THREATS TO INDIGENOUS KNOWLEDGE IN IMPROVING AGRICULTURAL PRODUCTIVITY IN CROP PRODUCTION:

A Case Study: Kabasekende Sub-County, Kibaale District

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DEDICATION

To my father Aston Sewante, my beloved mother Miss Tekera Nsungwa, my wife Asiimwe Florence, Late my Grand farthers Eriyazali Kawesa,and Mubyazarwa Emanuel, our children Katusiime Patience, Ngonzi Innocent, Murungi Jacqueline, Kawesa Vincent, Sewante Brian,Goodluck Joel, my brothers Mwesige John, Asiimwe Disan, my sisters Tusiime Joyce ,Birungi Christine,Late Katusabe Gertrude and Akugizibwe Beatrice and Without forgetting Nakku Prossy who tirelessly contributed to my success.

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LIST OF ACRONYMS

AIDS	-	Acquired Immune Deficiency Syndrome
CVI	-	Content Validity Index
GMO	-	Genetically Modified Organisms
HIV	-	Human Immunodeficiency Virus
IFIS	-	International Financial Institutions
IIRR	-	International Institute of Rural Reconstruction
IK	-	Indigenous Knowledge
IKS	-	Indigenous Knowledge Systems
ITK	-	Indigenous Technical Knowledge
MDG	-	Millennium Development Goals
NARO	-	National Agricultural Research Organization
NGO	-	Non-Governmental Organization
SPSS	-	Statistical Packages for Social Sciences
UNEP	-	United National Environmental Program
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
UNHS	-	Uganda National Household Survey

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ABSTRACT

The study was conducted in Kabasekende Sub- County, Kibaale District to examine the threats to indigenous knowledge in improving agricultural productivity in crop production. The specific objectives of the study were; to determine the ways in which IK is used in farming systems, to determine the benefits that farmers get from using IK in their farming systems, to establish ways by which IK used by farmers is losing its centrality in agricultural productivity and to suggest mechanisms of ensuring the IK survival and maintenance of its central position in farming in Kabasekende Sub-county.

Data was collected using interview guides. The study used a sample size of 96 respondents. At the end of the study, it was confirmed that farmers were still using IK in Livestock to manage parasites and diseases and selection of breeds. In crop production IK is still instrumental in selection of seed, determining seasons, control of pests and diseases, harvest and harvest handling and ensuring safety of produce.

Additionally, IK was reported beneficialinreducing on the costs of buying chemicals and maintaining soil fertility, recycling of farm resources, controlling pests and diseases, avoiding pollution of the environment, promoting the use of locally based resources in agricultural production, resiliency to climate change, maintenance and conservation of crop genetic diversity, increasing food security at house hold level and promoting life-support ecosystem services.

The study established lack of scientific proof , indigenous knowledge generated by farmers was becoming more difficult to share freely, IK lacked power at the global scale, employment opportunities provided a varied influence on knowledge produced by farmers, continual death of elders without passing on knowledge to the young ones and young people were growing up in a world of globalization as ways by which IK used by farmers was losing its centrality in agricultural productivity and respondents identified.

Further the study established that individuals and communities should be supported to document the IK they possess record but also use it for future generations. Innovators of IK should own

patents, sensitization and awareness on the value of indigenous knowledge, establishment of community resource centers for indigenous knowledge and integration of IK into the school curriculum where culturally and educationally is appropriatedas mechanisms of ensuring IK survival and maintenance of its central position.

The study thus recommended that there was need to understand the major factors that contribute to indigenous knowledge production and how it‘s used within the farming communities, if it is to be sustained for future development. Development programs need also to be tailor-made to suit specific situations and places, thereby increasing the likelihood of their success. They should embrace IK in practice and theory in their programs. IK to gain much power and be sustained for generation there is a need to be published. There is a clear need to weigh the positive contributions of indigenous knowledge against their negative ones, in the sense that, for many in Africa, the use of indigenous knowledge has not necessarily transformed their lives as compared to modern technology.

CHAPTER ONE
GENERAL INTRODUCTION

1.0 Introduction

This study was conducted as an investigation into threats to indigenous knowledge in improving agricultural productivity, using a case study of Kabasekende Sub-county-Kibaale District. The chapter presents the background to the study, statement of the problem, research objectives, research questions, conceptual framework, and significance of the study as well as the scope of the study, definition of key terms and justification.

1.1Background to the study

Traditional agriculture is believed to have been sustainable. This stimulates conservationists to analyze and, if possible, benefit from the wisdom of indigenous knowledge at least what has remained from it or can still be remembered by local people (Kumar,2010). The reason for such a search is clear: world population is steadily increasing and the demand for food is too appealing. Poverty is growing and natural resources are degrading (Briggs, 2005). Some 550 million of the 1,370 million hectares of global arable lands have suffered degradation as a result of non-sustainable cultivation (Glasod, 1991).

The Green Revolution technologies, which partly solved the problem of food and fibre needs, appeared to be too expensive, as the costs of technology transfer, soil erosion and loss of plant genetic materials that were resistant to diseases are high (Kumar,2010). Traditional agriculture, as it was originally applied, can neither be fully resumed nor would it satisfy the food needs of the increasing world population (Kumar, 2010). It is however useful to preserve and mobilize local knowledge, which reflects expertise in and understanding of the environmental aspects gained over thousands of years (Kumar 2010).

The indigenous communities played an important role in generating knowledge based on the understanding of their environment, devising mechanisms to conserve and sustain their natural resources (Warren 1992) and establishing community-based organization that serve as a forum for identifying problems and dealing with them through local-level experimentation, innovation and exchange of information with other societies (Kumar,2010). Observation of nature and through elementary reasoning based on such observation, the communities accumulated a store of working knowledge concerning the effects of certain elementary mechanical processes, the apparent movements and functions of some of the heavenly bodies, the habits and haunts of animals and birds, the properties of plants, fruits and flowers, barn and roots, the nature and qualities of different kinds of soils and variations of weather (Kumar 2010). Indigenous knowledge is historically constituted (emic) knowledge instrumental in the long-term adaptation of human groups to the biophysical environment (Purecell, 1998).

UNEP (2002) argues that indigenous knowledge is the knowledge contained in the heads of farmers and agricultural workers. He draws the relation of indigenous knowledge to the development of technologies: ―Part of indigenous knowledge consists of technologies developed over decades of adjusting farming systems to local agro-climatic and social conditions. And in some circumstances, local knowledge also consists of knowing how to keep conditions of productivity over the long run, rather than maximizing productivity in years of optimal conditions‖ (2001:94). On the other hand, Amiott(2003) indicates that indigenous knowledge entails practices of local communities around the world developed from experience gained over centuries and adapted to the local culture and environment, and transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Sometimes it is referred to as an oral tradition for it is practiced, sung, danced, painted, carved, chanted and performed down through millennia. According to Nakata (2007), indigenous knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health, horticulture, forestry and environmental management in general. Additionally, indigenous knowledge is often perceived as historical and ancient practices of the African peoples, which is a problematic perception (Micheal M van Wyk (2014) and Owur (2008)).

Semali & Kincheloe (2000), indigenous knowledge reflects the dynamic way in which the residents of an area have come to understand themselves in relationship to their natural environment and how they organize that folk knowledge of flora and fauna, cultural beliefs, and history to enhance their lives. Indigenous knowledge is the basis for local-level decision-making in many rural communities. It has value not only for the culture in which it evolves, but also for scientists and planners striving to improve conditions in rural localities. Incorporating indigenous knowledge into agricultural production can lead to the development of effective adaptation strategies that are cost-effective, participatory and sustainable (Robinson and Herbert, 2001).

In Uganda, agriculture is the source of livelihood (cash and food crops) and employment. The largest percentage of rural communities satisfies their subsistence needs through agricultural production by tending to majorly coffee, maize, beans, bananas and cassava.

For decades, farmers have planned agricultural production and conserved natural resources by adopting indigenous knowledge. According to Briggs (2005) the use of indigenous knowledge has been seen by many as an alternative way of promoting development in poor rural communities in many parts of the world. Kumar (2010) argues that with the rapid environmental, social, economic and political changes occurring in many rural communities, there comes a danger that the indigenous knowledge possessed is likely to be strained and lost forever.

1.2 Problem Statement

Local sustainable development strategies for any society involve working, learning and experimenting together at the local level. This can be achieved through appreciating what IK can contribute to a local sustainable development strategy while taking into account local circumstances, potential, experiences and wisdom (Kumar, 2010). Indigenous Knowledge has been developed, tested and passed on over thousands of generations, but it is likely that as a result of tumultuous changes in recent generations, vast amounts of knowledge could be lost, probably over the next decade if current trends continue (Briggs, 2005). It is not clearly documented how indigenous knowledge (IK) could be applied in farming systems as one the approaches of safeguarding against the IK‘s loss. The use of IK in farming is believed to enormously benefit farmers but a systematic investigation into the possible benefits had not been carried out. Further, options into mechanisms of ensuring sustainability of IK had not been documented. Thus, this was the underlying reason that compelled the researcher to undertake a study on the threats to indigenous knowledge in improving agricultural productivity using a case study of Kabasekende Sub-county.

1.3 Objectives of the Study

1.3.1 Major objective

The general objective of the study was to determine factors that threaten indigenous knowledge in improving agricultural productivity in Kibaale District.

1.3.2 Specific Objectives

i) To determine the ways in which IK is used in farming systems

ii) To determine the benefits that farmers get from using IK in their farming systems

iii) To establish ways by which IK used by farmers is losing its centrality in agricultural productivity

iv) To suggest mechanisms of ensuring the IK survival and maintenance of its central position in farming in Kabasekende Sub-county.

1.4 Research Questions

i) What are the ways in which IK is used in farming systems?

ii) What are the benefits of indigenous knowledge towards agricultural production?

iii) What are the ways by which IK used by farmers is losing its centrality?

iv) What are the mechanisms of ensuring the IK survival and maintenance of its central position in farming in Kabasekende Sub-County?

1.5 Scope of the Study

1.5.1 Geographical Scope

The study was conducted in Kabasekende Sub County, Kibaale District. The study covered the farmers and agricultural officials in Kabasekende Sub County. Kabasekende was chosen because it is part of those western parts of Uganda where agricultural production has highly been practiced.

1.5.2 Content Scope

The study focused on threats to IK in improving agricultural productivity in Kabasekende Sub-County, Kibaale District. Threats became the independent variable and agricultural productivity became the dependent variable.

1.5.3 Time Scope

The research activities specifically considered farmers that engaged in agricultural production for eight years and above. This implies that all farmers whose years of operation less than the stated duration above were not considered in the study. This was so because farmers who have operated between ten years above have got a chance of using both the modern knowledge and the indigenous knowledge long enough.

1.6 Significance of the Study

The study may be of much importance to agricultural practitioners as it will act as a guide in pointing at where indigenous knowledge is still central in agricultural production. The study also served as a tool in discovering critical points where IK can complement the modern agricultural practices and technologies that is imparted on local farmers. The study also identified mechanisms on how we can use IK to improve agricultural production instead of resorting to modern knowledge that seems to be too expensive to the farmers. The study will guide policy makers in designing and implementing appropriate strategies required to tap and harness indigenous knowledge for improved agricultural production

1.7 Justification of the Study

As we enter into the 21st century, new global agricultural technologies, researches and improved ways of modern agricultural knowledge in form of cultural, social, political, and economic changes are emerging. This kind of modernity that is going on all over the world seems to put indigenous knowledge systems at risk of becoming extinct. The more the farmers use new technologies and they find it easier and convenient, the indigenous knowledge disappears. In agro-ecology therefore, the issue is not always to oppose technology or inputs in agriculture but instead to assess how, when, and if technology can be used in conjunction with natural, social and human assets. There is need therefore to capture, preserve and disseminate this knowledge widely and avoid the risk of getting extinct. Achieving this will require a thorough knowledge on the threats hence their effective management. Despite the fact that there were such studies done on threats to IK but they were done in other areas of study. This kind of research is very important and the first that was conducted in Kabasekende sub county, Kibaale district.

1.8 Definition of Terms used in the Study

The terms below have been defined operationally thus;

i) **Indigenous knowledge:** referred to the complex set of activities, values, beliefs and practices that has evolved cumulatively over time and is active among communities and groups who are its practitioners Micheal M Van Wyk, (2014).

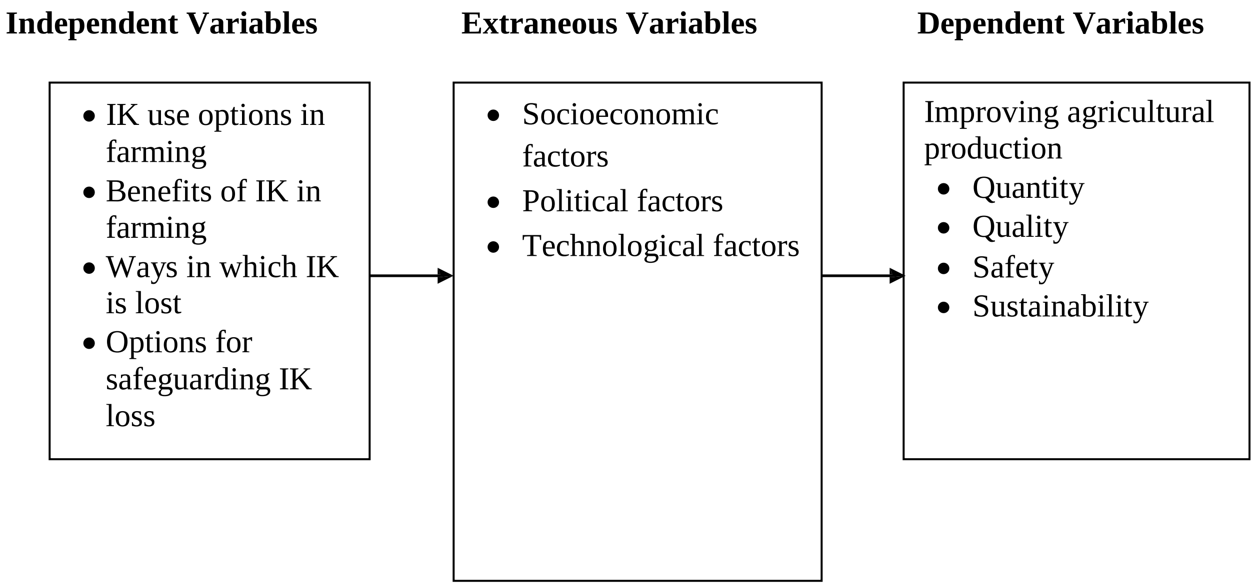
ii) **Agricultural productivity:** in this study, this was conceived to refer to any change in the agricultural practices put in place to ensure sustainable food production at the local level

iii) **Threats**: in this study, this was used as a situation or activity that could cause damage or loss.

iv) Crop production: this referred to the growing of staple food crops, fruits, nuts as well as other food produce and commercial crops

1.9 Conceptual Framework

The importance of indigenous knowledge in agricultural advancement cannot be underestimated. The present strides in technology have had a greater borrowing from indigenous knowledge. However, IK has been threatened and its future depends on a better understanding of the potential threats and to ensure their integration to achieve the obvious gains. The researcher therefore conceptualized that effective utilization of IK can only succeed if these factors are properly understood. Thus the conceptual framework is as follows;



Conceptual frame work for the study

In the conceptual framework above, it can be realized that independent variable: threats to IK in form of social, economic, political and technological advancements directly affects extraneous variable: indigenous knowledge in form of seed selection, knowledge of season, crop management, postharvest handling, pasture management, vector and disease control, breed selection destroying the indigenous knowledge which would be of much importance in improving agricultural productivity dependent variable: in forms of increasing the quantity, quality, safety and sustainability of food production.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this chapter, the researcher critically analyzed work of other people related to variables under study. A review of the ways under which IK is used in farming systems, its benefits and threats is presented. Additionally, it presented the related literature on mechanisms how IK can be maintained and sustained.

Indigenous knowledge (IK) is the local knowledge – knowledge that is unique to a given culture or society. IK contrasts with the international knowledge system generated by universities, research institutions and private firms. It is the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management, and a host of other activities in rural communities (Warren 1991). Indigenous Knowledge is the information base for a society, which facilitates communication and decision-making. Indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems (UNESCO 2002)

2.1 The Indigenous Knowledge used in Farming Systems

This section handles reviewed literature used in farming systems. Particularly, literature here is divided into two that is indigenous knowledge used in crop husbandry which consists of seed selection. Knowledge on seasons, crop management, post-harvest handling and indigenous knowledge used in animal husbandry which includes pest management, vector and disease control.

2.1.1 Indigenous Knowledge used in Crop Husbandry

2.1.1.1 Seed Selection

Indigenous knowledge is viewed in many forms and among which is seed selection. The selection of seeds was the beginning of food production. Proper selection was important in achieving food security.

For instance, before the emergence of colonialists, winnowing was followed by separation of the seeds for planting and grain crops for consumption. Selection was based on seed size, color, texture and resistance to diseases and pest attacks. The indigenous seeds did not have the problems of reduced yields as would be the case with modern-day hybrid seeds UNEP(2008) .In the islands of Mfangano and Rusinga in Lake Victoria, for example, the people relied on their own seeds, which were identified during harvesting and preserved for the next season. That is how old dependable, such as sorghum, millet, yellow maize and other popular food crops, were produced among the indigenous communities. They were dependable because of their high tolerance to drought communities also devised many native technologies and approaches to ensure there was food security given the climatic hazards and uncertainties. Winnie Fridah (2013) reports that selection was done by elderly women who were well versed in indigenous knowledge systems. This means that those even grown up women are able to spend the whole day selecting seeds. Interesting to note was that where there were elderly men like women, these did not select seed crops. It was viewed as specific role for women. They could go ahead to treat grain crops for future consumption**.** Sorghum, millet, and maize were treated using manure and wood ash mixture as a preservative. According to Mukiibi (2001), selection of seeds traditionally depended on good seeds which at the start were good crops, those seeds which in the garden contained more food and produce healthier, heavier seedlings with more roots. They also selected seeds which had result in uniform germination and growth, they also chose those seeds which grew faster after transplanting. These seeds must have possessed cultivar purity, free from weed seeds, uniformly-large seeds, free from seed-borne diseases, have low moisture content and have high germination capacity. Seeds could be naturally crossed with undesirable types, diseased plants, off-type plants and selective influence of certain diseases. To improve the seed quality, rouging at different crop stages: vegetative, flowering and at maturity was done, cleaning, drying, storing in a good place. (Mutyaba, 1998) argued that in the past, farmers were relying on own saved seed which is weakened by factors that include; climate change (natural factors), introduction of GMO‘s, fake seed on the market (man -made factors). NARO (1997) further states that smallholder farmers who produce more than 85% of total food production and consumption and marketing in Uganda have been the most affected by seed insecurity. According to Echweru 2012, 48% of the respondents acknowledged using indigenous knowledge in seed selection, seed storage weeding and planting mode. Therefore, to select a seed for plantation on the next season depended so much on morphological characteristics: like plant height, erectness of leaves, tillering ability, panicle size and grain type/size.

2.1.1.2 Knowledge of Season

According to Lisa and Asha (2000), in Rakai reveals that local people know the typical timing and duration of the seasons. The first rainy season (*toggo* in Luganda) is expected to run from March through May; the second season (*ddumbi* in Luganda) runs from September through December (Lisa and Asha (2000)).

Using the views of (Bifiirawala, 1994), many farmers prefer the use of indigenous grains such as millets and sorghums that are more drought-resistant than maize and also produce high yields with very little rain. Farmers also prefer specific crop varieties for drought seasons, such as an indigenous cassava, finger millet variety as it ripens fast, and an early maturing cowpea (*Vigna unguiculata*) variety. Generally, in areas with little moisture, farmers prefer drought-tolerant crops (like *Cajanuscajan*, sweet potato, cassava, millet, and sorghum), and management techniques emphasize soil cover (such as mulching) to reduce moisture evaporation and soil runoff. These varieties that exhibit high genetic variability have a huge untapped potential to be grown in many marginal environments of Africa and elsewhere threatened by climate change.

Mostly, rural communities depended on four seasonal indicators in villages (Baum and Godt, 2010) and these included astrological, vegetation (e.g baobab, acacia) indicators, birds (shift in the seasonal migration) and winds. There is, in fact, a vast amount of literature that documents how smallholder farmers use knowledge systems to adapt to climatic trends in Africa (Walter and Dietrich, 1992; warren, 1991). To take a few examples, a study of the Mende farming systems in Sierra Leone demonstrates how farmers use sophisticated agronomic practices to mediate poor rainfall Baum and Godt, 2010), while in northern Nigeria, farmers use multiple cropping and varietal experimentation to mitigate against uncertain precipitation and high rates of evaporation (Ebi and Schmier, 2005). The Nganyi community of western Kenya, furthermore, uses traditional methods of weather forecasting — the behavior of ants, bird songs and timing of tree flowering — to decide when to prepare lands and sow seeds (Guthiga and Newsham, 2011).

2.1.1.3 Crop Management

All over the world, shifting cultivation, also called swidden agriculture, has been and still is practiced to manage soil fertility. Shifting cultivation involves an alternation between crops and long-term forest fallow (Oxfam, 2008). In Uganda, Esegu *et al*. (2000) argue that forest is cut and burnt to clear the land and provide ash as 'fertilizer' or 'lime' for the soil. Crop yields are typically high for the first few years but then fall on account of declining soil fertility or invasion of weeds or pests. The fields are then abandoned and the farmer clears another piece of forest. The abandoned field is left to fallow for several years or decades and thus has a chance to rebuild fertility before the farmer returns to it to start the process again. Shifting cultivation is often characterized by a season-to-season progression of different crops which differ in soil nutrient requirements and susceptibility to weeds and pests. Akullo *et al*. (2007) mentioned various management practices using indigenous knowledge such as early planting to reduce incidence of pests and diseases, grass burning ash is assumed to be a source of nutrients and also burning is believed to kill crop pests.

Indigenous farmers developed various techniques to improve or maintain soil fertility. For example, farmers in Southern Sudan and Zaire noticed that the sites of termite mounds are particularly good for growing sorghum and cowpea (Chandler and Wane, 2002). Chandler and Wane (2002) adds that in Senegal, the indigenous agrosilvo pastoral system takes advantage of the multiple benefits provided by *Faidherbia* (formerly *Acacia*) *albida*. The tree sheds its leaves at the onset of the wet season, permitting enough light to penetrate for the growth of sorghum and millet, yet still providing enough shade to reduce the effects of intense heat .Mixed cropping and intercropping farming technologies were adopted to optimize the use of naturally available soil nutrients and to promote high yields. Mixed farming could also mean keeping livestock as well as engaging in crop growing at the same time, which helped improve the fertility of the soil by using the manure that came from the animals (UNEP, 2008)

Farmers in the Usambara Mountains in Tanzania developed a multistorey farming system in which they practiced fallowing, intercropping and selective weeding. Young crops do not provide ground cover. The farmers understood that, if weeds are left to grow, they cover the soil, prevent it from heating up or drying out excessively, induce a positive competition which stimulates crop growth, and reduce erosion during rainfall (Lwoga, 2010). Later in the season, when the farmers regarded weed competition as negative for crop growth, they did superficial hoeing. They left the weeds on the soil surface as protective mulch, to recycle nutrients and to allow nitrogen assimilation through the bacteria decomposing the plants. The crops could then develop fully. A second generation of weeds was allowed to cover the field completely and produce seed, so as to ensure their reproduction in future seasons. When the dry season start, the field is covered with high weeds, the soil remained moist, soft and rich in humus and was thus in good condition for the next growing season. However, the introduction of the principle of weed free fields led to the collapse of this system of weed-tolerant cropping, so that fertilizer became necessary to replace the green-manuring effect of selective weeding.

2.1.1.4 Post Harvest Handling

According to Tsiko (2007) indicates that most seeds, for example, from varieties of melons and pumpkins are not treated with any herbs or chemicals but undergo air and sun drying after which they are kept in clay-pots, calabashes and closed granaries to protect them from weather conditions. In Uganda, (Namazzi, 2007) adds that the green pumpkin maybe left in the fields until they are hardened and can no longer be eaten as fresh. These are dried and kept beneath granaries until the next planting season. The crushing is done towards the next planting season and the by-products are seeds and various calabashes, which are used as containers of water, beer, herbal medicines, milk, and grain among others. The seeds are kept safely in a dry place. People had it that all these type of seeds can stay for a year without being attacked by borers.

Tsiko (2007) still argues that if peas and ground nuts are left with outer covers, they last for 1-2 years. Storage places are drums, clay-pots, calabashes, sacks and closed granaries. Among all the seeds crops, beans were the most vulnerable to insect and fungal attacks. These rarely go beyond 12 months even after treatment. Shava (2013) also indicate that for beans, besides drying with outer covers, they can also be treated with ash mixtures or be half-heated. UNHS (2010) adds that the sun dried, ash treated and heated beans are stored in sealed containers or granaries until the next planting season.

Akullo *et al*. (2007) revealed that various practices farmers use in post-harvest handling which she referred to as rudimentary. The remains of the freshly harvested cassava if not consumed or sold all, because of the high perish ability, the fresh tubers are buried in moist soil measuring 1ft deep. According to farmers, the tubers stay fresh for up to seven days. She further reveals that storage pests for beans are controlled by cutting and putting elephant grass flowers locally known as estate together with leaves of ‗obukomera' and neem tree (Mukiibi, 2001). The scent produced by these plants is believed to have a repelling effect on pests during storage.

2.1.2 Indigenous knowledge used in Animal Husbandry

This section handles the indigenous knowledge that was used in animal husbandry. These consist of past management, vector and disease control.

2.1.2.1 Pasture Management

Traditionally, farmers used transhumance pastoralism to manage their pastures (Braman, et al, 2013). Where livestock are kept in regions with large seasonal differences in precipitation and temperature, a rational low-external-input management form is to move the livestock with the season. American ranchers use winter and summer pastures; shepherds in European mountain areas use alpine and valley pastures; African pastoralists use wet-season and dry-season pastures (Kikomeko 1994). Traditionally, pastoral peoples, such as the Fulani in West Africa, keep their livestock in more arid areas during the wet season, where forage quality is relatively high. In the dry season, when water becomes scarce in the north, they move their animals further south to more humid areas, where the livestock can graze the crop residues in harvested fields and the still-green grass in low-lying areas along streams and rivers (Oyedokun and Oladele, 1999)

Majority of ruminant livestock farmers in the rural areas depend on natural pastures and forages usually found in communal grazing area. These are overgrazed and therefore cannot provide adequate nutrients for good level of productivity among the ruminant livestock. There are reports that one of the major constraints for improved productivity is the low quantity and quality of available forages during the dry season that cannot meet nutrient requirements of grazing ruminant livestock in Limpopo province (Matowanyika, 1994).

According to Matlebyane (2010), in Zimbabwe, farmers' example use *Aloe vera* leaves to induce oestrus in female ruminant animals. The slippery-foamy liquid produced by *Dicerocaryum seneciodes* (mompati), a shrub used to assist cattle that experience problems during parturition and this observation concurred with Van der Merwe *et al*. (2001).Orloveet *et al*. (2008) in southwestern Uganda, *Dicerocaryum seneciodes* isusually ground and smeared around the protruding foetus for easy expulsion. Farmers identified *Solanum parduriforme* (motholla) as herb used for treating diarrhea and bloat and this agreed with Bossard (1996) in Angola for the treatment of diarrhea and bloat in cattle. Mathabe et al (2006) reported the use *Gymnosporia senegalensis* (mophato) to prevent diarrhea ruminant livestock. In addition, this shrub was associated to stop bleeding and treatment of wounds in animals attacked by predators. The farmers indicated that the stem of Euphorbia species is ground and mixed with water. The resultant liquid obtained from the mixture was introduce into the reproductive tract of a cow to induce the expulsion of a retained placenta and this agrees with Jaouad El-Hilaly *et al*. (2003) in northern Morocco. The farmers also indicated that they use *Aloe zebrina* to treat livestock against contagious abortion.

National Agricultural Research Organization (1997) argues that rotational grazing is also another means of pasture management employed traditionally in Uganda. For instance, Iteso pastoralists in Eastern Uganda use rotational grazing as a strategy for effective utilization of rangelands. Rotational grazing is undertaken for two reasons. The first is to avoid the problem of overgrazing and allow regeneration of pasture. The second is the need to respond to the climatic variations within and between months of the year. Controlled burning is another management strategy used by cattle pastoral community to improve the quality of their rangelands. This is done mainly to allow the regeneration of new pasture. The decision to burn a specified area is usually made through the meeting of elders (usually only males).

2.1.2.2 .Vector and Disease Control

The interest in ethno veterinary practices was employed. Many of these practices offer viable alternatives to conventional western-style veterinary medicine especially where the latter is unavailable, unaffordable or inappropriate. Ethno-veterinary medicine can provide low-cost health care for simple animal health issues though it tends to be ineffective against infectious diseases. Ethnoveterinary remedies are often based on knowledge and tradition from folk medicine for human use. Most of the plants used are easily available but non-plant substances are also used. For example, warm stout is given to animals after they have given birth to help remove the afterbirth and cobwebs are used on cuts to help stop the bleeding. Some of the plants used are multipurpose such as guava, bamboo, rice, turmeric (*Curcuma longa*), aloe (*Aloe vera*), banana (*Musa spp.*) and *Kalanchoe pinnata (*Gomez, 1988). These plants are either already found on farms or they can easily be grown. Many of these plants also have a food value. For example, an excess of green bananas can be ground, boiled and fed to stock as a source of carbohydrates and iron. Guava fruits and leaves contain useful vitamins. *Cymbopogon citratus* and *Ocimum gratissimum* can be used to make delicious teas. Medicinal plants to treat ruminants are used mainly for internal parasites, internal and external injuries and pregnancy-related conditions. Farmers usually boil the plants to make a decoction. Other plants are administered as teas, in which water is boiled and thrown on to the fresh leaves, which are left to steep (an infusion) and then administered once or over a period of days. Bamboo joints, thin-necked bottles or other appropriate instruments are used to drench the animals. As with any technology, care has to be taken in the use of indigenous medicine and application of knowledge. However, more attention to the potential of these approaches is likely to unlock a vast area of useful knowledge for conditions where modern medicine is out of reach (Tsiko, 2007)

IK indicates that animals may be kept in stables year-round or only seasonally. During wet growing seasons animals tend to be kept on the homestead whereas afterwards they are allowed to graze on the harvested fields and in the bush. In semi-zero grazing systems, animals are kept in a stable or fenced enclosure for part of the day and particularly during the night, where they may be given some cut fodder. For the remainder of the day, they are allowed to graze.

Castration of a male animal that is not to be used for reproduction. Animals are castrated to prevent unwanted reproduction, to make them easier to handle or to obtain a particular meat quality. Animal housing in the warm tropics requires a shed design that keeps out rain and solar radiation, while allowing the free flow of air. Ventilation helps to cool the animals by allowing evaporation of water (sweat), thus cooling the air; by keeping the sun out, the place is also kept cool. In the hot tropics walls can be absent, although thick brick, stone or mud walls can help to lower temperature fluctuations between day and night. Roof overhang is important to keep out the sun and rainstorms when walls are absent. Trees provide shade and fresh air around the stable. They can be used to store feed and roofing material should reflect the solar radiation and allow ventilation while preventing draught. To deflect solar radiation the roof can be painted white, made of reflecting materials, of tiles and/or plant materials that insulate (such as straw, grass or palm tree leaves). Below is table 2.1 indicating the disease and ITK used.

Table 1:ITK used in disease control

Disease	TKs Used
Dysentery	• One hundred to one hundred fifty g *stem*, leaves of *Anantamul* (Indian sarsaparila, *Hemidesmus indicus*) is grounded and juice is extracted and mixed with honey and to be fed to the animal suffering from dysentery. • Three pieces of *Golmorich* (Black pepper, *Liquorice Glcyrrhiza glabra Piper nigrum*), 2 teaspoon full ghee and 50 g smashed *Jastimadhu* are mixed with 250 ml cold water and to be drenched. • Decoction of the root of *Babul* (*Acacia arabica*) is mixed with mustard oil in the ratio of 1:3 and to be drenched to the animal.
Disease	ITKs Used
Dog bite	• Roots of *Bonson* tree are mixed with 21 pieces *Golmorich* (Black pepper, *Piper nigrum*) and the paste is fed to the animal.
Disease	ITKs Used
Cough and cold	• One hundred g *Tulsi* leaves (Holy basil, *Ocimum sanctum*) and 100 g *Basak* leaves (*Adhatoda vasica*) are boiled with water. Then extracted juice is mixed with 1-teaspoon honey and fed to the animal. • Three to four pieces of *Tejpata* (Indian cassia lignea, *Cinnamomum tamala*), 50 g *Ada* (Ginger, *Zingiber officinale*) and *Aswatha* (*Ficus religiosa*) leaves are mixed. Extract is made from the mixture and is drenched to the animal along with water.
Disease	ITKs Used

Anoestrus	• Seven pieces of chicken egg per day is to be fed for seven days. • Twelve pieces of *Kala* (Edible banana, *Musa paradisiaca*) along with 400 g sugar are to be fed for 2 days. • One hundred g paste is made from *Jaba* (Chinese hibiscus, *Hibiscus rosa sinensis*) flower's bud and old sugarcane *(Saccharum sinense*) jaggery, then to be fed for 15 days.
Disease	ITKs Used
Wound	• Sap extracted from leaves and stem of Kesurta (*Scirpus grossus*) is mixed with *Rasun* (Garlic, *Allium sativum*) and to be applied topically. • *Halud* (Turmeric, *Curcuma domestica*) is grounded and applied topically. • Roots of *Kuchila* (Snakewood, *Strychnos nux-vomica*) and roots of *Surjamukhi* (Common sunflower, *Helianthus annuus*) is mixed with *Palas* (*Butea monosperma*) petals and mustard oil and applied topically over the wound.
Disease	ITKs Used
Diarrhea	• Pulp of 100 g old ripened *Tentul* (Tamarind, *Tamarindus indica*) is fed to the animal for two to three days. • Fifty ml sap of *Peyara* (Common guava, *Psidium guajava*) leaves is fed. It is efficient for goat especially. • Juice of *Anarash* (Pine apple, *Ananus comosus*) leaves is mixed with water and then is to be drenched 100 ml daily for 2-3 days. • *Neem* (Margosa tree, *Azadirachta indica*) leaves and bark of *Daka* and bark of *Daniaa* are mixed and sap is extracted from the mixture and then 100 ml of it is drenched everyday for 3-4 days.

Source: Madebwe, Madebwe and Kabeta (2005)

2.1.2.3 Breed Selection

The breeding objective of increasing productivity per animal has been attempted through: grading up of local cattle with improved indigenous breeds, selection within the indigenous breeds, and crossbreeding of native cattle with temperate dairy breeds. Upgrading programs bring the level of inheritance of the local stock to 15/16 of the breed used for upgrading in four generations which takes approximately 30 years. The entire population at the end of 30 years in the region could be, for example, Sahiwal, with a production level between 1800 and 2000 kg per lactation Lindsay and Charan (1999) & McCall, (1994).

The Red Sindhi, Sahiwal, Gir, Kankrej and Ongole breeds have been used in grading up in various parts of the tropics and sub-tropics for improving milk production. This is due to their tick resistance and heat tolerance qualities. The method has helped to increase yield levels especially in the Indian sub-continent where good indigenous dairy breeds were available and used in the grading program. A genetic study in Kenya of grading up of East African Zebu to the Indian Sahiwal covering over 25 years, revealed a substantial increase in milk production in various Sahiwal grades (31-64 per cent) over East African Zebu. The increased production in Sahiwal grade cows was associated with an increased length of lactation, and a slightly larger calving interval than in East African Zebu (Mahadevan *et al*. 1962). Sahiwal grades proved adaptable to conditions of high altitude and high rainfall.(Lindsay and Charan 1991).

Selection for higher milk yield in indigenous cattle breeds through culling of inferior cows and selection of young bulls on dam's yield and body conformation is the origin of animal breeding. In most herds, culling of cows was practiced after three or four lactations. Thus progeny of inferior cows need to be called also, a difficult task in smallholder conditions (Lwoga, 2010)

Mukiibi (2001) indicated that crossbreeding of indigenous tropical breeds with temperate dairy breeds is undertaken to combine high milk yield and early maturity of European dairy breeds with hardiness, disease resistance, and adaptability of local cattle. Initial crossbreeding experiments had setbacks due to outbreaks of rinderpest and other killer diseases to which European breeds are particularly susceptible. Control of these diseases with prophylactic vaccines allowed planned crossbreeding experiments to be taken up in countries such as, India, Pakistan, Sri Lanka, the Philippines, East Africa, West Indies, southern United States and Australia. These crossbreeding experiments clearly demonstrated that crossbreeds were better producers of milk than indigenous breeds and were more adaptable to the tropics than pure-bred exotic breeds (Garwe*et al*., 2009).

The Benefits that Farmers Get From Using IK in their Farming Systems

Empowerment has been singled out as a major benefit for using IK according to Moyo (2010), IK leads to the empowerment of local people through their participation in development programs. He further reveals that Indigenous knowledge is also found to be resilient and beneficial to farmers regardless of income level by reducing their costs of production, to be adaptable to different environmental and economic circumstances, and to provide for a more sustainable use of resources in farming. Indigenous Knowledge Systems (IKS) in farming practices form a bed rock of a community's composite and collective wisdom which is passed from one generation to the other Madebwe*et al*. (2005). IKS act as a community's armor against environmental shocks and manifests community's resourcefulness. Madebwe *et al*. (2005) argue that IKS allow local communities to solve local environmental problems using endogenous solutions which they have full control of. Wide range of indigenous agricultural land use practices by farmers are based on generations of informal experience and experiments and intimated understanding of bio-physical and social environment (Mapara, 2009).

Madebwe *et al*. (2005) noted that marginalization of IKS has resulted in rapid loss of traditional seed varieties best suited to the prevailing agro-economic conditions. It has also led to the cultivation of unsuitable crops for marginal farming areas. Traditional ways of seed selection and preservation are not considered a priority after years of dependence on commercially produced high yielding varieties.

Winnie Fridah (2013) is of the view that Africa is rich in traditional and indigenous foods which have not been researched on to show nutritional value and methods of improving their processing and preservation. Researchers have been undertaken on modern methods of processing to improve acceptance and utilization of overall food security. Traditional methods of production, processing, preservation and storage have been ignored .Grain (1990), states that the hesitance of farmers to adopt hi-tech packages is often a positive indication of farmer innovation. Farmers are unlikely to risk making wholesale changes to their production systems, given the precarious nature of their environments. Instead, they experiment with new technologies, modify them, and incorporate parts into their own proven farming methods. Millennium Development Goals (MDG) (2004) cites that maize is the staple food, as such; hunger is commonly associated with its shortage in the country. Other crops like sorghum and millet are not considered as staple grain. This is echoed by Mararike (2000) who postulates that maize is the most popular crop in Africa which is grounded into flour used to prepare thick porridge sadza or kawuga, the staple food for most people in Zimbabwe and Uganda respectively.

2.3 Threats to Indigenous Knowledge (The Ways by Which IK Used by Farmers is Losing its Centrality in Agricultural Productivity)

When British colonialists first arrived in the East Africa they perceived its landscape as a wild habitat. The presence of people and cattle was considered a threat to the landscape and its wildlife. Their background in a sedentary culture made them fail to see the inter-connections and rationale of the nomadic strategy and its role in creating and maintaining the landscape. They also failed to see the resource use efficiency of the pastoral systems when viewed from a larger space-temporal scale than the agricultural zone for a single all-year-around use. Many of these perceptions persist today. Wildlife conservationists and land use planners who are trained in land zoning and planning for a single use, continue to have rigid perceptions of how land and resources should be managed in space and time, with a clear separation of ―wild‖ and ―agricultural use‖ areas. This has consequences for policies, resource access legislation, institutional arrangements for land management and delivery of services, causing great disturbances to the pastoral-ecological dynamics, and the culture and social organization that underpins the system. These perceptions are materialized largely in land tenure legislation by creating restrictions to livestock movement, loss of access to key areas and resources, and subsequent and sometimes deliberate erosion of the culture of the Maasai. This in turn has negative effects on the capacity to deal with ecological risk, causing a decline in food and livelihood security, but also increasingly on wildlife abundance, through invasion of bush and pests on the shared habitats of livestock and wildlife. Many customary institutions for land management and access to resources have been delegitimized and/or replaced. Also, the open system of resource use is not sufficiently safeguarded against agricultural settlers (due to population pressures outside the system) and land grabbing through corruption, which are both threats of a growing magnitude. HIV/AIDS is also an increasing problem, causing loss of leadership, parental care, labor force and knowledge (Nyong *et al*., 2007).

Indigenous knowledge tends to be viewed by some as being ―backward‖, compared to the western scientific knowledge. This has led to a loss of the indigenous or traditional practices as people try to embrace ―modern western‖ ways of doing things. Nevertheless, it is important to note that indigenous knowledge is not static, but rather evolves and changes as it develops, influenced by interactions with other knowledge systems (Nyong *et al*., 2007).

Nyong et al, 2007 argues that colonization had a major effect on indigenous knowledge, as the indigenous people ended up shunning their ―backward, un-civilized‖ knowledge in favor of western knowledge systems, whether willfully or not. Another contributing factor to the loss of indigenous knowledge is rural-urban migration of youth, who are expected to learn and implement some of the traditional knowledge.

Despite recognition of its importance by the Intergovernmental Panel on Climate Change (Parry *et al*., 2007) and other international forums, governments throughout Africa continue to undervalue the role of indigenous knowledge in national climate change adaptation policies. Instead, policy makers are turning to international financial institutions (IFIs) and donors to transform farming by introducing large-scale industrial agriculture practices as the key to adaptation (World Bank, 2008). Paradoxically, this method of production relies on hybrid seeds, synthetic fertilizers and machinery run with large carbon inputs, further jeopardizing the climatic stability on which all types of agriculture rely (Robertson*et al*., 2000).

As with scientific knowledge, however, IK has its limitations, and these must be recognized. IK is sometimes accepted uncritically because of naive notions that whatever indigenous people do is naturally in harmony with the environment. There is historical and contemporary evidence that indigenous peoples have also committed environmental 'sins' through over-grazing, over-hunting, or over-cultivation of the land. It is misleading to think of IK as always being 'good,' 'right' or 'sustainable‘. For example, a critical assumption of indigenous knowledge approaches is that local people have a good understanding of the natural resource base because they have lived in the same, or similar, environment for many generations, and have accumulated and passed on knowledge of the natural conditions, soils, vegetation, food and medicinal plants etc. However, under conditions where the local people are in fact recent migrants from a quite different ecological zone, they may not have much experience yet with their new environment. In these circumstances, some indigenous knowledge of the people may be helpful, or it may cause problems (e.g., use of agricultural systems adapted to other ecological zones). Therefore it is important, especially when dealing with recent migrants, to evaluate the relevance of different kinds of indigenous knowledge to local conditions (Robertson *et al*., 2000).

Indigenous knowledge can also be eroded by wider economic and social forces. Pressure on indigenous peoples to integrate with larger societies is often great, and as they become more integrated, the social structures which generate indigenous knowledge and practices can break down. The growth of national and international markets, the imposition of educational and religious systems and the impact of various development processes are leading more and more to the 'homogenization' of the world`s cultures (Grenier, 1998). Consequently, indigenous beliefs, values, customs, know-how and practices may be altered and the resulting knowledge base incomplete.

Sometimes IK that was once well-adapted and effective for securing a livelihood in a particular environment becomes inappropriate under conditions of environmental degradation (Thrupp, 1989). Although IK systems have a certain amount of flexibility in adapting to ecological change, when change is particularly rapid or drastic, the knowledge associated with them may be rendered unsuitable and possibly damaging in the altered conditions (Grenier, 1998). Finally, an often overlooked feature of IK which needs to be taken into account is that, like scientific knowledge, sometimes the knowledge which local people rely on is wrong or even harmful (Thrupp, 1989). Practices based on, for example, mistaken beliefs, faulty experimentation, or inaccurate information can be dangerous and may even be a barrier to improving the well-being of indigenous people. However, researchers need to be careful when making such judgments (Padmakumar, 1998).

2.4 The Mechanisms of Ensuring the IK Survival and Maintenance of Its Central Position in Farming

With the rapid environmental, social, economic and political changes occurring in many areas inhabited by indigenous people there comes the danger that the IK they possess will be overwhelmed and lost forever. Younger generations are acquiring different values and lifestyles as a result of exposure to global and national influences, and traditional communication networks are breaking down, meaning that Elders are dying without passing their knowledge on to children. In some cases, the actual existence of indigenous people themselves is threatened. Researchers can assist in preserving IK through the following:

- Record and use IK: document IK so that both the scientific and local community have access to it and can utilize it in the formulation of sustainable development plans.
- Raise awareness in the community about the value of IK: record and share IK success stories in songs, plays, story-telling, videos and other traditional or modern means of communication. Encourage people to take pride in their knowledge.
- Help communities record and document their local practices: Get local people involved in recording their IK by training them as researchers and providing means of documentation (computers, video equipment, etc.).
- Make IK available: disseminate IK back to the community through newsletters, videos, books and other media.
- Observe intellectual property rights: have agreements so that IK is not misused and benefits return to the community from which it originates. (Source: IIRR, 1996a)

Gomez (1988) note that there is loss of vast and ancient legacy of knowledge in identifying and recognition of traditional resources and elaborate technology for utilization. He cites that it is important to preserve traditional knowledge from oral heritage in a more durable form. Braidotti in Chandler and Wane (2002) also say indigenous practices need to be documented for sustainability. Parawira and Muchuweti (2008) posit that Zimbabwe is rich in traditional indigenous foods which have not been researched. For these reasons this paper seeks to excavate and expose traditional methods of seed and crop yield processing, preservation and storage as a way of increasing food security in (arid and semi-arid) marginal areas of Matabeleland South. Deliberate efforts must be made to initiate nature to support low cost agriculture in small holder farming sector through harnessing indigenous knowledge systems and farming practices. Sporadic efforts have been made to maintain data base and to restore the dignity of traditional crops by a few NGOs. Women‘s indigenous knowledge of traditional food processing, preservation and storage must be harnessed for food security (Othiokpehai, 2003). Tsiko (2009) cite that challenges of production of indigenous food include seed availability, lack of information, seasonal variability as well as post-harvest handling and quality control.

More women need to be included in extension work and education. It is important for agricultural training institutions to incorporate IKS in their extension courses. IKS of subsistence farmers (both men and women) should be viewed as a priority because it affords them independence in decision making. It also reduces expenses relating to agricultural inputs by enabling local communities especially women to adapt and to depend on their environments rather than external assistance. Attitudes and beliefs that indigenous food and practices are for the poor need, to be deconstructed, through education on IKS. Chandler and Wane (2002) conclude that nature and culture needs to be fused with traditional conceptions of women‘s roles.

2.5 Conclusion

Indigenous knowledge (IK) is the knowledge used by local people to make a living in a particular environment. It evolves in situ and is dynamic and creative, constantly growing and adapting to meet new conditions. The term 'indigenous knowledge' sometimes refers to the knowledge possessed by the original inhabitants of an area, while the term 'local knowledge' is a broader term which refers to the knowledge of any people who have lived in an area for a long period of time. IK is considered to be cultural knowledge in its broadest sense. It is embedded in a dynamic system in which spirituality, kinship, local politics and other factors are tied together and influence one another, and researchers must take this into account when examining a particular part of the IK system. IK has many positive aspects, and incorporating IK into projects can contribute to local empowerment and can provide valuable input for alternative natural resource management strategies. However, IK also has its limitations, and researchers should not make the mistake of romanticizing it and believing that whatever indigenous people do is right or sustainable. IK researchers should also play a part in stemming the loss of IK, by helping local people record and use their knowledge.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

The chapter indicated how data for the study was collected, analyzed and interpreted in order to answer the research questions. This chapter comprises of introduction, area of study, study population, sampling procedures, sample size, sampling techniques, data collection methods and instruments, quality control methods, data management and processing, data analysis, ethical considerations and limitations of the study.

3.1 Research Design

A research design is the overall blueprint or strategy for the research (Amin, 2005). This study used a cross sectional research design. A cross sectional research design facilitates the collection of vast amount of information on the study variables in a relatively short period of time (Sekaran, 2003). A cross sectional research design was selected as ideal because the study was conducted within a specific period of time and respondents were purposely selected based on the knowledge they poses.

3.2 Area of the Study

The study was conducted in Kabasekende Sub-county of Kibaale District. The Sub-county is located 11 km from Kibaale town. The study covered six parishes which included; Nyamugusa, Rwamagando, Bukonda, Kabasekende, Nyamugura and Kicumita.

3.3 Study Population

The researcher carried out the study on Threats to indigenous knowledge in improving Agricultural productivity in crop production, Kabasekende Sub County, Kibaale District. The target population was 120 peoples. These consisted of 10 sub-county agricultural officials/extension staff and 110 indigenous farmers that were accessed through the Sub County‘s registry having 8 year and above of experience. The agricultural officials/extension workers were chosen because they were expected to be aware of the prevailing indigenous knowledge in the area which is used by local farmers‘ versus the modern knowledge introduced.

Farmers were chosen since they hold a lot of indigenous knowledge that they repeatedly apply in farming against the modern knowledge being introduced.

3.4 Sampling Procedures

Accordingly, a minimum sample size of 96 was obtained from a population size of 120 as shown above. The sample size was then proportionately disaggregated for the six parishes, in the sub-county: Nyamugusa, Bukonda, Nyamugura, Rwamagando, Kabasekende, and Kicumita

3.4.1 Sample Size

The sample size was determined using the Morgan and Krejcie (1970), as cited in Amin & Kayanja (2005). This therefore meant that the sample included 96 farmers. The sample sizes are depicted in Table 2 below.

Table 2: Sample Size of Respondents and Sampling Technique

Category of Population	Population Size	Sample Size	Sampling Technique
Village agricultural officials	10	10	Purposive sampling
Village Farmers	110	86	Purposive sampling
Total	**120**	**96**	

3.4.2 Sampling Techniques

The study used purposive sampling method of non-probability sampling technique. This technique is used based on the knowledge of the population and the purpose of the study. It was used to select both agricultural extension officials and farmers who were targeted due to their perceived knowledge arising out of their experience. Purposive sampling was employed on assumption that if sampling has to be done from smaller groups of key informants, there is need to collect very informative data (Sekaran, 2003).

3.5 Data Collection Methods and Instruments

3.5.1 Interview Guide

A semi-structured interview guide was used to conduct interviews with village farmers and agricultural/extension officials. Interviews were chosen because they provide in-depth information about a particular research issue or question. Interviews also provide in-depth data which is not possible to get using questionnaires (Mugenda and Mugenda, 2003). Still, interviews make it is easy to fully understand someone's impressions or experiences, or learn more about their answers as compared to questionnaires.

3.6 Quality Control Methods

3.6.1 Validity

The validity of the interviews was established using the content validity test. Using the ratings the content validity indices were computed. The Cronbach Alpha method of internal consistency was used to compute the validity of the questions from both interview items administered to respondents (Kothari, 1990).

According to Content validity Index,(CVI) the interview guides were considered valid since all the coefficients were above 0.7 acceptable in survey studies (Amin, 2004; Gay, 1996) hence the interview guides were considered valid for data collection.

3.6.2 Reliability

Gay (1996) defined reliability as the degree of consistency that the instrument demonstrates. Pilot testing was done with farmers of Wakiso district, Gombe Sub-county. After pilot testing in the field, reliability of the instrument was tested via the Cronbach Alpha Method provided by Statistical Package for the Social Scientists (Foster, 1998). This method was used because of the possibility of multiple responses per question. The liability of the interview guides was established by computing the alpha coefficient of the questions. According to Cronbach Alpha Coefficient Test (Cronbach, 1971), the interview guides were considered reliable since all the coefficients were above 0.7 which is the least recommended CVI in survey studies (Amin, 2004g; Gay, 1996).

3.7 Data Management Processing

Data collected was mainly qualitative but there was also some quantitative data from farmer respondents. The data collected included a range of opinions, socio-economic background of respondents, threats to indigenous knowledge, benefits farmers get from using IK and ways by which IK used by farmers is losing its centrality in agricultural productivity. The researcher presented views collected following a derived pattern. This was mainly a qualitative presentation of findings from the different subjects. Any quantitative data collected was rated in frequencies using tables and items recorded in percentages (%).

3.8 Data Analysis

Data generated was analyzed using Statistical Package for Social Science (Safalaoh and Sankhulani, 2004; Mwale et al, 2005). The generated descriptive statistics was analyzed using tables, figure, frequencies and percentages to determine relationships between study variables. The generated statistics were also used to examine how indigenous knowledge was being used in the study area, benefits obtained, how it is losing its centrality and mechanisms of ensuring that IK survives. Farmers‘ preferences and decision making were determined by using rank and point score analysis. The points were added and the totals were then expressed as percentages. The importance of preferences was determined by ranking the highest percentages as the most preferred option with the lowest percentage as the least preferred option. Qualitative themes were determined after reading through the scripts of the interviews (Tembo, 2003; Johnston, 2006; Bringer et al, 2006; Briggs et al, 2007).

3.9 Ethical Considerations

The major ethical problem that was faced in the study was participation as they thought that the study was meant for some investigations from the government or other officials. Therefore, the researcher adopted voluntary participation so that a respondent who imagined of something beyond research was left out. Still, to ensure voluntary participation, those who attended to the study were informed upfront that indeed their names are not required, that they have the right to leave questions unanswered for which they do not wish to offer the requisite information, and that the researcher was not to put the respondent under pressure if this happens (Mugenda & Mugenda, 2003).

3.10 Limitations of the Study

Respondents were a bit busy since they had to look after their gardens. This delayed the overall progress of the study but this did not stop the researcher from finishing the study. The researcher traveled in the evening when respondents were back from their gardens. Poor means of transport was a problem because many of the roads were dusty and bumpy which lead to increased transport costs. In this case the researcher travelled in the evening when traffic is low and dust the dust is reduced.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF RESULTS

4.0 Introduction

This chapter presents analysis and interpretation of findings in the study which was conducted on Threats to Indigenous Knowledge in Improving Agricultural Productivity in Crop Production: A Case Study of Kabasekende Sub-County, Kibaale District. The study targeted old people because of their known knowledge. The findings are presented according to the objectives of the study. In the first section, the social background of the respondents is given. In the second section, the empirical analysis of the study findings are analyzed, ways in which IK is used in farming systems, the benefits of indigenous knowledge towards agricultural production, the ways by which IK used by farmers is losing its centrality and the mechanisms of ensuring the IK survival and maintenance of its central position in farming in Kabasekende Sub-County.

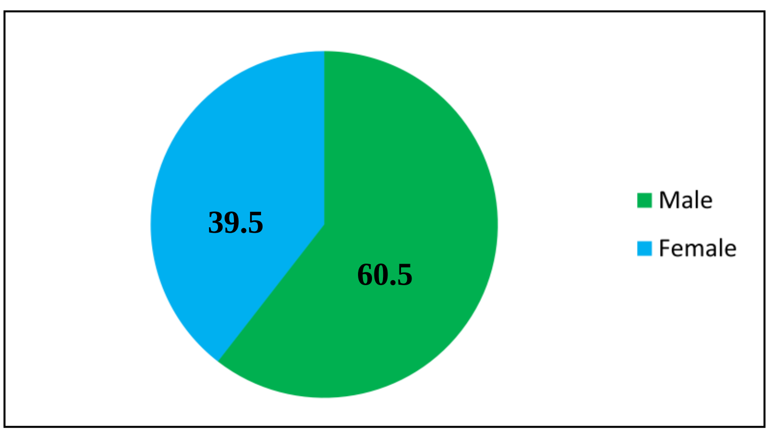
4.1. Social Background of the Respondents

This section handles the background information of the respondents used in the study. This included, gender, age, household populations and level of education. The researcher used frequencies and percentages to determine the group where farmers belong.

4.1.1 Gender of the Respondents

Gender was recorded and below are the results

Figure 1: **Gender of the Respondents**



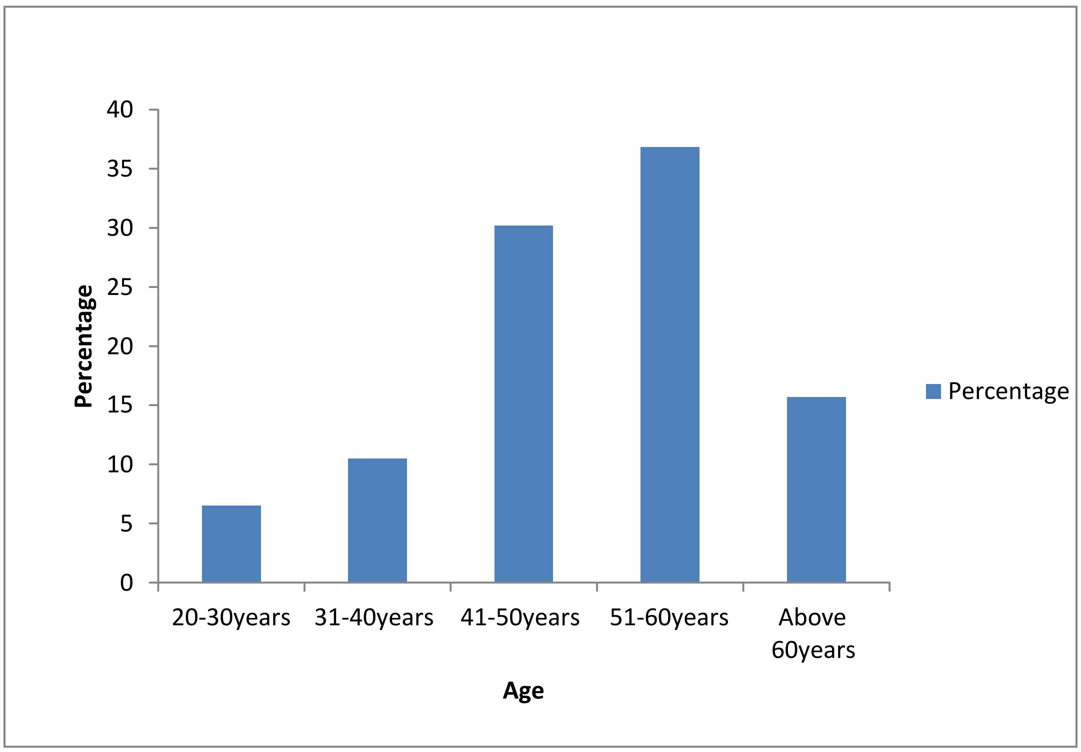
Source: primary data 2018

Figure 5, indicates that the study was conducted mainly from the male respondents who constituted 60.5%. Females on the other hand constituted 39.5% of the respondents. At the time of conducting the interview most women were busy with other house activities while men were readily available. No matter the percentage of males and females who attended the study, the researcher got mixed responses which favorably brought out evidenced information since a number of women and men were represented

4.1.3 Age of the Respondents

Respondents were asked to state their age and below are the results recorded in the table.

Figure 2: Age of Respondents



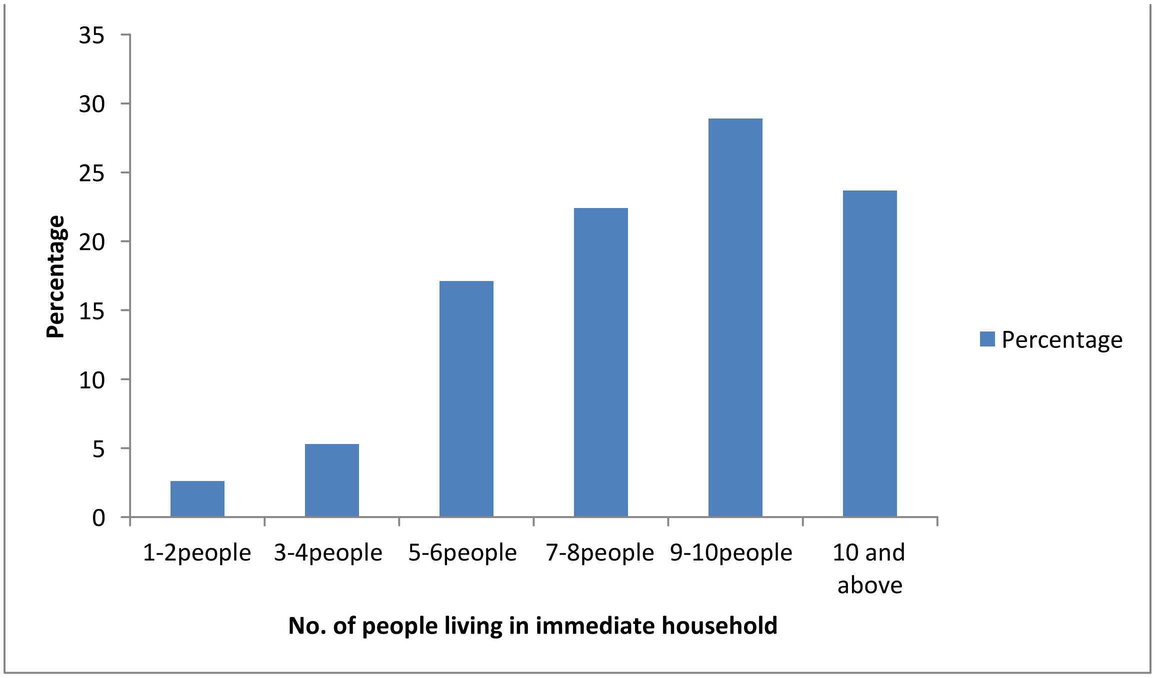
Source: primary data 2018

Figure2, indicates that 51-60years of age of the respondents constituted 36.8%,41-50years of the respondents constituted 30.2%, >60yearsof the respondents constituted15.7%, 31-40years of the respondents in the study constituted 10.5% and 20-30years respondents constituted 6.5%. This directly tells us that given the fact that most of the respondents were above 40years, the study meet the target group to offer the required information as far as IK in agricultural productivity is concerned.

4.1.4 Number of People Living in Immediate Household

In this study, a household was taken to mean all usual residents, where they sleep and share common facilities.

Figure 3: **showing Number of people living in immediate household**



Source: primary data 2018

Figure 3, indicates that9-10respondents in a household constituted 28.9%, 10 and above of the respondents in a household constituted, 23.7%,7-8of the respondents in a household constituted 22.4%,5-6of the respondents in a household constituted 17.1%,3-4of the respondents in a household constituted 5.3% and 1-2of the respondents in a household constituted2.6%. This means that at least, most of the participants in the study (farmers) had a good number of people in their household which holds a basis of application of IK in agricultural productivity as a form of labor.

4.1.5 Level of Education

Respondents were also asked to state their level of education and most of them indicated that they had stopped nursery level as shown in table 3 below.

Table 3: Showing the level of education of the respondents

Level of education	Frequency	Percentage
Never been to school	20	26.3
Nursery	22	28.9
Primary	19	25
Secondary	15	19.7
Total	**76**	**100**

Source primary data 2018

Note; 1.Never been to school (can,,t read or write); 2. Under- primary (1-4 years of schooling; 3. Primary (5 years of schooling); 4. Secondary (9-10 years of schooling)

Table 3, shows that 22 of the respondents in Kabasekende Sub-county had studied but under primary and these constituted 28.9%, 20 of the respondents had never been to school constituting 26.3%, 19 had attained primary level constituting 25%, and 15 of the respondents had attained secondary education constituting 19.7%. Perhaps, this exactly fits in the intention of the study since the main aim of this study was to discover threats to IK in the farming system and such categories of the respondents hold so much as far as indigenous knowledge is concerned since they seem to use so much local knowledge rather than formal knowledge since they lack the formal education.

It was found out that practical courses about farming under informal education that is available to farmers and their children are responsible for most of the knowledge farmers have developed and used. Indeed, local knowledge acquired through informal education is widely accepted, and, as such, is widely used within the community and this justifies their levels of the education listed above. Farmers' well-tested knowledge is deemed relevant, and is passed on through generations; it is unlikely to be easily displaced by _new' knowledge produced and promoted through formal education or from agricultural extension staff.

4.2 Empirical Findings on the Threats to Indigenous Knowledge in Improving Agricultural Productivity in Crop Production in Kabasekende Sub-county

In this section, the research findings are presented as per the study findings on the specified objectives. These findings were thus obtained on ways in which IK is used, its benefits, ways by which IK used by farmers is losing its centrality and mechanisms of ensuring the IK survival and maintenance of its central position. Below are the findings;

4.2.1 Ways in Which Indigenous Knowledge is used in Farming Systems in Kabasekende Sub-County

The study findings indicated that there are several ways in which indigenous knowledge in Kabasekende Sub-county is used and among the ways include the following as obtained from respondents;

4.2.1.1 Crops Grown by Famers in Kabasekende Sub-county

Initially, to establish the ways in which indigenous knowledge is used in farming system in Kabasekende Sub-county, respondents were asked to state the crops grown in their gardens and table 4below has details.

Table 4: Crops Grown by Famers in Kabasekende Sub-county

Name of the crops (in order of importance and nature of use)	**Smallholder farmers Name of the crops (in order of growing the crops**	
	Number of farmers growing the crop	Percentage of farmers growing the crop
Maize	76	100%
Beans	76	100%
Cassava	76	100%
Sweet potatoes	76	100%
Coffee	73	96%
Bananas	73	96%
Groundnuts	49	64.4%
Pineapples	40	52.6%
Green vegetables	36	47.3%
Mangoes	29	38.1%
Avocado	24	31.5%
Sugar cane	18	23.6%
N=76		

Source primary data 2018

Table 4 indicates that 76 respondents constituting a percentage of(100%)grow maize, beans, cassava and sweet potatoes. 73 of the respondents constituting 96% grow coffee and bananas, 49 of the respondents constituting 64.4% grow groundnuts, 40 of the respondents constituting 52.6% grow pineapples,36 of the respondents constituting 47.3% grow green vegetables, 29 of the respondents representing 38.1% grow mangoes. 24 and 18 of the respondents representing 31.5% and 23.6% of the respondents were growing avocado and sugar cane. It can thus be evident that most of the crops grown in the area are food crops. This shows that the major food crops were maize, beans, cassava and sweet potatoes grown by all farmers in the study area. The patterns of crops grown indicate that farmers are able to satisfy nearly all their dietary needs from their own production. Therefore, all crops grown by Kabasekende farmers were indigenously rooted in the area and were essentially grown to overcome their local problems.

4.2.1.2 Type of Livestock Kept by Famers in Kabasekende Sub-County

The researcher observed the types of livestock kept by farmers in Kabasekende Sub-county and below is some of the livestock that were noted down in table 5.

Table 5: Type of Livestock Kept by Famers in Kabasekende Sub-County

Livestock	Frequency	Percentage
Cattle	18	23.7%
Goats	11	14.5%
Pigs	5	6.6%
Chicken	40	52.6%
Sheep	2	2.6%
Total	**76**	**100**

Source primary data 2018

It was found out that 40 of the respondents kept chicken and these constituted 52.6% It was established in the study that they kept more of the local breed as compared to the exotic breed, 18 of the respondents were rearing cattle constituting 23.7%, 11 of the respondents were rearing goats constituting 14.5%, 5 of the respondents were rearing pigs constituting6.6%and2 of the respondents were rearing sheep constituting 2.6%. This gives a clear picture that most of the respondents in the study kept cattle and local chicken, goats, pig and sheep. This viably tells us that by keeping such livestock, farmers were ensured with food security (UNEP) 2008.They were also able to satisfy most of their dietary requirements using their own local production. It should be noted that cattle and chicken has a lot of proteins and fats. Pigs are also a source of minerals and important vitamins. Manure that came from the animals helped improve the fertility of the soil.

4.2.1.3 Indigenous Knowledge in Selection of Crops for Planting in Kabasekende Sub-County

When farmers were contacted and asked on how they select crops for planting in the area, below is what they said as shown table 6.

Table 6: Selection of Crops for Planting in Kabasekende Sub-county

Method	Very important (4)	Important (3)	Neutral (2)	Not important (1)	Not very important (0)	percentages
Seed size	18%	9%	2%	0%	0%	29%
Color	16%	8.4%	0%	0%	0%	24.4%
Texture	23%	8%	1.5%	0%	0%	32.5%
Recommended by extension staffs	15%	22%	7%	1.3%	0%	45.3%
Resistant to diseases	29.2%	7%	0%	0%	0%	66.2%
Resistant to pest attack	41%	24%	0%	0%	0%	65%
Drought resistance	32.5%	0%	0%	0%	0%	32.5%
Yield capacity	39.5%	0%	0%	0%	0%	39.5%
N= 76						

Source primary data 2018

Table 6 establishes that 66.2% of the farmers in Kabasekende Sub-county selected crops based on resistance to diseases. Those who based on resistance to pest attack constituted65% of the respondents, 39.5% of the respondents considered the yield capacity of the crop, 32.5% of the respondents considered both texture and drought resistance, 29% considered seed size and 24.4% color of the seed. This means that most of the farmers preferred resistant seed to diseases and when they were asked on how they got to know those crops that are resistant to diseases, one farmer was quoted saying,

"Got to know such as I was growing up"

Others said that such knowledge is obtained from NAADs coordinators and scientists from research stations e.g. Kawanda and Namulonge. Most of the farmers (66.2%) acknowledged using indigenous knowledge in selection of seeds for disease resistance. This agrees with

UNEP(2008) who stated that in the islands of Mfangano and Rusinga in Lake Victoria, for example, the people relied on their own seeds, which were identified during harvesting and preserved for the next season.

From the interviews conducted with agricultural officials/extension staff in the area, it was established from one of the officials that farmers in the area know best how they select their crops for farming because such knowledge has been passed on from generation to generation and they have their own ways and names they call certain crops that they take as resistant to diseases. In his own words, he was quoted:

"Our farmers have been advised several times to plant seeds that are scientifically proven from research institutes but it seems that their turn up has not been good because they locally have their own seeds they want because of several reason but mostly they want those crops that are disease resistant and can make the best yields".

When you listen critically to their reasoning, it tallies directly with what Mukiibi (2001) found out in Masaka district. He found out that selection of seeds traditionally depended on good seeds which at the start were good crops, those seeds which in the garden contained more food and produce healthier, heavier seedlings with more roots. They also selected seeds which had result in uniform germination and growth, they also chose those seeds which grew faster after transplanting. These seeds must have possessed cultivar purity, free from weed seeds, uniformly-large seeds, free from seed-borne diseases, have low moisture content and have high germination capacity. Seeds could be naturally crossed with undesirable types, diseased plants, off-type plants and selective influence of certain diseases. To improve the seed quality, rouging at different crop stages: vegetative, flowering and at maturity was done, cleaning, drying, storing in a good place. According to Egeru (2012), he acknowledged that most of the farmers in Soroti district use indigenous knowledge in seed selection, seed storage weeding and planting mode. Therefore, to select a seed for planting the next season depended so much on morphological characteristics: like plant height, erectness of leaves, tillering ability, panicle size and grain type/size. These are closely linked with modern knowledge but embedded on indigenous generated knowledge.

4.2.1.4 Indigenous Knowledge on Season Determination for Planting in Kabasekende Sub-County

Table 7: Information on Determination of Season for Planting

Method	Very important (4)	Important (3)	Neutral (2)	Not important (1)	Not very important (0)	Percentage
Use birds	23%	2.5%	0%	0%	0%	25.5%
Use insects	16%	2%	4.1%	0%	0%	22.1%
Friends/other villagers	19.5%	17%	0%	0%	0%	36.5%
Agricultural officers advice	12.8%	0%	0%	0%	0%	12.8%
Meteorological Department	7.6%	4%	0%	0%	0%	11.6%
Rainfall	17.2%	15%	5%	0%	0%	37.2%
Clouds	33%	5.3%	0%	0%	0%	38.3%
Temperature	21%	5.1%	1.8%	0%	0%	27.9%
Direction of wind	3%	7%	8.6%	0%	0%	18.6%
N=76						

Source primary data 2018

Table 7, shows that 38.3% of the farmers determined season for planting while looking at clouds, 37.2% of the respondents determined season at onset of rains, 36.5% of the respondents heard from friends and other villagers, 27.9% of respondents determined season based on temperatures, 25.5% determined season on appearance of birds especially in February. 18.6% of the respondents considered direction of wind. The wind starts increasing speed especially the season is beginning, respondents who based on Meteorological Department constituted 11.6%. From the above analysis, the season was determined based on clouds. Most of the respondents interviewed believed that when the clouds become blue in the corner that goes to Kampala that is in the East of the county, it means that the rainy season has began for planting. According to village farmers, such clouds are lighter. Other farmers mentioned that if temperature levels increasing even at night, one of the farmers was quoted saying:

> „*You can easily know that the rainy season has begun when every night you push your bracket away and feel too hot and sweating all the night*.‘

The respondents who talked about Meteorological Department(11.6) seem to be very few compared to those who mentioned of traditional indigenous knowledge (89.4%). This is an indication of employing indigenous knowledge in the area.

One of the interviewees was quoted saying:

> *"It is very difficult to rely on meteorologists because all factors have always proved them wrong in our area. The time they determine that rainfall will start, it doesn"t, only to come when people are not prepared."*

UNEP (2008) reported an experience with peasant farmers who listen to weather forecasts on radio by the meteorological department but still prefer to rely on their own traditional knowledge of when to start planting.

4.2.1.5 Indigenous Farmers Knowledge on Crop Management in Kabasekende Sub-County

It was established in the study that farmers have a range of knowledge about crop management in Kabasekende Sub-county and below is exemplified in table 8.

Table 8: Indigenous Knowledge Based Practices on Crop Management

Crop management	Very important (4)	Important (3)	Neutral (2)	Not important (1)	Not very important (0)	Percentage
Mixed cropping	40%	5.5%	0%	0%	0%	45.5%
Crop rotation	26%	2%	4.1%	0%	0%	32.1%
Varying planting time	19%	7%	0%	0%	0%	26%
Weeding	12.8%	10%	0%	0%	0%	22.8%
Mulching	7.6%	4%	0%	0%	0%	11.6%
Application of synthetic chemicals.	7%	4.4%	0%	0%	0%	11.4%
Roughing	11.2%	0%	0%	0%	0%	11.2%
Hand picking and crushing pests	9.3%	0%	0%	0%	0%	9.3%
Drying of seeds prior to planting	7.9%	0%	0%	0%	0%	7.9%
N=76						

Source primary data 2018

Table 8 establishes that most respondents used mixed cropping and this was ranked highest by most of the respondents (45.5%), Crop rotation was reported by 32.1% of the farmers, Varying planting time was recorded by 26% of the respondents,22.8% of the respondents reported Weeding. Mulching and roughing of the crops were reported by 11.6% and 11.2% respectively. Handpicking and crushing was reported by 9.3% of the farmers, and lastly, drying of seeds prior to planting and trapping of crops were reported by 7.9% and 5.6% of the respondents. In the above table, it can be noted that farmers who used synthetic chemicals constituted 11.4% posing a risk to indigenous knowledge.

From the above analysis, mixed cropping and crop rotation were the highly used practices. They have benefits like protecting the soil surface. This is so as stated by (UNEP 2008) who noted that mixed cropping and intercropping farming technologies optimize the use of naturally available soil nutrients and promote high yield

The use of indigenous knowledge in crop management in Kabasekende was continually supported by the agricultural officials in an interview. It was noted that farmers leave weeds to grow in their fields, even when they have perennial crops, such as coffee and bananas. Weeds grow vigorously and are maintained by slashing and let them rot in the field, weeding once or twice in a year in coffee. In bananas weeding is practiced and mulching were material is available.

> *"I think Weeds left to grow have an additional purpose; that of controlling soil erosion during the rainy season. This helps to replenish fertility that is taken up by crops. Farmers are aware that farming activities such as land preparation and tilling, loosen the soil and expose it to erosion by rain water."*

It was observed however, that farmers who are employed and have additional income are able to improve yields through the application of chemical fertilizers, and therefore prolong crop production beyond what would be possible without chemical fertilizers. This was observed as a challenge in using of indigenous knowledge in the study area.

> *A farmer was quoted saying that hawkers move with chemicals in smaller units affordable to farmers from door to door.*

If this trend continues it poses a danger to the use of IK and it may be lost forever. According to the study, this has resulted into the dominance of Western ideologies with their corresponding silencing effects as rightly pointed out by Agrawal (1995), Mohan and Stokke (2000).

4.2.1.6 Indigenous Knowledge Based Practices in Harvesting Handling in Kabasekende Sub-County

This section indicates how the respondents handle their harvests as a way of identifying how they use indigenous knowledge in the area. Table 9below has more details.

Table 9: Information on Farmers Knowledge on Harvest, Harvest Handling and Ensuring Safety of the Harvest

Harvests , harvest handling and safety of harvest	Very important (4)	Important (3)	Neutral (2)	Not important (1)	Not very important (0)	Percentage
Harvest when completely dry	20%	7.3%	0%	0%	0%	27.3%
Sun dried	30%	5.5%	0%	0%	0%	35.5%
Gunny bags	10.1%	0%	0%	0%	0%	10.1%
Keep in a dry place	27%	2%	2.1%	0%	0%	31.1%
Keep in granaries	0%	0%	0%	0%	0%	0%
Ash treated	7%	4.2%	0%	0%	0%	11.2%
Use of locally made pesticides	7.6%	3.5%	0%	0%	0%	14.1%
Use modern chemicals/pesticides	9.3%	0%	0%	0%	0%	9.3%
N=76						

Source: primary data 2018

It was established from the study that most of the farmers employed IK in harvest handling. Harvesting when completely dry constituted 27.3%,sun drying constituted 35.5%, of the respondents, use of gunny bags constituted 10.1%, respondents who kept in dry places constituted 31.1%. No farmers kept in granaries. From the study it was observed that respondents practiced other activities to ensure safety of the harvest. 11.2% of the respondents applied ash to ensure safety, 14.1% used locally made pesticides. Locally made pesticides which were mentioned in interviews were prepared using; *akayukiyuki (tick berry).hot pepper, omujaja*, *kamunye, evvu (ashes)* Use of modern chemicals in harvesting and harvest handling constituted 9.3% of the respondents.

4.2.1.7Indigenous Knowledge on Pests and Diseases and how they are controlled in Kabasekende Sub-County

To further understand indigenous knowledge people had on pests and diseases and how it is used in controlling pests and diseases, they were asked to state the pests they observed in their crops and below are some of the pests that were mentioned (Table 10).

Table 10: CommonPests Observed by Farmers in Their Crops

Scientific Name	Common Name	Crop	Very important (4)	Important (3)	Neutral (2)	Unimportant (1)	Very unimportant (0)	Percentage
Microtermes spp	Termites (enkuyege)	Beans and maize, sugarcane	10%	10.5%	0%	0%	0%	25.5
Busseeola Fusca, Chilo partellus	Maize stalk borer (ndiwulira)	Maize	2%	2%	2.1%	0%	0%	6.1
Aphis fabae, Brevicoryne brassicae	Aphids(Efidisi) Nnamukkuto	Beans, Cabbage	11.1%	0%	0%	0%	0%	11.1
Sitophilus zeamais	Maize weevil	Maize	20%	7.3%	0%	0%	0%	27.3
	Fire ants (Entalumbwa)	Coffee	7%	2%	2.1%	0%	0%	11.1
(Dysmicoccus brevipes)	Mealy bugs(Muwempe)	Coffee, Pine apples	11%	2%	2.1%	0%	0%	15.1
	Sweet potatoe Catapillar	Sweet potatoes	20.2%	2%	0%	0%	0%	22.2
	squirrel and rat(Kamuje	Cassava, groundnuts,	17%	4.2%	0%	0%	0%	21.2

	n'emmese)	maize, sweet potatoes						
Xylosandrus compactus	Coffee twig borer	Coffee	26%	7.3%	0%	0%	0%	33.3
Acanthoscelides obtectus	Bean Bruchid (Kawukuumi)	Bean	17%	2%	2.1%	0%	0%	21.1
Tetranychus spp	Mites(Obukwa)	Beans and Tomatoes, Vegetables	27%	2%	2.1%	0%	0%	31.1
	Borers (Mmoggo)	Vegetables, Beans	7%	4.2%	0%	0%	0%	11.2
Ceratitis spp., Dacus spp., Bactrocera spp.	Fruit-fly	Mangoes, avocado	21.2%	2%	0%	0%	0%	23.2
Gryllus pennsylvanicus	Crickets (Amayenje)	Sweet potatoes	7%	4.2%	0%	0%	0%	11.2
Agrotis spp	Cutworms (Amatemi)	Maize ,Vegetables	27%	2%	2.1%	0%	0%	31.1
Cosmopolites sordidus	Banana weevil (Kayovu)	Bananas	26%	7.3%	0%	0%	0%	33.3
	No.76							

Source: primary data 2004

Table 10 above, it can be realised that 33.3% of the respondents were affected by coffee twig borer and banana weevil, those who were affected by cutworms and mites came next with 31.1% and these were reported to affectMaize, vegetables and Beans and Tomatoes, maize weevils were reported by 27.3% of the respondents, termites in the area affected maize, beans and sugarcane (25.5%), bean bruchid were reported by 21.1% and they affected beans. Sweet potatoes caterpillars were affecting sweet potatoes and were reported by 22.2% of the respondents. 21.2%were affected by squirrels and rats 15.1% affected by mealy bugs in coffee and pine apples,11.2% affected by borers in Vegetables, Beans and crickets in sweet potatoes, 11.1 % reported aphids in beans, cabbage and fire ants in coffee. Most respondents were affected by coffee twig borer. Egonyu et al (2009) coffee twig borer is a serious pest identified in Mukono and Kayunga….it was evident that the pest was spreading in other sub counties surveyed within and outside Mukono Districts

Table 11: Common Diseases Observed by Farmers in Their Crops

Scientific Name	Common Name	Crop	Very important (4)	Important (3)	Neutral (2)	Not important (1)	Not very important (0)	Percentage
P. parasitica	Heart rot	Pineapples,	30%	5.5%	0%	0%	0%	35.5%
Gibberella xylarioides.	Coffee wilt Disease(Okukala kwemwanyi)	Coffee	32%	2%	2.1%	0%	0%	36.1%
Uromyces appendiculatus var. appendiculatus	Bean Leaf Rust (obutalavu ku bitundu ebikwatidwa)	Beans	27%	2%	2.1%	0%	0%	31.1%
Ralstonia solanacearum	Bacterial wilt (Kiwotoka)	Vegetables, Beans	19%	1.3%	0%	0%	0%	20.3%
Alternaria solani&Phytophthora infestans	Blight Early and Late (Okubabuka ebikoola n'okuvunda	Tomatoes	21.2%	2%	0%	0%	0%	23.2%

	ebibala)							
Fusarium oxysporum	Banana wilt	Bananas	6.8%	1.5%	0%	0%	0%	8.3%
Maize streak virus	Maize Streak (Ekikoola okulaga enkoloboze)	Maize	7%	5.2%	0%	0%	0%	12.2%
Vegetables, Tomatoes, Groundnuts Cassava	Ebigenge		10.1%	0%	0%	0%	0%	10.1%
Xanthomonas axonopodis pv. Phaseoli	Common Blight	Tomatoes						
Potyvirus – Potyviridae	Cassava brown streak disease (ekigave)	Cassava	15%	2%	2.1%	0%	0%	19.1%
Cassava Mosaic disease	African Cassava mosaic (okugengewala)	Cassava	27%	2%	2.1%	0%	0%	31.1%
	Total=76							

Source: primary data 2018

Table 11 above that most of the farmers are affected by coffee wilt disease and this was reported by 36.1% of the respondents. 35.5 % 0f the respondents were affected by heart rot, 31.1% of the respondents were affected by cassava mosaic and bean leaf rust affected 31.1, 23.2 reported early and late blight on tomatoes, 20.3% reported bacterial wilt onvegetables and beans, 12.2% of the respondents reported maize streak on maize, 19.1% reported cassava brown streak on cassava, 10.1% reported *Ebigenge on* Vegetables, Tomatoes, Groundnuts, Cassava 8.3% reported banana wilt on bananas.From the above findings it indicates that coffee wilt disease was the highly ranked disease affecting the farmers in Kabasekende.

Table 12: Indigenous Knowledge Based Practices in Managing Pests in Kabasekende Sub-County

ScientificName	Common Name	Crop	Indigenous Control mechanisms	Very important (4)	Important (3)	Neutral (2)	Not important (1)	Not very important (0)	Percentage
Microtermes spp	Termites (enkuyege)	Beans and maize, sugarcane	Queen removal from termite mound.	10%	10.5%	0%	0%	0%	25.5%
Busseeola Fusca, Chilo partellus	Maize stalk borer (ndiwulira)	Maize ,coffee	Removing affected plant, crushing pest	4%	4%	2.1%	0%	0%	10.1%
Aphis fabae, Brevicoryne brassicae	Aphids(Efidisi) Nnamukkuto	Beans, Cabbage	Planting resistant seeds	9%	3%	2.1%	0%	0%	14.1%
Sitophilus zeamais	Maize weevil	Maize	sun drying	28%	1.2%	0%	0%	0%	29.2%
	Fire ants(Entalumbwa)	Coffee	Burning	30.2%	2%	0%	0%	0%	32.2%
(Dysmicoccus	Mealy	Coffee,Pin	Spread ash	7.6%	13.6%	0%	0%	0%	21.2%

brevipes)	bugs(Muwepe)	e apples							
	Sweet potatoe Catapillar	Sweet potatoe	Hand pick and crush caterpillar Apply ash	17%	4.7%	0%	0%	0%	21.7%
	squirrel and rat (Kamuje n'emmese)	Cassava, groundnuts , maize,	Use f traps	7%	2%	2.1%	0%	0%	21.1%
Xylosandrus compactus	Coffee twig borer	Coffee	Collect dry twigs and burn, prune coffee tree,	26%	7.7%	0%	0%	0%	33.7%
Acanthoscelides obtectus	Bean Bruchid (Kawukuumi)	Bean	Sun drying,use of pepperand tick berry	10.2%	2%	0%	0%	0%	12.2%
Tetranychus spp	Mites(Obukwa)	Beans and Tomatoes, Vegetables	pestcides.	17%	1.2%	0%	0%	0%	18.2%
	Borers (Mmoggo)	Vegetables, Beans	Crop rotation	12%	2%	2.1%	0%	0%	26.1%

Ceratitis spp., Dacus spp., Bactrocera spp.	Fruit-fly	Mangoes, avocado	Grow resistant varieties	37%	2%	2.1%	0%	0%	41.1%
Gryllus pennsylvanicus	Crickets(Amayenje)	Sweet potatoes	Traps	8%	4.4%	0%	0%	0%	12.4%
Agrotis spp	Cutworms (Amatemi)	Maize ,Vegetables	Field hygiene,hand pick and crush	29%	2%	2.1%	0%	0%	34.1%
Cosmopolites sordidus	Banana weevil (Kayovu)	Bananas	Use of ash	33%	7.9%	0%	0%	0%	43.9%
	No.76								

Source: primary data 2018

Table 12 above, shows that 43.9% of respondents use ash in bananas to manage banana weevils,34.1% use field hygiene, hand picking and crushing manage cut worms, 41.1% grow resistant varieties to manage fruit flies, 33.7% of respondents collect dry twigs and burn, prune coffee trees to manage coffee twig borer, 29.2% use sun drying to manage maize weevil,25.5% remove queen termite from anthills to manage termites, 21.7%hand pick and crush and also apply ash to manage sweet potato caterpillars, 21.2% spread ash to control mealy bugs in coffee. 14.1%plant resistant seeds to manage aphids in cabbage and beans, 12.4% use traps to manage crickets. This is mostly done by children who enjoy them as a delicacy by roasting them. 12.2% dry their beans in the sun and others add pepper and tick berry to manage bean bruchid. 10.1% remove affected plant and crushing pest to control maize stalk borer.32.2% use burning as a practice to manage fire ants. On the other hand, the risk to indigenous knowledge is observed in the use of pesticides by 18.2% of the respondents to control mites in beans, tomatoes and vegetables. The indigenous knowledge adopted in the study areas are directly in line with what earlier scholars had found out. For instance, Mukiibi (2001), in his study in Masaka and Rakai district, he realized that people favored 82% indigenous knowledge in controlling pests in their crops as they lowered scientific knowledge to only 18.2%. He mentioned of methods like scare crowing, bush fallowing, planting resistant crops.

Table 13: Indigenous Knowledge Based Practices in Managing Diseases in Kabasekende Sub-County

Scientific Name	**Diseases**	**Crop**	**Indigenous Control mechanisms**	**Very important (4)**	**Important (3)**	**Neutral (2)**	**Not important (1)**	**Not very important (0)**	**Percentage**
P. parasitica	Heart rot	Pineapples	Resistant seeds ,use pesticides	26%	10.5%	0%	0%	0%	36.6%
Gibberella xylarioides.	Coffee wilt Disease(Okukal a kwemwanyi)	Coffee	Planting resistant Varieties, Uproot and burn affected plant.	22%	2%	0%	0%	0%	24%
Uromyces appendiculatus var. appendiculatus	Bean Leaf Rust (obutalavu kubitundu ebikwatidwa)	Beans	Planting resistant seeds, Burn crop residue, crop rotation.	11%	2%	3%	0%	0%	16%
Ralstonia solanacearum	Bacterial wilt (Kiwotoka)	Vegetables, Beans	Removal of diseased plants,	20%	11.3%	0%	0%	0%	32.3%

			planting resistant varieties, crop rotation						
Alternaria solani&Phyto phthora infestans	Blight Early and Late (Okubabuka ebikoola n'okuvunda ebibala)	Tomatoes	Crop rotation, field sanitation, removal of diseased leaves and plants, use of pesticides.	20.2%	2%	0%	0%	0%	22.2%
Fusarium oxysporum	Banana wilt	Bananas	Use of clean suckers, cow urine, application of ash	17.6%	13.5%	0%	0%	0%	31.1%
Maize streak virus	Maize Streak(Ekikoola okulaga enkoloboze)	Maize	Uproot diseased plant, Plant resistant varieties	17%	4.2%	0%	0%	0%	21.2%

	‗Ebigenge‘	Vegetables,Tomatoes,Groundnuts	Resistant Varieties, Use of Pesticides	11.1%	0%	0%	0%	0%	11.1%
\ *Xanthomonas axonopodis pv. Phaseoli*	Common Blight	Tomatoes	Use of resistant seeds ,Use of pesticides	11%	2%	2.1%	0%	0%	15.1%
Potyvirus - *Potyviridae*	Cassava brown streak disease(ekigave)	Cassava	Use of resistant seeds , select clean planting material, field hygiene	26%	7.3%	0%	0%	0%	33.3
Cassava Mosaic Disease	*African*Cassava mosaic (okugengewala)	Cassava	select clean planting material, field hygiene	17%	4%	0%	0%	0%	22.7

Source: primary data 2018

Table 13, shows that 36.6% of respondents used resistant varieties as well pesticides to manage heart rot in pineapples, 33.3% used resistant seed, clean planting material and field hygiene to manage cassava brown streak disease, 32.3% removed diseased plants, planted resistant varieties, crop rotation to manage bacterial wilt in vegetables and beans, 24% planted resistant varieties, uprooted and burn diseased tree to manage coffee wilt disease, 31.1% used clean suckers, cow urine application and selected clean planting material, field hygiene to manage banana wilt,22.7% of the respondents selected clean planting material to manage cassava mosaic, 22.2% reported crop rotation, removal of diseased plants and leaves, use of pesticides to manage early and late blight, 21.2% reported uprooting diseased plants and planting resistant varieties to manage maize streak in maize,16% of the respondents plant resistant seeds, burn crop residue and crop rotation to manage bean leaf rusts15.1% of the respondents reported using resistant seed and pesticides to manage common blight in tomatoes, 11.1% used resistant varieties and pesticides to control *ebigenge* in vegetables, tomatoes and groundnuts.

However, some of the methods are also recommended by scientists and these included, use of resistant seeds, field sanitation, crop rotation, removal of the affected plants, clean planting material , uproot and burn. Therefore, it was reached that the use of indigenous knowledge in controlling pests and diseases has a link with scientific modern methods. There are cases were farmers employed both indigenous and conventional methods for example in the control of Heart rot, Bean Leaf Rust, Blight Early and Late, *ebigenge* and Common Blight. This poses a challenge in that IK at this point is considered weak compared to the conventional option which could result into the eventual neglect of the IK practices.

According to interviews conducted in the area, most of the agricultural officials indicated that indigenous knowledge is a foundation of scientific methods. Most of the methods used in controlling pests and diseases by farmers in the area are locally founded but also supported by scientific experiments. For instance, one of the officials was quoted saying:

> *Okay.., we may despise indigenous knowledge for some scientific reasons but such knowledge has been used and it has ably helped the farmers to prevent and manage pests and diseases for example use of resistant seeds, crop rotation, removal of the affected plants and plant parts, clean planting material, uproot and burn. I have seen these being used by our farmers in the area and we also recommend them.*

He added:

Our challenge is how we can integrate such knowledge into scientific knowledge.

From the above findings, selection of clean planting material and use of resistant seed were the commonly used practices. Turning to Byabakama et al 2005 one finds out that in his study… about half of the farmers used their own mature crops as their main source of planting material and the others mostly obtained their planting material from their neighbors‘ crops or from a market. Almost all of those who selected planting material specifically selected disease-free material.

4.2.1.8 Sources of Information on Preventing and Managing Pests and Diseases in Kabasekende Sub-County

Table 14: Information on Farmers Source of Knowledge on Harvest Handling

Source of information	Very important (4)	Important (3)	Neutral (2)	Not important (1)	Not very important (0)	Percentage
Farmers‘ own knowledge from ‗experiments‘ and observations	83%	16.3%	0%	0%	0%	99.3%
From friends/relatives	18%	54%	2.8%	0%	0%	74.8%
From extension Services	14%	45.6%	7%	1%	1%	68.6%
Scale runs from 4 = very important to 0 = very unimportant	20.2%	2%	0%	0%	0%	22.2%
N=76						

Source: primary data 2018

Table 14 shows that farmers' own knowledge is very important with a score of 99.3% as a source of information used in decision-making. The second important source of information for farmers in the study area is friends and relatives with a score of 74.8% and the extension services are least in importance with a score of 68.6%. From the above findings it indicates that farmers' most trusted source of knowledge is their own individually produced knowledge.

If experts based their understandings on the knowledge which farmers use, this would create an opportunity for development experts to engage farmers in knowledge production effectively by learning from them.

Farmers are suspicious of second-hand information, even from experts, without first being tested and experienced so that where their experience is clearly showing advantages over experts' recommendations, changing their ways of practice becomes impossible.

4.2.1.9 Indigenous Knowledge Based Practices in Feeding and Keeping Livestock in Kabasekende Sub-County

Table 15: Indigenous Knowledge Based Practices inFeeding and Keeping Livestock

Feeding Method.	Very important (4)	Important (3)	Neutral (2)	Unimportant (1)	Very unimportant (0)	Percentage
Zero grazing	30%	4.5%	0%	0%	0%	34.5
Graze in my own herd	27%	1%	1.1%	0%	0%	29.1
Rotational grazing	10%	2.3%	0%	0%	0%	12.3
Use of improved modern feeds	20.2%	1%	0%	0%	0%	21.2
Use natural pastures and forages	9.8%	3.5%	0%	0%	0%	13.3
N=76						

Source: primary data 2018

Table 15, shows that respondents feed and keep their livestock using zero grazing and these were indicated by 34.5%. Those who grazed in their own herd were 29.1%, 12.3% were using rotational grazing. Use of modern feeds was reported by 21.2%. Natural pastures and foliage (*ebisagazi*) were reported by 13.3%. All the indigenous methods as indicated by the respondents accounted for 78.8% and only 21.2 belonged to modern feeds. This means that use of IK in feeding and keeping livestock in the study area takes a bigger percentage of respondents. Thus this shows that the importance IK still holds in the farming system.

4.2.1.10CommonParasites and Diseases in Kabasekende Sub-County

The respondents have encountered the following parasites and diseases among their herds

Table 16: Common Parasites and Diseases of Livestock in Kabasekende Sub-County

Parasites and diseases	Frequency	Percentage
A. Parasites		
Ticks	12	15.8%
Lice	11	14.5%
Helminthiasis(worms)	15	22.4%
B. Diseases		
East Coast Fever	10	13.2%
Bloat	6	7.9%
Coccidiosis	9	11.8%
Cough	7	9.2%
Diarrhoea	4	5.2%
N=76		

Source: primary data 2018

Table 16,indicated that farmers were affectedly; worms constituting 22.4%, Ticks constituting 15.8%,Lice constituting 14.5%, East Coast Fever constituting 13.2%,Coccidiosis constituting 11.8%,Cough constituting 9.2%, Bloat constituting7.9% and Diarrhoea constituting 5.2%. This shows that respondents were mostly affected by worms. This is so because all the type of livestock kept is affected by worms implying that worms are a serious pest according to the study.

4.2.1.11Indigenous Knowledge Based Methods to Manage Parasites and Diseases of Livestock in Kabasekende Sub-County

Various indigenous methods used by respondents to control parasites and diseases of cattle in their herds are presented in Table 17

Table 17: Control Methods of Pests and Diseases in Livestock

Pests and diseases	**Control Method**	**Frequency**	**Percentage**
A. Pests			
Ticks	Conventional method	76	100
Lice	Conventional method	76	100
Helminthiasis(worms)	Combination(Indigenous & conventional)	23	30.3
B. Diseases	**B. Diseases**		
East Coast Fever	Conventional method	52	67.5
Bloat	Combination(Indigenous &conventional)	15	19.5
Coccidiosis	Combination(Indigenous & conventional)	68	89.5
Cough	Combination(Indigenous & conventional)	60	78
Diarrhoea	Conventional method	76	100
N=76			

.Source: primary data 2018

Table 17, shows that 76 of the respondents used conventional methods constituting to100% to control ticks, lice, and diarrhoea. 68 of the respondents constituting 89.5% used a combination of both knowledge to manage coccidiosis. Ticks and lice were managed using the chemicals prescribed by veterinary officers. 60 of the respondents constituting 78% used a combination of indigenous and conventional method to manage cough. 52of the respondents constituting 67.5% controlled East Coast Fever using conventional methods. 23of respondents constituting 30.3% used both conventional and indigenous knowledge to manage worms and bloat. The indigenous locally available plants used to manage worms, bloat, Coccidiosis and cough were pawpaw seeds, sodom apple, *kisanda, ekisula, ekibwankulanta,*tick berry From this table it can be drawn that western technology is dominating indigenous knowledge. Much as there is growing interest in IK, the work of Agrawal (1995) and Mohan and Stokke (2000) reveals that there is dominance of Western ideologies with their corresponding silencing effects.

4.2.1.12 Indigenous on Selection of Breeds in Kabasekende Sub-County

Table 18: Information on Selection of Breeds in Kabasekende Sub-County

Breeds selection	Very important (4)	Important (3)	Neutral (2)	Not important (1)	Not very important (0)	Percentage
Indigenous Local breeds favorable	23%	7.5%	3%	2%	1%	36.5
High milk productive breeds	24%	4%	2.1%	3%	1%	34.1
Crossbreeding	28%	7.1%	0%	0%	0%	35.1
Use modern breeds introduced by extension officers	20.2%	2%	1%	7%	3%	33.2
N=76						

Source: primary data 2018

Table 18, shows that most of the farmers use indigenous local breeds which they take as favourable constituted 36.5%, cross breeding constituted 35.1%,high milk productive breeds constituted 34.1% and modern breeds introduced by extension officers constituted 33.2From this table, it is clear that respondents still preferred using local indigenous breeds because of their adaptability to the ecological environment.

4.3 The Benefits Farmers get from Using IK in Farming Systems in Kabasekende Sub-County

Various responses were given by the respondents on the benefits of using indigenous knowledge in agricultural production.

Table 19: Benefits Farmers get From UsingIK in there Farming System

Benefits of using IK	**Frequency**	**Percentage**
Reduced cost of buying chemicals	72	94.7
Avoiding pollution of the environment	67	88.1
Reduced cost of production	70	92.1
Maintenance and conservation of crop genetic diversity	56	73.6
Maintains soil fertility	72	93.5
Promotes use of locally available resources	67	88.1
Recycling of farm resources	70	92.1
Resilience to climate change	56	73.6
Promotes life-support ecosystem services	37	48.6
Controlling pests and diseases	67	88.1
Increased Food security at house hold level	37	48.6
Employment creation	22	28.9
Increased yield	17	22.4
N = 76		

Source: primary data 2018

Table 19, indicates that 72 of the respondents constituting 94.7%reported that indigenous knowledge was a remedy for reducing on the costs of buying chemicals. 70 of the respondents constituting 92.1% reported reduced cost of production and recycling of farm resources, 67 of the respondents constituting 88.1% reported promoting use of locally available resources,56 of the respondents constituting 73.6% reported maintenance of crop genetic diversity. 37 of the respondents constituting 48.6 %) indicated that IK is beneficial in increasing Food security at house hold level and promoting life-support ecosystem services, 22 of the respondents constituting 28.9% IK provide employment, 17 of the respondents constituting 22.4% indicated that IK leads to increased yield. From the table, reduced cost of buying chemicals, reduced cost of production and recycling of farm resources are among the highly ranked indicating that IK is beneficial in the farming system. The work of Moyo (2010) revealed that… indigenous knowledge is also found to be resilient and beneficial to farmers regardless of income level by reducing their costs of production, to be adaptable to different environmental and economic circumstances, and to provide for a more sustainable use of resources in farming.

4.4 Ways by Which IK used by Farmers is Losing its Centrality in Agricultural Productivity

Thoroughly, it was established from the study findings that IK is losing centrality because of several reasons deduced. Among the central basis as to why IK used by farmers is losing centrality includes:

Table 20: Showing Ways by Which IK Used by Farmers is Losing its Centrality in Agricultural Productivity

Mechanisms	**Frequency**	**Percentage**
Knowledge lives in isolation	11	14.4
Lack of scientific experimentation	17	22.3
Knowledge is becoming a commodity	7	9.2
Low-levels of income	11	14.4
Lack of power of indigenous knowledge at the global scale	10	13.2
Employment opportunities	9	11.8
Age of the farmers and continual death of old ones	6	7.8
Education of the farmers	7	9.2
Younger generations are acquiring different values and lifestyles as a result of exposure to global and national influences	10	13.2
No.76		

Source: primary data 2018

Table 20 above, shows results for the underlying reasons why IK is losing its centrality.17 of the respondents reported lack of scientific experimentation constituting 22.3%. 11 of the respondents constituting 14.4% mentioned of low levels of income and knowledge lives in isolation respectively. 10 of the respondents constituting 13.2% thought of IK as lacking power at the global scale and young generations acquiring different values and lifestyles as a result of exposure to global and national influences. 9 of the respondents constituting 11.8% reported employment opportunities, 7 of the respondents constituting 9.2% reported knowledge is becoming a commodity and education of the farmers. 6 of the respondents constituting 7.8% reported age of farmer and continual death of old ones.

4.4.1 The Knowledge Lives in Isolation

One of the officials was quoted saying:

> *"Indigenous knowledge appears to be inadequate in dealing with global phenomenon such as world trade agreements because of its nature of having limited exposure to such events. Rarely are local people adequately represented in such forums to enable them to develop indigenous knowledge to deal with such global events."*

This study has already shown that indigenous knowledge is not evenly held across farmers within a community because of factors such as gender, past experience and having lived outside the study area impact on indigenous knowledge production.

4.4.2 Lack Scientific Experimentation and Proof

Other key informants informed that IK lacks scientific proof and it is only experimented on individual level. Farmers conduct many ‗experiments' with crops and livestock, particularly regarding the time of planting of crops to escape pest damage and to achieve higher yields. For example, one of the interviewee expressed,

> *"Farmers who had lived outside the study area for some time plant maize earlier than those who had lived inside the study area, and their level of „experimentation" is partly influenced by knowledge gathered from elsewhere".*

Those with only a limited experience of living elsewhere have a more limited exposure to ideas and their ‗experiments' are limited to the extent of this exposure, which are derived from the practices observed from childhood and from what extension workers have promoted and demonstrated.

While the fact that not all farmers have the same knowledge is also true with development experts, who is rarely acknowledged in the study findings, it becomes more of a limiting factor to farmers because of limited resources for exchange of knowledge.

> *"The big challenge for indigenous knowledge is that it has no extensive sources as compared to experts who might have access to journals, conferences and the internet"*

4.4.3 Knowledge is Becoming a Commodity

In addition, in the continued discussion with the agricultural officials, it was reported that indigenous knowledge generated by farmers is becoming more difficult to share freely because of the need to pay for it. One of the farmers who sells locally made vitamins demonstrates this point clearly.

> *"In the past, knowledge was free and we could reveal it to fellow farmers so that they could obtain it them themselves from the wild (virgin forests), but now I have to keep this as a secret to enable me sell the knowledge in the form of a product or commodity."*

> *"Another farmer said my treatment for bloat is effective but I cannot reveal it unless am paid so I keep it to myself".*

Since knowledge can be seen as a commodity and can be sold, indigenous knowledge at the farmer level is turning into a potentially big business. This could be a significant development that has a potential to reduce farmer to farmer extension, which is considered more effective compared to the official use of extension agents (World Bank, 2004). According to Nggabutho (as cited in Maumbe and Swinton (2003), their study showed that…farmers rely on their colleagues for important information concerning farming

4.4.4 Low-Levels of Income

Still, key informants asserted that there are low levels of incomes of farmers in the study area, which can partly explain the low levels of external input use. However, for those who have higher incomes, the low input use appears to be advantageous, because it results in increased savings. The use of indigenous knowledge therefore has two implications. The first is that those with limited financial resources can survive with a low external input use; and the second is that those who have higher incomes also survive on low input use and potentially can make higher profit margins. However, a major limitation of low input use is shown by

Bebbington (1993), who argues that there are few experiences where low-input agriculture has proven economically viable. When the sole objective is to make profits, indigenous knowledge has mixed performance results.

4.4.5 Lack of Power of Indigenous Knowledge at the Global Scale

The limitation recognized in this study is an indication of the lack of power of indigenous knowledge at the global scale, as a result of the dominance of Western ideologies with their corresponding silencing effects as noted by Agrawal (1995) and Mohan and Stokke (2000). The study in Masaka also shows that reliance on scientific knowledge has not fully worked either. Development strategies, such as the milk-shed and egg production, did not benefit farmers in the study area. The trick is to use both knowledge systems in a manner that benefits the farmers most, and avoids swinging from one untenable position, that the scientist knows best, to an equally untenable one, where farmers know best (Mukiibi, 2001, Mohan and Stokke, 2000). Farmers in the study area have noted changes in the attributes of different crops. For example taste of maize where chemical fertilizers have been applied, beans take long to cook when synthetic chemicals are applied. This has resulted in farmers losing out in such attributes although they gain in terms of yields. Synthetic chemicals can change the taste of crops, which is a limiting factor for farmers despite increasing the yields. The study findings point to the importance of using both knowledge (Indigenous and Modern) in development processes

4.4.6 Employment Opportunities

It was also recorded from the agricultural officials that another important factor that is seen to influence Indigenous knowledge production in the study areas is employment opportunities available in companies, NGOs and government offices. This study found that employment opportunities provided a varied influence on knowledge produced by farmers in the study area. Those who have jobs with a monthly wage income, said that they have the financial resources to buy synthetic chemicals, and hence they easily access and apply them in their fields. This opportunity, despite the negative effects of synthetic chemicals discussed earlier meant that some farmers have lost indigenous knowledge

4.4.7 Age of the Farmers and Continual Death of Old Ones

Elders are dying without passing their knowledge on to children. This threatens to break the communication network as Alan, R. Emery and Associates (1997) perceptively state, as the elders die, the full richness of tradition is diminished; some of it has not been passed on and so is lost. There is a danger that the knowledge will die with them because young people do not always follow traditional ways. One farmer was quoted saying:

> *" I know the sound frogs make when it"s about to rain and I also see the swarm of bird in the sky but I have never taken the effort to explain this to my children yet they are with me most of the time".*

Living in and from the richness and variety of complex ecosystems, they have an understanding of the properties of plants and animals, the functioning of ecosystems and the techniques for using and managing them that is particular and often detailed. (UNESCO 2000)

4.4.8 Education System

In the study it was found out from respondents that parents have little time for their children. They spend more time at school and less time at home so they have not been able to pass on this knowledge to them. The work of Tabuti and Damme (2012) reveals that ... the young were failing to acquire IK because they spent most of their time at school away from their relatives who would have taught them cultural aspects of traditional way of life and indigenous knowledge.

Further they have acquired different life styles looking at IK practices as ‗old fashion' as UNESCO (2000)makes it clear that…It was, until recently, assumed that indigenous knowledge was irrelevant, unscientific and outdated. Many scholars correctly argue that formal education changes societies' ways of living and expectations leading to the adoption of modern technologies that result in increased income generation necessary for the improvement of their living standards

4.4.9 Younger Generations are Acquiring Different Values and Lifestyles as a Result of Exposure to Global and National Influences

Key informants and farmers continued to indicate that young people are growing up in a world of globalization, education has improved and the movement of youth in different environments in search of better education, jobs has come along with the attainment of social classes and eventually segregation. Consequently, the IK with them if any or around them is regarded as backward. Therefore, to meet the demands of modernity, many of the youths end up disorienting themselves away from indigenous knowledge to catch up with scientific knowledge which seems to cause the loss of IK

Mechanisms of Ensuring the IK Survival and Maintenance of its Central Position in Farming in Kabasekende Sub-County

A number of respondents had different views on how IK can survive and be maintained to regain its central positions in farming especially in the study area and among the ways is what table 21 indicates below.

Table 21: Showing Mechanisms of Ensuring the IK Survival and Maintenance of its Central Position in Farming in Kabasekende Sub-County

Mechanisms	**Frequency**	**Percentage**
Recording and using IK.	38	50
Sensitize community on Values of IK.	33	43.4
Make IK available and accessible.	29	38.2
Support communities document their indigenous Practices.	19	25
Establish community resource centers.	12	15.7
Patent rights.	9	11.8
Integrate IK into school curriculum.	6	7.8
No.76		

Source: primary data 2018

Table 21, indicates that 38 of the respondents constituting 50% in the virtue to ensure survival and maintenance of IK, suggest that indigenous knowledge should be recorded and used, 33 of the respondents constituting 43.4% suggested to sensitize communities on values of IK, 29 of the respondents constituting 38.2% suggested IK should be made available and accessible, 19 of the respondents constituting 25% suggested government and non-government organization supporting communities to document their indigenous practises, 12 of the respondents constituting 15.7% suggested establishment of community resource centres for IK, 9 of the respondents constituting 11.8% suggested innovators of IK should own patent rights, 6 of the respondents constituting 7.8% suggested integration of IK into school curriculum to strengthen adoption of IK.

The above findings tally almost with what had earlier been established by some scholars. For instance, Braidotti in Chandler and Wane (2002) said that indigenous practices need to be documented for sustainability. Parawira and Muchuweti (2008) has drawn attention to the fact that… deliberate efforts must be made to initiate nature to support low cost agriculture in small holder farming sector through harnessing indigenous knowledge systems and farming practices. Efforts should be made to maintain data base and to restore the dignity of traditional crops by a few NGOs. Women‘s indigenous knowledge of traditional food processing, preservation and storage must be harnessed for food security (Othiokpehai, 2003).

Recording and Using IK

Respondents within the study area suggested that IK should not only be recorded but also be used by incorporating it into agricultural programmes. The work of World Bank (2008) revealed that recording and documentation is a major challenge because of the tacit nature of IK (it is typically exchanged through personal communication from master to apprentice, from parent

to child, etc. It is the view of (IIRR 1999) that development efforts should therefore consider IK and use it to best advantage. Although more and more development professionals have come to realize the potential of IK, it remains a neglected resource. A key reason for this is the lack of guidelines for recording and applying IK. Without such guidelines, there is a danger that IK will become just another empty buzzword of the sort that litters the history of development efforts

Sensitize community on Values of IK

There should be sensitization and awareness of the value of indigenous knowledge, especially its potential contribution to sustainable development. According to Simon Brascoupé and Howard Mann(2001), an informed community can meet any challenge to its IK whether it is preventing encroachment, negotiating equitable sharing arrangements, or creating processes to communicate traditional knowledge to future generation. In an article by Mphela Raphesu (2010) The International Federation of Library Association asserts that libraries could also help in: - collecting, preserving and disseminate indigenous and local traditional knowledge - publicizing the value, contribution, and importance of indigenous knowledge to both non-indigenous and indigenous peoples. - raising awareness on the protection of indigenous knowledge against exploitation. – involving elders and community in the production of IK and teaching children to understand and appreciate the traditional knowledge. According to World Bank (1998) pg. 21 has drawn attention to the fact that… increasing the awareness of the importance of indigenous knowledge and enhancing the application of indigenous knowledge in development activities.

Patent Rights

The way seed companies own seed and seed patents, so it be to the innovators of indigenous knowledge. According to Mphela (as cited in Doubell, 2010) rightly points out that… intellectual property rights of the individuals and communities have to be protected and benefits have to be generated for innovators as well as local communities. Furthermore, it is crucial to safeguard indigenous knowledge holders from exploitation by commercial players. NARO (2010) correctly argues that recognition and protection of IK, copyrights and patent are the most important categories of rights to be considered. Wekesa (Anon) concludes that indigenous knowledge should be protected to afford local communities the right to use the same. He adds that other IK especially of medicinal value and even the art and craft for example, beading, weaving should be patented to avoid being legally used or being patented elsewhere as if it was unique and owned by the country, company or person patenting it.

Make IK Available and Accessible

Indigenous knowledge should be made available to ease its access. Egeru (2012) has drawn attention to the fact that…it is imperative for education institutions, including primary schools, secondary schools and universities, to work with communities to validate and strengthen community practices. Educational institutions should particularly help the younger community members appreciate their cultural heritage and find value in the practices of their forefathers.

Support Communities Document their Indigenous Practices

Respondents in the study area suggested that individuals and communities should be supported to document the IK they posses. According to a study by Tabuti and Damme (2012, in Uganda, opportunities to support and promote IK exist. Firstly there is a good institutional and legal frame work for IK. Further the report reveals that in 1998, UNCST made a formal declaration in which it recognized the role of IK in improving and sustaining the lives of Ugandans and therefore called for the promotion of the IK systems of local communities to improve their social and economic statuses. UNCST also works to ensure that IK custodians share benefits with counterparts interested in developing products using IK.

Establish Community Resource Centers

During the study some respondents suggested the establishment of community resource centers for indigenous knowledge. These were to involve participation of local communities in Collecting IK regarding Agriculture, record and store it. The work of Greyling(2010) reveals a model for community participation to preserve Indigenous Knowledge. The model is a triangular approach with three cornerstones, i.e. the public library, the community and current information ICT technologies. Together they shape the outcome of the programme and are inter-dependent upon one another. The model was originally developed to suit networked public library systems such as exist in the metropolitan areas in South Africa. He further concludes that implementing this, model communities will be able to preserve and manage their own indigenous knowledge in an economically viable and sustainable manner

Integrate IK into School Curriculum

It was observed by respondents that one way of ensuring IK survival and maintenances was to incorporate it into school curriculums so that its part of the subjects studied. According to UNESCO (2000), formal education systems had little place for indigenous knowledge or indigenous methods of education. Interestingly the same report has drawn attention to the fact that today there is a growing recognition of the value of indigenous knowledge for sustainable development. It would, therefore, be wise to sustain indigenous knowledge in traditional communities and integrate it into the school curriculum where culturally and educationally appropriate

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This is the concluding chapter of the study. It consists of the summary; conclusion and recommendations offered on the topic of the study, entitled Threats to Indigenous Knowledge in Improving Agricultural Productivity in Crop Production: A Case Study of Kabasekende Sub-County, Kibaale District

5.1. Summary and Conclusions

5.11 Ways in Which IK is used in Farming Systems in Kabasekende Sub-county

The study findings established that there were several ways in which IK was used in farming systems. It was found out that indigenous knowledge was used in the selection of Livestock and crops for growing in the next season using criteria of their own knowledge. Well known indicators included; disease resistance, pest resistance, drought resistance. Further their growing season was based on clouds, temperatures and appearance of rainfall. IK is also used in the management of crops. Various IK based practices were realized in the management of crops. Mixed cropping was highly used. Other areas where IK is used included pest and disease control in both crops and livestock but the use was minimal due to use of modern technologies which are convenient and results are seen very fast compared to a IK.

5.1.2 The Benefits that Farmers get from Using IK in their Farming Systems

The study examined the role that indigenous knowledge plays in farming system particularly the ways in which farmers use and incorporate it within their everyday practices and gain benefits: Reducing on the costs of buying chemicals and maintaining soil fertility. IK has been beneficial in helping them recycle farm resources and reduction on the cost of production. Farmers considered IK beneficial in controlling pests and diseases. Respondents pointed at IK as beneficial is avoiding polluting the environment compared to the scientific methods or knowledge if used and also, IK promotes the use of locally based resources. IK was considered beneficial as it is resilient to climate change and can maintain and conserve crop genetic diversity.

Other respondents indicated that IK was beneficial in increasing Food security at house hold level and promoting life-support ecosystem services.

5.1.3 Ways by Which IK used by Farmers is losing its Centrality in Agricultural Production.

The study revealed that indigenous knowledge lacks scientific proof and it is only experimented on individual level, yet farmers conduct many ‗experiments' with crops and livestock. Indigenous knowledge generated by farmers was becoming more difficult to share freely because of the need to pay for it. Respondents pointed out that unlike western ideologies, indigenous knowledge lacked power at the global scale.

Employment opportunities provided a varied influence on knowledge produced by farmers, agricultural officials and the community at large most especially in the field of agriculture. They tend to practice more of what they have acquired in their places of work, foregoing the IK they have, leading to the eventual loss. Communication network was at a risk of being broken down as result of continual death of elders without passing on knowledge to the young ones. Young people are growing up in a world of globalization, education has improved and the movement of youth in different environments in search of better education, jobs has come along with the attainment of social classes and eventually segregation. Consequently, the IK with them if any or around them is regarded as backward.

5.1.4 Mechanisms of Ensuring the IK Survival and Maintenance of its Central Position in Farming in Kabasekende Sub-county

Several methods to ensure that indigenous knowledge was safe guarded against ―erosion‖ were suggested by respondents. Individuals and communities should be supported to document the IK they possess. In addition, IK should not only be recorded but also be used by incorporating it into agricultural programmes.

Innovators of IK should own patents. Further findings indicated that there should be sensitization and awareness of the value of indigenous knowledge, especially its potential contribution to sustainable development. Suggestions were made to establish community resource centers for indigenous knowledge and to involve participation of local communities in Collecting IK regarding Agriculture, record and store it. In addition to the above, it was observed that to sustain indigenous knowledge in traditional communities, it should be integrated into the school curriculum where culturally and educationally appropriate.

5.2 Conclusions

It can thus be concluded that;

- There were several ways in which IK was used in farming system and among these ways involving selection of Livestock and crops for growing in the next season, determining the growing season, IK based practices were realized in the management of crops.
- The benefits that farmers get from using IK in their farming systems ranges from reducing on the costs of buying chemicals and maintaining soil fertility, recycle farm resources , controlling pests and diseases, avoiding polluting the environment, promotes the use of locally based resources in agricultural production, resilient to climate change and can maintain and conserve crop genetic diversity, increasing food security at house hold level and promoting life-support ecosystem services..
- Among the major ways deduced from the study that are leading to IK used by farmers to lose centrality in agricultural productivity includes;IK lacks scientific proof , indigenous knowledge generated by farmers is becoming more difficult to share freely,. Indigenous knowledge lacked power at the global scale, employment opportunities provided a varied influence on knowledge produced by farmers, continual death of elders without passing on knowledge to the young ones and young people are growing up in a world of globalization.
- It can also be concluded that among the mechanisms of ensuring the IK survival and maintenance of its central position include; Individuals and communities should be supported to document the IK they possess, IK should not only be recorded but also be used, innovators of IK should own patents, sensitization and awareness on the value of indigenous knowledge, establishment of community resource centers for indigenous knowledge and integrate IK into the school curriculum where culturally and educationally appropriate

5.3 Recommendations

From the basis of conclusion the researcher makes the following recommendations:

- There is a need to understand the major factors that contribute to indigenous knowledge production and how it‘s used with the farming community, if it is to be sustained for future development

- The development agricultural programs need also to be tailor-made to suit specific situations and places, thereby increasing the likelihood of their success. They should embrace IK in practice and theory in their development programs
- Just like scientific research, indigenous knowledge can only attract recognition and respect through publications and research stations have to live by this expectation. Therefore, for IK to gain much power and be sustained for generation there is a need to be published.
- Finally, there is a clear need to weigh the positive contributions of indigenous knowledge against their negative ones, in the sense that, for many in Africa, the use of indigenous knowledge has not necessarily transformed their lives as compared to modern technology.

5.4 Areas of Further Research

- There is a need for future research to ensure that indigenous knowledge is fully valued in the development process, and that we carefully describe and evaluate such knowledge so that it contributes fully to development without the need for farmers to have to keep ―re-inventing the wheel‖. How we might go about this is a pointer to future research.
- Research can be done to find ways in which Western science and technology can benefit from the incorporation of local knowledge. The use of naturally available resources creates opportunities to find ways of enhancing crops yields premium so that products fetch high prices on the market, not necessarily as organic, but at least as environmentally friendly products.
- Further, research needs to be done to find out how indigenous knowledge could be included in publications that are acceptable to both the local farmer and the academics.

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APPENDICES

Appendix 1: HOUSE HOLD SURVEY QUESTIONNIARE GUIDE.

My name is Ngonzi Wilson I am carrying out a study about threats to indigenous knowledge in improving agricultural productivity in crop production a case study of Kabasekende Sub-county, Kibaale District, Uganda. This study is part of the requirements for the award of a Master's of Science Degree in Agro – ecology of Uganda Martyrs University Nkozi.

Responses from the interview will be confidentially treated.

Tick whichever is applicable.

A1: FARMER SOCIAL CHARACTERISTICS

A.1.1 Sex of the respondent

1. Female
2. Male

A.1.2 Age of the respondent

Less 25

26-35

36-45

Above 46

A.1.3 Number of years of schooling of the household head

No education

Primary

Secondary

Tertiary

A.1.4 What is the occupation of the household head

Farmer

Agric official

Teacher

Business man/woman

SECTION B: IDENTIFICATION

B.1 Name of the parish in which the respondent is located

1Nyamugusa

2 Kabasekende

3 Bukonda

4 Nyamugura

5 Kicumita

6 Rwamagando

B.2 Number of persons in the household

1 member

2-4 members

5-7 members‘

8-10members

Above 10 members

SECTION C: CROP PRODUCTION

C.1 How many acres of crops did you grow in the previous season?

Below an acre

1-3 acres

4-7 acres

8-10 acres

C.1.1 What was the total yield in the indigenous knowledge (tones)?

Below one tone

1-2.5 tones

3-5 tones

7-10 tones

C.1.2 What was your total yield per acre in the modern knowledge?

Below one tone

1-2.5 tones

3-5 tones

7-10 tones

C.1.3 What are the commonest indigenous knowledge based practices used in the past farming systems?

Zero grazing

Mulching

Terracing

Bush furrowing

Mixed cropping

C.1.4 What are the common modern knowledge based practices used in present farming systems?

Ranching

Fertilizer application

Irrigation

Plantation farming

C.1.5 How long have you been growing crops (years)

1-5

6-8

9-12

Above 12

C.1.6 What are the benefits that farmers get from using indigenous knowledge in their farming systems?

Reduced cost of buying chemicals

Avoiding pollution

Reduction in cost of production

Avoiding death of micro organisms

C2 PRODUCTION TECHNOLOGY CATEGORY

C.2.1 What is the number of family labour that you use in crop production?

1) Less than 5

2) 6 and above

C.2.2 which common tools do you use in production of crop in the modern knowledge?

1) Hand tools

2) Fuel driven machines

C3 PRODUCTION COST PER ACRE. (In Uganda shillings as per current season)

C.3.1 What cost of land rent do you incur

50,000-80,000

90,000-120,000

130,000-160,000

170,000-250,000

C.3.2 What is the cost of synthetic fertilizers for an acre that you incurred

Less 50,000

60,000-80,000

90,000-160,000

Above 170,000

C.3.3 What is the cost of organic fertilizers for an acre that you incurred

Less 50,000

60,000-80,000

90,000-160,000

Above 170,000

C.3.4 What is the cost of land preparation using a tractor per acre in crop production?

50,000-80,000

90,000-120,000

130,000-160,000

170,000-250,000

C.3.5 What is the cost of hired labour in crop production? "(land preparation – harvesting)

50,000-80,000

90,000-120,000

130,000-160,000

170,000-250,000

C.3.6 What is the cost of storing out-put per acre in modern knowledge?

50,000-80,000

90,000-120,000

130,000-160,000

170,000-250,000

SECTION D FARMERS' SUGGESTIONS

D.1What is the most important factor for successful crop yield in your sub-county?

………………………………………………………………………………………………

………………………………………………………………………………………………

D.2 What is the most pressing challenge that you face in crop production?

………………………………………………………………………………………………

………………………………………………………………………………………………

D.3 What are the different ways in which indigenous knowledge is used in your farming systems?

………………………………………………………………………………………………

……………………………………………………………………………………………….

………………………………………………………………………………………………..

D.4 What other benefits do you get from using indigenous knowledge in your farming systems?

………………………………………………………………………………………………

………………………………………………………………………………………………

………………………………………………………………………………………………

D.5 What do you suggest that government should do for you to improve crop production?

………………………………………………………………………………………………

………………………………………………………………………………………………

D.6 From where do you get advice on crop production?

1) Fellow farmers

2) Extension staff

3) Radio

4) Others

―Thank you very much for you cooperation‖

Appendix 2: INTERVIEW GUIDE FOR AGRICULTURAL OFFICIALS

- What are the main indigenous and modern practices used in the sub-county?
- What are the estimates in terms of output per acre of crop production using the two types of knowledge for the past years?
- What benefits do you think people are likely to obtain in the usage of the indigenous knowledge practices in the farming system in the area?
- As an agricultural officer compare between the indigenous and modern knowledge in the farming system and advise the farmers on which knowledge to adopt and why?
- In which ways can indigenous knowledge be maintained in the farming system in your area?
- Are farmers aware of the indigenous knowledge based practices in your sub-county?
- How have farmers adapted the indigenous ways of farming in the area especially when it comes to improving crop production?

OBSERVATION CHECK LIST

- How are locally available materials used in the area of study?
- How are the pests and diseases managed in the study area?
- How are the crops managed in the area of study?
- What are the indigenous knowledge based practices in the study area.

FOCUS GROUP DISCUSSION GUIDE

- What are the most indigenous knowledge and modern knowledge practices that are used in the study area?
- What benefits do farmers obtain in the study area in the usage of the indigenous and modern knowledge based practices?
- What are the different ways in which indigenous knowledge farming practices are maintained?
- What challenges do you think are countered in adopting the indigenous knowledge practices in your study area?

Appendix 3: ***Sample size (s) required for a given population size (N)***

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	256	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	**1000**	**278**	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	100000	384

(Source: Amin, 2005:454)

From R.V. Krejcie and D.W. Morgan (1970), Determining sample size for research activities, Educational and psychological measurement, 30,608, Sage Publications.