management improvement specifications required in these areas.

### **1.9 Significance of the Study**

The significance of the study findings is that environment managers and extension workers are to find information generated as a useful guide in their routine activities. Nutritive and environmentally friendly plant species are to be promoted and adopted. Livestock productivity is to increase as climate change adaptation and mitigation enhanced as well, food insecurity and poverty reduced through increased milk production and reproductive efficiency since the study has established the pasture status. The overall effect is the

sustainable management of grazing land leading to sustainable cattle productivity and production translating into sustainable development in the area.

### **1.10 Definition of key terms**

**Communally Owned:** Means land where members in a particular community are using it together without individual boundaries.

**Public Land:** Refers to land where the state is the custodian

**Grazing land:** Grasslands, shrub lands, Pasture land used for grazing.

**Management Practices:** Actions that aim at improving productivity of grazing land with respect to both environment and livestock.

**Individually owned grazing land:** Refers to land used for grazing where powers of management lies in a single person and there are clear boundaries separating one's land from others.

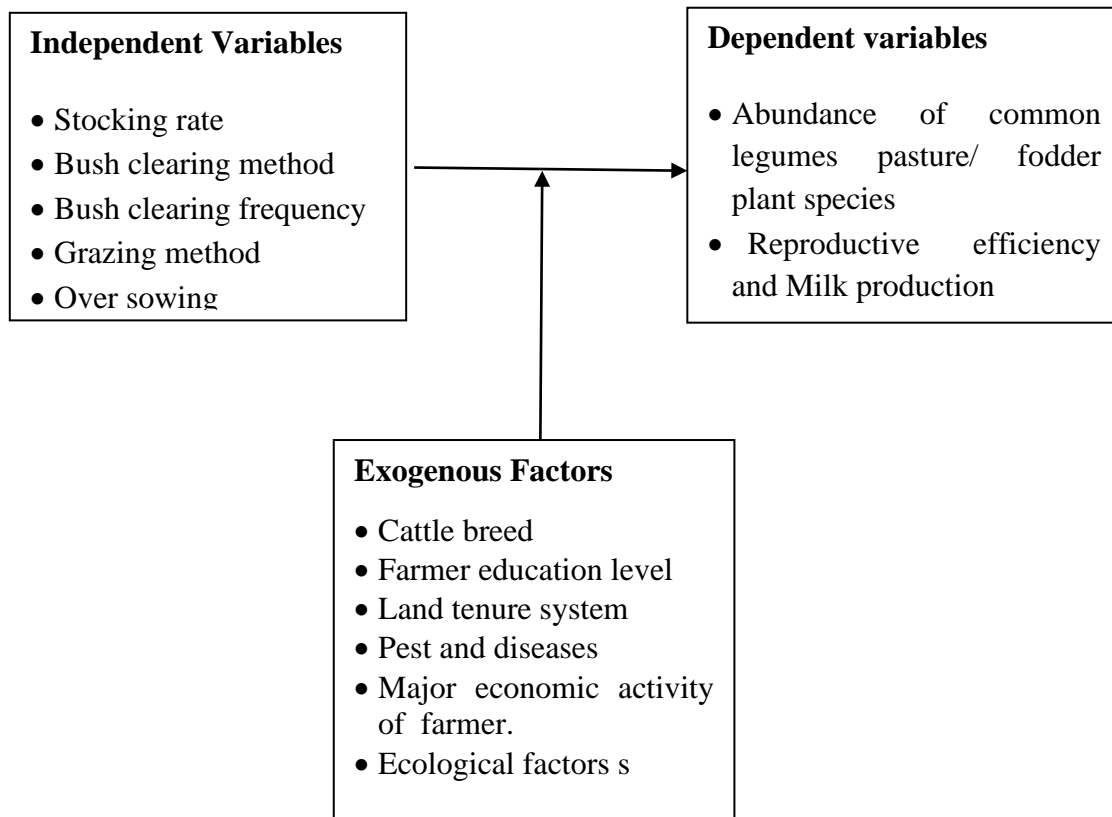
**Intensive sylvo pastoralism:** Means deliberate cultivation of trees/shrubs in grazing land.

**Extensive sylvo pastoralism;** means selective removal of tree/shrub or species that are not desired by the owner and maintenance of those that are beneficial to him.

**Legume plants,** Refers to trees, shrubs and herbs with inherent properties of fixing atmospheric nitrogen into the soil.

**Common Pasture** ,In the context of this research refers to the ten plant species that were focussed on ; *Desmodium intortum* (Green leaf desmodium), *Desmodium uncinatum*(Silver leaf desmodium),*Glycine wightii*, *Centrocema pubescens*, *Panicum maximum* (guinea grass), *Hyperrenia rufa* ,*Bracharia Spp*, *Setaria anceps* , *Chloris gayana* and *Penisetum clandestinum*

## 1.11 Conceptual Framework



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter presents the review of the relevant literature to the study; it presents what other scholars have written in relation to the specific objectives of the study.

#### **2.1 General milk production in Uganda and implications**

Milk Production in Uganda is still low, despite the number increasing with time. For example, basing on the UNHS 2005/6 and the last livestock census, 2008, there has been an increase from 7.5 million heads of cattle to 11.4 million. However, the national average milk production per milked cow as per UBOS (2008) stands at 8.5 litres per week, and 7.4 litres in Rakai the mother of Kyotera district in which Kakuuto County is found. Although majority of the cows are indigenous, this is still below the potential milk production. On the other hand, the population growth in Uganda has outgrown the increment in milk production, threatening food security (FAO, 2010, Agrittera, 2012) since in Uganda milk production currently is mainly for consumption and only 34.7% of the milk produced is sold (UBOS, 2008). Again, according to UBOSs (2008), available statistics show that for Rakai the mother district of Kyotera district its only 29.1% being sold. This implies that the situation in Kyotera is not different since it's just a year old. Since Majority of cattle are grazed on natural pasture generally in Uganda and Kakuuto County in particular, Weltz, M (2012), Kimbugwe. G. (2013), this again speaks volumes regarding the future of the livestock sector where cattle contributes the biggest percentage in terms of GDP from the sector. Reference being made to contribution to the National Economy, where livestock of which the major component is cattle, contributes only 5.2% to National GDP and 12.7% of agricultural GDP, a contribution

that is regarded to be much below the potential capacity. (National Livestock Dialogue Report, 2015).

Further still, some of the effects of the low productivity of cattle, have been food insecurity and abject poverty among cattle keepers in Uganda. What worsens the matter is that the affected persons are small holder farmers who constitute 90% of cattle ownership in the Country (UBOS, 2008) .More worrying is that there is positive correlation between poverty and environment degradation(T.B.solomon,2006 ). Thus any effort to enhance the Country's GDP through the livestock sector and reduce the negative environment impacts of the sector need to focus on management practices.

## **2.2 Over view of the challenges facing cattle farming in Uganda**

In Uganda today, land available for livestock is becoming small particularly privately used. For example, in central region the mean land holding is 3.5 ha. The other aspect is high dependence on natural pasture. The Natural Pasture is estimated at 43.3%, this is in accordance to (UBOS 2008). According to FAO (2010), Agriterra (2012), Uganda National livestock dialogue report (2015). The availability of pasture in terms of quantity and quality is wanting. Poor breeds, diseases, limited extension services in the veterinary sector also weigh heavily. However, with government's intervention of improved Technology distribution through programmes such as operation wealth Creation (OWC), Private actors such as MADO, Send A COW among others that provide improved technologies, rejuvenation of the extension service through establishment of the Directorate of Extension in the Ministry of Agriculture and Animal Industries and Fisheries (MAAIF, 2016), the problem of poor breed and lack of extension service appear being gradually solved. However, Sustainable pasture production remains the significant issue regarding enhancement of cattle

productivity in a non-degraded environment in this era of climate change and rapid population growth.

## **2.3 Grazing land Management history**

### **2.3.1 Pre-colonial time**

Most grazing land originally were communally owned (Kisamba.W, 1995, Mugambwa J. 2007, Byakagaba et al. 2018, basing on Okuku, 2006) and domestic animals co- used this land. This was much evidenced in rangeland where livestock co-existed with wild animals. Wild animals experienced unrestricted movement using established corridors to move from one end to another. Pastoralists also adopted similar behaviour. Pastoralists kept on moving from place to place. Moving to areas of water and pasture scarcity as a coping mechanism. Thus, unlike today the coping strategies to adverse conditions involved moving to resources instead of looking for intervention that would ensure resources are available at that time when most needed. Cattle farmers exhibited pure nomadic pastoralism. During this period bush burning and grazing determined plant species compositions in grazing land that were communally used (T.B. Solomon et al 2006)

Generally, nature played key role in determining the vegetation characteristics of grazing land.

### **2.3.2 Grazing land management- colonial era**

Colonial invasion and subsequent partitioning of Africa, had important key implications to note with respect to grazing land management history. Colonialists established colonial boundaries that dictated state boundaries. Colonial Governments, were against communal use of grazing land giving reasons related to impediment of economic development.

Colonialists introduced several laws that led to registration of land in various regions of Africa and in particular Buganda, (Mugambwa, 2007).

This could be taken as the first turning point to individualization of grazing land particularly in rangelands and other areas that were used communally. But despite the introduction of the above laws, under this era most grazing land remained under communal use. Uncontrolled bush burning persisted. Colonialists enacted the bush burning law to regulate the bush burning.

The use of fire in grazing land has been a management practice of controversy. For example, ( T.B Solomon et al 2006, Weltz M. and Spaeth 2012, Obua 2012), urges that traditional management practices of bush burning and grazing are key practices that have shaped the nature of Biodiversity in most grazing land communally used . Further, it is urged that abolishing burning will lead for example degradation of grazing land since most grazing land plant species have evolved and adapted to those forces.

### **2.3.3 Grazing land management post-colonial era**

Post-colonial era is characterized by a number of legislation which are important when looking at management practices in grazing areas and their status. Different land tenure systems define the powers of ownership, access and administration and implicitly incentives to manage grazing land individually. Available literature shows that post-colonial government inherited the negative attitude towards communal ownership of land because of the perception that it impedes economic development, consequently, perpetuated the same trend of individualising communal land.(Kisamba, 1992, Kisamba. W, 1995, Kisamba W. Kato E. and Pender J. 2006, Byenkya, 2014 and Byakagaba et al, 2018). Customary ownership and communal use still exists today in most arid and semi-arid parts of the

country. Still, in most pastoral communities grazing land is communally used, owned and governed according to norms/customs of the community it exists.

However, this communal ownership of grazing land has been a centre of controversies as key for causing grazing land degradation and other land categories used communally due to overstocking resulting into serious secondary adverse effects very well-known and summarised as tragedy of the common. Government has been against communal use giving reasons of lack of proper management (Kisamba and Kato, 2006 Mugambwa2007). The government intervention as a result among others has been through formulation of policies and laws promoting individual ownership or recognised communal land management schemes. For example, Environment Act 1995 section 47 emphasises sustainable utilisation of grazing land such as rangelands, the National Land use policy 2013, and section 62 calls for zoning.

#### **2.4. Individualization of Former Communal land and implications**

Individual ownership of former public land that for long has been used communally has been a centre of controversy among various people. Proponents and those opposing individualisation have continued to exist citing the fragility nature of some of the ecosystems such as Rangelands. This is widely documented by Kisamba .W 1992, Kisamba .W, 1995, Kisamba W., Pender J. and E. Kato, 2006 Byakagaba et al,2018) . There are arguments that individualisation will not achieve economic growth among people owning grazing land individually as is suggested neither will it improve the conservation of these grazing land in environmental terms. For example, change in pattern of fire use and introduction of rotational grazing as management practices under individualisation will not cater for plants that have evolved and adapted to forces of fire. Rotational grazing will not provide sufficient resting time as provided by migration patterns during time of pasture and water scarcity. It is

suggested that all the above changes tend to work against the positive effects expected from individualisation. (Byenkya et al., 2014, Byakagaba et al, 2018).

However, the population growth forces in Uganda tend to point out that rangelands and other communally used areas are on decline and such areas will continue to reduce in size and individualisation is the trend. The current Ugandan land laws and other land related reforms in Uganda emphasize that individualization is the trend. For example , the land Act of 1998 (sections 9 and 28)Provides that lease hold could be turned into freehold, customary land owners could have certificate of occupancy and or be turned into free hold. Still the drivers being the long held view that land tenure is key determinant in influencing the kind of management/ investment an individual can put.

Individualization, hence, is seen as one strategy through which grazing land could be protected from the effects of competitive stocking with less regard to carrying capacity and lack of necessary management practices. It was envisaged that individual ownership would result in increased cattle productivity and environment conservation because of the incentives at personal level contrary to communal ownership. Now that individualisation of former communal lands has overridden the long known practice of communal ownership, it remains to be seen.

## **2.5 The effects of fire and grazing on plant species diversity in grazing land**

A number of scholars have tried to establish the impacts of fire use in grazing land particularly in areas communally used on plant species diversity and on the general productivity of such grazing land with respect to livestock production and environment conservation. The findings that are common to majority of scholars are that fire use has both negative and positive effects. However, the point of divergence is whether the positives outweigh the negatives. And a number of questions then emerge whether fire use should be

continued or banned. If continued how best can it be used to minimise the negative effects? (Wasiolka B., et al 2011 Hendricks H., 2006 Belnap J. et al, 2012). Fire use on a positive side is known to stimulate regrowth of more nutritive grass and in control of parasites. According to K.W Davies et al (2010), Fynn Richard (2012), long periods in grazing land without burning lead to accumulation of dry matter and a lot of mature grass of less quality. Planned burning results into reduced biomass, but young grass of high value to livestock. However, frequent burning leads to serious soil erosion and disappearance of plants with less tolerance to fire and emergence of those with high degree of resistance. Unfortunately, quite often, those which increase are those that of less value to livestock and harmful to environment such as the invasive plant species (Lechmere-oertel un dated, Eguru et al, 2014).

## **2.6 Agro Forestry practices in grazing Land**

The practice of integrating trees/ shrubs to support livestock is much emphasized in several documents authored by ICRAF and Other researchers. For example, in the document by ICRAF(1998) called Agroforestry in Dry Land Africa brings it out well how man can influence grazing land conditions and livestock productivity through deliberate cultivation of trees (intensive sylvopastoralism or by eliminating those not perceived of value in the grazing lands (extensive sylvo pastoralism). With Climate change this practiced has gained popularity as trees can provide fodder during extended drought (Mifitukumiza et al, 2017), Mcgahey and Visser (2015), Zake (2015), Sebyuku et al, (2012), Bayina I. et al (2012). Legume trees /shrubs improve soil conditions through fixing Nitrogen into the soil. But, again there are number of factors that influence adoption of this practice leading to heterogeneity in ecosystems and benefits attained (Nyaga J. et al, 2015). Consequently, agroforestry practice in grazing land such as rangeland and other ecosystems can significantly influence the biodiversity in these landscape and the nature of species there in. Therefore, agroforestry practice undoubtedly has great potential towards improving conditions of grazing land such

as range land or other ecosystems and productivity of cattle grazed in there. That made this research very important.

## **2.7 Pasture management**

Pasture is the basis of any livestock operation that purports to be truly sustainable. It is especially important as the livestock sector continues to experience extraordinarily high fuel and other input costs. Pasture based production systems offer farmers and ranchers the ability to let the ruminant's environment and immune system work together, thereby gaining an acceptable level of production while naturally maintaining the integrity of the ecological connections between ruminants, the soil and the pasture plants (Rinehart, 2008).

A well-managed grass pasture is one of the most cost-effective and high value feeds that can be produced and utilized. Pasture management can provide significant benefits including improved forage yields, lower feed costs and improve livestock performance (Whatcom conservation district, 2015). In order to sustain a healthy field and grass crop, livestock need to be rotated through a system of pastures rather than being allowed to graze continuously on one large pasture. The pasture rotation system includes a system of cross-fence to define areas of smaller pastures that livestock can be moved through. This system results in more forage, less overgrazing and reduced soil compaction. Livestock may have to be removed to a confinement area when pastures dry out and grasses become dormant. If livestock are allowed to continue grazing pastures down to bare earth, the root systems are destroyed and the grass will not be able to recover when rain returns (Whatcom conservation district, 2015).

According to Rinehart (2008), continuous grazing is probably the most common cause of erosion and damage to the plant community if livestock numbers are increased and not closely monitored. Grazing and resting plants on pasture land in a planned sequence gives the more desirable plants a chance to regrow, compete and multiply, thus gradually increasing

the amount of high quality plants available per acre. This improved pasture condition increases livestock production, reduces soil erosion and helps to conserve water (Rinehart, 2008).

Sound pasture management is critical for maintaining a healthy and vigorous pasture that benefits the cattle, owner, and environment. According to Teutsch, Tech and Smith (2009), pastures should be soil tested every 2-3 years in order to provide a baseline for tracking changes in PH and fertility. Soil pH can dramatically affect nutrient availability and plant growth. Maintaining pH between 6.2 and 6.5 for grass-legume according to the soil test provides suitable pastures. Furthermore, phosphorus and potassium should be maintained in the high range as determined by soil testing. If land area is limited, uniform grazing must be controlled to maintain healthy pastures and establishing four or more pastures and graze them rotationally and resting pastures allows plants to replenish food reserves (Teutsch, 2009).

## **2.8 Reproductive efficiency**

Reproductive performance efficiency in dairy cattle is an integral section of the production management system in all dairy farms. It is perceived to be on the decline over reproductive management, increased incidence of metabolic and infectious diseases and their complex interactions appear to be the main factors that negatively affect reproductive efficiency (Bouamra, Ghozlane and Ghozlane, 2016).

There are numerous factors that affect reproductive efficiency on individual farms. According to Reno (2007) these include heat detection rate, heat stress, semen quality, bull fertility, AI (Artificial Insemination) technique, nutrition, body condition score, clinical and subclinical mastitis, cow comfort, and many other factors related to whole farm management, individual farm managers and laborers, and individual cows.

Similarly, a study conducted by Tesi and Isperto (2008) indicated that temperature humidity index during the peri implantational period and warm season were a risk factor for pregnancy losses. Cows that got pregnant before 90 days postpartum were those who produced more milk on 50 days postpartum. Management practices of these herds offset the negative effects of milk production and demonstrated to be an important factor for conception rate. Furthermore, the study showed that three times per day milking, inseminating bull and AI technician were a risk factors for infertility and environment proved to be directly affecting conception rate especially around AI period. The authors concluded that to increase reproductive performance of high producing dairy herds, it is necessary to monitor their status periodically.

Reproductive efficiency is measured by the timeliness of getting a cow bred back and producing a healthy calf within a 12 month period and reproductive efficiency is governed by two factors: length of the anestrus period and then conception rate at estrus (Drovers, 2011). The conception rate at estrus is affected by body condition score (BCS), the environment, health of the cow, disposition of the cow and the bull. The factors that play a role in determining the length of the oestrus period are the presence of the calf, the body condition score of the cow, the age of the cow, the number of days since calving, birthing difficulties, calving season, and general health of the cow (Drovers, 2011).

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Study Area**

##### **3.1.1 Location**

Kakuuto county is located in Southern Uganda at GPS points  $0^{\circ} 50' 24. 0''$ ,  $31^{\circ} 27'36.0''$ . (Latitude – 8400, and longitude – 31.4600. The County comprises of currently four Sub Counties and two newly upgraded town boards to town councils. The sub counties include Kakuuto, Kasasa, Kyebe and Nangoma. The town councils are Mutukula and Kasensero .Kakuuto County is one of the two counties that constitute the present Kyotera District. Kyotera District gained district status on 1<sup>st</sup> July, 2017. Originally with Kooki County constituted Rakai District after Lyantonde district was curved out of Rakai. Kakuuto County forms an international border with Tanzania at Mutukula border point.

##### **3.2 Vegetation**

Kakuuto County has a varied range of ecosystems which explains the varied vegetation types. There is swampy vegetation along Bukoola River, Kagera river basin and Sango Bay basin. Kakuuto Sub-county is adjacent to Kyebe Sub-county which is part of the Sango Bay Ramsar site.

Again its grassland and woodland vegetation has been continuously degraded especially during dry conditions, yet is one of the biodiversity hot spot in the region (NEMA, 2005, Kiyingi J, 2013)

##### **3.3 Water bodies**

Kakuuto County has River Bukoola which has its base in Mbarara District where it's referred to as River Rwizi. Kagera River and Lake Victoria are found in Kyebe Sub- County adjacent

to Kakuuto Sub-county, one of the study area of choice. Kakuuto and Kasasa Sub County are chosen because pastoralists in these sub-counties used to migrate to Sango- Bay wetlands and Bukoola wetlands during extended dry season when pasture and water became scarce. Therefore, it is felt important to assess the current status of the former communal land. Many of the former public land are individually owned in Kakuuto and Kasasa sub-counties favoured by current government policies.

### **3.4 Climatic Conditions**

#### **3.4.1 Temperature**

Kakuuto and Kasasa sub-counties are found in the southern part of Kyotera District and temperature ranges between 26<sup>0</sup> and 27<sup>0</sup> C. The temperatures are high and part of Kakuuto lies in the cattle corridor.

#### **3.4.2 Rain seasons**

The area experiences two rain seasons. The principal peak occurs between March- April and May and the minor peak occurs between October and November. The mean annual varies between 1,350mm to 2,125mm. However, in some parts of Kakuuto falls to 850mm particularly to those areas found in the cattle corridor. (Kiyingi Jamil, 2013).

#### **3.4.3 Population.**

The total number of households in the Sub counties of Kakuuto, Kyebe and Kasasa was 4019, 3336 and 2555 respectively in 2009. This represented a Percentage increase of 11.57%,7.19 and 49.67% between 2002 and 2009 for Kakuuto Kyebe and Kasasa Sub counties respectively since in 2002 were 3602,3096 and 1707 in the same order .The house hold Percentage engaged in cattle farming being 66%,9.5% and 19% for Kakuuto, Kyebe and Kasasa sub county respectively. Communal grazing accounts 62.2%, pastoral

stands at 22 %, semi-extensive 37%, semi- intensive 1.48 and zero-grazing/peri-urban 5.7%. (Rakai District Development Plan, 2011/2012 – 2013/2014 in accordance to UBOS (2009) under CIS. , The above was taken to represent the Present Kakuuto County since Kyebe, Kakuuto and Kasasa represent the Sub counties that existed by that time and still part of the County . Kibanda and Kifamba were administratively transferred to Kooki after curving out Kyotera District from Rakai District . Nangoma Sub county and Kasensero were part of Kyebe Sub County and Mutukula town council part of Kakuuto Sub county .

### **3.5 Sample size determination.**

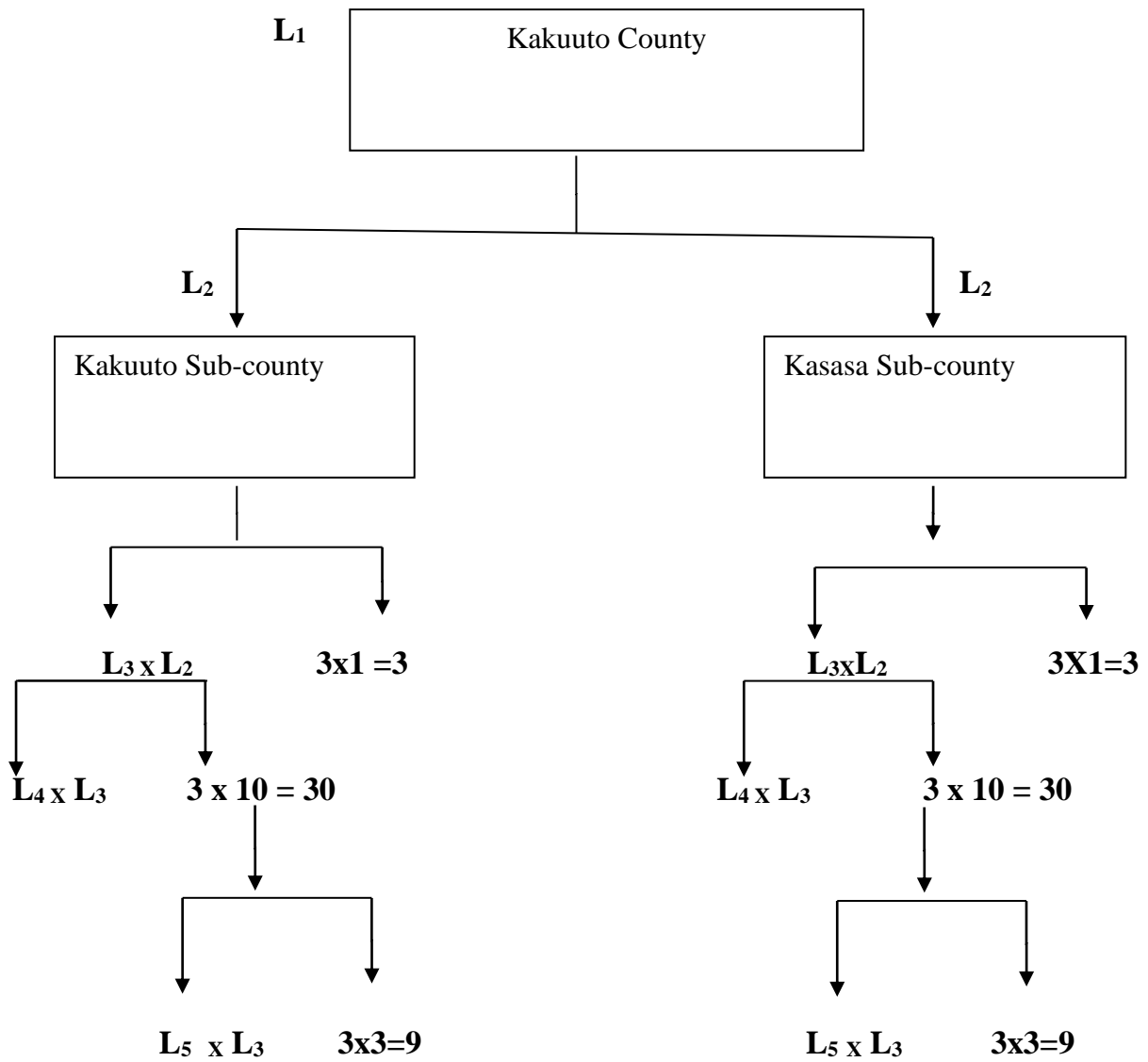
The Rakai District production and Marketing sector development plan, Planning Period 2010/2011 -2012/2013, showed that Kakuuto county had a total of 24 Farms(17 small scale,4 medium and 3 large). After curving out Kyotera District out of Rakai District in 2017 no such census had been done. The population size of farms individually owned was estimated to be 70 due to many former communal land being subdivided and individualized. (Personal Communication District Veterinary Officer Kyotera ) **Using Krejcie and Morgan (1970) Table of determining sample size of a finite population,** for a population of 70, the sample size is 59. So the researcher sampled sixty (60) Respondents.

### **3.6 Sample selection criteria**

Kakuuto and Kasasa sub counties were purposively selected because they have a reasonable number of cattle keepers' individually owning grazing land. Kyebe Sub County purposively was excluded because the greatest part of grazing land belong to Sango Bay Forest reserve and Sango Bay Estate hence the grazing land not individually owned. Nangoma is a small Sub County Island. In the past also information available showed pastoralists from Kakuuto and Kasasa used to migrate to swampy areas of Sango-Bay and river Bukoola in Kyebe Sub county whenever pasture and water became scarce as a coping mechanism (NEMA 2005,

Kiyingi, 2013). The Parishes were Kyebisagazi, Kakuuto and Mayanja in Kakuuto Sub County and Kimukunda ,Mityebiri and Kijonjo for Kasasa sub County also purposively selected on similar grounds. There was an equal number selected and interviewed in all parishes which was ten per parish. The ten farmers interviewed were identified using snow ball approach. This was because cattle farmers knew themselves and was easier for a cattle farmer to direct the researcher to another farmer meeting certain criteria once explained to him/her. The cattle farmers identified by snow ball method were interviewed using an interview guide. Then three farms of the ten cattle farmers interviewed per parish, were later randomly selected for assessing the abundance of common legume pasture /fodder plant species using a 1mx1m quadrat described. Observation of key management practices existing on the farm were made to back up the data obtained during interview. In total, sixty farmers (60) in the two sub-counties that constituted the area of study were selected for interview and eighteen (18) farms sampled for ecological data on abundance of common legume /fodder pasture species.

### 3.7 Sampling Design



#### Individual farmers and farms

#### Key

- L<sub>1</sub> = County = purposively selected
- L<sub>2</sub> = Sub-county = purposively selected
- L<sub>3</sub> = Parish = purposively selected
- L<sub>4</sub> = Farmers = selected using snow ball method.
- L<sub>5</sub> = Farms = randomly selected

This study used a case study research design. This design was chosen because it allows researchers to study a case in details and data are collected and analysed about a large number of features of each case (Canhoto, Spinks and Rose, 2015). Case study design also allows the use of multiple sources of data including interviews, observation, archival documents and even physical artefacts to allow triangulation of findings (Yin, 2009). The researcher used both qualitative and quantitative research approaches where both qualitative and quantitative data were collected.

### **3.8 Data collection methods and Instruments**

This study used interview method and observation method in the data collection process

#### **3.8.1 Interview Method**

The researcher scheduled interviews with different farmers so as to obtain different opinions, views and feelings about pasture management and milk production. Interview guides with open ended questions were administered to farmers and farmers participated in an oral interview to enable a deeper analysis based on their role and experience in pasture management and milk productivity. The interview guide was used to guide the researcher in which type of questions to pose to the respondents, to collect rich qualitative data and in this case the respondent was given an opportunity to respond verbally while the researcher kept recording the responses.

#### **3.8.2 Observation Method**

The researcher used observation checklist in selected farms. Structured observation checklist was used to guide the researcher on what to observe in the different farms. The researcher used his naked eye to observe the pasture management practices being used in the selected farms and the common legumes in the farms. Photographs using camera of some observed features relevant to the study were taken with permission from the farm owner.

### **3.9 Data Collection and Analysis**

The study used a mixed method approach so as to acquire the diversity of data needed.

#### **3.9.1 Objectives 1 and 2**

To assess both the current pasture management practices applied to provide sustainable pasture production and productivity in terms of milk production and reproductive efficiency, data for the two objectives above were obtained by conducting guided interview with individuals owning grazing land formerly communally used. This was enriched by field observations noting some relevant management practices.

#### **3.9.2 Objective 3**

To assess the current status of grazing land owned individually in terms of abundance of common pasture Grass and Legumes /forage plant species. That is, vegetation sampling was done using technique described by Hall and Bawa (1993) and the same method described by Ranjit et al. (1996).

The study involved establishing strata based on the topographic variation of the grazing land and the vegetation. Then, the area to be studied was divided into three strata basing on homogeneity or heterogeneity of the area. Six random quadrat measuring 1m x 1m were placed in each of the stratum giving a total of eighteen quadrats per farm. The plant species under investigation their presence and percentage cover was estimated and noted in the respective area of the data collection sheet. Observation and taking photographs with permission from the farm owner was done while noting observed important management practices to enrich the data obtained from interview. Identification of common non targeted plant species was done in the field and data noted on the data collection sheet in space provide for that purposes, however, plant species that could not be identified in the field were

collected and processed and taken to Makerere University herbarium for identification. The information regarding size of the farm fortunately was known by all the farm owners.

Data collected was analysed using descriptive statistics for qualitative data whereas quantitative data was analysed using measures of central tendencies and bivariate analysis. SPSS software version 20 was used to analyse quantitative data.

### **3.10 Ethical Considerations**

**Anonymity and Confidentiality;** In order to promote ethics in the study, respondent's names were withheld to ensure anonymity and confidentiality in terms of any future prospects and in-order to avoid bias.

The researcher interviewed the respondents one after the other and ensured that he informed them about the nature and extent of the study

**Plagiarism;** The researcher avoided plagiarism by acknowledging the different authors of any material or literature reviewed during the research process.

**Voluntary Participation;** the researcher gave respondents reasons as to why he was interviewing them and that encouraged voluntary participation of the respondent in the study.

**Guarantee Privacy;** most important is that the researcher guaranteed privacy of all the respondents throughout and after the study.

## CHAPTER FOUR

### PRESENTATION, ANALYSIS AND INTERPRETRATION OF RESULTS

#### 4.0 Introduction

This chapter analyses and interprets the study findings arising from the field information collected from respondents on Pasture management practices, milk production and reproductive efficiency of cows on individually owned grazing land in Kakuuto county - Kyotera district -Uganda. The first section presents the response rate, followed by presentation and analysis of the study findings in relation to the specific objectives of the researcher's study.

#### 4.1 Response rate

A total of 60 Interviews using interview guides were conducted to 60 respondents who were farmers and all the 60 Interview Guides were filled-up and returned as reflected in the response rate Table 4.1 below. A total of 18 farm observations were scheduled and all the 18 observations were successfully conducted.

**Table 4.1: Response rate**

Particulars	Sample	Returned questionnaires	Percentages
Interview Guide	60	60	100%
Observation Checklist	18	18	100%
Total	78	78	
<b>The Overall Response Rate</b>			<b>100%</b>

**Source:** *Primary Data, (2018)*

The Table 4.1 above shows a resultant response rate of 100% suggesting that the results contain substantial information and the survey results were representative of the survey on Pasture management practices on individually owned grazing land in Kakuuto County

- Kyotera district -Uganda. The proportionately high response rates of 100% suggested more accurate survey results (Amin, 2005).

#### **4.2 Demographic Characteristics**

According to the results presented in Table 4.2 below, 26.7% of the respondents who were 16 were in the age group between 51 – 60 years, 25.0% of the respondents who were 15 were in the age group between 41 – 50 years, 23.3% of the respondents who were 14 were in the age group 71 years and above, 20.0% of the respondents who were 12 were in the age group between 31 – 40 years, and the remaining 5.0% of the respondents who were 3 were in the age group between 20 – 30 years. Implying that the different age groups were evenly represented.

According to the results presented in Table 4.2 below, 81.7% of the respondents who were 49 were male and the remaining 18.3% of the respondents who were 11 were Female. Implying that both sex of interest were not evenly represented.

According to the results presented in Table 4.2 below, 60.0% of the respondents who were 36 attended to primary level of education, 28.3% of the respondents who were 17 had no formal education, 6.7% of the respondents who were 4 attended to secondary level of education, 3.3% of the respondents who were 2 attended to a Bachelor's level of education, and the remaining 1.7% of the respondents who was 1 attended to a Diploma level of education. Implying that the majority of the respondents (those with no formal and primary) had not acquired the necessary formal training with respect to pasture management. However, field observation showed that cattle farmers who had cross breeds irrespective of the level of education exercised to certain level pasture management practices such as bush clearing and selective removal of shrubs and trees, though not as appropriate as would be required technically.

According to the results presented in Table 4.2 below, 50.0% of the respondents who were 30 had a range of 1 to 10 members in their household, 45.0% of the respondents who were 27 had a range of 11 to 20 members in their household, 3.3% of the respondents who were 2 had a range of 21 to 30 members in their household, and the remaining 1.7% of the respondents who was 1 had a range of 41 and above members in his/her household, Implying that there is high level of dependency in each household.

According to the results presented in Table 4.2 below, 55.0% of the respondents who were 33 had cattle rearing as their major source of income, 30.0% of the respondents who were 18 had crop cultivation and cattle rearing as their major source of income, 6.7% of the respondents who were 4 had Livestock/cattle rearing and trade in general merchandise as their major source of income, similarly, 6.7% of the respondents who were 4 had crop cultivation as their major source of income, and the remaining 1.7% of the respondents who was 1 had Cattle rearing, Agriculture and Trading merchandise as his/her major source of income. Implying that the major source of income of the respondents was cattle rearing and this meant that cattle farming needed to be taken seriously if such members were to get out of poverty.

**Table 4.2: Demographic characteristics of respondents**

Description	Indicators	Frequency	Percentage
Age group of the respondent	20 - 30 Years	3	5.0%
	31 - 40 Years	12	20.0%
	41 - 50 Years	15	25.0%
	51 - 60 Years	16	26.7%
	71 Years and above	14	23.3%
Gender of the respondent	Male	49	81.7%
	Female	11	18.3%
Education level	No Formal Education	17	28.3%
	Primary	36	60.0%
	Secondary	4	6.7%

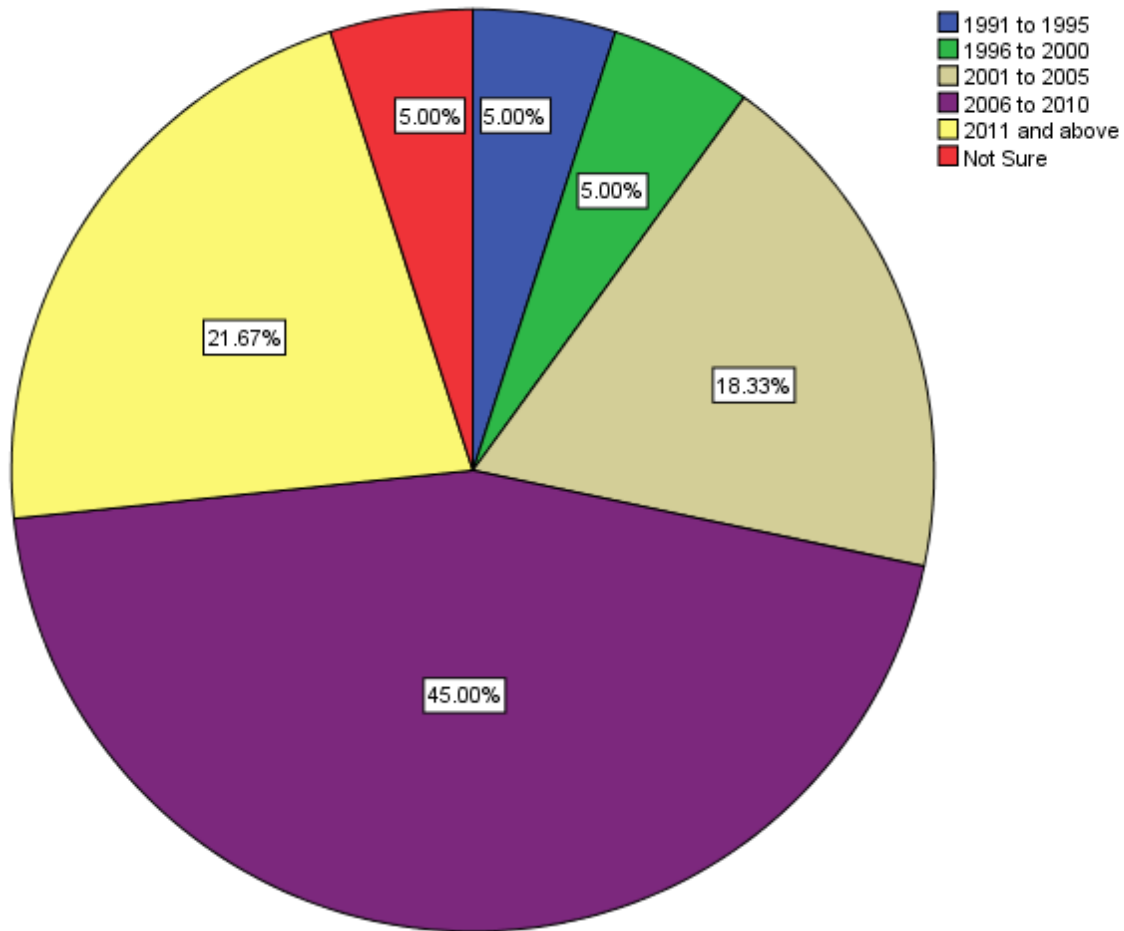
	Diploma	1	1.7%
	Bachelor's Degree	2	3.3%
Household size	1 to 10 Members	30	50.0%
	11 to 20 Members	27	45.0%
	21 to 30 Members	2	3.3%
	41 Members and above	1	1.7%
Major sources of income	Cattle rearing	33	55.0%
	Agriculture	4	6.7%
	Agriculture and cattle rearing	18	30.0%
	Cattle rearing, Agriculture and Trading merchandise	1	1.7%
	Livestock/cattle rearing and trade general merchandise	4	6.7%

**Source:** *Primary Data, (2019)*

### **4.3 Descriptive Statistics of the Respondents Farm Characteristics**

#### **4.3.1 The period within which the farm was acquired**

According to the results in fig. 4.1 below, it is seen that the majority of the farmers who were 27 respondents representing 45.0% of the total number of respondents acquired their farms between 2006 and 2010, followed by 13 farmers representing 21.7% of the total number of respondents acquired their farms from 2011 and above, followed by 11 farmers representing 18.3% of the total number of farmers(respondents)who acquired the farms between 2001 and 2005,followed by 3 respondents (farmers) representing 5.0%of the total number of farmers(respondents) acquired the farm between 1996 and 2000,followed by 3 farmers representing 5.0% of the total number of respondents(farmers) acquired their farms from 1991 to 1995 and the remaining 3 respondents(farmers) representing 5.0% of the total number of respondents(farmers) were not sure when they acquired their farms. Implying that majority of the respondents had acquired their farms between 2006 and 2010 and was sufficient enough for the farmer to have started investing in improving pasture. The results from observation and interview show there was investment towards improving the pasture but was still wanting.



**Source:** Primary data, (2019)

**Figure 4.1:** Illustration of the period within which the farm was acquired

#### 4.3.2 Description of the respondents farm characteristics

The results in Table 4.3 below depicted that majority of the farmers who were 42 respondents representing 70% of the total number of farmers owned between 1 to 100 acres of land, followed by 12 farmers representing 20% of the total number of respondents who owned between 101 to 200 acres of land, followed by 5 respondents (farmers) representing 8.3% of the total number of respondents and the remaining only 1 respondent representing 1.7% of

the total number of respondents owned above 500 acres of lands, implying that majority of the respondents had enough land for farming and were sufficient enough to inform this study.

The results in Table 4.3 below depicted that majority of the farmers who were 31 respondents representing 51.7% of the total number of farmers owned cattle and goat, followed by 20 farmers representing 33.3% of the total number of respondents who owned cattle and the remaining 9 respondent representing 15.0% of the total number of respondents owned the three types of cattle, goat and sheep, this implied that the majority of the respondents reared both types of cattle and goat on their farms and this was sufficient enough to inform this study.

The results in Table 4.3 below depicted that majority of the farmers who were 32 respondents representing 53.3% of the total number of farmers did not inherit, inherit and buy, rent/lease/hire, followed by 23 farmers representing 38.3% of the total number of respondents who inherited land, followed by 4 respondents (farmers) representing 6.7% of the total number of respondents rented/leased/hired land and the remaining only 1 respondent representing 1.7% of the total number of respondents inherited and bought, implying that majority of the respondents had neither inherited, inherited and bought nor rented/leased/hired land for farming which was sufficient enough to verify this study how the land was acquired.

According to the results in Table 4.3, it is seen that the majority of the farmers who were 32 respondents representing 53.3% of the total number of respondents(farmers) leased land, followed by 26 farmers representing 43.3% of the total number of respondents free held land, and the remaining 2 respondents(farmers) representing 3.3%of the total number of respondents(farmers) were tenants implied that majority of the respondents' land tenure system is owned by lease and was sufficient enough to inform this study.

The results in Table 4.3 below proved that majority of the farmers who were 43 respondents representing 71.7% of the total number of farmers did not have any natural water source on the farm and the remaining 17 respondents representing 28.3% of the total number of respondents (farmers) had natural water sources on their farms, this implied that the majority of the respondents did not have natural water source on their farms and this was sufficient enough to inform this study.

The Table 4.3 below, showed that majority of the farmers who were 42 respondents representing 70.0% of the total number of farmers established water sources on their farms and the remaining 18 respondents representing 30% of the total number of respondents (farmers) did not establish any water source on their farms, this implied that the majority of the respondents established water sources on their farms and this was sufficient enough to inform this study. The type of tenure ship plays a great role towards determining the level of investment in land management such as improving grazing land. Therefore was not surprise since majority of respondents owned under lease hold (53.3%)

**Table 4.3: Descriptive Statistics of the Respondents Farm Characteristics**

Description	Indicators	Frequency	Percentage
Size of the respondents farm	1 to 100 acres	42	70.0%
	101 to 200 acres	12	20.0%
	201 to 300 acres	5	8.3%
	501 acres and above	1	1.7%
Types of animals on the respondents farm	Cattle	20	33.3%
	Cattle and goat	31	51.7%
	Cattle, goat and sheep	9	15.0%
How it was acquired	Inherited	23	38.3%
	Inherited and bought	1	1.7%
	Renting/Lease/Hired	4	6.7%
	None	32	53.3%
Land tenure system you own it	Lease	32	53.3%
	Freehold	26	43.3%
	Tenant	2	3.3%
Natural water source on this farm	Yes	17	28.3%
	No	43	71.7%
Establishment of any water source on this farm	Yes	42	70.0%
	No	18	30.0%

#### 4.4 The existing Management Practices on former communal land owned individually

##### 4.4.1 Cross tabulation between socio- demographic characteristics and Pasture Management Practices

**Table 4.4 socio- demographic characteristics and Pasture Management Practices**

Demographic data	paddocks on this Farm				cultivated some trees/ shrubs/pasture on this Farm				Selective removal of trees/shrub from the farm				Practice Bush Clearing			
	Yes	No	LR	P- value	Yes	No	LR	P- value	yes	No	LR	P- value	Yes	No	LR	P- value
<b>Age group</b>																
20 - 30 Years	2	1	5.994	0.017	1	2	1.490	0.08	2 5.3%	1 4.5%	9.641	0.027	3 7.5%	0 0.0%	5.663	0.025
31 - 40 Years	1	11			3	9			11 28.9%	1 4.5%			8 20.0%	4 20.0%		
41 - 50 Years	5	10			4	11			10 26.3%	5 22.7%			12 30.0%	3 15.0%		
51 - 60 Years	3	13			7	9			6 15.8%	10 45.5%			8 20.0%	8 40.0%		
71 Years and above	2	12			5	9			9 23.7%	5 22.7%			9 22.5%	5 25.0%		
<b>Sex</b>																
Male	13	36	6.022	0.000	18	31	1.513	0.34	35 92.1%	14 63.6%	7.338	0.027	36 90.0%	13 65.0%	5.265	0.001
Female	0	11			2	9			3 7.9%	8 36.4%			4 10.0%	7 35.0%		
<b>Level of Education</b>																
No Formal Education	1	16	6.306	0.006	5	12	7.699	0.06	10 26.3%	7 31.8%	1.461	0.041	11 27.5%	6 31.30.0%	4.443	0.032
Primary	9	27			10	26			23 60.5%	13 59.1%			23 57.5%	13 65.0%		
Secondary	2	2			2	2			3 7.9%	1 4.5%			4 10.0%	0 0.0%		
Diploma	0	1			1	0			1 2.6%	0 0.0%			1 2.5%	0 0.0%		
Bachelor's Degree	1	1			2	0			1 2.6%	1 4.5%			1 2.5%	1 5.0%		

**Source:** Primary data, (2019)

According to the results in Table 4.4, results from a Pearson's Chi-Square test of independence revealed that there is an association between socio- demographic characteristics and pasture management practices used by the respondents since the demographics of age group, sex and level of education against paddocks on this Farm, cultivated some trees/ shrubs/pasture on this Farm, Selective removal of trees/shrub from the farm and Practice Bush Clearing were significant at 5% level of significance since their Probability values (P-values) were all less than the level of significance (P-value < 0.05) implying that the study established a significant relationship between the socio- demographic characteristics that included age group, sex and level of education and the pasture management practices used by farmers that included paddocks on this Farm, cultivated some trees/ shrubs/pasture on this Farm, Selective removal of trees/shrub from the farm and Practice Bush Clearing.

The likelihood ratio of the relationship between the socio- demographic characteristics of the farmers and the existing pasture management practices were all high and not close to zero with the lowest being 1.461(LR=1.461) and the highest being 9.641(LR=9.641) implying that there was a high likelihood ratio that the farmers were aware of pasture management practices that included paddocks on this Farm, cultivated some trees/ shrubs/pasture on this Farm, Selective removal of trees/shrub from the farm and Practice Bush Clearing.

#### **4.4.2 Grazing Methods**

The findings of the study showed that majority of the respondents (farmers) who were 47 farmers representing 78.3% of the total number of respondents did not have paddocks on their farm and the remaining only 13 respondents representing 21.7% of the total number of respondents representing 21.7% had paddocks on their farms. Implying that majority of the

farmers in Kasasa and Kakuuto sub-county still regard the system of having paddocks as not being relevant to the farm.

According to the findings of the study, was also determined that majority of the respondents who were 17 respondents representing 28.3% of the total number of respondents had only two (2) paddocks on their farms, followed by 6 respondents representing 10% of the total number of respondents who had 5 paddocks, followed by 5 respondents (farmers) who had only 1 paddock on their farms and the remaining 1 respondent representing 1.7% of the total number of respondents had only 3 paddocks on his/her farm.

**Table 4.5: Illustration of the existing grazing methods**

<b>Description</b>	<b>Indicators</b>	<b>Scores (n, %) (Frequency, Percentage)</b>
<b>Having paddocks on this Farm</b>	Yes	13 (21.7%)
	No	47 (78.3%)
<b>Number of paddocks do you have</b>	1 Paddock	5 (8.3%)
	2 Paddocks	17 (28.3%)
	3 Paddocks	1(1.7%)
	5 Paddocks	6(10.0%)
	No Paddock	31(51.7%)

#### **4.4.3 Pasture Improvement**

The results show that majority of the respondents who were 40 respondents representing 66.7% of the total number of respondents had not cultivated trees/shrubs/pasture on this farm and only 20 respondents representing 33.3% of the total number of respondents had intentionally cultivated some trees or shrubs or pasture on the farm

The findings indicate that the majority of the respondents who were 24 representing 40.0% had cultivated Elephant grass on their farms, 20 of the respondents representing 33.3% had cultivated Eucalyptus trees on their farms, 10 of the respondents representing 16.7% had cultivated Fruit producing trees on their farms, 5 of the respondents representing 8.3% had

cultivated Ficus (Amareere) on their farms and the remaining 1 of the respondent representing 1.7% was not sure whether he/she had cultivated trees/shrubs/pasture on this farm or not.

The results show that the majority of the respondents who were 26 representing 43.3% had cultivated trees/shrub/pasture with no basis, 17 of the respondents representing 28.3% had cultivated trees/shrub/pasture for shade, 7 of the respondents representing 11.7% had cultivated trees/shrub/pasture for fruit, 4 of the respondents representing 6.7% had cultivated trees/shrub/pasture for firewood, 3 of the respondents representing 6.7% cultivated trees/shrub/pasture for poles, and the remaining 3 respondents representing 5.0% cultivated trees/shrub/pasture for soil conservation.

The findings of this study are in line with the findings of a studies by Weltz, M (2012) and Kimbugwe. G, (2013) who asserted that majority of cattle are grazed on natural pasture generally in Uganda and Kakuuto County in particular, this again speaks volumes regarding the future of the livestock sector where cattle contributes the biggest percentage in terms of GDP from the sector, Weltz, M (2012), Kimbugwe. G, (2013)

The findings further indicate that majority of the respondents who were 38 respondents representing 63.3% of the total number of respondents agreed with having practiced selective removal of trees/shrubs from this farm and only 22 respondents representing 36.7% of the total number of respondents rejected not to have practiced selective removal of trees/shrubs.

This study established that majority of the respondents who were 40 respondents representing 66.7% of the total number of respondents agreed with having practiced bush clearing in their farms and only 20 respondents representing 33.3% of the total number of respondents rejected not to have practiced bush clearing.

This study established that the majority of the respondents who were 15 representing 25.0% practiced bush clearing after every two year, similarly 15 of the respondents representing 25.0% were not sure when they practice bush clearing, 10 of the respondents representing 16.7% practiced bush clearing whenever there was a bush, 7 of the respondents representing 11.7% practiced bush clearing after every a year , 4 of the respondents representing 6.7% practiced bush clearing after four years, 4 of the respondents representing 6.7% had no specific time on when to practice bush clearing, 3 of the respondents representing 5.0% practiced bush clearing after five years, and the reaming 2 of the respondents representing 3.3% practiced bush clearing after three years.

This study established that the majority of the respondents who were 22 representing 36.7% practiced bush clearing when there was a bush, 12 of the respondents representing 20.0% practiced bush clearing to stimulate growth of pastures, 10 of the respondents representing 16.7% had no specific basis for practicing bush clearing, 8 of the respondents representing 13.3% practiced bush clearing when they had money , 6 of the respondents representing 10.0% practiced bush clearing to get pasture, and the remaining 2 of the respondents representing 3.3% practice bush clearing to get a goat grazing area.

The results indicated that majority of the respondents who were 54 respondents representing 90.0% of the total number of respondents rejected not to have practiced bush burning on their farms and only the reaming 6 respondents representing 10.0% of the total number of respondents agreed to have practiced bush burning on their farms.

In a related observation, it was observed that in some of the firms were over grazed and the was total need for pasture which led to some farmers resorting to nomadic farming where farmers keep traveling with their animals to graze along roads, these findings are in agreement with the findings of Agriterra (2012) who asserted that the availability of pasture

in terms of quantity and quality is wanting. The researcher and FAO (2010) further assert that the Natural Pasture is estimated at 43.3%, this is in accordance to (UBOS 2008). According to FAO (2010), Agriterra (2012), Uganda National livestock dialogue report (2015). The availability of pasture in terms of quantity and quality is wanting. Poor breeds, diseases, limited extension services in the veterinary sector also weigh heavily.

The results indicate that the majority of the respondents who were 37 representing 61.7% were not sure of when they practiced bush burning, 14 of the respondents representing 23.3% practiced bush burning every year, and the remaining 9 of the respondents representing 15.0% practiced bush burning after every two years on their farms.

The finding that the majority of the respondents who were 57 representing 95.0% practiced bush burning not sure of the basis, 2 of the respondents representing 3.3% practiced bush burning to stimulate re-growth of pastures, and the remaining 1 of the respondent representing 1.7% practiced bush burning to tick control.

The findings showed that majority of the respondents who were 53 respondents representing 88.3% of the total number of respondents agreed with having experienced pasture scarcity and only the remaining 7 respondents representing 11.7% of the total number of respondents rejected upon the experience of pasture scarcity on their farms.

The findings indicated that the majority of the respondents who were 17 representing 28.3% Persist with the situation during pasture scarcity, 11 of the respondents representing 18.3% have no mitigation measures during pasture scarcity, 9 of the respondents representing 15.0% Reduce on the number of animals during pasture scarcity, 8 of the respondents representing 13.3% practice Rotation during pasture scarcity, 5 of the respondents representing 8.3% get elephant grass for supplement during pasture scarcity, 4 of the respondents representing 6.7% do nothing during pasture scarcity, 3 of the respondents representing 5.0% Renting more land

during dry season and during pasture scarcity, 2 of the respondents representing 3.3% during pasture scarcity One paddock is spread when it is approaching dry season, and the remaining 1 of the respondent representing 1.7% during pasture scarcity Pays for extra land during dry condition.

**Table 4.6: Pasture management practices**

Description	Indicators	Frequency	Percentage
Have you cultivated some trees/ shrubs/pasture on this Farm	Yes	20	33.3%
	No	40	66.7%
The type of trees/ shrubs you have planted on this farm	Eucalyptus tree	20	33.3%
	Fruit producing trees	10	16.7%
	Ficus (Amareere)	5	8.3%
	Elephant Grass	24	40.0%
	Not sure	1	1.7%
The basis for the choice of trees/shrub/pasture you plant	Shade	17	28.3%
	Poles	3	5.0%
	Firewood	4	6.7%
	Fruit	7	11.7%
	Soil conservation	3	5.0%
Selective removal of trees/shrub from the farm	None	26	43.3%
	Yes	38	63.3%
	No	22	36.7%
Practice Bush Clearing	Total	60	100.0%
	Yes	40	66.7%
Frequency of bush clearing	No	20	33.3%
	After every a year	7	11.7%
	After two years	15	25.0%
	After three years	2	3.3%
	After four years	4	6.7%
	After five years	3	5.0%
	No specific time	4	6.7%
	Whenever there is a bush	10	16.7%
	Not sure	15	25.0%
Basis of bush clearing	When there is a bush	22	36.7%
	To get pasture	6	10.0%
	When they have money	8	13.3%
	Goat grazing area	2	3.3%
	Stimulate regrowth of pastures	12	20.0%
	No specific basis	10	16.7%
Practice bush burning	Yes	6	10.0%
	No	54	90.0%

Frequency of bush burning	Every year	14	23.3%
	After every two years	9	15.0%
	Not sure	37	61.7%
Basis of bush burning	To stimulate regrowth of new pastures	2	3.3%
	Tick control	1	1.7%
	Not sure	57	95.0%
Experience of pasture scarcity	Yes	53	88.3%
	No	7	11.7%
What you do during pasture scarcity	Pays for extra land during dry condition	1	1.7%
	No mitigation measures	11	18.3%
	One paddock is spread when it is approaching dry season	2	3.3%
	Renting more land during dry season	3	5.0%
	Reduce on the number of animals	9	15.0%
	Persist with the situation	17	28.3%
	get elephant grass for supplement	5	8.3%
	Rotation	8	13.3%
None	4	6.7%	

#### 4.5 The milk production and reproductive efficiency of cows

This section presents the assessment of milk production and reproductive efficiency of cow

**Table 4.7: Socio- demographic characteristics and Milk production**

Demographic data	Main livestock on the farm				Number of cows milked on the farm					
	Cattle	Goat	LR	P-value	1 to 10 Cows	11 to 20 Cows	21 to 30 Cows	31 Cows and above	LR	P-value
<b>Age</b>										
20 - 30 Years	3 5.1%	0 0.0%	2.824	0.017	2 4.9%	1 9.1%	0 0.0%	0 0.0%	10.539	0.023
31 - 40 Years	12 20.3%	0 0.0%			8 19.5%	3 27.3%	1 16.7%	0 0.0%		
41 - 50 Years	14 23.7%	1 100.0%			11 26.8%	1 9.1%	3 50.0%	0 0.0%		
51 - 60 Years	16 27.1%	0 0.0%			12 29.3%	3 27.3%	0 0.0%	1 50.0%		
71 Years and above	14 23.7%	0 0.0%			8 19.5%	3 27.3%	2 33.3%	1 50.0%		
<b>Sex</b>										
Male	48 81.4%	1 100.0%	3.409	0.000	31 75.6%	10 90.9%	6 100.0%	2 100.0%	4.913	0.041
Female	11 18.6%	0 0.0%			10 24.4%	1 9.1%	0 0.0%	0 0.0%		
<b>Level of Education</b>										
No Formal Education	17 28.8%	0 0.0%	1.033	0.006	13 31.7%	2 18.2%	1 16.7%	1 50.0%	10.543	0.022
Primary	35 59.3%	1 100.0%			24 58.5%	6 54.5%	5 83.3%	1 50.0%		
Secondary	4 6.8%	0 0.0%			1 2.4%	3 27.3%	0 0.0%	0 0.0%		
Diploma	1 1.7%	0 0.0%			1 2.4%	0 0.0%	0 0.0%	0 0.0%		
Bachelor's Degree	2 3.4%	0 0.0%			2 4.9%	0 0.0%	0 0.0%	0 0.0%		

Source: Primary data, (2019)

According to the results in Table 4.6, results from a Pearson's Chi-Square test of independence revealed that there is a linkage between socio- demographic characteristics and Milk Production by the farmers since the demographics of age group, sex and level of education against Main livestock on the farm and Number of cows milked on the farm were significant at 5% level of significance since their Probability values (P-values) were all less than the level of significance ( $P\text{-value} < 0.05$ ) implying that the study established a significant relationship between the socio- demographic characteristics that included age group, sex and level of education and Milk Production by the farmers that included Main livestock on the farm and Number of cows milked on the farm. These results also revealed that the main livestock on the farm was cattle, majority of the firms had 1 to 10 Cows milked and majority of the respondents with better milk production had primary level as their level of education.

The likelihood ratio of the relationship between the socio-demographic characteristics of the farmers and the existing Milk Production was all higher and not close to zero with the lowest being 1.033 (LR=1.033) and the highest being 10.543 (LR=10.543) implying that there was a high likelihood ratio that the farmers had high Milk Production.

#### 4.5.1 Assessment of milk production

The findings indicate that majority of the respondents who were 59 respondents representing 98.3% of the total number of respondents were grazing cattle while as only 1 respondent (farmer) representing 1.7% of the total number of respondents was grazing goats.

The results showed that majority of the respondents who were 43 respondents representing 71.1% of the total number of respondents the major purpose of their farms was dual purpose(milk and beef) while as only 17 respondents (farmers) representing 28.3% of the total number of respondents the major purpose of their farms was for only milk.

The study findings showed that 21 respondents representing 35.0% of the total number of respondents had cross breeds on their farms; still 21 respondents representing 35.0% of the total number of respondents had both cross and local breeds on their farms, followed by 17 respondents representing 28.3% of the total number of respondents who had only local breeds on the farms while as only 1 respondent (farmer) representing 1.7% of the total number of respondents had bran on his farm.

The results indicated that majority of the respondents who were 29 respondents representing 48.3% of the total number of respondents had acquired breeds on their farms through buying, followed by those cross bred who were 18 respondents representing 30.0% of the total number of respondents, followed by 8 respondents(farmers) representing 13.3% of the total number of respondents had acquired breeds through inheriting and the remaining 5 respondents only 5 respondents (farmer) representing 8.3% of the total number of respondents did not acquire breeds by buying, inheriting and cross breeding on their farms.

The findings of this study are in line with the findings of the Uganda Bureau of Statistics in 2008, which established that the national average milk production per milked cow as per UBOS (2008) stands at 8.5 litres per week, and 7.4 litres in Rakai the mother of Kyotera district in which Kakuuto County is found, UBOS report, (2008).

The findings indicated that majority of the respondents who were 53 respondents representing 88.3% of the total number of respondents milked 1 to 30 litres of milk per day in a dry season on their farms, followed by 4 respondents representing 6.7% of the total number of respondents (farmers) did not get any milk per day in a dry season on their farms , and the remaining only 3 respondents (farmers) representing 5.0% of the total number of respondents milked 31 to 60 liters on their farms per a day in a dry season.

**Table 4.8: Descriptive statistics of assessment of milk production**

<b>Description</b>	<b>Indicators</b>	<b>Frequency</b>	<b>Percentage</b>
The main livestock on the farm	Cattle	59	98.3%
	Goat	1	1.7%
The Major purpose of your farm	Dual purpose(milk and beef)	43	71.7%
	Milk	17	28.3%
Type of breeds you have on the farm	Cross breeds	21	35.0%
	Local breeds	17	28.3%
	Cross and local breeds	21	35.0%
	Bran	1	1.7%
Way of acquiring them on the farm	Bought	29	48.3%
	Inherited	8	13.3%
	Cross bred	18	30.0%
	None	5	8.3%
Number of liters milked got per day in a dry season	No milk at all	4	6.7%
	1 to 30 Liters	53	88.3%
	31 to 60 Liters	3	5.0%

**Source:** *Primary Data, (2019)*

## Bi-variate analysis between Pasture Management Practices and Milk Production

**Table 4.9: Cross-tabulation between Pasture Management Practices and Milk Production**

Demographic data	The main livestock on the farm					Number of cows milked on the farm						
	Cattle	Goat	LR	P-value	Corr (r)	1 to 10 Cows	11 to 20 Cows	21 to 30 Cows	31 Cows and above	LR	P-value	Corr (r)
<b>Paddocks on the farm</b>												
Yes	12 20.3%	1 100.0%	3.121	0.01	.481	7 17.1%	4 36.4%	1 16.7%	1 50.0%	2.641	0.001	0.722
No	47 79.7%	0 0.0%				34 82.9%	7 63.6%	5 83.3%	1 50.0%			
<b>Cultivated some trees/shrubs/pasture on this Farm</b>												
Yes	20 33.9%	0 0.0%	.819	0.042	.532	12 29.3%	5 45.5%	2 33.3%	1 50.0%	1.241	0.012	0.82
No	39 66.1%	1 100.0%				29 70.7%	6 54.5%	4 66.7%	1 50.0%			
<b>Selective removal of trees/shrub from the farm</b>												
Yes	37 62.7%	1 100.0%	.923	0.022	.702	23 56.1%	7 63.6%	6 100.0%	2 100.0%	8.212	0.044	0.573
No	22 37.3%	0 0.0%				18 43.9%	4 36.4%	0 0.0%	0 0.0%			
<b>Practice Bush Clearing</b>												
Yes	39 66.1%	1 100.0%	.819	0.021	.671	23 56.1%	11 100.0%	4 66.7%	2 100.0%	12.517	0.048	0.431
No	20 33.9%	0 0.0%				18 43.9%	0 0.0%	2 33.3%	0 0.0%			

Source: Primary data, (2019)

According to the results in Table 4.9, results from a Pearson's Chi-Square test of independence revealed that there is an association between Pasture Management Practices and Milk Production of the respondents animals on the farm used by the respondents since all the indicators of both parameters were significant at 5% level of significance with their Probability values (P-values) all less than the level of significance ( $P\text{-value} < 0.05$ ) implying that the study findings indicated a significant relationship between the Pasture Management Practices whose indicators were paddocks on this Farm, cultivated some trees/shrubs/pasture on this Farm, Selective removal of trees/shrub from the farm and Practice Bush Clearing and the Reproductive Efficiency whose indicators were the main livestock on the farm and Number of cows milked on the farm

The likelihood ratio of the relationship between the Pasture Management Practices by the farmers and the Milk Production of farms were all high with a few close to zero and the lowest being 0.819 ( $LR=0.819$ ) and the highest being 12.517 ( $LR=12.517$ ) implying that there was a high likelihood ratio that proper Pasture management practices that included paddocks on this Farm, cultivated some trees/shrubs/pasture on this Farm, Selective removal of trees/shrub from the farm and Practice Bush Clearing among other significantly contributed to Milk Production of the surveyed farms.

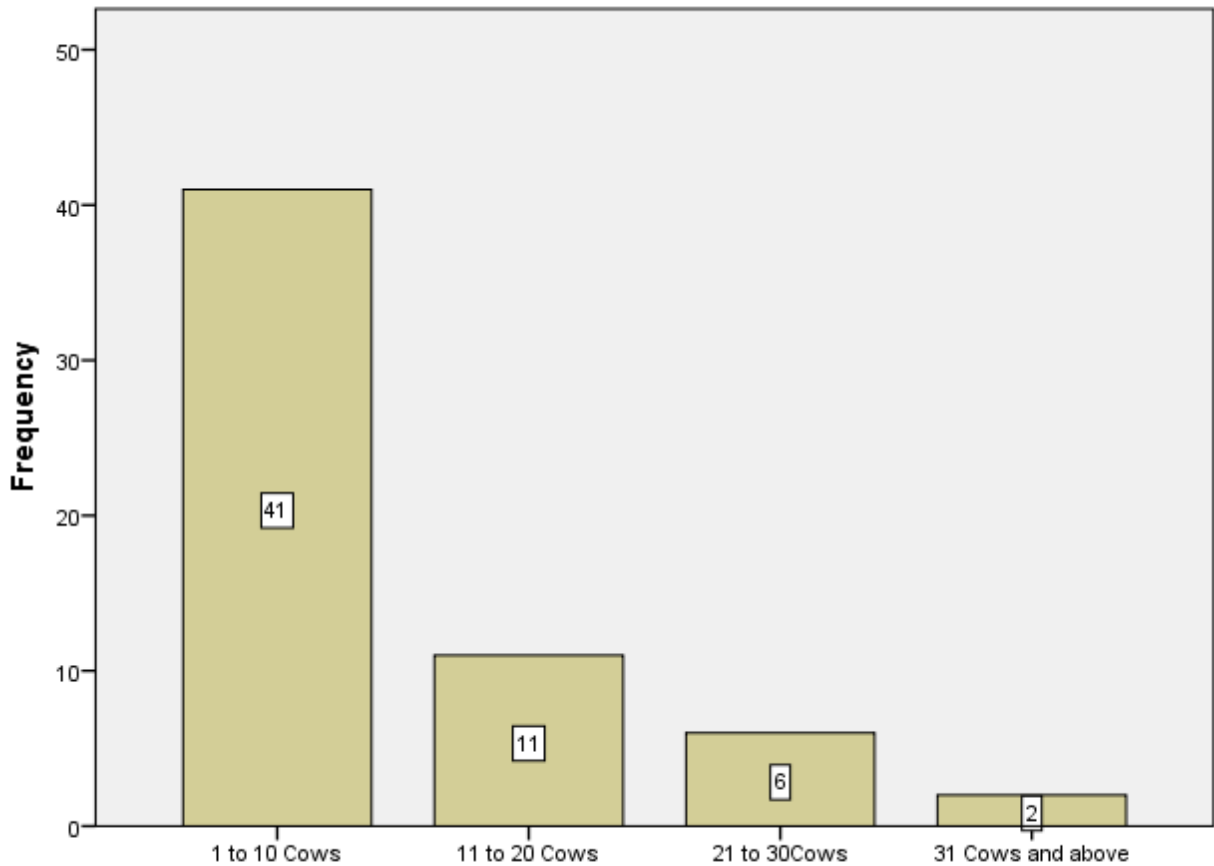
According to the results, the Pearson's correlation coefficients were all positive implying there was a positive relationship between Pasture Management Practices and Milk Production at the farms. Therefore an improvement in the available pasture management practices would significantly lead to an improvement in the Milk Production of the farm. The lowest Pearson's correlation coefficient ( $r$ ) was 0.431 ( $r = 0.431$ ) implying that in this particular situation there was a moderate positive relationship between pasture management practices and Milk Production of the farm while as the highest correlation coefficient was 0.82 ( $r =$

0.82) implying that in this particular farm there was a very strong positive relationship between pasture management practices and Milk Production.

#### 4.5.1.1 Number of cows milked on the farm

According to the results in the bar graph below, the results show that over 41 farmers (respondents) who were the majority had between 1 and 10 cows that are milked, followed by 11 respondents who asserted that they had 11 to 20 cows that are milked, followed by 6 respondents who asserted that they had 21 to 30 cows which are milked and the least number of respondents who were 2 asserted that they actually had over 30 cows that are milked. These responses imply that all farms at least has a cow that is milked and therefore management of pasture is prudent for farm productivity.

The findings of this study show that farmers are challenged by poor breeds of animals are in line with the findings of MAAIF, (2016) which also established challenges such as Poor breeds, diseases, limited extension services in the veterinary sector also weigh heavily. The Ministry of Agriculture and Animal Industries and Fisheries in its report published in 2016 however asserted that government's intervention of improved Technology distribution through programmes such as operation wealth Creation (OWC), Private actors such as MADDO, Send A COW among others that provide improved technologies, rejuvenation of the extension service through establishment of the Directorate of Extension in the Ministry of Agriculture and Animal Industries and Fisheries (MAAIF, 2016), the problem of poor breed and lack of extension service appear being gradually solved. However, Sustainable pasture production remains the significant issue regarding enhancement of cattle productivity in a non-degraded environment in this era of climate change and rapid population growth.



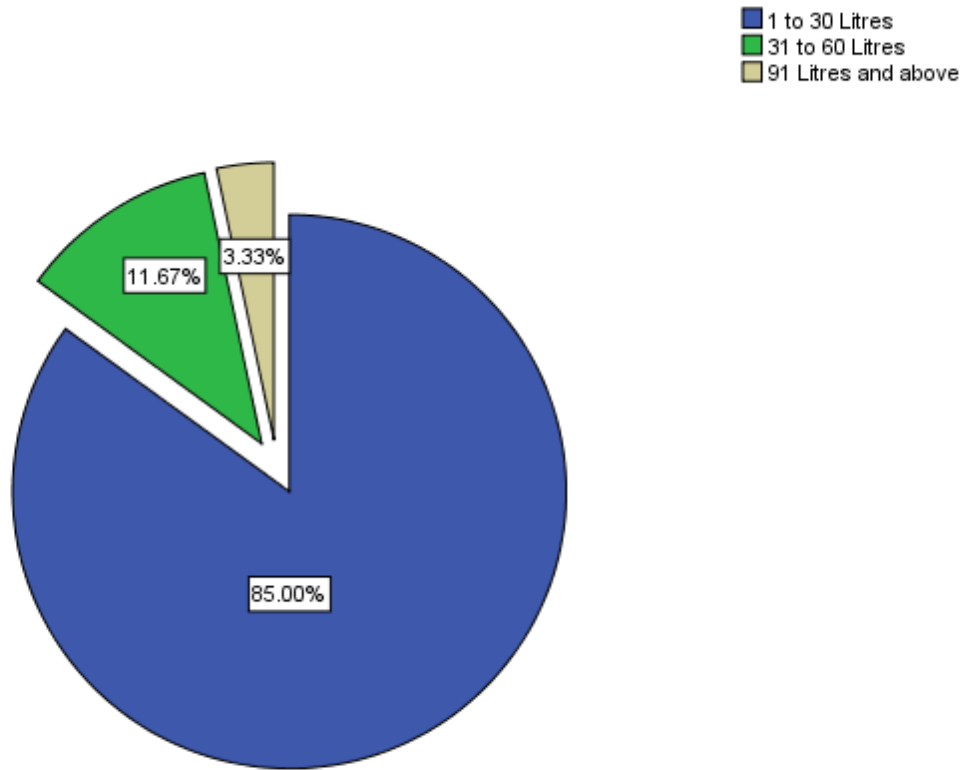
Source: Primary Data, (2019) **Number of cows milked on the farm**

*Figure 4.2: Illustration of the number of cows milked on the farm*

#### 4.5.1.2 Number of liters of milk got per day in a wet season

According to the results presented in the sliced pie chart below, majority of the respondents represented by the blue slice who were 85% of the total number of respondents asserted that they milked 1 (one) to 30 litres of milk per day from their farm, followed by 11.67% of the farmers who asserted that they milked between 31 to 60 litres of milk per day and subsequently 3.33% of the respondents who asserted that milked more than 91 litres of milk from their farms a day. Implying that all farms had milk as one of the by-product of the farm. The findings again show that milk production is still low implying the quality of pasture

available on the farm wanting. One litre from a cow be it a local, this much below the potential milk Production .



**Source:** *Primary Data, (2019)*

**Figure 4.3:** *Illustration of the number of liters of milk got per day in a wet season*

#### 4.5.2 Assessment of reproductive efficiency

**Table 4.10: Cross-tabulation between socio- demographic characteristics and Reproductive Efficiency of Cows**

Demographic data	The number of adult cows on a farm						The number of calves got from adult cows per year					
	1 to 20 Cows	21 to 40 Cows	41 to 60 Cows	61 Cows and above	LR	P-value	1 to 10 Calves	11 to 20 Calves	21 to 30 Calves	31 Calves and above	LR	P-value
<b>Age</b>												
20 - 30 Years	3 8.1%	0 0.0%	0 0.0%	0 0.0%	11.68	0.017	2 5.3%	1 5.6%	0 0.0%	0 0.0%	12.239	0.08
31 - 40 Years	8 21.6%	3 17.6%	1 20.0%	0 0.0%			7 18.4%	4 22.2%	1 50.0%	0 0.0%		
41 - 50 Years	9 24.3%	6 35.3%	0 0.0%	0 0.0%			11 28.9%	4 22.2%	0 0.0%	0 0.0%		
51 - 60 Years	10 27.0%	5 29.4%	1 20.0%	0 0.0%			8 21.1%	7 38.9%	1 50.0%	0 0.0%		
71 Years and above	7 18.9%	3 17.6%	3 60.0%	1 100.0%			10 26.3%	2 11.1%	0 0.0%	2 100.0%		
<b>Sex</b>												
Male	30 81.1%	13 76.5%	5 100.0%	1 100.0%	2.726	0.000	28 73.7%	17 94.4%	2 100.0%	2 100.0%	5.644	0.54
Female	7 18.9%	4 23.5%	0 0.0%	0 0.0%			10 26.3%	1 5.6%	0 0.0%	0 0.0%		
<b>Level of Education</b>												
No Formal Education	7 18.9%	8 47.1%	2 40.0%	0 0.0%	8.980	0.006	12 31.6%	4 22.2%	1 50.0%	0 0.0%	10.210	0.06
Primary	26 70.3%	7 41.2%	2 40.0%	1 100.0%			23 60.5%	10 55.6%	1 50.0%	2 100.0%		
Secondary	2 5.4%	1 5.9%	1 20.0%	0 0.0%			1 2.6%	3 16.7%	0 0.0%	0 0.0%		
Diploma	1 2.7%	0 0.0%	0 0.0%	0 0.0%			0 0.0%	1 5.6%	0 0.0%	0 0.0%		
Bachelor's Degree	1 2.7%	1 5.9%	0 0.0%	0 0.0%			2 5.3%	0 0.0%	0 0.0%	0 0.0%		

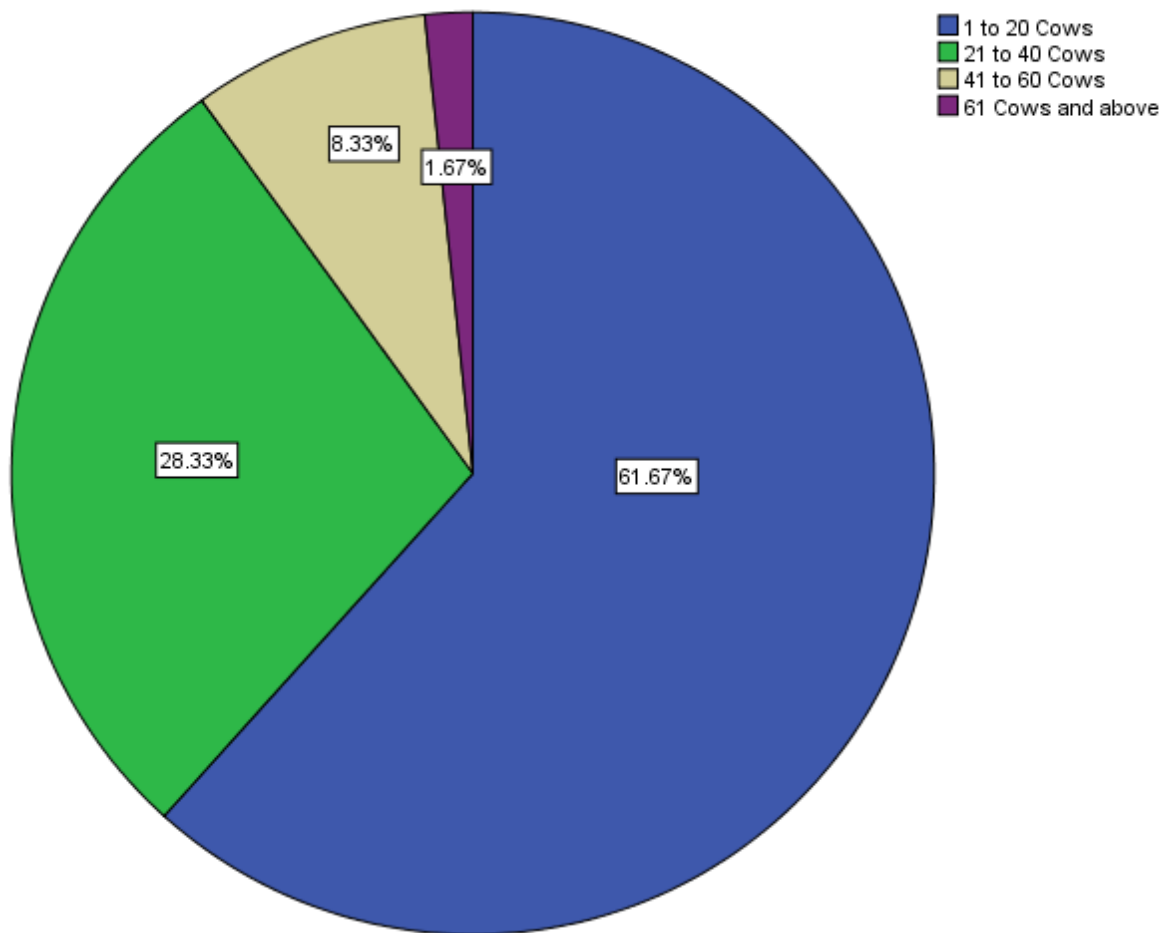
Source: Primary data, (2019)

According to the results in Table 4.10, results from a Pearson's Chi-Square test of independence revealed that there is a linkage between socio-demographic characteristics and Reproductive efficiency of cow on the respondents farms since the demographics of age group, sex and level of education against the number of adult cows on a farm and the number of calves got from adult cows per year were significant at 5% level of significance since their Probability values (P-values) were all less than the level of significance (P-value < 0.05) implying that the study established a significant relationship between the socio-demographic characteristics that included age group, sex and level of education and the reproductive efficiency of animals on the respondents farms used by farmers that included the number of adult cows on a farm and the number of calves got from adult cows per year.

The likelihood ratio (LR) of the relationship between the socio-demographic characteristics of the farmers and the existing reproductive efficiency were all high and not close to zero with the lowest being 2.726 (LR=2.726) and the highest being 12.239 (LR=12.239) implying that there was a high likelihood ratio (LR) of an association between socio-demographic characteristics and Reproductive efficiency of the respondents cattle on the farm.

#### **4.5.2.1 The number of adult cows on a farm**

According to the results presented in the pie chart below, majority of the farmers (respondents) representing 61.67% in the slice shaded blue had 1 to 20 adult cows on their farm, followed by 28.33% of the respondents in the slice shaded green who had 21 to 40 cows, followed by 8.33% of the respondents in the slice shaded grey who had 41 to 60 cows and subsequently the least represented with a percentage representation of 1.67% in the purple slice were respondents with 61 adult cows and above. This therefore implies that all farms had adult cows.

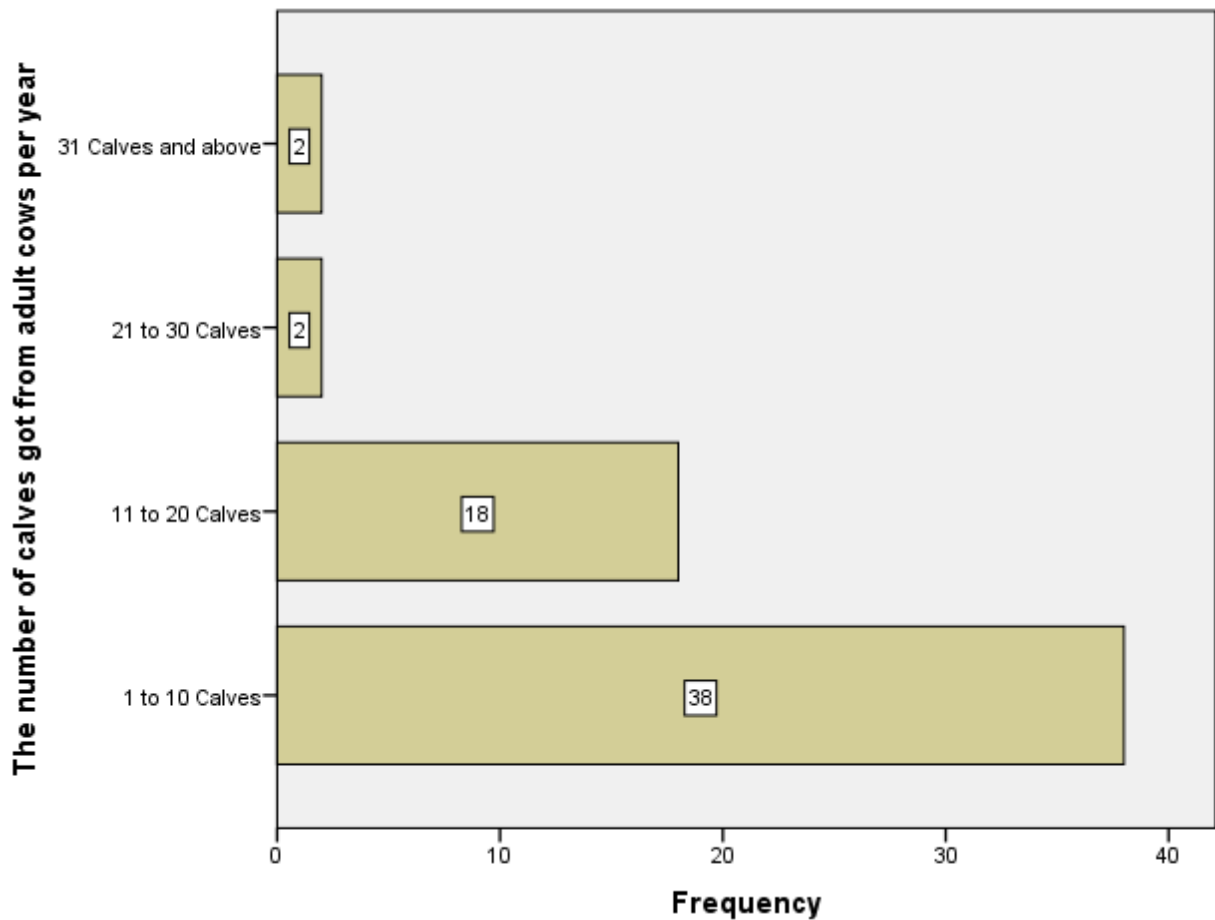


**Source:** *Primary Data, (2019)*

**Figure 4.4:** *Illustration of the number of adult cows on a farm*

#### 4.5.2.2 The number of calves got from adult cows per year

The study findings as well show as presented in the bar graph below that, majority of the respondents who were 38 asserted that they got 1 to 10 calves from their adult cows per year, followed by 18 respondents who asserted that they got 11 to 20 calves a year from their adult cows, followed by 2 respondents who asserted that they got 21 to 30 calves from their adult cows a year and the least represented were respondents who asserted that they got more than 31 calves from their adult cows and these were only 2 respondents. Therefore, these findings imply that few could give a calf per year. This finding indicate a poor reproductive efficiency where a cow is expected to give a calf every year.



Source: *Primary Data, (2019)*

Figure 4.5: Illustration of the number of calves got from adult cows per year

## Bi-variate analysis between Pasture Management Practices and Reproductive efficiency

**Table 4.11: Cross-tabulation between Pasture Management Practices and Reproductive efficiency**

Pasture Management Practices	The number of adult cows on a farm							The number of calves got from adult cows per year						
	1 to 20 Cows	21 to 40 Cows	41 to 60 Cows	61 Cows and above	LR	P-value	Corr	1 to 10 Calves	11 to 20 Calves	21 to 30 Calves	31 Calves and above	LR	P-value	Corr (r)
<b>Paddocks on the farm</b>														
Yes	9 24.3%	2 11.8%	1 20.0%	1 100.0%	4.345	0.030	0.641	8 21.1%	3 16.7%	1 50.0%	1 50.0%	1.840	0.009	0.237
No	28 75.7%	15 88.2%	4 80.0%	0 0.0%				30 78.9%	15 83.3%	1 50.0%	1 50.0%			
<b>Cultivated some trees/shrubs/pasture on this Farm</b>														
Yes	13 35.1%	5 29.4%	2 40.0%	0 0.0%	1.082	0.003	0.201	10 26.3%	9 50.0%	1 50.0%	0 0.0%	4.854	0.041	0.661
No	24 64.9%	12 70.6%	3 60.0%	1 100.0%				28 73.7%	9 50.0%	1 50.0%	2 100.0%			
<b>Selective removal of trees/shrub from the farm</b>														
Yes	20 54.1%	12 70.6%	5 100.0%	1 100.0%	7.212	0.041	0.712	20 52.6%	14 77.8%	2 100.0%	2 100.0%	7.216	0.043	0.698
No	17 45.9%	5 29.4%	0 0.0%	0 0.0%				18 47.4%	4 22.2%	0 0.0%	0 0.0%			
<b>Practice Bush Clearing</b>														
Yes	20 54.1%	15 88.2%	5 100.0%	0 0.0%	13.017	0.049	0.87	22 57.9%	15 83.3%	2 100.0%	1 50.0%	5.661	0.022	0.668
No	17 45.9%	2 11.8%	0 0.0%	1 100.0%				16 42.1%	3 16.7%	0 0.0%	1 50.0%			

Source: Primary data, (2019)

According to the results in Table 4.11, results from a Pearson's Chi-Square test of independence revealed that there is an association between Pasture Management Practices and Reproductive Efficiency of the respondents animals on the farm used by the respondents since all the indicators of both parameters were significant at 5% level of significance with their Probability values (P-values) all less than the level of significance ( $P\text{-value} < 0.05$ ) implying that the study established a significant relationship between the Pasture Management Practices whose indicators were paddocks on this Farm, cultivated some trees/shrubs/pasture on this Farm, Selective removal of trees/shrub from the farm and Practice Bush Clearing and the Reproductive Efficiency whose indicators were the number of adult cows on a farm and the number of calves got from adult cows per year

The likelihood ratio of the relationship between the Pasture Management Practices by the farmers and the Reproductive efficiency of farms were all high with a few close to zero and the lowest being 1.082 ( $LR = 1.082$ ) and the highest being 13.017 ( $LR = 13.017$ ) implying that there was a high likelihood ratio that proper Pasture management practices that included paddocks on this Farm, cultivated some trees/shrubs/pasture on this Farm, Selective removal of trees/shrub from the farm and Practice Bush Clearing among other significantly contributed to reproductive efficiency of the surveyed farms.

According to the results, the Pearson's correlation coefficients were all positive implying there was a positive relationship between Pasture Management Practices and Reproductive efficiency at the farms. Therefore an improvement in the available pasture management practices would significantly lead to an improvement in the reproductive efficiency of the farm. The lowest Pearson's correlation coefficient ( $r$ ) was 0.201 ( $r = 0.201$ ) implying that in this particular situation there was a very weak positive relationship between pasture management practices and reproductive efficiency of the farm while as the highest correlation

coefficient was 0.87 ( $r = 0.87$ ) implying that in this particular farm there was a very strong positive relationship between pasture management practices and reproductive efficiency.

#### 4.6 The abundance of common legume pasture/fodder plant species in grazing land

**Table 4.12: Results from the observed farms**

Quadrat No / Plant species	01 (%)	02 (%)	03 (%)	04 (%)	05 (%)	06 (%)	07 (%)	08 (%)	09 (%)	10 (%)	11 (%)	12 (%)	13 (%)	14 (%)	15 (%)	16 (%)	17 (%)	18 (%)	% AC	F in 18	% AF	Ranks	
<i>Hyperrenia-rufa</i>	6.5	15.3	2.3	14.3	14.8	19.3	11.1	19.4	0.1	0.7	10.4	23.1	3.6	3.7	16	9.1	15.4	8.2	<b>10.74</b>	18	<b>100</b>	<b>2<sup>nd</sup></b>	
<i>Bracharia spp</i>	4	15.7	18.9	30	39.3	24.5	28.4	8.3	6.1	14.7	31.1	20.3	20	27.5	23.0	33.1	35	17.9	<b>22.10</b>	18	<b>100</b>	<b>1<sup>st</sup></b>	
Nandi-grass ( <i>Setaria anceps</i> )	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	<b>0.03</b>	1	<b>5.56</b>	<b>9<sup>th</sup></b>
Rhode-Grass ( <i>Chloris gayana</i> )	0	9	0	0	0	0	0.2	0	0	0	1.1	0	1.7	0	0	0	0	4.8	<b>0.93</b>	5	<b>27.78</b>	<b>4<sup>th</sup></b>	
<i>Pennisetum-clandestinum</i> kikuyu grass	0	0	0	0	0	0	0	0	0	0	0.4	0	0.1	0	0	1.9	0	0	<b>0.13</b>	3	<b>16.67</b>	<b>7<sup>th</sup></b>	
<i>Panicum-maximum</i>	0	0.1	0	0	0	0	0	0	0.1	0	1.6	0	0.1	0	0.1	0	0	0.1	<b>0.12</b>	6	<b>33.33</b>	<b>8<sup>th</sup></b>	
<b>%AC for Grasses</b>																			<b>5.675</b>				
<b>AF for Grasses</b>																				<b>8.5</b>			
<b>%AF for Grasses</b>																					<b>42.22</b>		
Green leaf desmodium ( <i>Desmodium intortum</i> )	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.2	0	<b>0.02</b>	2	<b>11.11</b>	<b>10<sup>th</sup></b>
Silver leaf desmodium ( <i>desmodium uncinatum</i> )	0	0.3	0	0	0	0	0	0.1	2.2	0.1	0.6	0	0	0	0.3	0	0.3	0.1	<b>0.22</b>	8	<b>44.44</b>	<b>5<sup>th</sup></b>	
<i>Glycerine-wightii</i>	0	0	0	0	0	0	0	0	0	0	0.3	0	0.3	0	2.3	0	0	0	<b>0.16</b>	3	<b>16.67</b>	<b>6<sup>th</sup></b>	
<i>Centrocema-pubescens</i>	0	0.1	1.5	3	0.5	1.1	0.6	1.7	0.6	0	4.2	0	2.9	0.4	0.1	1.1	1.5	0	<b>1.07</b>	14	<b>77.78</b>	<b>3<sup>rd</sup></b>	
<b>%AC for Legumes</b>																			<b>0.368</b>				
<b>AF for Legumes</b>																				<b>6.75</b>			
<b>%AF for Legumes</b>																					<b>37.5</b>		

**Source: Primary Data, (2019)**

Where AC is Average cover, F is Frequency and AF is Average Frequency

According to the results in Table 4.12 above, *Bracharia* spp grass had the highest percentage average cover of the observed farms with an average cover of 22.1% followed by *Hyperrenia-rufa* grass which had a percentage cover of 10.74% of the surveyed farms and it's only these two types of grass that appeared in all the observed farms with a frequency of 18 out of the 18 observed farms implying that they had a percentage frequency of 100%. The least represented grass was Nandi-grass (*setaria anceps*) which had a percentage cover of 0.03% and only appeared in 1 out of the 18 observed farms making a percentage frequency of 5.56%.

The results in Table 4.12 above, show that out of the four (4) legumes types observed during the *Centrocema-pubescens* had the highest percentage average cover or presence of the observed farms with an average cover of 1.07% followed by Silver leaf desmodium (*Desmodium uncinatum*) which had a percentage cover of 0.22% of the surveyed farms and the two legumes had a frequency of 14 and 8 times of the surveyed farms out of the 18 observed farms implying that they had a percentage frequency of 77.78% and 44.44% respectively. The least represented legume was Green leaf Desmodium (*Desmodium intortum*) which had a percentage cover of 0.02% and only appeared in 2 out of the 18 observed farms making a percentage frequency of 11.11%.

Therefore grass had a higher percentage average coverage than legumes which was 5.675% as compared to the legumes which was 0.368%, the average frequency of grass in the observed farms was higher than that of legumes which was 8.5 and 6.75 respectively with percentages of 42.22% and 37.5% respectively. The presence of legumes signifies overgrazing which is part of poor pasture management. Legumes are decreaser species in cases of overgrazing.

Ultimately, the researcher ranked the grass and legumes based on the percentage average coverage in the last column to the right of the Table.

The commonly observed non targeted plant species in the grazing land was Couch grass like identified as , *Eragrostis mild braedii*, thatching grass identified as “*Hyperthelia dissoluta* *Sporobolus pyramidalis* , *Ocimum suave*, (Mujaja- luganda) and *lantana camara* ( *Kayukiyuki* in Luganda or *Kapanka- lunyankole*) . However, in most farms *Lantana camara* and *sporobolus pyramidalis* had been ignored and gradually were eating away many farms. The abundance of studied legume pasture plant species in the grazing land was dominant in farms that were not over grazed/overstocked.

**Note** =the couch grass like is *Eragrostis mildbraedii*

#### Key observations



*Sporobolus pyramidalis* is eating many of the farms, but dispute farmers acknowledging the bad effects on animal teeth no attention paid/made on it. An upright and long-lived grass growing 90-200cm tall and forming large tussocks, it's very long and narrow leaf blades (20-70 cm long and 3-10 mm wide) may be flat or Somewhat rolled. Its elongated, pyramid-shaped, seed-heads (20-45 cm long and about 3 cm wide) have many short branches, these seed-head branches are initially held closely to the stem, but as the seed-head opens they become stiffly spreading and each of these branches bears numerous tiny flower spikelets (1.7-2.2 mm long).



*Lantana Camara* is also another invasive plant species eating away the people's farms.

Cattle farmers with a mixture of cross, Bran and local breeds tend to pay attention to farm management more than those

with purely locals Cattle farmers who exhibited nomadic pastoralism and kept more than the carrying capacity (overstocking) commented that communal was better than individualizing the farm area. *Lantana camara* is a species of flowering plant within the verbena family Verbenaceae.

*Hyperthelia dissoluta* grass at its mature stage, most farmers ignored this grass yet it was dangerous to the animals and it more dangerous in its mature stages since in extreme circumstances it can lead to the removal of a cow's teeth. Common in deciduous bush land and wooded grassland, in fixed dunes, along roads and in disturbed farms, including areas contaminated with nickel and molybdenum. *Hyperthelia dissoluta* is palatable when young, but too coarse when mature. It is completely grazed in the early stage, but at later stages the stems are usually left ungrazed and only the leaves are eaten by animals. Several *Hyperenia* species provide very similar thatching material, while many other grasses and palms leaves are used for the same purpose.



*Ocimum suave*, the shrub was observed in most of the quadrants. The respondents asserted that species have a combination of reproductive system which varies with the locality and cultivar. The respondents also stated that the effects can be achieved using a potent antioxidant. It had grown widely and was distributed throughout most of the visited farms.

Justification for the ten species focused on;

The legumes help in milk production and also soil fertility management. They are liked by the animals indirectly giving information on over grazing since they are eaten first, so an over grazed environment cannot be observed. Some species like *Panicum maximum* are indicators of the levels of manipulation since they can only be found in the farm that has been modified by cultivation and also do not tolerate heavy grazing.

Some species like *Hyperenia rufa* is drought tolerant and liked by the animals. It was also observed that in most farms that had poor drainage *Eragrostis mildbraedii* was the dominant species.

## CHAPTER FIVE

### SUMMARY, CONCLUSION & RECOMMENDATIONS

#### 5.1 Introduction

This study investigated the pasture management practices and current status of individually owned grazing land in Kakuuto county - Kyotera district –Uganda. This chapter presents a summary of the findings, conclusions, recommendations and areas for further research.

#### 5.2 Summary of findings

The researcher observed that there was presence of Couch grass like grass *Eragrostis mild* in poorly drained areas and there was over grazing due to over stocking. It was also observed that of the non-targeted grass plant species grass *Hyperthelia dissoluta* dominated some of the farms. Some of the farms were not over grazed as compared to others .But, it was observed that some cattle farmers who had plenty of land ignored pasture management practices and instead depended on stocking less than the potential capacity of the farm. This again reduces potential production. Swamp weeds were also observed in some of the farms and sometimes overgrazing observed in others to the extent of bare ground patches being seen. *Sporobolus pyramidalis* was another emerging nuisance invasive plant gradually eating many farms and despite farmers acknowledging the negative impacts no attention was paid on it. A Section of cattle farmers had started a practice of removing shrubs and trees, but lacked technical guidance as there was unselective removal of trees and shrubs and no replacement , something that is equally dangerous. The researcher also observed the existence of *Ocimum suave* and *lantana camara* as common shrubs, but the latter being the most serious threat to many farms by the fact of its invasive characteristics.

Milk production was still poor per house hold with majority (53) having between 1-30 litres per day since all farmers interviewed at least had a cow being milked. Further, results showed

a wide gap between milk production in dry and wet season. This confirmed the irregularity in pasture availability a sign of poor pasture management practices since most farmers accepted having water that could have been a big factor. Reproductive efficiency was poor with majority having 1-21 cows (61.67%) and those with 1-10 calves per year (38%). Generally pasture management was still poor.

### **5.3 Conclusion of the Findings**

The study concluded that only 13 (21.7%) of the total number of respondents had paddocks on their farms. Implying that majority of the farmers in Kasasa and Kakuuto sub-county still regard the system of having paddocks as not being relevant to the farm. It further concluded that majority of the respondents who were 40 (66.7%) of the total number of respondents had not cultivated trees/shrubs/pasture on their farms. Only 6 respondents representing 10.0% of the total number of respondents agreed to have practiced bush burning on their farms. This study also concluded that 57 (95.0%) practiced bush burning to tick control. The most common pasture grass species were *Bracharia species* and *Hyperrenia rufa* with average percentage cover of 22.1% and 10.7.4% respectively. The most common legume of the four studied was *Centrocema pubescens* with an average percentage cover of 1.07%. The shortage of legumes indicate over grazing in majority of the farms since legumes are decreaser species under such circumstances.

This study concluded that the commonly observed non targeted plant species in the grazing land was Couch grass like , *Eragrostis mild braedii*, *hyperthelia disoluta* *Ocimum suave*, *Lantana camara* and *Sporobolus pyramidalis*. However in most farms *Lantana camara* was ignored and the abundance of a common legume pasture/fodder plant species in the grazing land was dominant in farms that were not over grazed/overstocked and those firms that were implying that pasture management still wanting.

This study concluded that the highest milk production in dry season was 1-30 litres (53), 31-60 litres (3%), and no milk production (4%). In Wet season milk production was 1-30 litres (85%), 31-60 litres (11.77) and 91 litres and above (3.33%). This implied a wide variation in milk production in wet and dry seasons. Since majority of the farmers acknowledged having water and accepted pasture scarcity conclude that pasture management is still a problem to milk production.

The study also concludes that the reproductive efficiency was 1-10 calves per year majority (38 or 63.33%) whereas the majority had 1-21 cows (61.7) implying that many cows do not give a calf every year.

#### **5.4 Recommendations**

The researcher recommends improved grazing methods such as having paddocks on the farm, Paddock grazing is where a farmers land is divided into sections by using a fence. The researcher therefore encourages farmers to subdivide the land into paddocks. It's a more intensive management system and requires higher capital costs in fencing, water and access routes but on a long term basis pays. Each paddock is created to suit the number of stock in the herd.

Rotating animals between paddocks on the farm, Farmers should practice moving grazing of livestock between pastures (often called paddocks) as needed or on a regular basis. But well-managed rotational grazing means that you evaluate the nutritional and forage needs of your animals, assess forage quality and quantity, regulate the acreage of access and control which parts of the pasture/range that the animals have access to.

Farmers should cultivate some trees / shrubs / pasture on the farm, farmers should prepare a large area of grassy flat land where it is appropriate to keep livestock, or is a new horizon for you to explore that may offer new opportunities.

Highly productive forage lands used to graze livestock. They are created by improving the surface of natural forage lands or old unproductive grasslands and by sowing grass mixtures on newly reclaimed lands.

This study also suggested that farmers should practice selective removal of trees / shrubs / pasture

The study also recommended that farmers should practice bush clearing, but technical guidance is needed.

This study also recommended that farmers should practice bush burning, but need much technical guidance which extension worker should pay attention on. Technicalities relating to biomass accumulation, time of burning, the influence of topography among other. Bush burning is regarded as a necessary evil with potential of causing biodiversity loss, destruction of humus causing soil compaction and erosion altering vegetation type among others.

The researcher recommends farmers should be encouraged to cross breed their cows. This will boost their income but, it was also observed that farmers who had improved their breeds had also endeavored to manage their grazing land.

Farmers should adopt better pasture management practices in order to have more pasture to feed animals and receive more milk as well improve on reproductive efficiency.

The abundance of common legume pasture/fodder plant species in grazing land

The respondents suggested that farmers should avoid overgrazing, this will enable and promote abundance of common legume pasture / fodder plant species in grazing land.

The researcher recommends that extension workers now that extension services have been rejuvenated sensitize cattle farmers on many aspects of pasture management for example

understanding the plant growth cycle, being able to understand the plant-growth rate on grazing lands is essential to ongoing pasture support. Certain plants require shorter or longer amounts of time in order to grow, presence of increasers as a sign of farm deterioration. By rotating animals based on the plant growth cycle, a large number of the overgrazing issues that are being seen today can be eliminated almost immediately.

Recognize bare soil areas and remove livestock from them, certain animals love to graze in one spot. It happens. Over time, however, this creates a bare soil area from their activities. Once this occurs, plant spacing issues in the grazing area reduce the viability of the living plants which still exist. Bare soil also increases the risks of erosion or weed growth. Recognizing where these favorite spots are and rotating livestock away from them will stop overgrazing symptoms.

Don't rely only on grazing charts or planning worksheets, many farmers and pasture managers find that even though they use charts and worksheets to manage their lands, they still wind up dealing with overgrazing issues. That's because people need to get out to that pasture and walk it to see what is really going on. Worksheets are never a substitute for first-hand knowledge.

Build a series of paddocks on grazing lands, paddocks are small enclosures where traditionally cattle would be kept and exercised. The same principle can apply to virtually all livestock when it comes to grazing. By keeping a series of 6-8 paddocks, restoration periods can be granted to lands that are taxed while the selective grazing behaviors of the animals can still be encouraged.

Have feed stockpiled to support grazing activities, if livestock are not receiving an adequate amount of feed, then they will begin grazing early in the pasture. Heavy early grazing can prolong the needed recovery period for the pasture in question, so it can be helpful to

stockpile feed to reduce early season grazing needs, allowing the pasture to establish itself. When these steps are combined with monitoring rainfall, maintaining pasture residuals, and adapting to changing land conditions, then the solutions to overgrazing become much easier to implement. Mistakes may happen, but if we all learn from those mistakes, the land and livestock can both operate at a top performance level.

The researcher commends that to improve milk production during dry conditions since majority accepted having water, there need for cattle farmers to cultivate pasture plant on part of their land to provide supplementary nutritious feed to cows being milked since majority had 1-20 cows milked

### **5.5 Areas for Further Studies**

The researcher recommends that future researchers should investigate the impact of specific pasture management practices on farm performance in Uganda.

Integration of cattle with goats its economic and environmental sustainability need to be studied since it is becoming a common practice yet the two at times have contradicting pasture management practices.

## REFERENCES

- Agriterra (2012). *Identification of Livestock Investment Opportunities in Uganda, Arnhem, Netherlands.*
- Bayiyana, I., Ekere, W. and Mugisha, J. (, 2012). *Economic Analysis of Trans Boundary Animal Disease Control in Ntungamo and Rakai Districts of Uganda, Third RUFORUM Biennial Meeting(24-28 September 2012 / Entebbe Uganda)*
- Belnap J. et al (2012). *Introduced and Invasive species in Novel Rangeland Ecosystem, Friends or Foe?, Journal Of Rangeland, Ecology And Management 65 (6). 426 – 450.*
- Bouamra M., Ghozlane F., and Ghozlane M. K. (2016). *Factors affecting reproductive performance of dairy cow in Algeria: Effects of clinical mastitis. African Journal of Biotechnology. Vol. 16(2), pp. 91-95,*
- Canhoto, I.A., Spinks, N., and Rose, S. (2015). *Management Research: Applying the Principles*
- Byakagaba *et al* (2018), *Rangeland Policy, Intentions, Consequences and Opportunities.*
- Drovers.(2011).Cattle Breeding: Improve Reproductive Efficiency. Retrieved from <https://www.drovers.com/article/cattle-breeding-improve-reproductive-efficiency> (accessed on 24th July,2019)
- Fynm Richard (2012), *Functional Resource Heterogeneity Increases Livestock and Rangeland Productivity. Society for Rangeland Management.*
- Government of Uganda (2014), *Draft of Rangelands Management and Pastoralism Policy*, Ministry of Agriculture, Animal Industry and Fisheries-Kampala.
- Hall and Bawa (1993). *Methods to Assess the Impacts of Extraction of Non-Timber Forest Products on Plants Population*

Hendricks H. *et al*(2006), *Biodiversity Conservation and Pastoralism- Reducing Herd Size in a Commercial Livestock Park System in Richterveld National Park.*

Davies K.W. *et al* (2010), *Effects of Long Term Livestock Grazing on Fuel Characteristics in Rangelands, an example from Sage-Brush Steppe*, *Journal of Rangeland Ecology and Management* 63 (6) 662 – 664.

Kimbugwe (2013), *Production and Marketing Department, Three Year Sector Development Plan Rakai District .* , Rakai District Local Government.

Kisamba Mugerwa (1992), *Rangeland Tenure and Resource Management; an Overview Of Pastoralism in Uganda*, Makerere Institute of Social Research.

Kisamba Mugerwa (1995), *The Impact of Individualisation on Common Grazing Land Resources in Uganda, Phd Thesis* , Makerere Institute of Social Research, Makerere University.

Kisamba Mugerwa, Pender John and Kato E. (2006), *Impacts of Individualisation of Land Tenure on Lives stock and Rangeland Management in South Western Uganda 11<sup>th</sup>Biennial Conference of the International Association For The Study of Common Property.*

Kiyingi Jamil (2013), *Rakai District State of Environment Report 2013/2014.*

Rakai District Local Government.

Mcgahey, D. And Visser, Z. (2015).*Climate Change Vulnerability and Adaptation in Uganda's Cattle Corridor. Available on [Www.Assar.Uct.Ac.Za/./Climatechange-Vulnerabilty And Adaptation-Uganda's Cattle Corridor](http://www.assar.uct.ac.za/./Climatechange-Vulnerabilty%20And%20Adaptation-Uganda's%20Cattle%20Corridor) .Accessed on 26<sup>th</sup>-January, 2018*

Mfitukumiza *et al* (2017) *Determinant of Agroforestry Adoption asan Adaptation to Drought Among Small Holder Farmers in Nakasongola District Central Uganda.* Makerere University Centre For Climate Change Research.

Ministry of Lands, Housing and Urban Development (2013). *The National Land Policy*.

Ministry of Lands, Housing and Urban Developments Kampala-Uganda.

Gachague, M (1<sup>st</sup> July 2015). *Background Information*. Uganda National Livestock Dialogue Grand Imperial Hotel, Kampala

Mugambwa J. (2007), *A Comprehensive Analysis of Land Tenure Reform in Uganda and Papua New Guinea; Journal of South Pacific Law*.

Nyaga, J. Barrios, E. and Muthurio C. (2015). *Evaluating Factors Influencing Heterogeneity in Agroforestry Adoption And Practices within Small Holder Farms in Rift Valley ,Kenya*.

Available on [http ps://doi.org/1016/j.agree.2015](http://ps://doi.org/1016/j.agree.2015) accessed on 26<sup>th</sup> November, 2018.

Oba and Gufu (2012), *Harnessing Pastoralists Indigenous Knowledge for Rangeland Management. Three Africa Case Studies Pastoralism; Research Policy and Practice*.

Ranjit Daniel *et al* (1996). *Biodiversity Indexing in Agriculture* M. S. Swaminathan Research Foundation.

Rinehart, L. (2008). *Pasture, rangeland and grazing management*. ATTRA

Reno, N.V. (2007). *Recent studies on nutritional factors affecting reproductive efficiency in U.S. dairy herds*. Western Dairy Management Conference.

SANBI(2014), *Grazing And Burning Guidelines For Biodiversity Conservation and Livestock Production, Compiled By Lechmere- Oertel R. G.*

*South African National Biodiversity Institute, Pretoria 42 Pages, IBN: 978-1-919976-91-4*

Ssebyuku, V. and Mosango, D.M. (2012). *Adoption of Agroforestry Systems by Farmers in Masaka-Uganda*. Journal of Ethno Botany Research and Applications, 10 059-068

*The Republic of Uganda (1998). The Land Act.*

Teutsch, C.D., Tech, V., and Smith, S.R. (2009). *Maintaining healthy horse pastures*. University of Kentucky

Tesi, D., and Isperto, G.I. (2008). *Epidemiological aspects of factors affecting reproductive efficiency in high producing dairy cows*. Universitat Autònoma de Barcelona

UBOS and MAAIF (2008), *The National Livestock Census*.

Uganda Bureau of statistics And Ministry of Agriculture, Animal Industries and Fisheries.

UBOS and Rakai District Local Government (2012) Sub county Development Programme of Community Information system.

Uganda Bureau of Statistics. Rakai District Socio Economic Report Volume ii.

Wasioka, B. et al (2011), *Comparing Biodiversity between Protected Savana and Adjacent Non-Protected Farmland in Southern Kalahari*. Journal of Arid Environments 75 (A), 836-84.

Weltz M. and Spaeth K. (2012) *Estimating Effects of Targeted Conservation on Non-Federal Rangelands*.

Whatcom conservation district. (2015). *Pasture management*. BMP Factsheet

Yin, R. K. (2009). *Doing case study research*. 4th ed. Thousand Oaks, CA: Sage.

Zake, J. (2015). *Smallholder Banana Farming Systems and Climate Variability: Understanding the Impacts, Adaptation and Mitigation in Mpigi District, Uganda*. Institute of Soil Research, Boku, and Vienna Austria. Phd Thesis, Institute of Soil Research Boku, Vienna Austria.

## APPENDICES

### Appendix I: Interview Guide

**Dear respondent,**

I am Kalokola James Pursuing a master's Degree in Agro Ecology at Uganda Martyrs University. Currently I am doing research on the Management practices and current status of individually owned Grazing land .The results of the findings will help cattle farmers on how to improve productivity of the farm. And above all will enable accomplish my studies since is one of the requirement .All information is kept confidential. Therefore, I do request for your cooperation. Thank you.

#### SECTION A

#### SOCIO DEMOGRAPHIC PROFILE

1. . (i) Sub county.....  
(ii) Parish.....  
(iii) GPS Co-ordinates.....
2. (i) Respondent's Name.....  
(ii) Age.....  
(iii) Gender.....  
(iv) Level of Education.....  
(v) No. of People in household.....
3. . (i) Major sources of income  
.....  
(ii) Major areas income spent on

**SECTION B: FARM CHARACTERISTICS AND FARM MANAGEMENT PRACTICES**

- 1 . (i) Farm location (GPS).....
- (ii) What is the size of this farm size? .....
- (iii)How many types of animals do you have on this farm and what is the number of each?.....
- (iii) When did you acquire this farm?  
.....
- (iv)How did you acquire it? (E.g. Inherited, donated, bought)  
.....
- (v) Under what land tenure system do you own it  
.....
- (vi) Do you have a natural water source on this farm? (In case is having is it all weather? )

**2. Section On Management practices .**

Do you have paddocks on this Farm? How many .....

How often do you rotate animals the animals between paddocks?

(ii) Have you cultivated some trees/ shrubs on this Farm (Intensive Sylvo pastoralism.)? .....

(iii) Name the type of trees/ shrubs you have planted?  
.....

(iv) Do you practice selective removal of unwanted trees/shrub? (extensive Sylvo Pastoralism)?  
.....

What nature of trees/shrubs do you remove?.....

(v) Do you practice Bush Clearing .....

How Often?

(vi) Do you practice Bush burning. How often?  
.....

(Vii) Have you established water sources on this farm? What is the nature? (E.g Bore hole, Valley dam) .....

(In case is not having, how does he cop with water scarcity?)

How do you compare this farm today in terms of being able to support your animals as compared to the past when you used to graze together with other members of the community? Give reasons .....

### **3. Assessment of Productivity**

(i) What is the main livestock on the farm

.....

(ii) What is the Major purpose of your farm?

.....

(iii) What type of breed do you have on this farm?

.....

(iv) What is the number of cows milked?

.....

(v) How many litres do you get per day?

.....

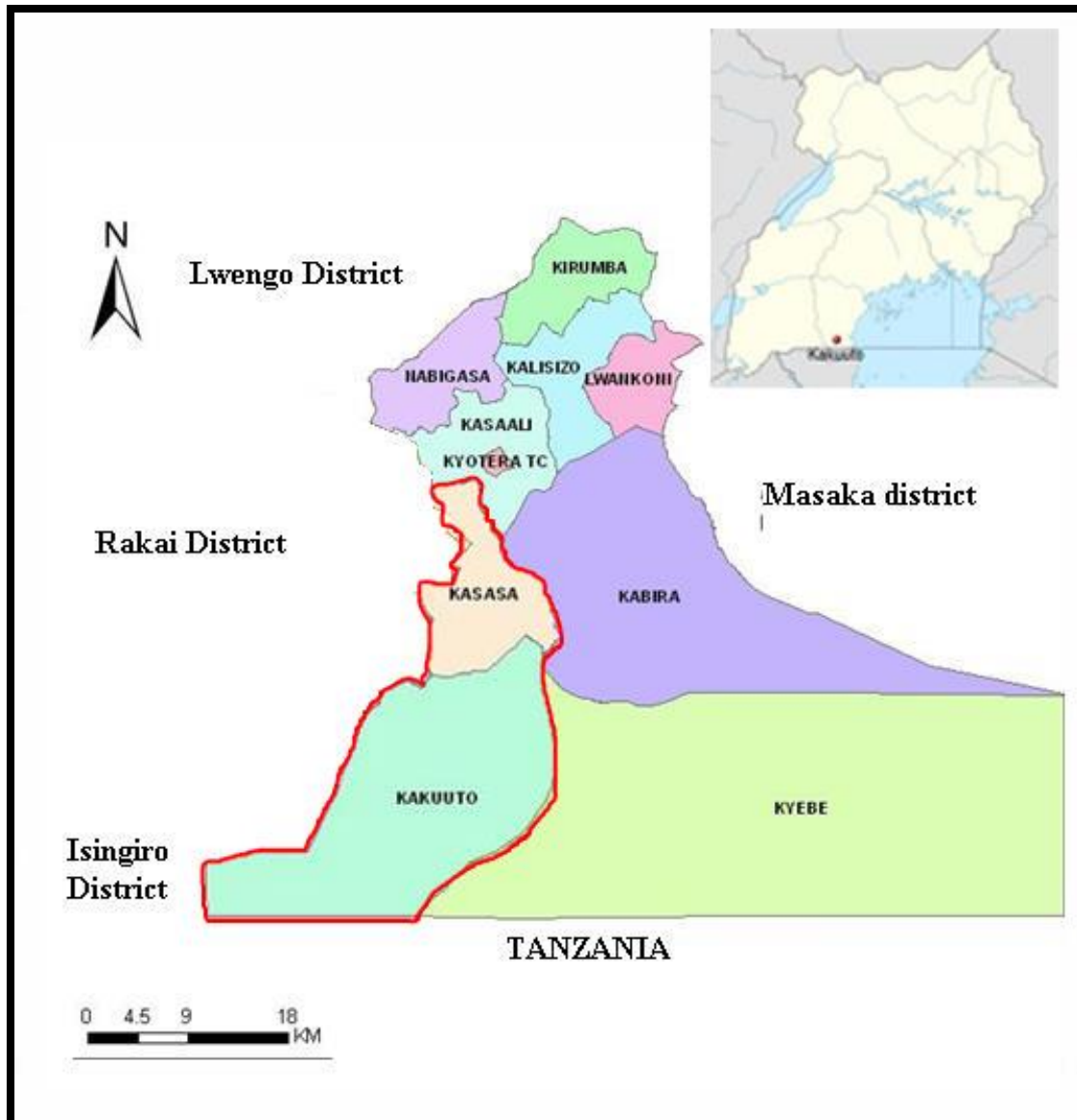
(vi) What is the average number of litres per day per milked cow?

.....

(vii) What is your view on the productivity of your animals today as compared in the Past when you used to the graze communally? Give reasons to justify your answer.

**Thank you so much for the time and cooperation**

**Appendix II: Map showing the location the study area**



### Appendix III: Budget for the entire research

No.	Item	Description	Units	Unit Cost	Amount
1	Stationary	This will support in the process of writing	L.S	L.S	150,000
2	Research Assistants	These was helpful in data collection	4	500,000	2,000,000
3	Transport	For both the research assistants and the researcher	L.S	L.S	700,000
4	Printing	To print draft copies and final copies	L.S	L.S	100,000
5	Binding	This is mainly for the final copies of the proposal and report	L.S	L.S	100,000
6	Umbrella's	These will help in saving time mostly in the field and guarding against rain which may spoil documents	5	15,000	75,000
7	Airtime	This will support the communication between the research team and respondents	5	40,000	200,000
8	Meals	Meals while in the field	L.S	L.S	150,000
	Miscellaneous	Other unforeseen costs	L.S	L.S	400,000
	<b>TOTAL COSTS</b>				<b>3,925,000</b>

### Appendix IV: The research work plan

No.	Activity	IMPLEMENTATION SCHEDULE											
		May				June				July			
		1	2	3	4	5	6	7	8	9	10	11	12
1	Introduction												
2	Literature review												
3	Methodology												
4	Designing of instruments												
5	Editing of the final copy												
6	Proposal submission												
7	Proposal Defence												
8	Addressing defence issues												
9	Data collection												
10	Data processing & analysis												
11	Compilation of the report												
12	First Draft of the report												
13	Proof reading and editing												
14	Submission of Research report												

#### Appendix IV: Surveyed Farmers

S/N	Parish of the Respondent	Farm owner	Farm location GPS – Coordinates
R1	Kijonjo	Mr. Kaviriri Geoge. W	S00-73845 <sup>0</sup> / E031-54366 <sup>0</sup>
R2	Kijonjo	Mr. Kabeera Sam	S00-75876 <sup>0</sup> / E031-56548 <sup>0</sup>
R3	Kijonjo	Gafari Jane	S00-72818 <sup>0</sup> / E031-56100 <sup>0</sup>
R4	Mityebiri	Mr. <sup>Abaho</sup> Moses	S00-72245 <sup>0</sup> / E031-52169 <sup>0</sup>
R5	Mityebiri.	Mr. Godfrey Kagwisagi	S00-70016 <sup>0</sup> / E031-52188 <sup>0</sup>
R6	kimukunda	Mr. Kateera	S00-75915 <sup>0</sup> / E031-49223 <sup>0</sup>
R7	Kimukunda	Mr. Kizza David	S00-76288 <sup>0</sup> / E031-51248 <sup>0</sup>
R8	Mityebiri	Mr. Mibirizi Geofrey	S00-770547 <sup>0</sup> / E031-51298 <sup>0</sup>
R9	Kimukunda	Mr. Kamuhanda	S00-74387 <sup>0</sup> / E031-51417 <sup>0</sup>
R10	Mayanja	Kobusingye	S 00.7870 <sup>0</sup> /E 031.54764 <sup>0</sup>
R11	Mayanja	Ntambara	S 00.80069 <sup>0</sup> /E 031.52464 <sup>0</sup>
R12	Kakuuto	Stephen	S 00.83454 <sup>0</sup> /E 031.45852 <sup>0</sup>
R13	Kakuuto	Kanamugire . E	S 00.87806 <sup>0</sup> /E 031.47056 <sup>0</sup>
R14	Kakuuto	Benon	S 00.81899 <sup>0</sup> /E 031.45362 <sup>0</sup>
R15	Kyebisagazi	Kalemera Didas	S 00.96219 <sup>0</sup> /E 031.38580 <sup>0</sup>
R16	Kyebisagazi	Joy Mbabazi	S 00.97042 <sup>0</sup> /E 031.38246 <sup>0</sup>
R17	Kyebisagazi	Lubega	S 00.97414 <sup>0</sup> /E 031.35427 <sup>0</sup>
R18	Mayanja	Kobusingye	S 00.78703/E 031.54764 <sup>0</sup>

### Appendix V: Observation Checklist

Parish: .....

Farm GPS Coordinates: .....

Farmers Name:

Quadrat No / Plant species	01 (%)	02 (%)	03 (%)	04 (%)	05 (%)	06 (%)	07 (%)	08 (%)	09 (%)	10 (%)	11 (%)	12 (%)	13 (%)	14 (%)	15 (%)	16 (%)	17 (%)	18 (%)	% AC	% AF	
<i>Hyperrenia-rufa</i>																					
<i>Bracharia spp</i>																					
Nandi-grass ( <i>Setaria anceps</i> )																					
Rhode-Grass ( <i>Chloris gayana</i> )																					
<i>Pennisetum- clandestinum</i> kikuyu grass																					
<i>Panicum maximum</i>																					
Green leaf desmodium ( <i>Desmodium intortum</i> )																					
Silver leaf desmodium ( <i>desmodium uncinatum</i> )																					
<i>Glycine-wightii</i>																					
<i>Centrocema- pubescens</i>																					

**Observational Notes**

1. Common plants observed (other than those mentioned above).....
2. General remarks on farm pasture management.....

## Appendix VI: Photographic Documentation

**EXHIBIT 1:** The researcher with one of the model farmers, who reserved land for pasture growing. He's specifically growing Gwatamala



**EXHIBIT 2:** The researcher (in around hat) listening to the responses advanced by the farmer



**EXHIBIT 3:** The researcher interacting with another set of respondents



**EXHIBIT 4:** The researcher keenly observing *Sporobolus pyramidalis*



**EXHIBIT 5:** The researcher with farmers standing at an over grazed farm



**EXHIBIT 6:** One of the farmers with better pasture management practices.

