USE OF IMPROVED METHODS OF CROP FARMING AND LIVELIHOODS OF SMALL HOLDER FARMERS IN LUUKA DISTRICT

BY

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DECLARATION

I, MAWOGOLE BOSCO declare that this dissertation entitled, Use of Improved Methods of Crop farming and Livelihoods of Small holder Farmers in Luuka district is my own work and has never been submitted to any institute for any award.

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APPROVAL

We certify that this dissertation by MAWOGOLE BOSCO has been done under our supervision and is submitted with our approval.

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DEDICATION

I dedicate to my beloved family, friends, workmates and classmates whose support, love, care and encouragement are immeasurable. This work is entirely dedicated to you!

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I would like to first thank the Almighty God who gave me the vigor, energy, knowledge and wisdom to complete this work. All the Glory goes back to Him!

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Together, we all make this world a better place!

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS Acquired Immune Deficiency Syndrome

AM Agricultural Modernization

CGIAR Consultative Group for International Agricultural Research

FAO Food and Agricultural Organization

GDP Gross Domestic Production

HIV Human Immune Virus

ICT Information Communication Technology

IFRC International Federation of Red Cross and Red Crescent Societies

MAAIF Ministry of Agriculture, Animal Industry and Fisheries

MAHFP Months of Adequate Household Food Provisioning

MCFAP Improved methods of crop farming Adoption practices

MOFED Ministry of Finance and Economic Development

NAADS National Agriculture Advisory Services

NEMA National Environment Management Authority

OWC Operation Wealth Creation

PEAP Poverty Eradication Action Plan

PFA Prosperity for All

PMA Plan for Modernization of Agriculture

RDS Rural Development Strategy

ROVC Return over Variable Cost

SADC Southern African Development Community

SDGs Sustainable Development Goals

SLF Sustainable Livelihoods Framework

SPSS Statistical Package for Social Sciences

TLUs Total Number of Livestock Units

UBOS Uganda Bureau of Statistics

USA United States of America

ABSTRACT

The purpose of this study was to establish the effect of improved methods of crop farming on the livelihoods of small-holder farmers in Luuka district. The objectives of study included; to find out the improved methods of crop farming used by small holder farmers, to determine the effect of improved methods of crop farming on the financial capital, physical possessions and food availability for small holder farmers in Luuka district. The study adopted a cross sectional study design. The sample size was 295 respondents which consisted of 275 household heads, 15 Village Local council 1 chairpersons, 2 Sub- County chairpersons, 2 Sub – County Operation Wealth Creation staff and 1 District Agricultural Officer. Purposive and simple random sampling was used to select the respondents. The study relied mostly on primary data that was collected using questionnaires, interview and observation methods. The quantitative data were analyzed by tabulating, and computing frequencies, percentages and the chi – square test was run to determine whether there were significant differences between adopters and non-adopters in terms of livelihoods. Qualitative data was analyzed by coding and establishing common themes according to objectives of study that emerged in the process of interacting with participants. The findings show that most farmers in Luuka district (69.1%) had adopted improved methods of crop farming. The dominant improved methods of crop farming in the area were; use of high breed crops (25.8%), use of pesticides (13.7%), use of crop rotation (13.2%) and use of fertilizers (11.1%). Findings reveal that use of improved methods of crop farming practices improved farmers' incomes, led to acquisition of more physical assets and increased food availability. Using the study findings it is recommended that it necessitates training small holder farmers to adopt improved methods of crop farming practices, sensitize small holder farmers in order to increase food availability and incomes. As such, policy makers should encourage adoption of improved methods of crop farming practices.

CHAPTER ONE
INTRODUCTION

1.0 Background to the Study

Agricultural development is extremely important if a sustained period of rising income and living standards from low productivity to high levels of productivity economic activities of any independent state by way of a lesser developed industrial base and lower levels of human development index are to be recognized. This shifts its economy that is from a predominantly agriculture to one that is built on industry and manufacturing (Jean-Jacques & Dethier, 2012). Majority of small holder farmers today work using the most innovative practice and farming methods to generate adequate food, fuel, and fiber for a developing country while reducing on environmental effects at the same time (Djurfeldt, Dzanku & Isinika, 2018). Modernization of agriculture has been paramount in the strong agricultural revolution experienced in most of the successful Asian nations. (Otchia, 2014). The nations that witnessed earlier and fastest growth at the same time underwent rapid development in industry and services. In a bid to transform their rural economies, a variety of reforms and strategic development activities in addition to the ones already in place, have been advanced in line with increased agricultural production as the major pillor (Jayne, Chamberlin &Benfica, 2018)

The development of the agricultural sector leads to surplus production for market and brings about an economy where a greater population engages in industry and manufacturing as the country grows. In such an economy, the population is heavily dependent on the nation's marketable food production surplus. The development of the agriculture sector means increased production which leads to growth in the marketable surplus for export which can be exported to other nations (Lowder, Skoet& Singh, 2014). As a result, many countries have embarked on improved methods of crop farming to enhance agricultural productivity and increase in agricultural output through agricultural modernization (Pingali, Khwaja, & Meijer, 2005).

Agriculture modernization in Sub-Saharan Africa has over the past years focused on agrarian development to cater for increased surplus. (Patel, 2013). The use of modern Farming leads to increase in agriculture output and surplus. This rapid agricultural growth leads to development of public infrastructure investments made to promote it, hence improving the livelihoods of farmers in Ethiopia (Asfaw, Shiferaw, Simtowe, & Haile, 2011)

In Africa, farmers have adopted the use of improved methods of crop farming since it is believed to increase agricultural output hence improving the livelihoods of small holder farmers (Ansoms, 2010).

According to Green (2015), between seventy-five and seventy-eight per cent of the Africa's labour earns a living in the agricultural sector either directly or indirectly. This is true, in the small landlocked countries with a high population concentration of about 430 people per square kilometer. Consequently, Africa's agriculture is greatly subsistence in the context of farms not exceeding three quarter hectare; part of this production finding its way in the local market (Housson, Johnson, Kolavalli and Asante-Addo, 2018). Aware of the fact that African countries experiences very high population growth rates, African governments look at surplus production as a way to go. As such, many African countries like Rwanda, Ethiopia, Egypt and South Africa have made progress in adopting improved methods of crop farming through a Green Revolution approach.

Modernization of agriculture will lead to agricultural commercialization; which means a multiplier effect on all incomes; with social and economic attendant benefits in development. At national level, the masses will have to take to specialization in agricultural output increment emphasizing the diversification in production. That is to say, more commodities destined for the market, as a result of small scale farmers engaging in commercial production. It is a known fact though that due to excess surplus production in staple foods. The subsistence farmers easily take on commercialized agriculture as a consequence of the aforesaid. To affirm this nation, Kenya offers the best example with 2012, as a case in point, it is estimated that over 60% income and employment opportunities came from the rural smallholder farmers in as the export commodities exceeded that percentage (Thorlakson & Neufeldt, 2012).

In Uganda's case, agriculture contributes a living to over 0.85 of the population (85%) which is basically rural most of these being poor households. In such a scenario revolutionizing agricultural means enhancing their capital base and resources. To change and modernize farming and livestock keeping in Uganda, a targeted expenditure has to focus on the predominantly subsistence farmers who make up one of the three major farming classifications in the country; the others being semi- commercial and commercial farmers. (Garnett & Godfray, 2012)

The Plan for Modernization of Agriculture (PMA) was initiated to tackle the problem of high subsistence Agriculture in Uganda by increasing financial capital and uplifting the quantitative and qualitative living conditions of peasant farmers, enhancing food security in every home, creating meaningful earning jobs and ensuring that there is a non-interruptible use and valuable control of natural resources. (Adherhe, 2009). Uganda has taken tremendous steps in adopting improved methods of crop farming in a bid to achieve vision 2040 (Owaraga, 2015). Farmers in Uganda are transforming the agricultural sector in general since they believe that it improves their livelihoods. Initially it was pertinent upon the central government to foot the bigger part in paying for availing extension services however, with time the local governments and the farmers would "own" the costs through their organizations. This would make the system demand driven, farmer led and private sector serviced. The overall development objective of the National Agricultural Advisory Services (NAADS) was to boost / bail out peasants to become aware of and be able to adopt improved agricultural technologies and management practices so as to enhance efficiency, effectiveness, economic welfare and ensure sustainability of farming operations (Ainembabazi & Mugisha, 2014).

Amidst all the economic (both capital and financial litigation), done in increasing extension services. The livelihoods of small holder farmers in most parts of Uganda, Luuka district inclusive still remains low. The people of Luuka District are mostly engaged in small scale farming characterized by small sizes of land owned and limited access to agricultural technologies. Most people in the district are poor with limited access to basic needs like health, education, housing and food limited use of improved methods of crop farming which affects livelihood (UBOS, 2016). This has affected their living standards thereby making their livelihoods complicated. It is upon this background that a geographical inquiry into the outcomes and results hereafter referred to as effects of improved methods of crop farming and livelihood of small holder farmers in Luuka district)

1.2 Problem Statement

Farmers in Uganda have recently embraced the movement from subsistence agriculture to modernization of agriculture (FAO, 2014). In addition, the government of Uganda has used improved methods of crop farming as key in the fight against poverty and to improve peoples' income and livelihood (UBOS, 2016). In line with this, the Uganda government embarked on a strategy of transformation of agriculture by subsidizing agricultural inputs that encourages farmers to adopt improved methods of crop production aimed at improving the

livelihoods of farmers. According to the National Development Plan two (NDPII),Uganda recognizes the need to boost agriculture output as a perquisite for a self- sustaining economy so as to propel Uganda into a middle income status, (MAAIF, 2013).

Despite the interventions put in place by the Ugandan Government in promoting Agriculture, the livelihoods of farmers in Luuka district remain poor. The fact that, Available data indicates more than 70% of the population in Luuka feed on one meal per day and at least 80% lack access to both financial and physical capital (UBOS, 2016). This has limited their participation in production and thereby affecting their livelihoods and personal growth. Given the general poverty that characterizes the households in the district, it's vital to examine the extent to which adoption of improved methods of crop farming has contributed to livelihoods in Luuka district.

1.3 General Objective

The study aims at finding out the effects of improved methods of crop farming on the livelihoods of small-holder farmers in Luuka district.

1.4 Specific Objectives

The study was guided by the following specific objectives;

i. To find out the improved methods of crop farming practiced by small holder farmers in Luuka district.
ii. To determine the effect of improved methods of crop farming on the incomes for small holder farmers in Luuka district
iii. To assess the effect of improved methods of crop farming on physical possessions of small holder farmers in Luuka district
iv. To determine the effect of improved methods of crop farming on food security for small holder farmers in Luuka district

1.5 Hypotheses

The following null hypotheses were tested in this study:

H_1^0: There are no considerable differences in incomes of adopters and non-adopters of improved methods of crop farming.

H_2^0: There are no considerable differences in physical possessions of adopters and non-adopters of improved methods of crop farming.

H_3^0: There are no remarkable differences in food security between adopters and non-adopters of improved methods of crop farming.

1.6 Significance of the study

The study was of great significance, smallholder farmers, and the government of Uganda and surrounding communities as follows;

In creating awareness to the central government about the status of small holder farmers in Luuka district and ways in which Agricultural Modernization can enhance livelihoods of these peasants.

The study was informative to the government and findings will be used by the ministry of agriculture and the secretariat for Operation Wealth creation to integrate models for sustainable struggle towards welfare of smallholder farmers.

To the surrounding communities, the study will be helpful in creating job opportunities for skilled and semi-skilled individuals. It may also be model to surrounding communities and as they copy, they also get sources of income, which, if sustained can improve their lifestyles.

The study is very important in establishing methods of improved crop farming that will be adopted. This is in line with the Uganda National Development Plan Two, Uganda's Vision 2040 and Sustainable Development Goal Two of ending hunger by 2030.

To the small holder farmers, the study is significant in improving conditions under which they operate. These include getting resource back-up through Operation Wealth creation, expanding markets and expanding on the knowledge about Agricultural Modernization.

To the researcher, the study is necessary in expanding knowledge about Agricultural Modernization and livelihoods of smallholder farmers.

To the future researchers, the study findings would be used for citation as a reference tool in carrying out, hence suggests gaps in their proposed studies.

1.7 Scope of the study

The main focus of this study was to find out the contribution of improved methods of crop farming on the livelihood for small holder farmers in Luuka district. Geographically, Luuka district consists of 8 Sub Counties, 33 parishes and 209 villages. This study considered the Sub Counties of: Bukanga and Bulongo. These are the Sub Counties which benefit so much from the Plan for Modernization Agriculture services owing to random selection in this study irrespective of their proximity to easy access to services (UBOS, 2016).

1.8 Conceptual framework

This conceptual framework explains the key variables of the study. In this study, the adoption of improved methods of crop farming is the independent variable measured in terms of irrigation, crop rotation, use of inorganic fertilizers, and chemical control of pests and adoption of high yielding plants. While livelihoods are the dependent variables measured in terms of food security availability, income, physical capital and possession of assets. The illustration also consists of intervening variables such as literacy levels, enforcement of government programs, farmer's attitude towards change and level of sensitization. These determine the state of livelihoods through intervening variables; we can tell whether the small holder farmers access livelihoods in the various aspects as in figure 1.1

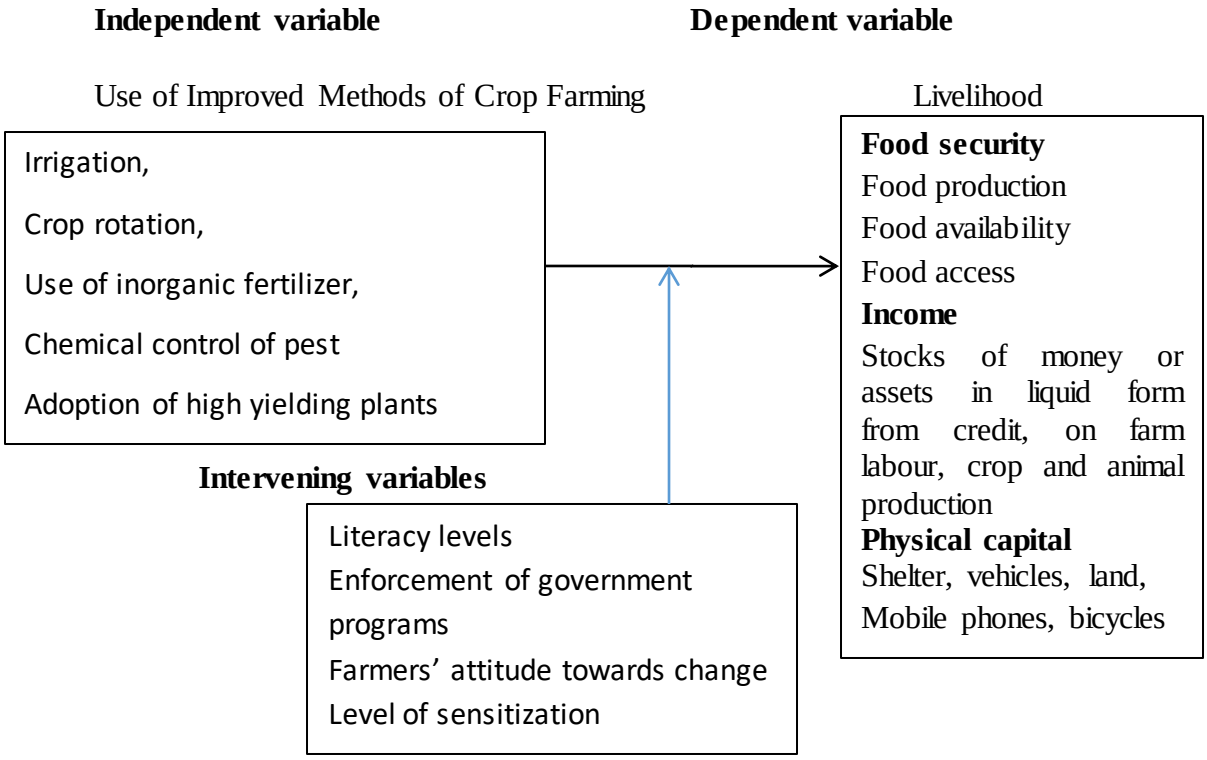


Figure 1.1: Conceptual frame work modified from works of (Adherhe, 2009; Ellis, 2009 and Knutssan, 2006)

From the above frame work, it is perceived that use of improved methods of crop farming which involves; the use of modern irrigation systems, crop rotation, application of non-organic fertilizers, chemical control of pests and high yielding plants will lead to improvement in the livelihoods of small holder farmers, income, physical capital and social capital. But for the above to be achieved their literacy levels must be improved, enforcement

of government programs on modernization of agriculture, farmers' attitude or mind set must change towards modern agriculture and level of sensitization must be improved upon.

1.9 Definition of Key Concepts

Improved methods of crop farming refer to transforming agricultural sector to have increased crop production. Farmers change from using local farming methods like slash and burn agriculture with reduced crop-free seasons. This study identified the modern methods of crop farming like irrigation, use of high breed crops, mechanization, grafting of crops, use of pesticides, mulching and Agro- forestry.

- Adopters refer to farmers who are practicing improved methods of crop farming in a particular village on their farms or gardens. They basically aim at improved incomes and having adequate food availability.
- Non- adopters refer to farmers who are persistently practicing traditional farming methods including bush burning after slashing with limited fallowing duration, ploughing straight down-hill sides degrades the soil and causes erosion. This has resulted into low crop production with increased Food insecurity concerns.
- Livelihood encompasses possession of assets, income generation, enhanced food security, and up scaling of the welfare of small holder farmers. Also refers to acquisition of basic needs of life easily and the means to sustainable acquisition of these necessities.
- Financial capital refers to income of the farmers earned from sale of crops. Financial capital is the same as income. It involves basically the sources of incomes by the farmers such as crop production, animal sale, credit from financial institutions, on farm labour and business.
- Physical capital refers to physical possession of assets by the farmer such as vehicles, land in both village and town.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter explores the conceptualization of the study as derived from the study background and the available literature is presented using themes which are derived from the research objectives and hypothesis.

2.1 Use of Improved Methods of Crop Farming

Agro-farming report (2019) indicates that this method of farming is geared towards transforming agriculture into active, technologically modern and competitive sector aimed at human resource development, and followed by principles of social justice. According to Gretchen (2018), the use of improved methods of crop farming is a result of expansion in the need for consistency and attaining of food security. Inclusively technology is now part and parcel of farming marshalling the initiation of technological ways in farming resulting into grand changes in people's farming approach now days. Deree, (2019) identifies the improved methods of crop farming namely; agro forestry, irrigation, mulching, excessive cultivation, use of manmade/ inanimate fertilizers, chemical control of pest and congenitally influencing plants leading to improved crop yields hence food secure. However, these studies were carried out in U.S.A, hence creating a geographical scope gap which this study intended to address.

2.1.1 Irrigation Farming

During inadequate supply of rainfall, man has invented a system through which water is supplied to crops to meet this deficit by controlled application; so that agriculture continues normally and this is what is termed as irrigation farming. The need for crop irrigation is justified by the fact that the world's populations are ever growing hence the need for enough food provision (Jennifer, 2019). Throughout the world, a variety of irrigation methods are practiced including centre-pirot sprinkler irrigation method. The centre-pirot is electric powered which operates the nozzles automatically attached to the sprinkler pipe or boom, which pipes supplies water to the area of the field to be irrigated. To have this done, supporters are elected at regular intervals and then the pipe is mounted across them. Then follows the use of electric power, prismatic mechanical or hydraulic. The amount of water used depends on what rate the system travels. The other type of irrigation is Drip or Micro,

here water is planned to reach into direct contact with the root zones of plants through use of applicators which are used under low pressure. The position of the applicators is either at the top or under the ground level. (Schroeder & Nar, 2013). However, Jennifer's study was on organic farming irrigation systems in London; Gretchen's study was on what is sustainable agriculture in Washington DC while Schroeders study was on potentials of modified and upgraded maize varieties for farmers on small acreage in Kenya hence creating a contextual gap which this study planned to address.

Irrigation is sometimes done by flooding or furrowing. It involves using ponded water to cover the surface of the soil entirely by allowing pumped or flooding water to freely flow all over the ground covered by crops. This facilitates and results into high crop productivity. In the ancient times, humans used to utilize the method in a primitive way by using buckets to carry water onto the fields and then pour it onto the plants. This method is simple and cheap and to date, no other method of irrigating crops is as pronounced as this one states of the U.S, Poorly developed lands of the world and those not yet fully engulfed in modernized agriculture the system is better known as flood irrigation. Its simplicity is all also seen its being cheap as a method (Coachella, 2018). However, this study was carried out on farm irrigation and drainage; the valleys success is in its agricultural roots in United States of America hence creating a geographical scope gap which this study planned to address.

Overhead sprinkler irrigation system; is where pipes with systematically designed holes or water outlets are operated under auto pressure, and as the water flows out it forms spray "canopy" or "liquid – water spectrum like design" over the land being irrigated, then there is photograph and sub – irrigation whereby water is passed beneath the surface of the water table within or around the rooting system area of the plants or by letting water for irrigation from perforated pipes reach into direct contact with the root regions (Doier, 2019). However, this study was carried out on irrigation methods a quick look at London hence creating a content scope gap which this study intended to address.

2.1.2 Use of Inorganic Fertilizer

The increasing usage of inorganic fertilizer undoubtly plays a pivot role in upscaling farm productivity. Uganda's experience on small holder farming industry has persistently recorded low levels of employing and adoption of fertilizers as compared to that of other sub – Saharan countries. In order to re-awaken the agricultural industry emphasis is rigorously put on the increased uptake of modified up to date farming technologies including inorganic fertilizers

as a farming promotion strategy (Ali &Abdulai, 2010). However, this study was carried out on use of improved cotton and poverty alleviation in 2010 hence creating time gap which this study planned to address.

While global use of inorganic fertilizer presents a wide range of crop production with high yields coupled with a gross variation of characteristics as far as adoption to environmental setting, Mechanisms of production and characteristics of the final yields. Small holder farmers in low developed states have constricted accession to inorganic fertilizers and inadequate knowledge associated with their use. In developing countries condition is more captions (demanding) in less income countries where peasants may not readily reach in organic fertilizers hence low crop yields (Ali &Abdulai, 2010). However, this study was carried out on the taking over of cotton whose genetic material has been altered using genetic engineering techniques and poverty alleviation in Pakistan in 2010 hence creating a geographical scope gap which this study intended to address.

FM Radio; Farm Radio International's strategy constitutes one of the earliest / primieval and most successful ICT tools; Frequency Modulation radio. As far as 1900s; the radio has offered farmers reliable farming and crop production advice the world over use of inorganic fertilizers, how to use it and its benefits as well as predicting weather conditions and provision of market news. Though a reliable tool to a vast number of people, the technology in its conventional form has many short comings- feedback is not possible and to make matters worse there is nothing like air broadcast. However, if it is coupled together with mobile technology, the use of radios becomes more relevant with feedback becoming possible from the audience, this opens up more space for participation and on demand access. Farmers can record interviews and send them to radio hosts; they can communicate with any other mobile phone gadget holder anytime by electives to listen to pre-recorded audio programming, granting them more of a choice in how they receive information on use of inorganic fertilizers (Anierobi, 2016). However, this study was carried out on can anyone tell me the indicators of sustainable livelihood and the best way to measure access to land in Tokyo hence creating a contextual scope gap which the study intended to address.

At worldwide level, a lot of research and policy verification has been done on fertilizer uptake. In Uganda it leaves a lot to be desired. A wide deficiency in correct information still hoovers. Upgrading the utilization of non-organic fertilizer needs a proper knowledge and comprehension of the constraints of market forces that render the utilization of fertilizers to

remain below the operation line in Uganda (Ssekandi & Chen, 2005). However, this study was carried out on modernization of agriculture in Uganda that works to alleviate poverty hence creating a content gap which the study intended to address.

2.1.3 Genetically Manipulating of Plants

Crop species considered to be improved are those that come into play after a well-organized scientific process of seeds and crop modification. This modification is done on plants in order to generate better characteristics and double their worthy. A plant breeding program has its basic aim being an expansion in the food yields; However, the new varieties have come along with a great number of positive effects / outcomes i.e. fairing extra ordinary in new agricultural zones, an un told immunity to diseases and pests, and conservative calendar to facilitate production beyond the seasons that tradition has put in place, better rated efficient meager water utilization and better nutritional capacity name it. (FAO, 2014). However, this study was carried out on Standard categories of seeds for small scale farmers in United States of America hence creating a content scope gap which this study planned to address.

Plant genetic modification involves choosing one best plant among several crops, orderly for high breedization of plant species and the modification of plant traits by inserting the required (essential) traits into crops among other crop yields and production (Foster & Rosenzweig, 2003). However, this study was carried out on agricultural productivity growth, rural economic diversity and economic reforms in India hence creating a time gap which this study intended to address.

Advocates of the seeds that are genetically manipulated advance it that these seeds explain the increase in crop production that addresses the food security question in the world. Global leading finance corporations have spent to well over $9.8 to british based scientists in their exploits on how to manipulate corns into variety. The same to wheat and rice seeds so that they can extract nitrogen from the atmosphere that would render nitrogen fertilizers null and void when the uptake of nitrogen is heightened, the crop yields would double and this inturn would be a blessing to farmers on continent Africa. (Shiferaw & Kebede, 2008). However, this study was carried out on technology adoption under seed access constraints and the economic impacts of improved agricultural technology in Tanzania hence creating a geographical scope gap which this study intended to address.

2.1.4 Plant Breeding

Man's deliberate attempts to harness plant nature in due respect to its genetis and heredity in view of maximizing crop productivity is what can be termed as plant breeding. Once manipulation is done to plants, there cannot be any reversing. This is professionally done by plant breeders. The main target of modifying and manipulating plant nature is to upgrade certain compositions of plants to new production functions or strengthen the prevalent ones to high levels of productivity. (Otchia, 2014). It should be stressed here that the aims and purpose of plant breeding are on focus. Plant breeding involves manipulation of sexual process to get the desired modification and biologically engineering a change in asexual plants as well. In plant breeding, the structural makeup and attributes are changed so that the plant becomes greatly resourceful to man for increased productivity. Mention should be made that, certain plant breeders results into increased production (Jennifer, 2019). However, both studies for Otchia and Jennifer were carried out in United Kingdom hence creating a geographical scope gap which this study planned to address.

2.1.5 Pesticides

A pest may be defined as any destructive organism in form of an insect or animal that causes loss or damage to the physical well-being of crops, animal, food and human beings. It destroys crops, orchards, animals causing diseases in them. There are a number of pesticides that can kill or destroy these pests. Pest management control measures include chemical, biological, cultural, physical and genetically. These chemicals are known as pesticides (cides is a Latin word referring to kill). Pesticides are sprayed on crops, which leads to high crop production. The mostly used pesticides include baygon spray, finit (flit), DDT, BHC which are mainly used by small holder farmers to kill pests, Tsetse flies, ants, moles, rodents etc. These types of pesticides are more advantageous in modern agriculture with increased side effects on organisms (pest), and brief idea of integrated pest management has resulted into high crop yields (Key & Roberts, 2007). However, this study was carried out on farm business survival and size growth in United States of America hence creating time gap which this study intended to address.

The main benefits of the use of pesticides has direct effects such as killing caterpillars that destroy the crops hence resulting into higher yields and better quality crops. Pesticides disrupt breeding behavior and affects mating of pests which results into better growth of

crops leading to high crop yields hence increased revenue. This has enhanced improved livelihood such as children's education or medical care, leading to a healthier, better educated population. There are various secondary benefits identified, ranging from fitter people to conserved biodiversity (Foster &Rosenzweig, 2003). However, this study was carried out on agricultural productivity growth, rural economic diversity and reforms in India hence creating a geographical gap which this study intended to address.

2.1.6 Improved Seed Varieties

Improved seed technology is mainly used for improving crop production and productivity. This leads to increased crop yields. The use of a variety of seeds is suitable for all climatic conditions which lead to improved yields and high quality. Drought resistant crops are suitable to all climatic regions due to quick maturing which results into increased crop productivity (Reardon, Barret, Berdegue and Swinnen, 2009). Quick maturing crop varieties grow faster, give quality seeds, high yields and stable production hence boosting agricultural productivity. Improved seed varieties are common in South Africa, although they are contentious and not accepted in several states (Reardon et al., 2009). However, this study was carried out on agri- food industry transformation in low developed countries hence creating time scope gap which this study intended to address.

The easy access to modern seeds is as a result of a number of reasons, such as accessibility, price, sensitization, and scale of crop growing. The quality of seeds needs to be considered such as ongoing genetic viability used for several years. The most important factor that hinders accessibility to a variety of is farmers' organizations and other promoting agricultural bodies influence the above factors (Henderson & Winters, 2011). However, this study was carried out on the food crisis and the future of small holder agriculture in Italy hence creating a geographical scope gap which this study intended to address.

2.1.7 Use of crop rotation

Crop rotation can be explained as the farming of economically valuable crops on the same farm land in continuous succession season after season with a stable and clear plan. This is done sequentially. (karfakis & HammamHowe, 2010), defined crop rotation as the combination of sequential plants cultivated in a single farm land. It is the sequential cropping that culminates into high crop productivity. In crop rotation, fullow, green manure or none of them may not be necessary. Even though, fallowing may lead to elimination of disease

occurrence but it is also true that monoculture can also greatly deter disease multiplication hence leading to high farm output (Collier &Dercon, 2009). However, these studies were carried out in 2010 and 2009 respectively hence creating a time scope gap which this study planned to address.

A well designed crop rotation plan will ensure that there is a routine regularity in farming of each crop, adequate fallow period at specific periods; a feasible list of crops to be rotated is in place, utilization of modern agricultural practices coupled with a definite crop order record throughout the farming cycle. The reverse of crop rotation is mono cropping. It is irrespective of outdated and advanced agricultural systems e.g. the green houses use it as a matter of necessity, economic factors and sticking to production of one economic plant in consideration. (Lowder, Skoet & Singh, 2014). However, this study was based on knowledge about the quantity of farms in the world used only qualitative method hence creating a methodological scope gap which this study planned to address.

The benefits of crop rotation is managing the spread of diseases has a lot to do with the nature of pathogens and the plant, the methods of agriculture used, the soil component make up, the biotic and a biotic considerations, However, crop rotation is also susceptible to these factors such as, large range of the pathogen, Adoption of pathogens in the absence of host, The wide range of large inoculums produced by Pathogens, Immunal weakness of plants to disease, how Crops are able to activate formation of resting structures. The frequency at which soils are attacked and contaminated by colonies of pathogen from outside sources. Soil accommodation to disease, Weed control mechanism. A vast number of diseases that result from pathogens borne by the soil can be eliminated through crop rotation greatly. These include sugarcane wilt, ergot and coffee wilt (Nagayets, 2005). However, this study was carried out on small farms: current status and key trends hence creating a time scope gap which this study intended to address.

2.1.8 Efficient Water Management Practices

Farmers who use irrigation method are able to obtain high crop yields because of reducing both foliar and soil borne disease (Lowder, Skoet & Singh, 2014). It changes soil moisture content, air, oxygen and temperature, this limits soil- tolerated infection through biotic progressions in soil. Irrigation hinders infection occurrence ultimately due to transformation in farming systems such as increased crop harvesting, variations in time of planting periods hence improved crop production (Henderson & Winters, 2011). However, all these studies

were carried out in Italy hence creating a geographical scope gap which this study planned to address.

Irrigation is a supply of water to land or crops to help in growth using drainage channels at regular intervals. It also refers to the process of providing water to plants manually when there is an insufficient rainfall amount to support proper growing of crops. The water source may be a lake, swamp, river, borehole and manmade water reservoir is supplied to crops through manual watering, pipes, canals. Irrigation system provides stable and constant supply of water to the crops which is dispersed uniformly. This has supported continued growth of crops leading to high yields (Key & Roberts, 2007). However, this study was carried out on commodity payments, farm business survival and size growth in United States of America hence creating time gap which this study intended to address.

Modern irrigation technology provides better control of the amount of water distribution in the soil. Soil dampness and drying are affected by a number of conditions, like the quantity of water given at each irrigation intervals between technique of irrigation, nature of the soil, the plant, and climatic influences. Desert areas, irrigation is of greater significance to increase on crop yields. (Karfakis & HammamHowe, 2010). However, this study was carried out on the economic and social weight of small scale agriculture hence creating a contextual scope gap which this study intended to address.

Reardon et al, (2009) stated that irrigation helps in the introduction of new crop varieties and growing seasons in desert areas. It can result into new soil-tolerated infection which was not in existence previously. Water management must be used to reduce the incidence of soil tolerated infection so as to increase crop yields. Salty water affects the occurrence of some diseases hence leading to low crop yields. However, this study was carried out on agri- food industry transformation and small farmers in developing countries hence creating time scope gap which this study intended to address.

2.2 Livelihood

According to Blaikie, Cannon, Davis, & Wisner (2014), Livelihood encompasses possession of required assets, financial capital and activities required to secure the necessities of life. Livelihood is obtained by working with people or organizations to satisfy the needs of the individuals or organization goals. (Morse & Namara, 2013). These authors add that the activities which define one’s livelihood are done frequently; such as, a fisherman's livelihood

depends entirely on fish. Taking this interpretation, farmer's way of life depends on quantity of harvest obtained and the extent to which they are in position to sustain high quality yields.

Livelihood Indicators

DFID developed the sustainable livelihoods framework (SLF) (Morse & Namara, 2013) that gives a better mechanism for choosing livelihood indicators and methods through which they can be weighed and compared. In this framework, at the centre of sustainability, we can identify five livelihood or capital assets. Accordingly these assets are a composition of all manner of materials, services and satisfying their daily essential needs and salvaging any disasters. The five types of assets include: Natural Capital: land, water, biological resources (biodiversity), Financial Capital: stocks of money or assets in liquid form, Social Capital: rights or claims derived from group membership; Physical Capital: infrastructure; resources created through economic production; Human Capital: quantity and quality of labor available (Knutssan, 2006)

The satisfaction of human basic wants in addition to health and education means that certain prerequisites must be in place. The availability of natural resources as number one, accessibility to resources is based on market economy (Ellis, 2009). Where certain goods and services must be got outside market channels, the rights to acquire the resource coupled with other services that ease resource exploitation must be guaranteed. These rights are determined and dependent upon customary norms or official laws that control the distribution of resources. To have labour supply and allocation in the manufacturing process, availability of the required commodities, the health wellbeing of the household as a basic unit is a core factor. (Clare, 2002).

The rule of law, procedure and system of control by a credible authority must be set up with sustainable structures to check on capital stocks that provide the sustainable flows of harvestable products to forestall overexploitation. The rule of the law must be strictly adhered to and enforced. The harvested product must be turned to currency value (cash), which is the basic medium of exchange today worldwide. Capital assets can also undergo conversion into cash, depending on who has the legal rights over them, ownership or illicit possession. (Anierobi, 2016).

Figure 2.1 below was adopted to explain the various components of livelihood to help draw clear understanding on the topic of study and Livelihood indicators.

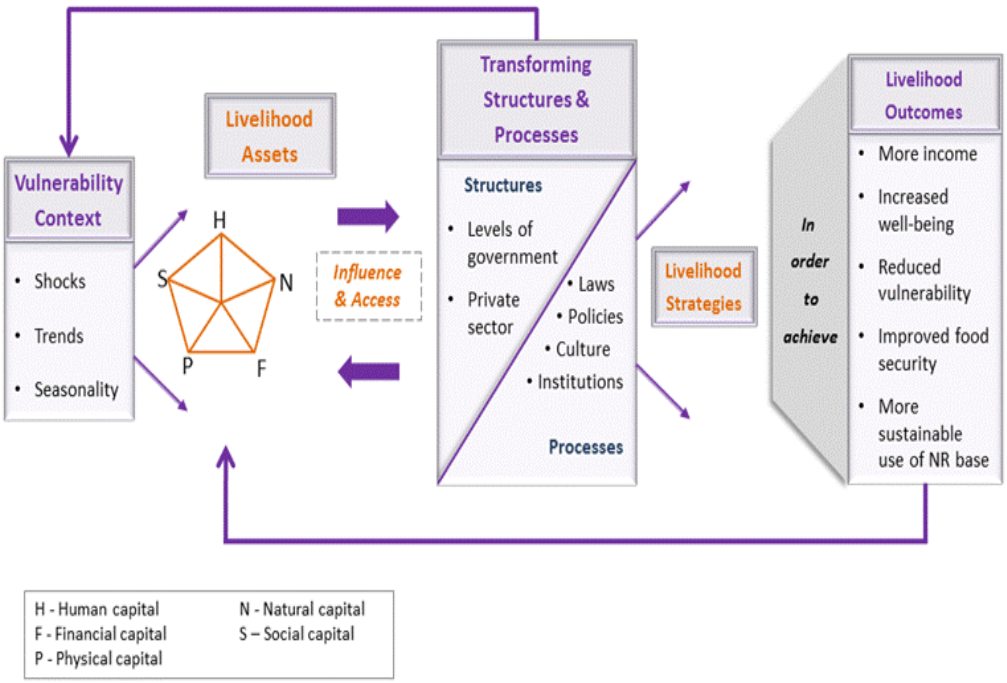


Figure 2.1 Components of Livelihoods Adopted from https://www.soas.ac.uk

According to Pradipta, Bhadra, &Subhrangsu (2015), the five paradigms of livelihood include; Human, social, natural, physical and mental capital. Human Capital covers mental, intellectual and technical ability, knowledge ability and stable credible health which all combined leads to the performance of productive livelihood indicators as fulfillment of goals. Social Capital encompasses all the connections, links and webs that reduce uncertainty and promote natural need to work together for a common goal in formalized social units with binding legalities. Natural capital covers the environmental resources and natural stocks on which man derives a livelihood. These include; but not limited to land, water bodies, soil conservation mechanisms name it "physical capital" can be considered in terms of basic infrastructural setup, services that support the production of goods. This is not limited to water resources, and sanitation, buildings, how easily information and communication can be tapped, the affordability of energy and power to mention but a few.

Financial Capital refers to financial possessions people use to attain livelihood goals, contains money helps individuals to adopt various livelihood strategies. This is consistent with Koerse, (2018) is any resource with economic value that can be converted into money to facilitate trade and commerce i.e. production process and activity upon which their industry hinges.

2.3 Effect of Improved methods of crop farming on Financial Capital for Small-holder Farmers

According to Koerse, (2018) stated that financial capital is any resource with economic value that can be converted into money to facilitate trade and commerce such as production process and activity upon which their industry hinges. However this study was not specifically addressing concerns in Luuka District and it was not empirically studied the way it was, hence creating a geographical scope gap the study intended to address.

As an avoidable tool for directing funding into the agricultural sector, credit is paramount importance, even as a driving force in other projects aimed at rural transformation. It offers a wide range of modern agricultural inputs meaning that we expect high returns in terms of up scaled production as a result of its utilization. There is valid proof to the effect that in Tanzania, commercial and rural development banks give rise to extensive holding farmers since the small scale farmers cannot access loans due to lack of collateral security to guarantee the loans, but beyond this, small holder farmers have inadequate credit management skills with no attempt to successful feasibility studies. To worsen it all, they can foot the exorbitant interest rates (Reardon et al, 2009). However, this study was carried out in 2009, hence creating a time gap which this study planned to address.

Smallholder farmers find it challenging to acquire loans from financial institutions due to diverse reasons such as limited credit skill, credit accessibility, limited financial sensitization and no security to guarantee the loans because of the inability of farmers to have securities. (Msuya et al, 2018). In Tanzania minority of small holder farmers have access to financial loans from commercial banks. In the study on moving out of poverty in Kagera region by Green,(2015), respondents pointed out that absence of credit and awareness were important hindrances to move out of poverty. However, this study was carried out in Tanzania, hence creating a geographical scope gap which this study intends to address.

Domestic labour in farming has been gradually substituted by hired laborers among the mechanized tribal and occupational diversification. The access of using improved methods of crop farming, schooling, and better transport system has aided small holder farmers to develop particular skills. The Santals have established particular skills that have helped them to give up their traditional way of living like hunting, gathering and cutting of wood. The skills gained are used for development purposes (Ellis, 2009). However, Ellis study was carried out on the livelihoods framework for micro policy analysis of rural livelihoods. This

created content gap since this study was on use of improved methods of crop farming and livelihood of smaller holder farmers

Changes in Expenditure Pattern: The rate at which patterns in the expenditure shutter keep on falling or rising, decreasing or increasing is most excellent indicator that clarifies the level of livelihood. Years back, the sandals could expend a great percentage of their incomes on food. However, now that their income have grown and with enlighten, most of their incomes are now expended on durable goods and basic services. Savings culture has also been incorporated (Munn &Drever, 2004). However, this study was carried out in Scotland which is a developed country but Luuka District is from a developing country, hence creating a geographical gap which this study intended to address.

All biological creatures hold food as the most important and therefore basic need they have to satisfy without compromise. Research shows that a rise in incomes does not lead to a proportionately greater expenditure on grains, in steady more is allocated to meet oil, vegetable, meat, fish, and eggs. Supplements, luxury and leisure is also eating up a greater part of their incomes. Once the basic necessity of food is fully met, a shift is made to cater for the needs of clothing and housing for the case of mechanized farmers (De &Ghosh, 2005). However, De and Ghosh study was carried out on result of infrastructure regional income in the era of globalization. This created content gap since this study was on use of improved methods of crop farming and livelihood of smaller holder farmers.

Other basic needs come after some proportion of money is directed to meet the costs of luxury goods. The sandals are perpetual liquor consumers. With growth in incomes realized after mechanization, there has been a gradual fall in the money spent on liquor (Ainembabazi & Mugisha, 2014). Famers in the mechanized sector spend money on consumption as well as a certain percentage on education, medical welfare and re-investing it which is really a fundamental change, rising proportionate to level of incomes among the farmers of the mechanized era which this study intended to address (Ellis, 2009). However, this study never showed that a cross sectional design was used, hence creating a methodological gap which this study intended to address.

2.4 Contribution of Improved methods of crop farming to Physical Capital for Small-holder Farmers.

Foster and Rozenzweig (2003) described that in addition to land and labour, physical capital is the other economically basic factor of production. In farming, the best examples are but not limited to farm equipment and machinery, structures in physical assets and variety of facilities employed in agricultural production. Generally, a firm's investment behavior manifests in its capital stock adjustments in regard to market forces and the pull to equilibrium. With specific references to farming, factors such as family norms, practices and attachments to factors of production greatly determines the course of decision to take and options on physical capital adjustments.

Another way production assets can be graded is according to category is the area of duration. This is further divided into the non-durable and durable assets. The non-durable assets are short lived and their use is for a particular timed action that does not have a recurring application for example the pesticides, herbicides and manure. Whereas, the durable assets have a recurring usable application as long as they are needed in the production chain for example buildings, farm equipments and machinery. Then the last category under discussion is that of reproducibility of assets both reproducible and non-reproducible, in each case being tangible in composition. Reproducible tangible assets are liable to duplication like machinery yet assets that cannot be remade like land, a mine and work of art (Key & Roberts, 2007). However, this study was carried out on commodity payments, farm business survival and farm size growth in United States of America hence creating a content scope gap which this study intended to address.

Mobile farm assets refer to a variety of Farming mechanized equipment fall under this category. Some are duplicable like combine harvesters, tractor ploughs and other capital goods essential in agricultural production. These assets are made up of relatively liquid assets such as cash on bank, cash on bank deposit and assets that can easily be changed to cash. Reproducible assets are those that can be copied and remade such as houses or buildings, farm machinery for example harvesters, ploughs (Pradipta, Bhadra & Subhrangu, 2015). However, this study was carried out on role of human capital for changing Livelihood pattern in Nadia district India hence creating a geographical scope gap which this study intended to address.

According to Alene and Manyang, (2007), these networks, farmers can then adopt latest methods and get expertise, acquire peer – peer informal training from those who are on board with such practices and even get extension services related to the different practices. Many documents provide information about the importance / value of communication and varied networks in the provision of information about employment and market availability. In essence of farm production and a sustainable economy together with regional sustainability, aware of the fact that the quantity of labour available ranging from family relationships to social networks is dependent on this. This is of particular importance in the face escalated rural urban migration, which may hamper and hinder rural farm labour supplies. However, this study was carried out in Nigeria, hence creating a geographical scope gap which this study was intended to address.

Ssekandi and Chen, (2005) Stated that social capital, which is constructed by society integration and participation can boost social responsibility by fostering the integration and application of modern farming techniques hence adding on input to environmentally friendly sustainable development. They further stated that social capital impacts, positively on environmental sensitization and clarity of the agriculturalists, and therefore on the uptake of latest environmental friendly farming methods. However, this study was on Uganda's agricultural modernization which helps to fight poverty, hence creating content gap which this study intended to address.

The nation that the practical assessment of farmers input to the farming basically comprises the value of social relationships and networks that complements the economic capital must be dependent, foretasted varied sizes has been perpetrated as a basic necessity for the sufficient construction, implantations and overseeing of agricultural policies geared towards supporting agricultural activities. The major handle is in how to jointly interpret the total sum of indicators need for such analysis; this is a great hindrance as far as community choice maintenance tool (Koerse, 2018). However, this study was carried out on monopoly finance capital and the paradox of accumulation in United Kingdom hence creating a geographical scope gap which this study planned to address.

2.5 Effect of Improved methods of crop farming on Food Security for Small-holder Farmers

In the debate about global issues and perspectives, food security and food insecurity are key words that we often come across. Food security is only realized when the communities

throughout their lifetime have sustainable physical and economic access to enough, safe and nutritious diet for a pro – active livelihood. When people have a deficiency in safe dietary supplies meaning that there healthy life is affected, we call that food insecurity. The deficiency may be due to famine, poverty or poor food retaining and preservation at household level. Physical and economic access to sufficient food nutrition which satisfies small holder farmers dietary needs for good healthy. The Food and Agriculture Organization (FAO) of the United Nations has observed worldwide population facing starvation and dietary deficiency in 2010 was as acute as to the tune of 925 million people (Jarosz, 2014). However, Jarosz study was carried out on comparing food security and food sovereignty discourses. This created a contextual gap which this study intended to address.

Foodshortage in Africa is a complex phenomenon that can not only be explained in terms of lack of needed farm equipments, Population increase, weak institutions and rule of law due to unsupportive government policy , land shortage, loose international trade networks, inadequate storage tools, misuse of food, pests and diseases, unstable economy and others are stakeholders in this predicament. Even when the communities get interventions to salvage the scarcity of farming technologies, the social, political and economic challenges the region shoulders in food security attainment remain a roadblock to this vision.(Abdu-Raheem & Worth, 2013). However, this study was carried out on food security and biodiversity conservation in the context of sustainable agriculture in South Africa hence creating a geographical scope gap which this study intended to address.

The agricultural sector is the master mind behind achieving sustainable availability of food and securing food surplus throughout our lifetime. Even though the demand for better diet is likely to escalate at global level in the coming decades, uncertainty worms as to whether the world has the ability to offset this demand by widening the food supply base. Food security ensured by boosting and widening on the acreage and variety of land for agricultural productivity is a workable mechanism that can alleviate and diminish hunger, however, for the case of third world countries, absolute and lack of state of art technology coupled with inadequate skills and information gaps, may not see them achieve a food security reality 2020 and beyond (Henderson & Winters, 2011). It exposes the necessity to bolster investments in agricultural research and extension services comprehensively for the third world nations to step up agricultural productivity per unit area and per agricultural labourer. For Sub Saharan Africa, this call for a targeted effort on investments transform farming in African to maximum without severely harming the environment. It is necessary to close the technology

gaps, address the knowledgibility constraints by systematic transfer of technology (Green, 2015). However, Henderson & Winters studies together with Greens study used quantitative methods only hence creating a methodological gap which this study intended to address.

Mechanization programs are capable of escalating wealth inequality. Extensive agriculture operations can acquire and keep machinery yet small scale farmers constrained. Small holder farmers with more than five hectares are able to mechanize. In case where those with the machines can allow rent out to those without, this could be a worthwhile intervention. But the other option would be for small holder farmers buying simpler and cheaper equipment such as the user friendly two wheel tractors. The advantage here is that these devices are simpler improved version on the hand tools that vast number of small holders uses to date (Bryceson, 2005). However, Brycesons study was carried out on rural livelihoods and agrarian change in Sub Saharan Africa in 2005 hence creating a time gap which this study intended to address.

World over, nearly an average of 35% of the world be harvest is destroyed by pestilence just before the crop is harvested. This loss goes hand in hand with a high food chain loss. A ware that, agriculture must come to terms with the worldwide level of progressive demand for food client supplements, home tailored fuel and other bio based commodities. In many regions, the attack by pestilence is profound just because simple agro ecosystems which took over from the once diverse ecosystems (now destroyed) cannot match the aggression by these attackers. So as a condition to safeguarding food security there should be a rigorous drive to crop protection against pestilence. When the farmer is empowered to fight crop and food loss, is a great factor in enhancing sustainable and reliable food supplies even to rural farmers whose aspiration is to have more food far beyond self-sufficiency. To have food security means a greater move towards greater economic self-reliance; this is the first step. The results accrued from the application of pesticides justifies its continued use as a vital tool in the variety of agricultural innovations that are geared towards improving standard of living of the people globally (FAO, 2014). However, FAO carried out a study on appropriate seed varieties for small scale farmers hence creating a content gap which this study planned to address.

Crop yields may be bolstered in many places by using high yielding varieties, improved water and soil sustainability, fertilization and varied farming methods. The potential for crops to increase their yields, however, is always proportionally met with the crops vulnerability to pest attack bringing into play grave losses and severe loss recurrence levels. It is true that poor weed control and actual losses to pests, account for low crop yields and an estimate of

about 50% losses are incurred. In most regions of Asia and Latin America, a lot of success has been made in farmer sensitization and empowerment yet in Soviet Union countries the situation is alarming due to resource vacuum and in sub – Saharan Africa. Farmers are still desperate due to poverty. (Key & Roberts, 2007). However, Key & Roberts carried out a study on commodity payments, farm business survival and farm size growth hence creating a contextual gap which this study intended to address.

The contribution of irrigation technological development i.e. surface and ground water supply has a reciprocal food supply. In evaluating its contribution and benefits an attempt should be made to realize that irrigation contributes to about 25 to 50 percent of the global food production (FAO, 2014). However, FAO carried out a study on appropriate seed varieties for small scale farmers hence creating a content gap which this study planned to address.

On the contrary, proponents of irrigation need not to blow the impact of irrigation on food safety out of proportion, water down the role of other contributors on global food security. Low prices at world market for food are as a result of the OECD nations, the high progressive application of fertilizers and crop securing chemicals, plus the emergency on market of modified and upgraded, high output and crop yielding species perpetuated by farming extension facilities. The continued changing effect of industrial farming strategy reduces production support, exchanged by direct farm income support and production-reducing conservation measures. Reduction in more developed nation injection in farming to move the pressure curve towards the peak on world food prices (FAO, 2014). However, this study of FAO was carried out on appropriate seed varieties for small scale farmers hence creating a contextual scope gap which this study intended to address.

There is a belief that more food production lies in biotechnology advances. In the seed industry there is little doubt that increased crop yields are a reality. This means a possibility of attaining 4% of yield potential up from 3% per year. The world's leading seed company, has vowed to come up with new crop varieties of maize, soybeans, and cotton by 2030 that doubles the yields with using 2/3 water per unit area (Kremen, Lles & Bacon, 2012). No doubt, these kinds of technological progress will greatly be demanded if we are enthusiastic at feeding the world's hungry; however, historical odds seems to tell the contrary that genetic innovations and progress falls short of answering the world's food shortage question. (K'Oloo, 2013) brings to light the fact that 40-year increasing trend for maize yields in USA per hectare have because of positively integrating technological advances with other factors

which modified genotypes, soil examination and treatment with chemicals rigorous irrigation and conservative tillage. Certainly, integration of up-to-date biotechnological, modern farming husbandry control methods and routine on great demand to push production upwards use of nutrient and fertilizers will need to be continuous with vast upgrading and modification aware that crop nutrition is the basis for the existence of other technologies. Both studies of Kremen et al and K'Oloo used only qualitative method to determine production of crops hence creating a methodological gap which this study planned to address.

The effect of doing away with the application of multiple inputs, including inorganic N fertilizer on leguminous crops including wheat and peanut yields in the U.S.A. The modified Delphi procedure was employed, making use of comparing the crop yields and the amount of money used. Similarly another study was carried out considering the N fertilizer, application on crops like cotton and maize together with non-leguminous crops was analyzed. Reductions in yields could not be estimated even though they would have been higher. When N was withdrawn from peanut and soya bean, the yields were not affected in anyway yet they have an N fixing potential nature (Kumar, 2017). However, this study was carried out on improved methods of crop farming in United States of America hence creating a geographical gap which this study intended to address.

Today, with a continuously growing population, the main challenge is how to create a better diet before constancy while, coping up with an increase in the number of climatic with economic disasters and ensuring long term sustainable food stability and livelihood. The concept of food security and nutrition are intervened (Kremen, Iles & Bacon, 2012) they further pointed out that the use of water conservation provides water access to crops during drought and hot temperatures which leads to high crop yields. However, this study was on diversified farming systems an agro ecological systems based to modern industrial agriculture hence creating content gap which this study intended to address.

With the recommended tools in their possession, small holder farmers have a stake in mitigating post-harvest losses of nutrient dense food. Alleviation of after harvest losses makes agricultural incomes to increase, nutrition to prosper and adds value to qualitative and quantitative supply of food. Post-harvest like storage and processing of crops through value addition increases richness in food nutrients (herforth, Jonest &Pinstrup-Andersen, 2012). However, this study was carried out on prioritizing nutrition and agriculture and rural

development, creating content gap, hence this study was on use of improved methods of crop farming and livelihood of small holder farmers.

Research done in numerous nations reveals that female small holder inject the income that they obtain from crop sales in feeding the family, accessing health facilities and paying fees for children. Females who have access to farming platforms disseminate nutrition based information are in better position to deliver improved nutrition outcomes (Hawkes, Turner & Waage, 2012). Alternatively, this study was carried out in London, hence creating a geographical scope gap which this study intended to address.

Advancing homestead agricultural output through vegetable farming, horticulture and animal rearing is a foundation for increasing food stability and intensive use of family labour. It allows women farmers to grow fruits and vegetable and rear small animals while fulfilling their domestic and child care responsibilities. It can be advanced as a basic occupation and a medium to acquisition of diversified foods throughout the year irrespective of the time of the year (Traore, Thompson & Thomas, 2012). However, this study used only quantitative techniques and yet mixed methods were applied in this study, hence creating methodological gap which this study intended to address.

Diets based mainly on cereals have an attendant's risk of lacking micronutrients. Sometimes coupled with inadequacy in a variety of micronutrients they are a sure supply of physic acid and dietary fibre which hinders the uptake / retention of valuable nutrients like zinc and iron. Production done at household level is a channel through which dietary micronutrient content can be boosted and stepped up by increasing on the consumption of animal generated foods, foods rich in protein quotient, mineral and vitamin inadequacies in micronutrient can vastly be controlled in line with home steady farming, mixed cropping, introduction of new crop varieties, and increasing on the exploitation of traditional food crops can help to solve the problem of micronutrient deficiancies (Dorward, 2013). However, this study was carried out on how interventions in farming practices play a part in adding value to nutrition, health and realizing the millennium development goals in third world creating a gap, hence this study was on use of improved methods of crop farming and livelihoods of smaller holder farmers.

Wiggins et al, (2015) emphasizes in his study findings on competitive or complementary commercial crops and food security in sub – Saharan region, that current development and sub-Saharan Africa are generally creating problems of pests which affects more of the food

securities in the land. This may lead to variable harvests, volatile precession market which this research intends to address.

CHAPTER THREE
METHODOLOGY.

3.0 Introduction.

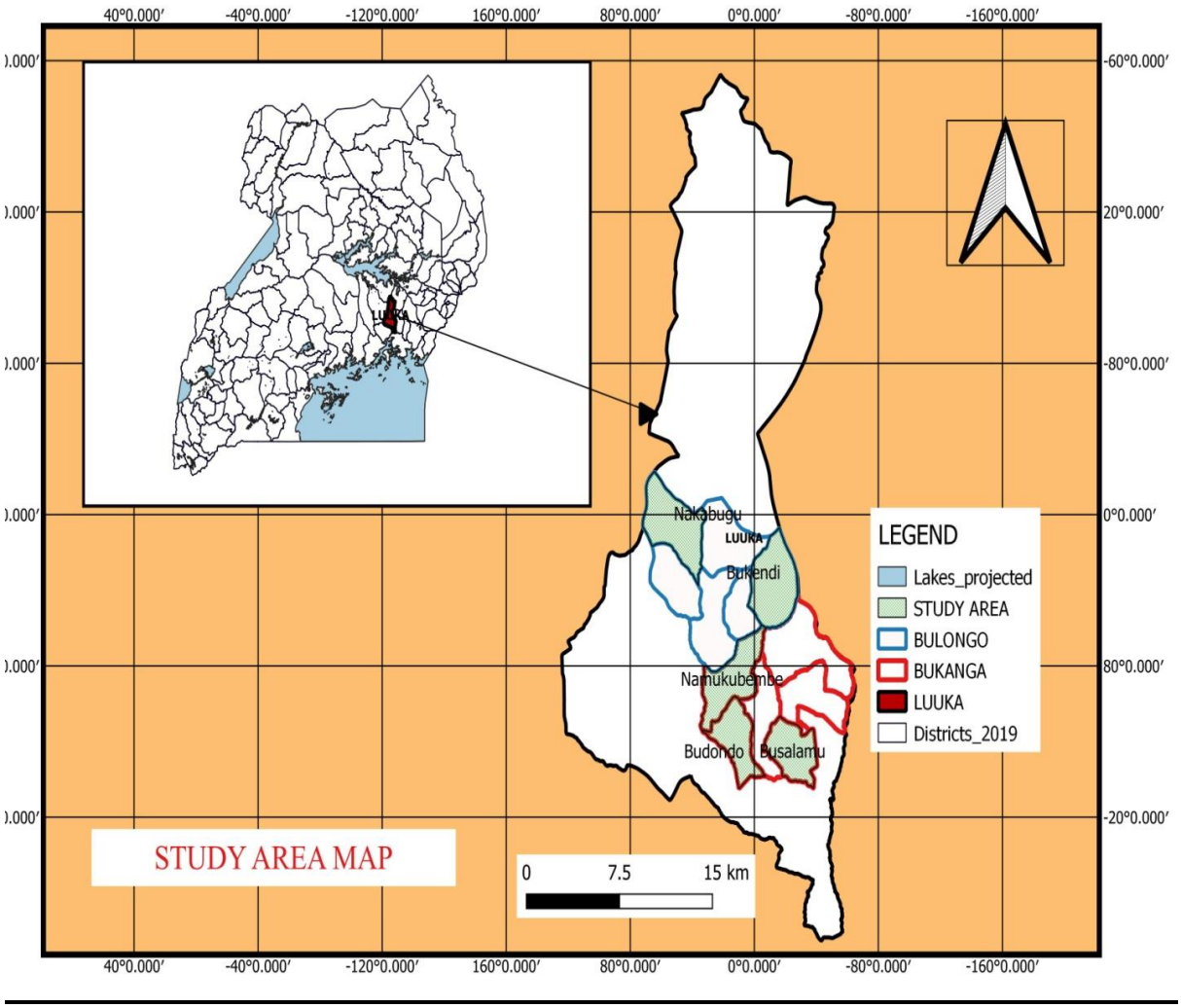
This chapter unfolds the various methodological approaches used. This chapter lays a preparation for chapter four. It consists of the location and area coverage, relief and drainage, geography and soils, climate, population, research design, study population and sample design, sampling techniques, measurement of study variables, data collection instruments, validity and reliability, data analysis techniques and ethical considerations.

3.1 Location and Area coverage

The study was executed in Luuka district which is located in Mid - Eastern Uganda (Busoga region) with coordinates 00 42 N and 33 18 E. The area is predominantly rural (95%). It occupies 650Km^2 with an estimated population of about 250,800 individuals. (UBOS, 2016) It is made up of the following Sub-Counties: Luuka Town Council, Bukanga, Bukooma, Bulongo, Ikumbya, Irongo, Nawampiti and Waibuga.the greater number of people in this area are farmers while a few are involved in Business. The district boundaries are Buyende district to the North, Kaliro district in the Northeast, Iganga district to the Southeast, Mayuge district to the South, Jinja district to the Southwest and Kamuli district to the Northwest. Luuka, where the district headquarters are located is approximately 33 kilometres (21 miles), by road, Northwest of Iganga, the nearest large town. (Sengendo, 2016)

The study was conducted in Luuka South County particularly in Bukanga and Bulongo sub-counties as shown on figure 3.1below.

Figure 3.1. A Map of Luuka district showing the Area of Study.



Source: DIVA and UBOS shape files

Figure 3.1 Map of Luuka District showing the location of the study area

3.1.1 Relief and Drainage

Luuka District has the highest point of 1443 meters or 4603 feet at kitikyambogo to the East, with average height of 1342 meters above sea level or 4285 feet,the entire Luuka district is dotted with several isolated flat toped hills. Bukanga and Bulongo sub-counties are entirely on a plateau land (Sengondo, 2016). The landscape is as an effect of a variety of ancient denudation processes that caused a sequence of erosion levels that are now old and exposed. Consequently, these changes led to land that is elevated and dissected, flat in many areas made up of a number of flat topped hills and wide interlocking valleys break up the low hills

(NEMA, 1997). The landscape is generally rolling and undulating with vertical galley heads and flat valley bottom swamps and streams flowing such as Lumbuye swamp to the east and Kiko stream to the west of the district. The area has gentle slopes in the western and southern parts of the District.

3.1.2 Geography and soils

Luuka district in particular Bukanga and Bulongo Sub-counties are underlain by metamorphic rocks of the Precambrian age with a few exceptions. Most of the geological formation consists of the basement complex system as the oldest overlain by a succession of sedimentary strata which have undergone a variable degree of metamorphosis (NEMA, 1997)

Jameson, (1970) described that the Nitosols which are dark and fertile clay soils in Luuka district in particular Bukanga and Bulongo sub counties were formed from parent material partially or wholly from basic amphibolites rocks that are neutral. The soil texture is varied from place to place ranging from red lateritic, deep red or brown loam clay soils which are very productive.

3.1.3 Climate

Luuka district particularly Bukanga and Bulongo sub counties experience the modified equatorial climate being influenced by relief, vegetation and nearness to water bodies like L. Victoria and Lumbuye swamp. The relief patterns are bimodal having two seasons. The area receives annual relief between 1000mm to 1250mm. The average annual highest temperature is 30°c and lowest annual temperature is above 12°c. The hottest temperatures are experienced in March while the coldest is in July (Sengendo, 2016).

3.1.4. Population

The population of Luuka district is 241,453. This is 85% increase in population since 1991 census where the population was 130,408. The current population density of Luuka district is 401 persons per square kilometer (UBOS, 2016).

3.2 Research Design

The study adopted a cross-sectional research design. This design involves studying phenomena in a single point in time to check on prevalence. It is appropriate for the study of phenomena that changes after a relatively long time period such that it can be studied during

anytime of the year. The researcher collected information from a sample population during a single specified time frame from April to July 2020. The use of quantitative research approaches namely interview guides, documentary review and on spot based observation techniques provided the required experience on social, behavioral and cultural considerations of the respondents into the study. The new research area as in this study was facilitated by qualitative research exhibits no limitation to non - dynamically definable variables since it works on subjective data. According to mugenda (2003), the use of quantitative research approach facilitates the researcher to establish the degree of the phenomenon in terms of the quantitative variables. By use of frequencies, percentages, mean, standard deviation and variance quantitative research was pivotal and fundamental in coming up with the relationship between the variable in the study.

3.3 Area Sample

Bukanga and Bulongo sub-counties have been selected using purposive non-random sampling for the study because they are the ones dominated by improved crop farming methods. 55% of the farmers have adopted improved methods of crop farming practices (Luuka district Agricultural Report, 2019)

The two sub counties consist of ten parishes. These include the five in Bukanga namely; Namukubembe, Buwologoma, Nabubya, Busalamu and Budondo and five parishes in Bulongo namely; Namalembe, Nakabugu, Bukendi, Budabangula and Bugonooka. Out of the ten parishes, five parishes were randomly selected for detailed study namely; Budondo, Busalamu and Namukubembe parishes from Bukanga Sub County and Nakabugu and Bukendi from Bulongo sub county. From the five Parishes fifteen villages were randomly selected taking three Villages from each parish. It was from these fifteen villages that the respondents for the research were chosen. This means that the entire study collected data from fifteen villages. The villages are: Busiringa, Butondolo, Kigulamo, Bumanya, kantenga, Bulwasira, Kimanto, Bugoba, Budondo, Busala, Buseete, Buyunze, Nabitaama, Lwanda, Bugabula.

3.4 Study population / Targeted population

The study population involved 880 household heads from Bukanga and Bulongo sub-county, Luuka district (UBOS, 2016). This population helped the researcher to select an appropriate sample for the study. Most of the people living in luuka district are subsistence farmers with

a few practicing improved methods of crop farming. This study considered the population of mainly peasant household heads staying in luuka district.

3.4.1 Sample Size Determination

The Solven's formula was used to calculate the sample size for the study from the entire population.

$$n = \frac{N}{1 + Ne^2}$$

n = sample size

N = the population size

e = level of significance, fixed at 0.05

$$n = \frac{880}{1 + 880(0.05)^2}$$

Therefore, n = 275

Thus, the study sample included 275 household heads. These included both adopters and non-adopters of improved methods of crop farming. In addition to this, 20 key informants including 15 LC1 chairpersons, 2 Sub county chairpersons, 2 Sub county OWC staff and 1 District agricultural officer.

Table 3:1: Summary of sample composition for the study participants

Category of respondents	**Number of respondents**
Household heads in 15 villages	275
Village chairpersons LC1	15
Sub county chairpersons	2
Sub county operation wealth creation staff	2
District agricultural officer	1
Total	**295**

Source: Field Data2020

3.5 Sampling Techniques

In order to ensure representative of the samples, a simple random sampling design and purposive sampling design was used.

3.5.1 Simple Random Sampling

Simple random sampling was used in the study to select the 275 household heads from the 15 Villages sampled from Bukanga and Bulongo sub-county, Luuka district. In 10 villages 18 farmers or household heads were selected randomly because they had small number of household heads and in 5 villages 19 household heads were randomly selected because they had a large number of people such as: Butondolo, Bumanya, Bulwasira, Kimanto and Bugabula. . Each member of the subset (sample) had an equal probability of being chosen to participate in the study (Amin, 2005). The approach was applied to small holder farmers heads only since it gave them an equal chance of participating in the study.

During the sampling process, the household register was obtained from the village chairperson of LC1 from whom individual household heads were selected at random. Each individual respondent was chosen randomly and entirely by chance in order to make each individual get the same probability of being chosen at any stage during the sampling process. This method was used because it gives chance to every respondent to get involved in the study.

3.5.2 Purposive Sampling

Purposive sampling was also employed in the study. To arrive at the individuals to take part in the sample were taken by the researcher, based upon a variety of criteria which included specialist knowledge of the research issue, or capacity and willingness to participate in the research. Purposive sampling was applied to District agricultural officer, Sub County Operation Wealth Creation staff (OWC), Sub county Chairpersons and Local council 1 chairpersons. Purposive sampling was used to this category of people because they are knowledgeable to the study of agriculture modernization and livelihood of farmers. They are directly responsible for monitoring and advising farmers. These acted as key informants as they were believed to be reliable.

3.6 Data Collection Methods

3.6.1 Establishing the Improved methods of crop farming used by Small holder farmers

Structured questionnaires were constructed to collect data on use of improved methods of crop farming by small holder farmers in Bulongo and Bukanga. They were administered to

the household heads by the researcher. These questionnaires were used to collect primary data about small holder farmers who apply improved farming agriculture methods such as irrigation, fumigation, fertilizers and machines and those not using. The questionnaire was used because respondents fill them at their own convenience and also appropriate in collecting large amount of data in a short time. As well as data can be got fairly, easily and questionnaire responses are easily coded to facilitate analysis.

In addition, observation method was used in that the researcher observed gardens of high bread maize in Bumanya village, garden of mulched water melon in Kigulamo village, farmer in Busala village irrigating green vegetables and tractor ploughing in Bumanya village.

3.6.2 The effect of Use of improved methods of crop farming on livelihoods

Structured questionnaires and observation were used to collect data on the effect of use of improved methods of crop farming on farmers' livelihoods. The data in the livelihood status of both the adopters and non-adopters in terms of incomes and food availability were obtained. Observation was used to gather data on observable aspect of livelihoods like physical assets possession.

3.6.2.1 Establishing the relationship between improved methods of crop farming and food availability among small holder farmers.

In order to collect information about the relationship between improved methods of crop farming adaptation practices and food availability, farmers were asked to state the months in which their households had enough food to eat. Coates, Swindale and Bilinsky, (2007) used the Month of Adequate Household Food Provisioning (MAHFP) to assess food availability status of the households. The study adopted Coates et al, (2007) MAHFP for assessing the food availability status of the small holder farmers in Luuka district. The MAHFP computes food availability by establishing the number of months that a household had enough food. The total scores are 12 with each month being given a score of one (Coates et al, 2007). Scores close to 12 indicate that food was available while scores far away from 12 indicates that food was not available.

MAHFP=12- number of month that a household is food insecure…… (i)

Using equation (i), three categories of food availability can be derived. The first category is that with scores 10-12 which means a household has adequate food availability: scores of 4-9 means a household has moderate food availability while a score of less than 3 means that a household has inadequate food availability (Coates et al, 2007).

3.6.3 Interviews

The interview sessions were conducted by the researcher on key informants such as Sub county chairpersons, Local council one chairperson, staff of sub county OWC and District Agricultural Officer. Interview was used to probe for in-depth investigations and perceptions of famers about agriculture modernization and livelihood of the farmers. This interview tool were used to assemble primary data about small holder farmers who apply improved farming agriculture methods such as irrigation, fertilizers and mulching. The interview also helped in bridging the gap created in the questionnaires through understanding the perceptions of the respondents better because it was a social encounter which caters for respondents who were more willing to talk than write as they would prefer to remain anonymous.

3.7 Reliability and Validity

3.7.1 Reliability

Reliability is the extent to which an assessment tool generates stable and consistent results after carrying out research, (Mugenda, 2003). The researcher used Cronbach Alpha (α) co-efficients to determine the reliability of the instrument. According to Amin, (2005) for an instrument to be reliable, its Cronbach Alpha must be at least from 0.70 and above. This method was to establish whether or not the score a person obtained on a test were administered some other time. The instruments were pilot tested in non – study area in Namungalwe Sub County in Iganga district which has similar rural characteristics with those in Bukanga and Bulongo sub counties. This area was preferred by the researcher because is a native, so it was cheap in terms of transport costs and time saving to test the instruments. Sixty household heads were selected in Kawete and Namunkanaga villages by considering thirty in each village and two village local council 1 chairpersons for pilot testing (Test – Retest method). The results of this are summarized in the table 3.2 below.

Table 3.2 Pilot testing results

Participants	Sample	Frequency of consistency	Percentage of Consistency
Kawete	30	28	93.3
Namunkanaga	30	30	100
Village chairpersons LC1	2	2	100
Total	62	60	97.8

Source: Field data 2020

A consistence level of 97.8% was considered high enough for the instruments to be reliable for the study.

3.7.2 Validity

Validity refers to the extent to which a concept, conclusion or measurement is well founded and corresponds accurately to real world, (Amin, 2005). To ensure validity of other research instruments, the researcher used scales whose validity had already been determined though they were modified to suit this particular study. The items to include in the scale were based on a extensive review of literature. Finally,during the design of the instrument, this was done under guidance of the supervisors of this research from the department of Geography and Social Studies at Kyambogo University. They were requested to rate the items as either relevant or irrelevant. This helped to get clear and proper judgment on the content validity to execute the pilot runs. The following formula was used to ascertain validity of the instrument.

The content validity index (CVI) as

$$CVI = \frac{\text{Number of items rated relevant}}{\text{Total number of items}}$$

Items with validity coefficient of at least 0.7 are accepted as valid in research (Kothari, 2004). The items in the questionnaire were rated to be relevant to the study,

$$CVI = \frac{70}{78}$$

$$= 89.7\%$$

The CVI was found to be 89.7% for the set of questionnaires, making the items relevant to the study objectives. This was high enough for the concerned instruments to yield the required data. The instruments were consequently adopted and administered to the subjects.

Furthermore, the researcher employed a combination of methods to corroborate each set of data so as to reduce errors and increase validity so as to conform to the study conceptual framework. Careful transcribing of data from the interview, the interviewee was given back the information for confirmation of the transcribed data to establish authenticity.

3.8 Data Analysis

3.8.1 Quantitative data analysis

In analyzing data, the pearson chi-square test was used to check whether there was a significant difference in livelihoods between adopters and non-adopters at 5% significance level. The Chi – square formula is stated below:

$$X^2 = \sum \frac{(o - E)}{E}$$

Where X^2 is Chi Square

O is observed frequency

E is expected frequency

$\sum$ is summation

This calculated chi- square value above 0.05% would show no significant difference while 0.05% and below would indicate a notable difference between adopters and non – adopters in terms of livelihoods.

The data collected was edited for accuracy, completeness. Editing was done to find out how well the answered questionnaires were in line with consideration paid to questions by the study respondents. The edited data was coded. Coding involved assigning numbers to similar questions from which answers were given unique looks to make the work easier. The row data was based on the study objectives and research questions which were coded.

The data collected through questionnaires was analyzed using Statistical Package for Social Sciences (SPSS). Descriptive analysis was carried out. The data was tabulated for easy presentation. Tabulation of data involved use of tables that were generated from the questions relevant to the study variables. The statistical tests that were used to test the hypothesis include the correlation and regression analysis.

3.8.2 Qualitative data analysis

Qualitative data was got from in depth interviews, were transcribed, translated, categorized, analyzed and organized according to the themes developed in the objectives of the study. The data from interview responses was analyzed by listing all the respondents' views under each question category. Quotes from respondents were used to give broader meaning to the interpretation. Qualitative data was descriptive and obtained from the interviews. This data was presented in accordance with the objectives of the study and helped to explain findings from quantitative data and some of it in form of direct quotations and narratives from the respondents.

3.9 Ethical considerations

Ethical considerations are a prerequisite whenever the collection of data involves human beings. The key ethical considerations here include; physical and psychological harm, deception, informed consent and privacy (Mugenda, 2003).

The study was carried out following ethical procedures. An introductory letter was secured from Kyambogo University introducing the researcher before respondents. Consent was sought from respondents before interviews, observation and questionnaires were conducted. In addition, each questionnaire contained an opening introductory statement requesting for the respondents' cooperation in providing the required information for the study. The respondents got assurance that the information provided would be kept confidential and that the findings of the study were to be used for research purpose only to avert the fear that there are negative implications arising from the research findings. Plagiarism was avoided through recognizing authors by acknowledging them in the work. This means that findings were presented in their original form the way it was adopted in the field.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETATION OF RESULTS

4.1 Introduction

This chapter lays out the findings on establishing the effect of improved methods of crop farming on the livelihoods of small-holder farmers in Luuka district. The chapter contains the presentation, analysis and interpretation of the findings. The presentation was guided by the following research objectives; to establish the improved methods of crop farming used by smallholder farmers in Luuka district; to determine the effect of improved methods of crop farming on the financial capital for small holder farmers in Luuka district; to establish the effect of improved methods of crop farming on physical possessions of small holder farmers in Luuka district; and to establish the effect of improved methods of crop farming on food availability for small holder farmers in Luuka district. A total of 275 household heads were given questionnaires and 20 interview guides to key informants.

4.2 Use of Improved Methods of Crop Farming in the Study Area.

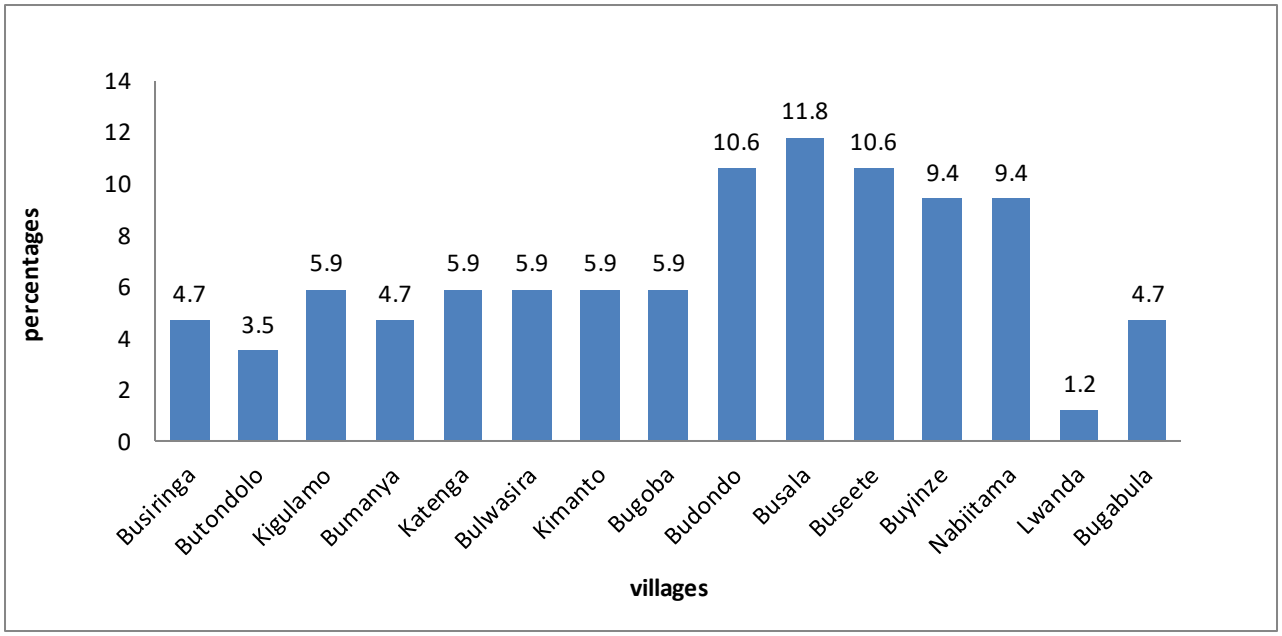
In line with the first objective of this study, the researcher established the use of improved methods of crop farming used by small holder farmers in the study area. In this case, farmers that were using improved methods of crop farming (adopters) and those that are not (non-adopters) were identified. The results are shown in table 4.1.

Table 4.1: Adopters and Non-Adopters of Improved Methods of Crop Farming (N=275).

	No.	**Percentage (%)**
Adopters	190	69.1
Non adopters	85	30.9
Total	**275**	**100**

Source: **Field Data, 2020**

Table 4.1 reveals that (69.1%) of the respondents were adopters of improved methods of crop farming while only (30.9%) were non-adopters. This therefore shows that the government has to do a lot of sensitization to increase farmers in Luuka to adopt improved methods of crop farming.



Source: Field data2020

Figure 4.1: A bar graph Showing Distribution of Non Adopters of Improved Methods of Crop Farming in the Sampled Villages

The findings from figure 4.1 show that Busala village had the highest number of non-adopters of improved methods of crop farming (11.8%) followed by Budondo and Buseete villages with (10.6%), Buyinze and Nabiitama villages with (9.4%), Kigulamo, Katenga, Bulwasira, Kimanto and Bugoba villages with (5.9%), Busiringa, Bumanya and Bugabula villages with (4.7%), Butondolo village with (3.5%) and lastly Lwanda village with (1.2%). The high number of non-adopters in Busala, Budondo and Buseete villages is due to being far from the sub county headquarters, hence failure to access information because the agriculture extension workers cannot reach distant areas as a result of limited resources and inaccessible roads. Lwanda and Butondolo villages had least non-adopter farmers because of being near the sub county headquarters, the areas are more urbanized and easily accessible to farmers by sub county agriculture extension officers.

4.3 The Distribution of Improved Methods of Crop Farming Used by the Farmers

The researcher established the different methods used by farmers in the study area. The results of the findings are indicated in table 4.2 below.

Table 4.2: Improved Methods of Crop Farming Used by Small Holder Farmers (Adopters) per Village on the Farms (N=190).

Village		On farm using										Total
		High breed crops	Mechanization	Grafting of crops	Pesticides	Fertilizers	Irrigation system	Water conservation	Mulching	Agro forestry	Crop rotation	
Busiringa	Count	5	1	0	3	2	0	0	1	0	2	14
	%	35.7	7.1	0	21.4	14.3	0	0	7.1	0	14.3	100
Butondolo	Count	4	2	1	2	3	0	0	2	0	2	16
	%	25.0	12.5	6.3	12.5	18.8	0	0	12.5	0	12.5	100
Kigulamo	Count	3	1	0	2	1	0	1	3	0	2	13
	%	23.1	7.7	0	15.4	7.7	0	7.7	23.1	0	15.4	100
Bumanya	Count	6	3	1	1	2	0	0	1	0	1	15
	%	40.0	20.0	6.7	6.7	13.3	0	0	6.7	0	6.7	100
Katenga	Count	3	1	0	2	1	0	0	3	0	3	13
	%	23.1	7.7	0	15.4	7.1	0	0	23.1	0	23.1	100
Bulwasira	Count	4	1	0	1	2	1	1	2	0	2	14
	%	28.6	7.1	0	7.1	14.3	7.1	7.1	14.3	0	14.3	100
Kimanto	Count	5	1	0	3	2	0	0	1	0	2	14
	%	35.7	7.1	0	21.4	14.3	0	0	7.1	0	4.3	100
Bugoba	Count	3	1	0	2	1	0	1	3	0	2	13
	%	23.1	7.7	0	15.4	7.7	0	7.7	23.1	0	15.4	100
Budondo	Count	1	0	1	0	1	1	1	1	1	2	09
	%	11.1	0	11.1	0	11.1	11.1	11.1	11.1	11.1	22.2	100
Busala	Count	1	0	1	1	1	1	1	1	0	1	08
	%	12.5	0	12.5	12.5	12.5	12.5	12.5	12.5	0	12.5	100
Buseete	Count	2	0	1	1	0	1	1	1	1	1	09
	%	22.2	0	11.1	11.1	0	11.1	11.1	11.1	11.1	11.1	100
Buyunze	Count	3	0	1	2	0	0	01	01	01	01	10
	%	30.0	00	10.0	20.0	0	0	10.0	10.0	10.0	10.0	100
Nabiitama	Count	2	1	1	1	1	1	1	1	0	1	10
	%	20.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	0	10.0	100
Lwanda	Count	4	2	1	2	3	01	01	01	01	01	17
	%	23.5	11.8	5.9	11.8	17.6	5.9	5.9	5.9	5.9	5.9	100
Bugabula	Count	3	1	1	2	2	01	01	01	01	02	15
	%	20.0	6.7	6.7	13.3	13.3	6.7	6.7	6.7	6.7	13.3	100
TOTAL	Count	49	15	09	26	21	07	10	23	05	25	190
	%	25.8	7.9	4.7	13.7	11.1	3.7	5.3	12.1	2.6	13.2	100

Source: **Field Data, 2020**

Table 4.2 reveals that (25.8%) of the farmers had adopted the use of high breed crops, (13.7%) pesticides, (13.2%) crop rotation, (12.1%) mulching, (11.1%) fertilizers, (7.9%)

mechanization, (5.3%) water conservation, (4.7%) grafting of crops, (3.7%) irrigation system and (2.6%) Agro forestry.

4.3.1 Use of High Breed Crops

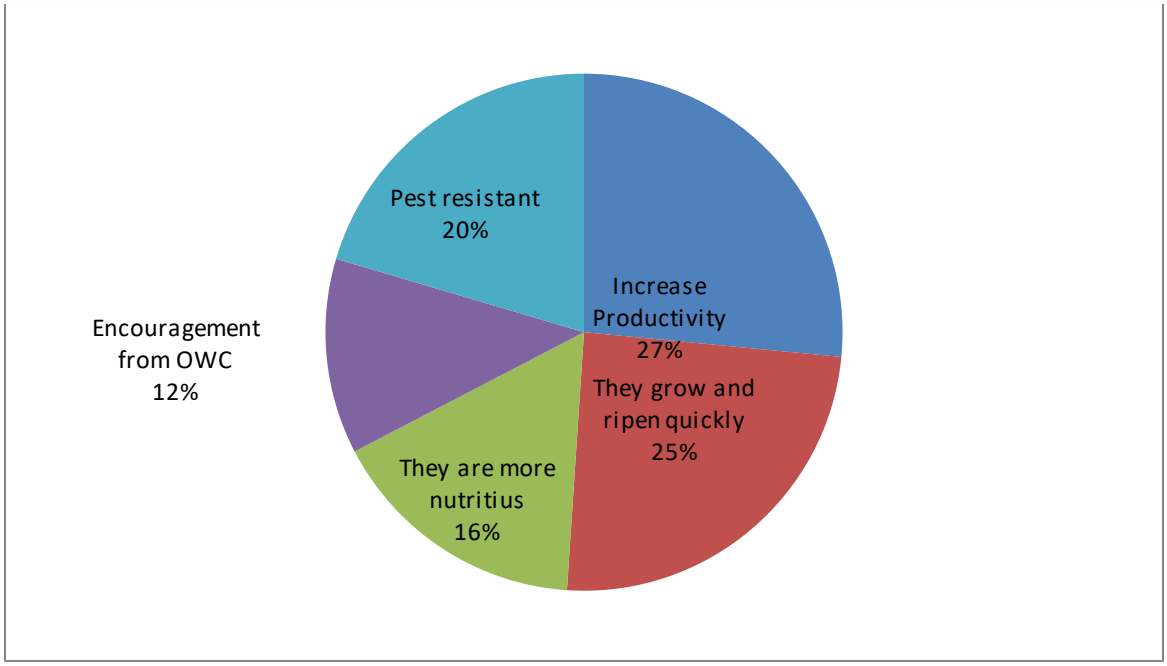
This was the most dominant improved methods of crop farming practice in the area of study. It was mostly carried out in Bumanya village and least practiced in Budondo village. The farmers mainly use high breed crops such as longe five maize, Bazooka maize, water melon and cabbages. These seedlings are at times given freely by operation wealth creation officers and others are bought from Agro-chemical shop owners who train farmers how to plant them.

Plate 4.1: Showing Garden of High Breed Maize at Bumanya Village being inspected by the Staff of Operation Wealth Creation.

Plate 4.1: Garden of High Breed Maize at Bumanya Village

To understand the intention of adoption of high breed crops, the respondents were asked to state the reason why they had adopted high breed crops and the results are shown in figure 4.2.

Figure 4.2: A Pie Chart Showing Reasons for Using High Breed Crops.



Source: **Field Data, 2020**

From figure 4.2 it can be observed that majority of the respondents indicated that use of high breed crops was mainly because it increases crop productivity, hence leading to food availability and stability.(24.5%) of the farmers gave a reason that they grow and ripen quickly which leads to early harvesting as well as increasing on their incomes. (20.4%) of the farmers showed that they use high breed seeds because they are pest resistant and this leads to increased food productivity. The other reasons include: they are nutritious with (16.3%) and (12.2%) indicated that encouragement from Operation Wealth creation staff so as to enable farmers increase on their incomes.

The results therefore showed that (87.8%) of the reasons were linked to food stability in form of food availability and accessibility while (12.2%) were not related to food stability. Therefore, to a greater extent the reasons for using high breed crops were mainly food stability and food availability.

During interviews one of the key informants pointed out that;

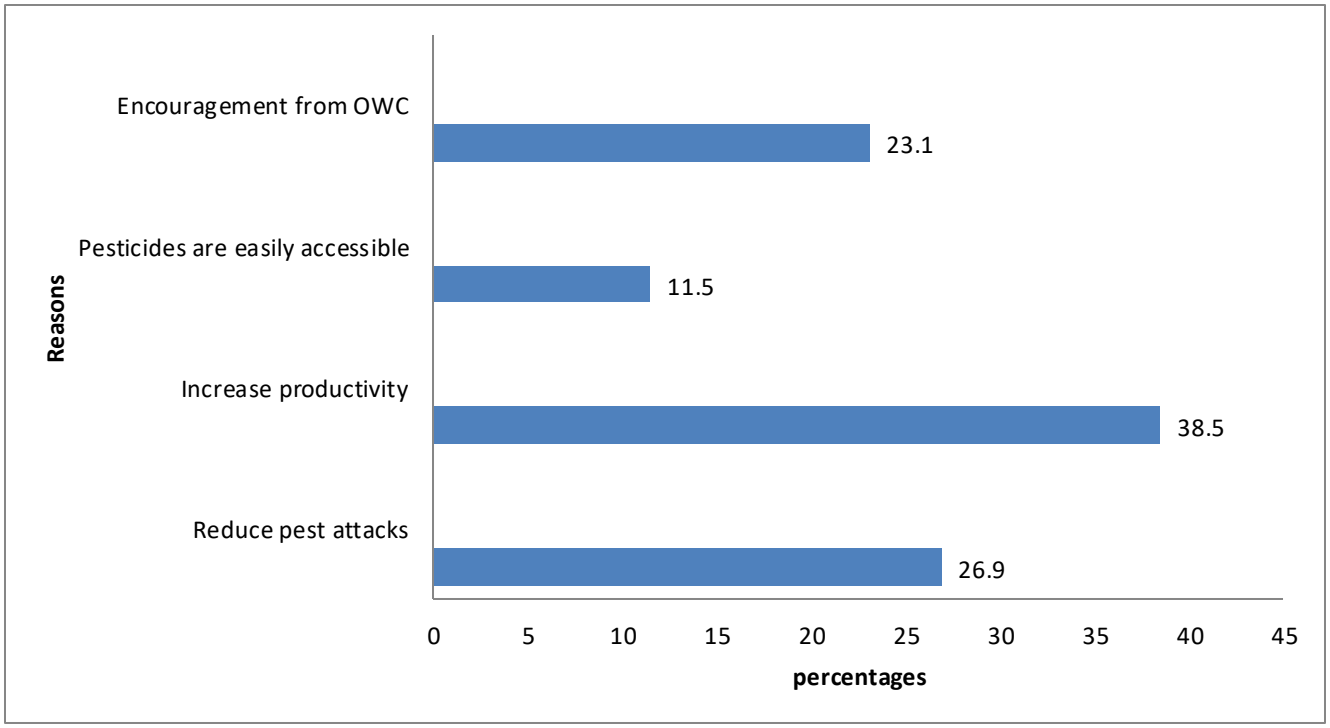
"The farmers adopted the use of high breed crops because they were easy to access due to free distribution by OWC staff and they have people who move around the villages selling the seeds which would make them less costly even in terms of transport"

4.3.2 Use of Pesticides

This was the second most dominant improved methods of crop farming method practiced by (13.7%) of the small holder farmers in Luuka district. It was most dominant in Busiringa and Kimanto villages with (21.4%) and least dominant in Bumanya and Bulwasira villages with (6.7%) and (7.1%) respectively. Most pesticides are distributed by Operation Wealth Creation staff and others bought from agro-chemical shops. OWC staff and some friends train farmers on how to use these pesticides. The most used pesticides are DDT (Dichloro Diphenyl Trichloroethane), baygon, striker, Dudu-acelemectin and dythane. The use of pesticides is most dominated in Busiringa and Kimanto villages because farmers obtain high crop yields and this increase on their income as well as being food secure.

To ascertain the motivation for use of pesticides, the respondents were asked to state the reasons why they had chosen to use this method and their responses are shown in figure 4.3.

Figure 4.3: A Bar Graph Showing Reasons for Using Pesticides



Source: **Survey Data, 2020**

Figure 4.3 revealed that majority (38.5%) of the farmers used pesticides because it increases productivity, (26.9%) of the participants chose it because it helps to reduce pest attacks, while (23.1%) of the farmers chose it because of encouragement from Operation Wealth Creation Staff and only (11.5%) of the farmers use it because pesticides are easily accessible. It can therefore, be seen that (38.5%) of the farmer's reasons to use pesticides was mainly to

increase food security and their incomes. Bulwasira and Bumanya villages had least use of pesticides because most farmers had limited access to pesticides. This was in line with one of the key informants who pointed out that; *"Some farmers want to use pesticides but they lack capital to buy them, others do not have spraying gadgets which leads to low crop yields".*

4.3.3 Crop Rotation

This was the third most dominant improved methods of crop farming method practiced by (13.2%) of the small holder farmers in Luuka district. The method was notably dominant in Katenga village and least practiced in Lwanda village. This method is practiced by all farmers through growing variety crops on the same farm land at different seasons such as maize, cabbages, beans and sweet potatoes. This has been emphasized by Operation Wealthy Creation staff and sub county extension officers who train farmers in its use. The practice dominated Katenga village because the area has small population which enables farmers to allow land to regain its fertility (fallow) and this has led to increased food stability. To understand the reasons for adoption of crop rotation, the respondents were asked to state the reasons why they had adopted crop rotation and the results are shown in table 4.3.

Table 4.3: Reasons for Using Crop Rotation (N=25).

No.	Reason	Frequency	Percentage
1	Increase crop productivity	8	32
2	Retain soil fertility	7	28
3	Protect the environmental eco- system	6	24
4	Encouragement from OWC	4	16
TOTAL		**25**	**100**

Source: **Field data, 2020**

From the table 4.3, it can be seen that (32%) of the farmers chose the practice because it increases crop productivity, (28%) of the participants indicated that crop rotation was used because it helps the soil to retain fertility, while (24%) of the farmers showed that crop rotation was used to protect the environmental eco system and only (16%) of the farmers revealed that they were encouraged by Operation Wealth Creation Staff to practice crop rotation to increase on the crop yields and incomes.

From an interview with the key informants, one of the informants pointed out that: *"Crop rotation could have been our best method used, however we are constrained by the land factor and that is why most of us fail to use this method because of the limited land but the*

method improves on the yields of the few who are able to use it". This finding was found to be in line with that of the quantitative results in table 4.2.

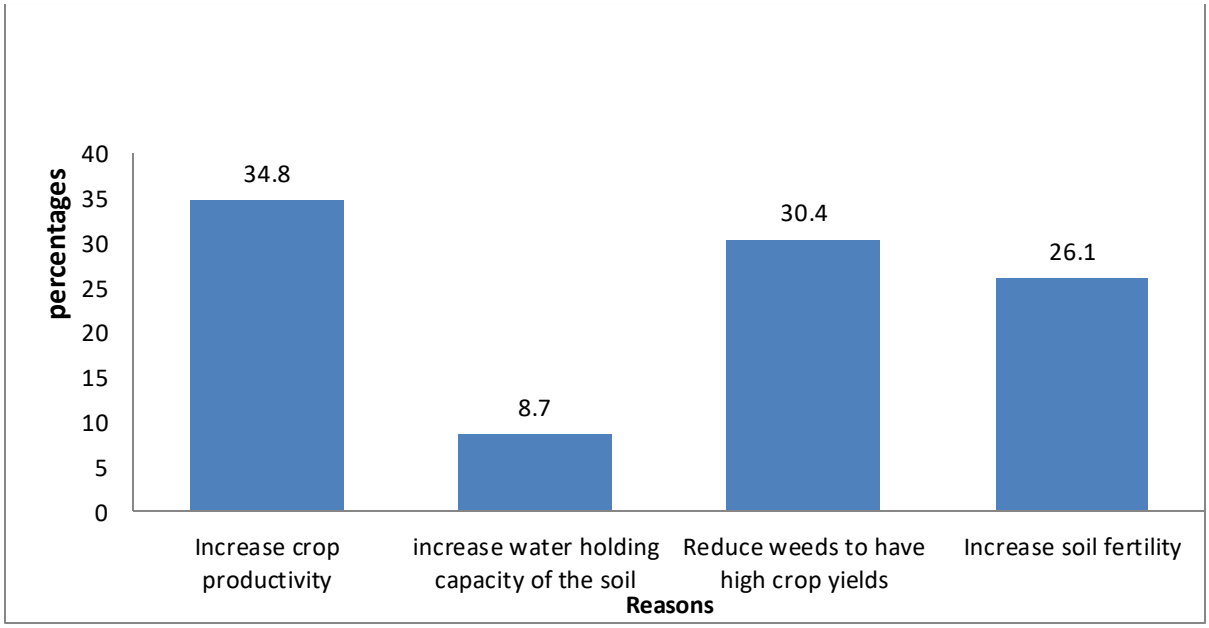
4.3.4 Mulching

This was the fourth dominant improved methods of crop farming method practiced by (12.1%) of the small holder farmers in Luuka district from table 4.2. All villages in the district were found to be practicing mulching and the leading ones are Kigulamo, Katenga and Bugoba with (23.1%) and the least dominant village was Lwanda with (5.9%). Farmers cover the gardens with grass and cut tree branches. This training has been done by some experienced friends who are farmers and sub county extension officers. The practice dominated Kigulamo, Katenga and Bugoba villages because it increases on crop yields and keeps soil moisture.

Plate 4.2: Showing Garden of Mulched Water Melon in Kigulamo Village Using Grass.

To ascertain the motivation for use of mulching as a improved methods of crop farming practice, the respondents were asked to state the reasons why they had chosen this method and their responses are shown in figure 4.4.

Figure 4.4: A Bar Graph Showing Reasons for Choosing Mulching.



Source: Field data 2020

Figure 4.4 revealed that most of the farmers (34.8%) chose mulching because of the increase of crop productivity, (30.4%) of the farmers showed that mulching helps to reduce weeds to have high crop yields, (26.1%) of the farmers indicated that mulching helps to increase soil fertility while only (8.7%) of the participants reasoned that it increases water holding capacity of the soil. This can therefore be seen that all farmers knew reasons for mulching their gardens to increase on crop yields.

From interviews with the key respondents, one of the informants pointed out that, "*Some farmers do not have grass or leaves to cover their gardens. But those who cover their gardens with leaves protect the soil from erosion, increase soil fertility hence get high crop yields.*"

4.3.5 Use of Fertilizers

This was the fifth most dominant improved methods of crop farming method practiced by (11.1%) of the small holder farmers in the study area. It was mainly dominant in Butongolo village with 18.8%, and in Katenga village with (7.1%). The use of fertilizers was however absent in Buseete and Buyunze villages. The fertilizers are given freely by Operation Wealth Creation staff and bought by farmers from agro-chemical shops such as Urea, NPK, DAP, and Foliar fertilizer. Sub county agricultural officers and OWC staff train farmers on how to apply them on the farms. The practice was dominant in Butongolo village because it

increases crop productivity. To ascertain the motivation for use of fertilizers, the respondents were asked to state the reasons why they had chosen to use this method and their responses are shown in the table 4.4.

Table 4.4: Reasons for Choosing Use of Fertilizers (N=21)

No.	Reasons	Frequency	Percentage
1	Increase crop productivity	14	66.7
2	Add soil fertility	5	23.8
3	Encouragement from OWC	2	9.5
TOTAL		21	100

Source: Field data 2o20

Results in Table 4.4 show that (66.7%) of the farmers were using fertilizers to boost crop production and have high crop yields, while (23.8%) of the farmers revealed that it adds soil fertility and only (9.5 %) of the farmers were encouraged to use fertilizers by Operation Wealth Creation Staff.

From interviews with the key informants, one of the informants pointed out that, "*Some farmers cannot afford to buy fertilizers because it's very expensive. Others used manures from cow dung, chicken droppings to increase on fertility of their land."* This finding coincides with that of the quantitative results and this could explain why it's not the most popular method used by the farmers.

4.3.6 Use of Mechanization

This was the sixth dominant improved methods of crop farming practice in the study area by (7.9%) of the small holder farmers (Table 4.2). It was most identified in Bumanya village with (20%), and least practiced in Bugabula village with (6.7%). Use of mechanization was however absent in Budondo, Busala, Buseete and Buyunze villages. Farmers are able to hire tractors and others use their own ox-plough to till the land. This is evidenced by plate 4.3 showing the use of a tractor ploughing land in Bumanya village. The practice dominated Bumanya village because it increases crop productivity due to cultivation on large area, hence food security and stability.

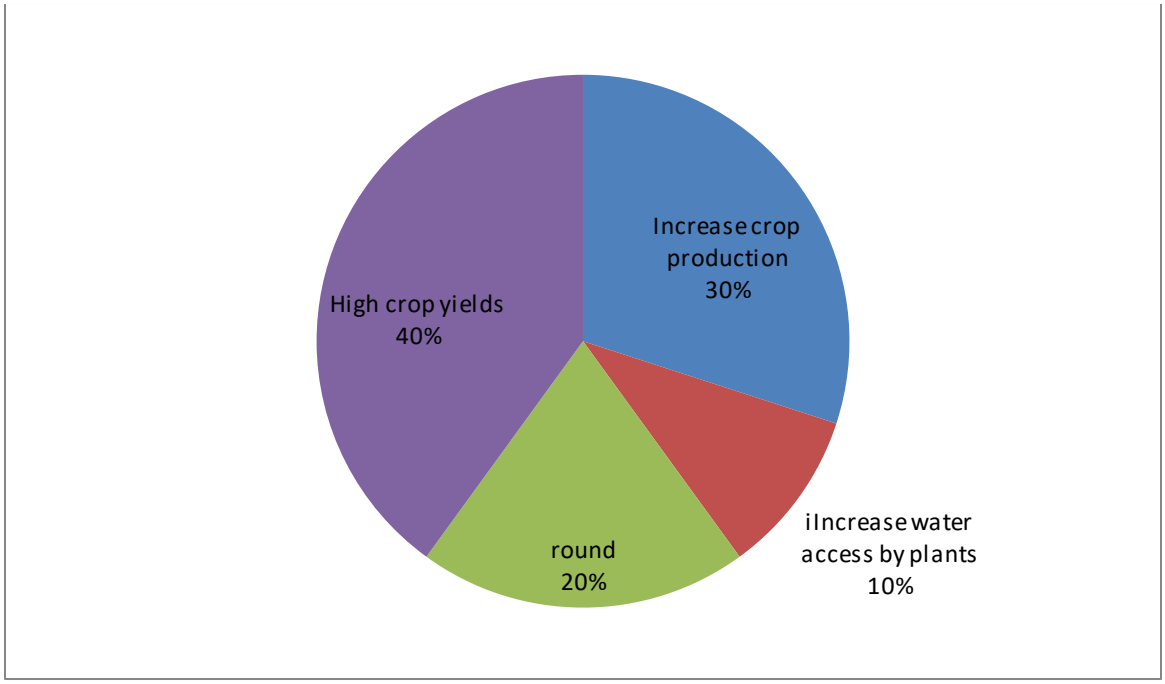
Plate 4.3: A Tractor Ploughing Land in Bumanya Village

The practice was not carried out in Budondo, Busala, Buseete and Buyunze villages because of the social economic status of the farmers as most of them could not afford the cost of hiring tractors and ox- ploughs. From interviews with the key informants, one of the key informants mentioned out that, "*The government of Uganda is slowly taking agricultural modernization to another level where they intend to buy a tractor for every sub county to increase on crop production."* This finding is consistent with that of the quantitative study that revealed that a few farmers adopted mechanization.

4.3.7 Use of Water Conservation

This was the seventh most dominant improved method of crop farming practiced by (5.3%) of the small holder farmers practicing it in the Study area (Table 4.2). It was most dominant in Busala village with (12.5%), followed by Budondo and Buseete villages. It was least practiced in Lwanda village with (5.9%). Use of water conservation was however absent in Busiringa, Butondolo, Bumanya, Katenga and Kimanto villages. The reasons for low adoption of water conservation were that the soil has enough water retention capacity. Farmers are able to store water in tanks and others digging drainage channels in the garden to increase on water retention of the soil. This training was done by agricultural extension officers and some friends who are experienced. To understand the intention of adoption of use of water conservation, the respondents were asked to state the reason why they had adopted use of water conservation and the results are shown in figure 4.5.

Figure 4.5: A Pie Chart Showing Reasons for Using Water Conservation.



Source: **Field data, 2020**

Figure 4.5 shows the reasons for using water conservation revealed that majority (40%) of the farmers use it because it leads to high crop yields, (30%) of the farmers gave the reason for increase of crop productivity, while (20%) of the farmers said that it ensures crop growing all year around and only (10%) of the farmers indicated it increases water access by crops. The results therefore show that (90%) of the reasons are linked to food availability and accessibility.

During the interviews with the key informants, one of the informants mentioned out that, *"Few farmers are able to make drainage channels in their gardens and others cover around the crops with grass to increase water access and retention".* The finding is in agreement with the quantitative results that show that water conservation was not the most common modern method used by the farmers.

4.3.8 Grafting of Crops

This was the eighth most dominant improved methods of crop farming method practiced by (4.7%) of the small holder farmers practicing it in the Study area (Table 4.2). Most grafted crops are mainly mangoes, oranges, passion fruits and lemon. Agriculture extension officers and OWC staff train farmers how to graft the crop and planting it. It was mainly dominant in Busala village with (12.5%) and least practiced in Lwanda village with (5.9%). The use of grafting of crops was not practiced in Busiringa, Kigulamo, Katenga, Bulwasira, Kimanto

and Bugoba villages. The practice of grafting of crops was dominant in Busala village because it encourages improved crop production throughout the year, hence food security and increased incomes earned. This is further indicated in plate 4.4 which shows grafted oranges in Lwanda village.

Plate 4.4: Grafted Oranges in Busala Village

From interviews with the key informants, one of the informants stated that, "A few *farmers who use grafting of crops like mangoes, oranges have high yields and this has improved on their incomes because of continuous harvesting".* This finding is consistent with that of the quantitative results.

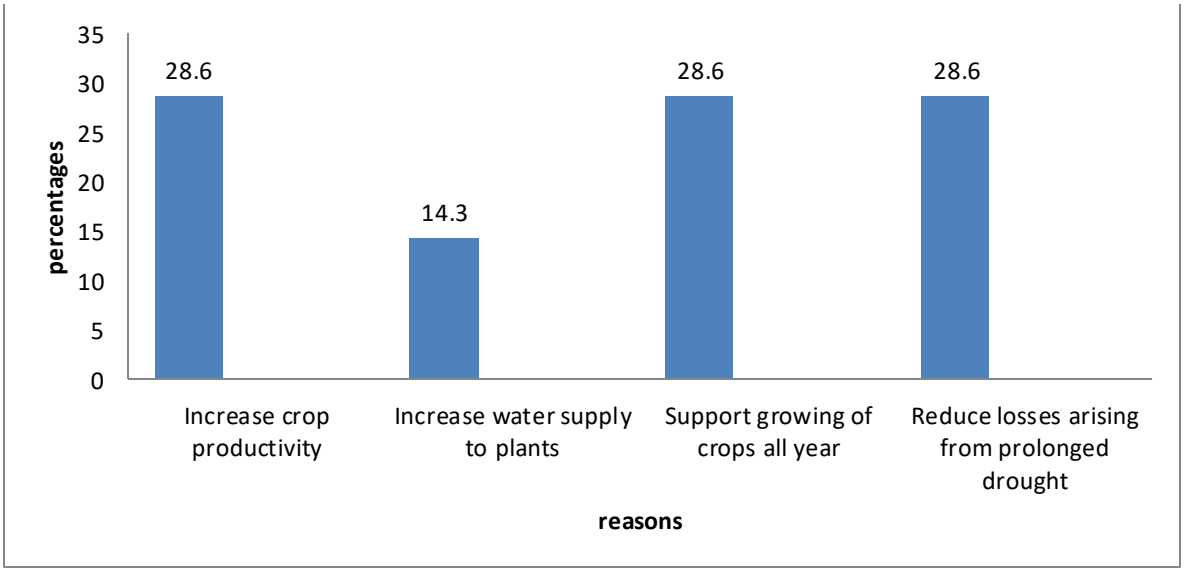
4.3.9 Use of Irrigation

This was the ninth most dominant improved methods of crop farming method practiced by (3.7%) of the small holder farmers in Luuka (Table 4.2). It was most dominant in Busala village with (12.5%) but least dominant in Lwanda village with (5.9%). Use of irrigation was however, absent in Busiringa, Butondolo, Kigulamo, Bumanya, Katenga, Kimanto, Buyunze and Bugoba villages. The farmers use water cans to irrigate the crops and also use drip irrigation by bottles to provide water to the plants. The water cans and bottles are bought by the farmers from agro-chemical shops. Sub county agricultural extension officers train farmers on how to use watercans and bottles in their gardens as seen in Plate 4.5 showing a farmer irrigating green vegetables using water can in Busala village.

Plate 4.5: A Farmer in Busala Village Irrigating Green Vegetables to have Sustainable Food Stability as well as Improving on Her Livelihoods.

To understand the intention of adoption of use of irrigation, the respondents, were asked to state why they had adopted the use of irrigation and the results are shown in figure 4.6

Figure 4.6: Bar Graph Showing Reasons for Using Irrigation



Source: **Field data, 2020**

Figure 4.6 shows that most of the farmers, (28.6%) revealed that use of irrigation helps to increase crop productivity, supports growing of crops all year round and reduces losses arising from prolonged drought while only (14.3%) of the farmers indicated that use of

irrigation helps to increase water supply to crops. The results therefore showed that (85.7%) of the farmer's reason was linked to increased food security.

From interviews with key informants, one of the informants pointed out that, "*Some farmers are now using plastic bottles to do drip irrigation of their crops. They pour water in the plastic bottle and drill a small hole on it and place it on the crop. Others whose gardens are near sources of water like boreholes, streams and Lumbuye Swamp, pour water on their crops in the morning and evening".* This finding is in agreement with the quantitative results

4.3.10 Agro Forestry

This was the tenth most dominant improved methods of crop farmingmethod practiced by (2.6%) of the small holder farmers in Luuka. It was most dominant in Budondo and Buseete villages with (11.1%), and least practiced in Lwanda village with (5.9%). Agro forestry was however absent in Busiringa, Butondolo, Kigulamo, Bumanya, Katenga, Bulwasira, Kimanto, Bugoba, Busala and Nabitama villages. Farmers are trained and encouraged by their friends as well as sub county agricultural extension workers to plant trees together with the crops. They plant eucalyptus, pine and Musizi trees which are distributed freely by OWC and others are bought by the farmers from the recommended tree seedling suppliers in Luuka district. The practice dominated Budondo and Buseete villages because the farmers have large sizes of land which increases crop productivity and maintains soil fertility which leads to high crop yields, hence food availability.

From interviews with the key informants, one of the informants pointed out that, *"They would have loved to apply this method in carrying out their farming activities, however, they don't have enough land to allow them do this in their area and that is the reason that only few people adopted the method".* This study finding was found to be in agreement with the quantitative results.

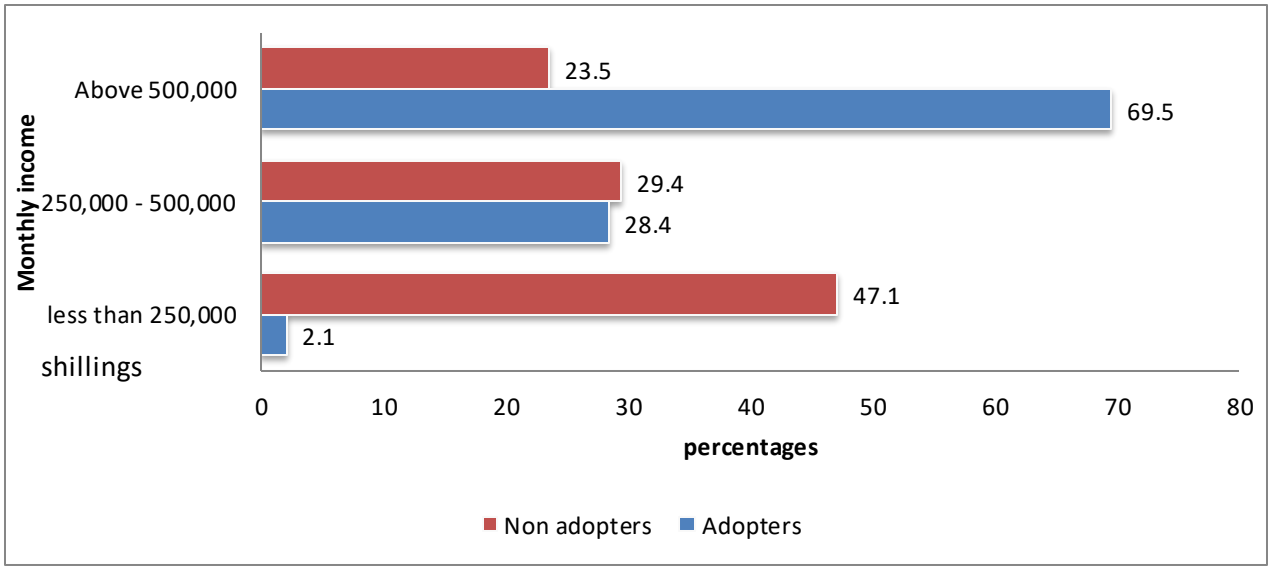
4.4 Effect of Improved Methods of Crop Farming on Livelihoods of Small Holder Farmers in Luuka District.

This involved mainly the amount of money earned by small holder farmers in terms of monthly incomes between the adopters and non-adopters.

4.4.1 The Effect of Improved Methods of Crop Farming on the Financial Capital for Small Holder Farmers in Luuka District.

The second objective of the study sought to determine the effect of improved methods of crop farming on the financial capital for small holder farmers. The findings are presented in figure 4.7

Figure 4.7: Grouped Bar Graph Showing Monthly Income in Shillings of both Adopters and Non-Adopters of Improved Methods of Crop Farming



Source: **Survey Data, 2020**

Results from figure 4.7 show desegregation of data into adopters and non-adopters revealed that among the adopters of modern crop farming, (2.1%) had an average monthly income of less than 250,000/=, (28.4%) had between 250,000/= and 500,000/= and (69.5%) reported earning a monthly average income of above 500,000/=. Among the non-adopters (47.1%) earned an average monthly income below 250,000/=, (29.4%) earned between 250,000/= and 500,000/= per month while (23.5%) earned an average above 500,000/= per month.

From the results, it is evident that the adopters reported earning higher income than non-adopters of improved methods of crop farming practices. In order to establish whether there are significant differences in monthly average incomes earned between adopters and non-adopters of improved methods of crop farming, a chi-square test was run. The results are presented in table 4.5.

Table 4.5: Chi – Square Test Results for Farmer's Average Monthly Income [Financial Capital]

	Value	Df	Asymp Sig(2 sided)
Pearson chi – square	29.714	1	0.000
Likelihood ratio	28.30	1	0.000
Linear by linear association	26.76	1	0.000
Number of valid cases	275		

Source: **Field Data, 2020**

Table 4.5 shows a chi – square test significance value of 0.000 for average income. This value is below the significance level of 5% which means that there is a significant difference between adopters and non-adopters of improved methods of crop farming in terms of average monthly incomes. This therefore means that adopters and non-adopters vary in terms of their average monthly income. The null hypothesis that there are no significant differences between adopters and non-adopters of improved methods of crop farming in relation to average monthly income is therefore rejected.

From interviews with the key informants, one of the informants pointed out that, *"Most farmers are now striving to use improved methods of crop farming to transform from subsistence farming to commercial farming so as to increase on household's incomes and food security"*. This finding is in agreement with that of the quantitative results.

4.4.1.1 Sources of Farmers Incomes

To establish whether the farmers' income was related to use of improved methods of crop farming, the respondents were asked to state the main source of their incomes and the results are shown below Table 4.6

Table 4.6: Showing Responses of all Respondents about their Sources of Income (N=275).

Adoption status		Major source of income						TOTAL
		Crop production	Animal production	Credit	On farm labour	Public service salary	Business	
Adopters	Count	90	35	30	0	15	20	190
	Percentage	47.4	18.4	15.7	0	8	10.5	100
Non adopters	Count	30	10	0	40	0	05	85
	Percentage	35.2	11.8	0	47.1	0	5.9	100
TOTAL	Count	120	45	30	40	15	25	275
	Percentage	43.6	16.3	10.9	14.5	5.5	9.1	100

Source: **Survey Data, 2020**

Table 4.6 shows that (47.4%) of the adopters earned most of their income from crop production, followed by animal production (18.4%) and minority (8.0%) earned their income from public service salary. Among the non-adopters, (35.2%) earned their income from crop production, (11.8%) was from animal production and majority of the farmers (47.1%) was from on farm labour. This therefore implies that adoption of improved methods of crop farming was mainly attributed to crop and animal production as major sources of income while as the non- adopters their major source of income was on farm labour because they are hired to work on the farms of the modern crop adopters.

4.5 The Effect of Improved Methods of Crop Farming on Physical Possessions for Small Holder Farmers in Luuka District.

Livelihoods can be determined in terms of physical possession. Promotion of improved methods of crop farming from subsistence to commercial farming. This is reflected by producing for market and hence high incomes.

Improved methods of crop farming have increased incomes of small holder farmers which enables them to acquire more assets as can be seen in the table 4.7 below.

Table 4:7: The Relationship between Adoption of Improved Methods of Crop Farming and Possession of Physical Resources(N=275).

Adoption status		Possession of physical resources							
		Vehicle	Domestic animals	Land in town	Land in Village	Bicycle	Motorcycle	Farm machinery	TOTAL
Adopters	Count	10	60	20	40	30	25	05	190
	Percentage	5.3	31.6	10.5	21.1	15.8	13.2	2.6	100
Non adopters	Count	00	10	05	20	38	12	00	85
	Percentage	00	11.8	5.9	23.5	44.7	14.1	00	100
TOTAL	Count	10	70	25	60	68	37	05	275
	Percentage	3.6	25.5	9.1	21.8	24.7	13.5	1.8	100

Source: **Survey Data, 2020**

The results in Table 4.7 show that non- adopters (25.5%) of the famers had domestic animals, followed by bicycles (24.7%), land in village (21.8%), motorcycles (13.5%), land in town (9.1%), and vehicles (3.6%) and only (1.8%) possessed farm machinery. Among the adopters, (31.6%) possessed domestic animals and only (2.6%) had farm machinery. On the other hand, majority (44.7%) of the non-adopters had bicycles, and no one owned farm machinery. From the analysis the adopter farmers had more possession of physical assets than the non-adopters. This is because adopters aim at transforming farming from small scale production to large scale production by practicing improved farming methods. It is reflected by growing crops for sale hence increased incomes.

From interviews with the key informants, one of the informants pointed out that,

"The numbers of farmers who currently own land has increased because they realized that it is the most important factor of production required by the farmers".

This finding is consistent with the quantitative results.

In this study, it was presumed to have a strong effect on response to improved methods of crop farming. A chi- square test was thus run to test whether the differences between adopters and non adopters in relation to physical possessions of assets significantly affected farmers' adoption of improved methods of crop farming as in table 4.8 below:

Table 4.8: Chi-Square Test for Possession of Physical Assets

	Value	**Df**	**Asymp sign (2 sided)**
Pearson chi – square	25.7	1	0.000
Likelihood ratio	27.20	1	0.000
Linear by linear association	28.41	1	0.000
Number of valid cases	275		

Source: Field data 2020.

Table 4.8 shows a chi-square test significance value 0.000 for physical possession of assets. This value is below the significant level of 5% which means that there is a significant difference between adopters and non-adopters in terms of physical possessions. This therefore means that adopters and non-adopters differ in terms of physical possessions. The adopters have more physical assets than the non-adopters. The null hypothesis that there is no significant difference between adopters and non-adopters of improved methods of crop farming in relation to physical possession is therefore rejected.

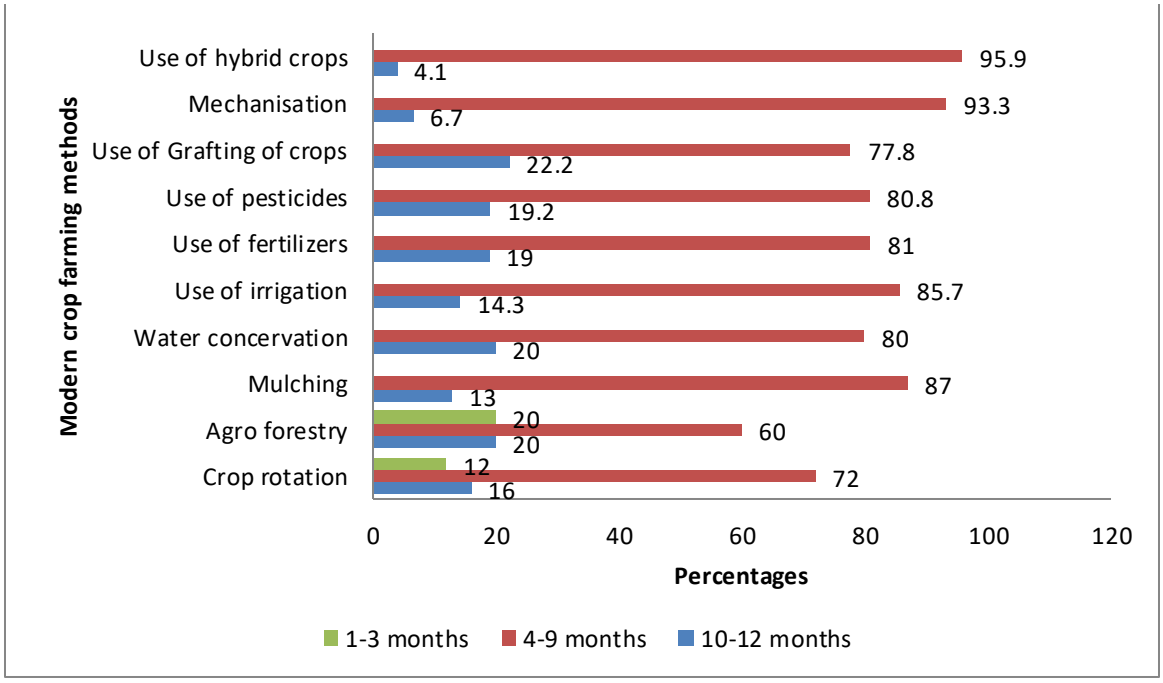
4.6 The Effect of Improved Methods of Crop Farming on Food Security for Small Holder Farmers in Luuka District.

The researcher, during this study looked at food security as the ones ability to be able to have the food stuff that could keep their families free from hunger situations that arise in times of food scarcity or during the drought seasons. The availability of food stuff was different between the adopters and non-adopters of the improved methods of crop farming which means that one of the groups suffered from food insecurity and the availability of food can be seen in table 4.9 below.

4.6.1. Improved Methods of Crop Farming Adoption Practices and Food Security.

The relationship between improved methods of crop farming adoption practices and food availability is obtained through the cross tabulation of food availability status of the households. In figure 4.7 food availability is categorized into three major groups following a methodology formulated by Coates et al, (2007), The methodology uses the Months of Adequate Household Food Provisioning as a measure of food availability. Counts of less than 3 show inadequate food availability, scores of 4-9 show moderate food availability while scores of 10-12 show adequate food availability.

Figure 4.7 Improved Methods of Crop Farming Adoption Practices and Food Availability Status of Adopters.



Source: Survey Data, 2020

Figure 4.7 shows that among the adopters of improved methods of crop farming, the methods that had higher levels of food availability are use of grafting of crops (22.2%), water conservation and agro forestry (20%), use of pesticides (19.2%) and use of fertilizers (19%) of the farmers had adequate food availability for the 12 months. The methods which had moderate food availability are use of high breed crops (95.9%), mechanization (93.3%), mulching (87%) and use of irrigation (85.7%). On the other hand, the methods of improved crop farming that were associated with inadequate food availability include agro forestry (20%) and crop rotation (12%).

4.6.2. Food Availability among Adopters and Non- Adopters.

To find out which of the two groups was better off in terms of food availability, comparison of food availability between the adopters and non- adopters was done and the results are displayed in table 4.9

Table 4.9. Cross Tabulating Adoption Status and Food Availability(N=275).

Adoption status		**Food availability status**			**TOTAL**
		1-3 months Inadequate food availability	**4-9 months Moderate food availability**	**10-12 months Adequate food availability**	
Adopters	Count	04	161	25	190
	Percentage	2.1	84.7	13.2	100
Non adopters	Count	61	24	0	85
	Percentage	71.8	28.2	0	100
TOTAL	Count	65	185	25	275
	Percentage	23.6	67.2	9.1	100

Source: **Survey Data, 2020**

Table 4.9 shows that majority 84.7% of the adopters of improved methods of crop farming had moderate food availability, followed by 13.2% who had adequate food availability and only 2.1% had inadequate food availability. Among those who had not adopted improved methods of crop farming practices, majority 71.8% had inadequate food availability while 28.2% had moderate food availability and none of the households had adequate food throughout the year. This shows that adopters were better off in terms of food availability than non-adopters.

To ascertain whether there was a significant difference in food availability status (months of available food) between adopters and non- adopters, chi square test was run and the results were shown in table 4.10.

Table 4.10 Chi Square Test to Determine the Significance Level in Terms of Food Availability

	Value	**Df**	**Asymp sig (2sided)**
Pearson chi square	50.99	2	0.000
Livelihood ratio	50.55	2	0.000
Linear by linear association	52.34	1	0.000
Number of valid cases	275		

Source: Survey Data, 2021

The chi square results in Table 4.10 show Pearson chi square value of significance 0.000 which shows that there is a significant difference between adopters and non-adopters in terms of food availability. This therefore indicates that adopters and non-adopters differ in terms of food availability. The null hypothesis which states that there is no significant difference between adopters and non-adopters in terms of food availability is therefore rejected.

4.7 Discussion of Findings

The subsection presents the discussion of findings on establishing effect of improved methods of crop farming on the livelihoods of small holder farmers in Luuka district.

4.7.1. The Improved Methods of Crop Farming Adopted by Small Holder Farmers in Luuka District.

The study found out that use of high bread seeds was the most dominant improved methods of crop farming in the study area. This was followed by pesticides, crop rotation, fertilizers and mulching. This was because these methods were less costly and easy to implement by the farmers. The least adopted improved methods of crop farming were grafting, agro-forestry, irrigation, machinery and water conservation because these methods were costly in terms of income and required more skills to adopt them.

The findings above show that farmers who plant improved crop varieties/high bread seeds are food secure and have increased incomes due to high crop yields. This finding is in line with Deree (2019) who in a study on precision agriculture also found out that manipulation of plants, use of inorganic fertilizers and chemical control of pests lead to improved crop yields hence food secure.

This study found use of pesticides to be the second dominant improved methods of crop farming employed by adopters in the study area. This is because they reduce on pest attacks on the crops and increase crop productivity, hence food availability and increased incomes. The findings concur with key and Roberts, (2007) stated that pesticides such as Baygon spray, finite DDT (dichloride phenyl trichloro ethane) are mainly used in modern agriculture and have side effects on organisms and brief idea of integrated pest control has resulted into high crop yields.

Crop rotation was found to be the third dominant improved methods of crop farming employed by small scale farmers. This is because it helps the soil retain its fertility and increases crop productivity hence food security and improved incomes. These findings

concur with those of Karfakis & HammamHowe, (2010) who defined crop rotation that refers to cropping system as the sequence or combination of crops growing in a single field. The term crop sequence is to be preferred which leads to high crop yields.

Use of mulching was found to be the fourth dominant improved methods of crop farming employed by the small scale farmers. The findings show that farmers who use mulching improve on their farm crop output and the soil retains its fertility, hence food stability as well as high incomes through sale of the crops. This is because it reduces on weeds which lead to high crop yields and increases crop productivity as well as increasing soil fertility which leads to food stability and improved incomes. The findings agree with those of Deree, (2019) who identified the modern methods namely mulching, intense tillage, use of inorganic fertilizes leads to improved crop yields, hence food secure.

Use of fertilizers was found to be the fifth dominant improved methods of crop farming employed by the farmers. This is because it increases crop productivity and leads to high crop yields hence food secure and improved income earning from sale of crops. This is due to the declining soil fertility; therefore farmers use both manure and artificial fertilizers to increase on the crop productivity so as to be food secure and increase on their incomes. The findings are in line with Ali and Abdulai, (2010) who stressed that encouraging improved use of better agricultural technologies such as artificial fertilizers is being pursued as a approach to revive the farming sector.

Use of mechanization was found to be the sixth dominant improved methods of crop farming employed by the farmers. This is because it increases crop productivity due to cultivation of large area, hence food stability and improved incomes of the farmers. The farmers use tractor and ox plough to till the land to plant crops. This is because of the costs involved in purchasing the mechanized equipment such as tractors, power tillers and water pumps. The respondents who used mechanization further revealed that they cultivated land that was four times greater than those of the farmers who never had tractors. This therefore implies that their output increased drastically than those who never had tractors. These findings agree with Owusu, (2016), revealed that the leading technologies that reduces small holder farmers level of poverty and marginality are in organic fertilizers for Afigliya-Kwabre, tillage by use of mechanization for Amansie of west, storage centers, marketing facilities, improved crop species and use of pesticides.

Water conservation was found to be the seventh dominant improved methods of crop farming employed by adopter farmers. This is because water conservation increases water access by crops and leads to high crop yields hence food stability and increases farmers' incomes. This is because of the limited knowledge of water conservation within the farm land. The farmers who used water conservation method revealed that their crop production increased and this ensured growth of crops throughout the year, hence food availability and improving on their incomes. These findings agree with that of Jennifer (2019) who argued that crop irrigation is very important throughout the areas so as to provide the world's ever-growing populations with adequate food supply.

Grafting of crops was found to be the eighth dominant improved methods of crop farming used by adopter farmers. This is because grafting of crops needed farmers with knowledge on grafting of crops yet majority of the farmers in the rural setting have limited education on how to carry out such activities. The farmers who applied this method revealed that they received much output during the harvesting period. These findings concur with Foster and Rozen Zweig, (2003), stated that use of plants to create new crop varieties so as to have high yields due to high breadization results into rapid agricultural production.

Use of irrigation system was found to be the ninth dominant improved methods of crop farming used by adopter farmers. This was because of limited access to water points and high costs of buying the water pumps. The farmers who used this method furthermore revealed that plants with high water contents generally produce more yields. These findings are in line with Karfaki and Hamman howe, (2010), stated that modern irrigation technology helps in better control of the amount of water in the soil, soil dampness and drying are affected by a variety of factors such as the amount of water given at each irrigation intervals, type of irrigation, nature of the soil, plant and climatic factors which increase on crop yields.

Use of agro forestry was found to be the least dominant improved methods of crop farming used by adopter farmers. This was as a result of a few farmers having enough land to carry out agro forestry. This is because it required more space and yet majority of the farmers had limited size of land that constrained them from adopting this method although it increases soil fertility, protects the environment inform of soil erosion and leads to high crop yields, hence food safety and improves the incomes. These findings concur with Deree(2019) who identified the improved methods of crop farming namely agro forestry, irrigation, mulching ,

use of manures and artificial fertilizer, chemical management of pest and genetically modified crops leading to improved crop yields hence food secure.

4.7.2 The Effect of Improved Methods of Crop Farming on the Financial Capital for Small Holder Farmers in Luuka District.

It was found out that farmers with high monthly average incomes had adopted the improved methods of crop farming than those with low monthly average income. This is because the farmers who adopted improved methods of crop farming received more output than those who didn't adopt. The reason for adoption of improved methods of crop farming method was because farmers are now being transformed from survival level to profitable farming, hence improved incomes and increased food availability. These findings concur with Ali and Abdulai, (2010) who stated that income, employment and wealth generation is taking place among the santal mechanized farmers. In the existing cropping pattern, the return on variable cost per acre is high, so the income is increasing due to modernization in agriculture. The cropping intensity is increasing and the farmers are engaged in cultivation around the year and get substantial Income from the occupation. It was also established that there is a significant difference in level of adoption between farmers with high monthly average income as compared with low average income.

It was also further established that majority of the farmers earned their income from crop production. This is because the farmers sell most of the crops grown to improve on their incomes and food accessibility. Similarly, the non- adopters 47.1% of them their source of income is from on farm labour. This is because they are able to work on the farms and they are paid for hired labour which has undermined the food security situation and only 10.5% of the adopters their source of income is from business. This is because they have been able to set up businesses which have led to improved standards of living and continuous food access. These findings agree with those of Munn & Drever, (2004) who stated that expenditure and income is the most important indicator to understand the level of living. Earlier, the santals used to spend most of their incomes on food but due to the increased income and awareness, they are now spending money for the durable consumer goods, education, and health care etc, savings tendency has also been developed.

It was established that only farmers who had adopted improved methods of crop farming were able to access credit facilities in Luuka district. This is attributed to the fact that majority of the farmers are small holders and do not have the security required to obtain loans

from the financial institutions. Similarly, all the non-adopter farmers in Luuka district did not have access to credit facilities. This is because it was very difficult to acquire a loan in the bank, microfinance and SAACO due to collateral security needed, hence leading to low incomes and continuous poverty which undermines food security. These findings concur with those of Msuya et al, (2018) who stated that small holder farmers usually find it difficult to obtain loans from formal lenders due to different reasons including lack of credit experience, credit accessibility and title security to guarantee the loans because they lead to inability of farmers to secure collateral loans.

4.7.3. The Effects of Improved Methods of Crop Farming on Physical Possessions for Small Holder Farmers in Luuka District.

The results of the possession of physical resources show that the adopters of improved methods of crop farming possessed more assets than the non-adopters.

It was further established that majority of adopters possessed domestic animals. This is because in case of any problem or eventuality which needs money, they can easily sale to solve the crisis, hence improving on the standards of living of the farmers and continuous boosting of their incomes. Similarly, 21.8% of the adopters possessed land in the village. This is because they sold the crops to buy the land so as to increase on the acreage to have continuous production, while 9.1% of the farmers possessed land in towns. This is because after selling their crops they get money and capital to set up business in the nearby trading centres. These findings are in line with those of Foster and Rozen Zweig, (2003) who stated that physical capital is generally considered as one of the three primary factors of production as in economic theory, with the other two being labour and land (natural resources), typical examples of physical capital goods in agriculture include farm machinery, farm buildings and different types of facilities and equipment used in agricultural production.

4.7.4 The Effect of Improved Methods of Crop Farming on Food Availability for Small Holder Farmers in Luuka District.

Farmers using grafting of crops had the highest percentage of participants with adequate food availability. This therefore, indicates that it was the most effective means of attaining food availability in Luuka district. This concurs with Otchia, (2014) who stated that plant breeding is a deliberate effort by human to nudge nature, with respect to the heredity of plants to an advantage of increasing crop yields. The changes made in plants are permanent and heritable. The professionals who conduct this task are called plant breeders. This effort of adjusting the

status quo is instigated by a desire of humans to improve certain aspects of plants to perform new roles or enhance existing ones to have high yields.

The households involved in the use of water conservation had moderate food availability. This was because it provides water access to crops during dry seasons which lead to continuous production. This agrees with Kremen illes and Bacon, (2012) who pointed out that the use of water conservation provides water access to crops during drought and hot temperatures which leads to high crop yields.

Most of the households using hybrid crop, and mechanization had moderate food availability. The households using hybrid crops said that practice had enabled them to have high crop yields and also the crop grows fast, matures early as well as being drought resistant. This is in line with Reardon et al, (2009) stated that improved seed technology and more strategic use of different types of seeds as suited to evolving conditions is a key mechanism through which agriculture can adapt to climate change. Different types of improved seed varieties exist, whilst the overarching goal is to maintain or improve yields (and ideally quality), the mechanisms through which this can be achieved differ. Improved seeds can be certified, drought tolerant or appropriate to other environmental and climate conditions. Early maturing which results into increased crop output.

The households practicing mechanization said that they cultivate large areas of land which leads to high crop production and increased incomes. This agrees with Owusu, (2016) who noted that dominant technologies and use of mechanization have the potential to reduce small holder farmer's level of poverty and increase crop production.

All small holder farmers involved in use of pesticides, fertilizers, irrigation and mulching had moderate food availability and increased crop productivity due to reduced pest attacks. This concurs with key and Roberts, (2007) stated that pesticides are sprayed over crops which lead to high crop production because they kill or destroy the pests.

The households involved in use of fertilizers said that it increases crop yields that enabled them to get food for more than half a year. This connects with Ali and Abdulai, (2010) who pointed out that although increasing inorganic fertilizers use is recognized as a key strategy for increasing farm productivity. Uganda's agricultural sector continues to register one of the lowest fertilizers use levels in sub –Saharan Africa. Promoting increased adoption of

agricultural technologies such as inorganic fertilizer is being pursued as a strategy to rejuvenate the agricultural sector.

The households using irrigation had enough food to eat for more than half a year because it provides water which supports growing of crops all year around. This is in line with Coachella, (2018) who stated that flood or furrow, the application of irrigation water where the entire surface of the soil is covered by ponded water. Early humans would have used this "Low-tech" method of irrigating crops, collect water in bucket and pour it on the fields to support crop growing.

The participants who were involved in using mulching had enough food to eat for more than half a year because it helps to maintain soil fertility which leads to high crop yields. This agrees with Deree, (2019) who identified the improved methods of crop farming namely agro forestry, irrigation, mulching, intense tillage, use of inorganic fertilizers, chemical control of pests and genetically manipulating of plants leading to improved crop yields hence food secure.

Agro forestry had the highest percentage of households who had inadequate food availability. In comparison to other improved methods of crop farming practices, agro forestry is the most ineffective improved methods of crop farming practice in attaining food availability given that it had the biggest percentage of households who did not have enough food to eat. This disagrees with Deree, (2019) who identified the improved methods of crop farming namely agro forestry, irrigation, mulching intense tillage, use of inorganic fertilizer, chemical control of pest and genetically manipulating of plants leading to improved crop yields hence food secure.

Crop rotation had the second highest percentage of households who had inadequate food availability. The households using crop rotation said that the practice had enabled them to get food for more than half a year because the soil retains its fertility and leads to increased crop yields. This concurs with Reardon et al, (2009) who defined crop rotation as the cropping system or the sequence or combination of crops growing in a single field. The term crop sequence is to be preferred which leads to high crop yields.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.0. Introduction

This chapter elucidates conclusions, recommendations and areas of further study.

5.1. Conclusion.

The study found out that most of the farmers in Luuka district have adopted improved methods of crop farming and the most dominant ones are using high breed crops, use of pesticides, crop rotation, mulching, use of fertilizers, use of mechanization, water conservation, use of grafting of crops, irrigation system and the least one is agro forestry. The findings further reveal that farmers adopted improved methods of crop farming because they need to increase crop productivity so as to be food secure and boost up their incomes.

The study found out that farmers who adopted improved methods of crop farming acquired more physical assets than the non-adopters. Therefore the adopters of modern farming practices increased on their physical assets, hence their wellbeing than the non-adopters.

From the study, it is evident that adoption of improved methods of crop farming practices increased on the farmers' incomes than the non-adopters. This was because of the surplus output which was sold off to earn income. The adopters of improved methods of crop farming are being transformed from subsistence farming to commercial farming. This is reflected by producing for market and hence high incomes for the farmers.

From the study, it is evident that adoption of modern farming improves the farmer's food security status. The findings show that farmers who have adopted improved methods of crop farming practices had adequate food availability because of the increased crop yields and productivity where food lasts for more than half a year. While the non-adopters have inadequate food availability with continuous food insecurity**.**

5.2. Recommendations

As was revealed by the study findings and confirmed by the district agricultural officer that the rate of adoption of improved methods of crop farming practices in the study area is still low, there is need to put emphasis on training of the farmers at local levels by the sub- county agricultural officers so that farmers are well equipped with the knowledge about the existing improved methods of crop farming practices and how best they can put them into practice. This can be done by both the government officials from the district, sub-counties as well as Operation Wealth Creation staff.

The findings show that adopters of improved methods of crop farming practices have improved livelihoods of small holder farmers in terms of food availability and increased incomes. The farmers in Luuka district should therefore be sensitized to adopt these practices by sub county agricultural officers and non-government organizations.

The adopters of improved methods of crop farming practices had more income earned compared to non-adopters in Luuka district. Therefore, the policy makers and political leaders should encourage farmers to have a changed mind set towards adoption of improved methods of crop farming practices to increase on crop productivity and their incomes.

The study found out that the non-adopters of improved methods of crop farming had less possession of physical resources especially assets. Therefore the local leaders and staff of operation wealth creation should enlighten farmers as a means to enforce government programs on modernizing the farming practices to increase on the physical assets.

The government should provide farmers with agricultural farm inputs which enhance improved methods of crop farming such as high breed crops, tractors, fertilizers and irrigation equipments at subsidized costs.

5.3. Further Research.

A study should be conducted on the factors affecting the adaption of improved methods of crop farming among small holder farmers.

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APPENDICES

APPENDIX I: QUESTIONNAIRE TO HOUSEHOLD HEADS

Dear esteemed respondent, my name is Mawogole Bosco, a finalist student at Kyambogo University. This questionnaire is carried out as part of the educational requirements for award of (Master of Arts in Geography) of Kyambogo University. It is intended to facilitate a study of the "Effect of Using improved methods of crop farming on the Livelihoods of Small-Holder Farmers in Luuka District- Uganda".

The answers you give are purely for academic purpose and the information given will be treated with uttermost confidentiality to your satisfaction. I therefore request you kindly, to participate willingly by putting a tick on appropriate option for each statement.

SECTION A: USE OF IMPROVED METHODS OF CROP FARMING

Use of High bread/Improved Crops

Are you aware of the existence of improved crop varieties in your area?

Yes ☐

No ☐

Do you have access to improved crop varieties in your village?

Yes ☐

No ☐

3. If yes, which varieties?

(a) Banana ☐

(b) Maize ☐

(c) Cassava ☐

(d) Potato ☐

(e) Millet ☐

(f) Rice ☐

Others Specify……

……..

4. State the reasons for the choice of the crop varieties being grown?

No.	Crop Variety	Reasons for the Choice of Crop Variety
1		
2		
3		
4		

5. If no, what are the reasons for not accessing improved varieties in your village?

It is expensive ☐

It is unavailable ☐

It is not profitable ☐

Its utilization is complex ☐

Others specify……..

High bread seeds

1. Do you use high bread seeds on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, what are the different high bread seeds you have on your farm?

……

……

……

3. If yes, have your incomes improved as a result of using high bread seeds?

(a) Yes ☐

(b) No ☐

4. What are the reasons for using high bread seeds?

a). Increase productivity ☐

b).They grow and ripen quickly ☐

c).They are more nutritious ☐

Others, Specify:……..

……

5. If no, why are you not using high bread seeds?

(a) Limited capital ☐

(b) Lack of technical skills ☐

(c) Lack of equipments ☐

(d) No need for grafting ☐

Others Specify……

……

Use of Technology/Mechanization

1. Do you use mechanization on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, which of the following do you use to plough?

(a) Tractor ☐

(b) Oxen ☐

(c) Hand hoe ☐

Others, Specify:……

3. What are the different reasons for the choice of the technology?

a). Increase productivity ☐

b). It is cost effective ☐

c). Easily accessible ☐

d). I just liked the technology ☐

Others, Specify:……..

……..

Grafting

1. Do you practice grafting on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, which crops are grafted?

……

……

3. What are the reasons for grafting?

a). Increase productivity ☐

b). It is cost effective ☐

d). I just liked grafting ☐

Others, Specify:……

……

4. If no, why are you not grafting?

(a) Limited knowledge about grafting ☐

☐

(b) Lack of technical skills

(c) Lack of grafting equipment's ☐

(d) No need for grafting ☐

Others, Specify:……

……

Pesticides

1. Do you use pesticides on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, what forms of pesticides do you use?

(a) Organic pesticides ☐

(b) Synthetic pesticides ☐

3. What are the reasons for using pesticides?

a). Reduce pest attacks ☐

b). increase productivity ☐

c). Pesticides are easily accessible ☐

Others, Specify:……

……

4. If no, why are you not using pesticides?

(a) Limited capital ☐

(b) Lack of technical skills ☐

(c) Lack of spraying equipments ☐

(d) No pests ☐

Others, Specify:……

……

Fertilizers

1. Do you use fertilizers on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, what forms of fertilizers do you use?

(a) Organic fertilizers ☐

(b) Inorganic fertilizers ☐

3. What are the reasons for using fertilizers?

a). Increase productivity ☐

b). It is cost effective ☐

c). Easily accessible ☐

Others, Specify:……

…….

4. If no, why are you not using fertilizers?

(a) Limited access to fertilizers ☐

(b) Lack of technical skills ☐

(c) My soil is fertile ☐

Others, Specify:…….

…….

Irrigation

1. Do you use irrigation systems on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, what form of irrigation do you use?

(a) Formal irrigation system ☐

(b) Informal irrigation system ☐

3. What are the reasons for using irrigation?

a). Increase productivity ☐

b). Increase water supply to plants ☐

c). Supports growing of crops all year around ☐

d). Reduces losses arising from heavy temperatures ☐

Others, Specify:……

…….

4. If no, why are you not using it?

(a) Limited capital ☐

(b) Lack of technical skills ☐

(c) Lack of irrigation equipments ☐

Others, Specify:…….

…….

5. Have your incomes improved as a result of using irrigation?

(a) Yes ☐

(b) No ☐

Water Conservation Methods

1. Do you use water conservation methods on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, which methods do you use?

…….

…….

3. What are the reasons for using water conservation methods?

a). Increase productivity ☐

b). Increase water access by crops ☐

c). Ensures crop growing all year around ☐

Others, Specify:……

…….

4. If no, why are you not using water conservation methods?

(a) Limited knowledge of the methods ☐

(b) Lack of technical skills ☐

(c) The soil has enough water. ☐

Others Specify…….

…….

Mulching

1. Do you practice mulching on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, which types of mulches do you use?

…….

…….

3. What are the reasons for mulching?

a). Increase productivity ☐

b). Increase water holding capacity of the soil ☐

c). Reduce weeds ☐

d). Increase soil fertility ☐

Others, Specify:……

…….

4. If no, why are you not using mulches?

(a) Limited capital ☐

(b) Lack of technical skills ☐

(c) Lack of mulches ☐

Others, Specify:……

……

Agro forestry

1. Do you practice agro forestry on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, which crops and trees do you have on your farm?

(a).Crops

……

……

(b).Trees

……

3. What are the reasons for practicing agro forestry?

a). Increase productivity ☐

b). Protect the environment ☐

d). Increase/maintain soil fertility ☐

Others, Specify:……

……

4. If no, why are you not practicing agro forestry?

(a) Limited capital ☐

(b) Lack of technical skills ☐

(c) Limited access to trees ☐

Others, Specify:……

……

Crop Rotation

1. Do you practice crop rotation on your farm?

(a) Yes ☐

(b) No ☐

2. If yes, which crops are under crop rotation system?

……

……

3. What are the reasons for using crop rotation?

a). Increase productivity ☐

b). Retain soil fertility ☐

c). Protect the environmental ecosystem ☐

Others, Specify:……
…….
4. If no, why are you not practicing crop rotation?
(a) Limited knowledge about crop rotation ☐
(b) Lack of technical skills ☐
(c) Am using other methods ☐
Others Specify…….
…….

5. In your opinion, what are the benefits associated with use of modern farming practices?

a). Increase out puts ☐
b). Retaining soil fertility ☐
c). Protecting the environmental ecosystem ☐
d). Increase productivity per unit area of land ☐

Others, Specify:…….
…….
6. What are the different challenges involved in the use of modern farming practices?
(a) Limited knowledge about modern farming practices ☐
(b) Limited capital for embracing modern farming practices ☐
(c) Limited technical experts ☐
(d) Lack of exposure by farmers ☐
Others, Specify:…….
…….

SECTION B: FINANCIAL CAPITAL OF SMALL-HOLDER FARMERS

I).What is the type of your farm?

Subsistence farm ☐

Commercial Farm ☐

Both ☐

Household Incomes

I) What is your monthly income?

Less than 250,000/= ☐

250,000/= to 500,000/= ☐

(c) Above 500,000/= ☐

II) What is your main source of income?

Crop production ☐

Animal production ☐

(c) Salary ☐

(d) Informal labor ☐

(e) Business ☐

Others, Specify:…….

……..

III) What share of your production do you and your family sell (and not consume yourselves)?

We sell nearly everything ☐

We sell most ☐

We sell about half ☐

We sell less than half ☐

IV) On average, how much do you earn from crop sales every one season?

Less than 250,000/= ☐

250,000/= to 500,000/= ☐

Above 500,000/= ☐

Household savings

I) Do you keep any savings?

(a) Yes ☐

(b) No ☐

II). If yes, where do you save?

(a) Bank ☐

(b) SAACO ☐

(c) Village saving group ☐

(d) Microfinance ☐

(e) In my house ☐

(f) Keep my money with a friend/relative ☐

Others, specify:……

……

(III). Give the reasons why you save?

(a) To cater for the basic needs of my family ☐

(b) To grow my crop farm ☐

(c) To invest in other businesses ☐

Others, specify:……

……

IV) What is the source of your savings?

(a) My crop farm ☐

(b) My business ☐

(c) My salary ☐

Others, specify:……

……

V) How much do you save currently on average per month?

(a) Below 50,000/= ☐

(b) Between 50,000/= to 100,000/= ☐

(c) Above 100,000/= ☐

VI) How do you rate your savings before the introduction of modern farming practices?

(a) Has increased

(b) Remained same ☐

(c) Has reduced ☐

Credit Accessibility

(I) Do you have access to credit?

(a) Yes ☐

(b) No ☐

(II) If yes, where do you get the credit?

(a) Bank ☐

(b) SAACO ☐

(c) Village saving group ☐

(d) Microfinance ☐

(e) From my friend/relative ☐

Others, specify:……

……

(III) How much credit do you take in a year?
(a) Less than 500,000/= ☐
(b) Between 500,000/= and 1,000,000/= ☐
(c) Between 1,000,000/= to 2,000,000/= ☐
(d) Above 2m ☐

(IV) What do you use your credit for?

(a) To cater for the basic needs of my family ☐
(b) To grow my crop farm ☐
(c) To invest in other businesses ☐
Others, specify:……
……

(V) Where do you get money to pay back the credit?

(a) From my crop farm ☐

(b) From my other businesses ☐

(c) My salary ☐

Others, specify:……

……

(VI) How was credit access before the introduction of modern farming practices and now?
(a) It is easier ☐
(b) It is more difficult ☐
(c) It remained the same ☐
Others specify……
……

SECTION C: POSSESSION OF PHYSICAL RESOURCES

(I) what are the different assets do you own?

……

……

……

……

……

……

(II) What is the main source of money for buying those assets?
(a) My crop farm ☐
(b) My other businesses ☐
(c) My salary ☐
Others specify……
……

(III) How do you compare your assets now and before the introduction of modern farming practices?

(a) Assets increased ☐

(b) Assets remained same ☐

(c) Assets reduced ☐

Others specify…….
……

SECTION D: FOOD AVAILABILITY

What are the sources of food for this holding (circle appropriate code)?

Own farm production ☐

Purchased food ☐

Government rations ☐

Supplies from relatives/friends ☐

Others (Specify)……...

……..

Which of the above is the main source?

Own farm production ☐

Purchased food ☐

Government rations ☐

Supplies from relatives/friends ☐

Others (Specify)……

……

Have your household experienced any food shortages over the past 12 months?

Yes ☐

No ☐

Number of meals the household normally has per day

One meal ☐

Two meals ☐

More than two meals ☐

Number of times this household eats meat in a month

Once ☐

Twice ☐

More than two times ☐

Regularly ☐

Has the family ever had food shortage?

Yes ☐

No ☐

Do you skip some meals?

Yes ☐

No ☐

If yes, how often

Rarely ☐

Very rarely ☐

(c) Often ☐
(d) Very often ☐

What are your yields per hectare?

……

Rate each of the following as reason(s) for food shortages in homes

By selecting *YES* or *NO*

No	**Statement**	**YES**	**NO**
	Decline in own farm production because of drought		
	Decline in own farm production because of pests and diseases		
	Decline in own farm production because of labour constraints		
	Decline in own farm production because of time constraints		
	Decline in own farm production because of soil degradation		
	Decline in own farm production because of low quality of agricultural inputs used		
	Lack of funds to purchase food		
	Decline in government food supplies		
	Decline in food supplies from friends and relatives		
	Decline in remittances received from relatives and friends		
	Increase of food prices		

	Unemployment of household member(s)		
	Increase of household expenditures due to Illness/death of household member(s)		
	Lack of groups in the society		

APPENDIX II: INTERVIEW GUIDE FOR DISTRICT AGRICULTURAL OFFICER, OWC OFFICER, LCI CHAIRPERSONS AND SUB COUNTY CHAIRPERSONS

1. What strategies have you come up with to help small-holder farmers modernize their agricultural practices?
2. In your experience, what is the average farm holding in acres, of a small-holder farmer who you think benefits largely from modernized agriculture?
3. What can you give as the general advantages of practicing modernized agriculture in relation to the following;

   Human Capital?

   Financial capital?

   General livelihood
4. What are some of the difficulties you have faced in encouraging modernized agriculture?
5. Give ways of increasing modernization of agriculture in your district