ASSESSING THE CONTRIBUTION OF BACKYARD GARDENING ON FOOD AVAILABILITY: A CASE STUDY OF NABIGASA SUB COUNTY, KYOTERA DISTRICT

TWESIGYE FRANCIS

2015-M152-20014

A POSTGRADUATE DISSERTATION PRESENTED

TO THEFACULTY OF AGRICULTURE; IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTERS OF SCIENCE IN AGRO ECOLOGY OF UGANDA MARTYRS UNIVERSITY

OCTOBER, 2018

Dedication

I dedicate this research work to my wife Christine Mugume and my son Arinda Peter Claver.

Acknowledgements

I am grateful to the almighty God who has protected me throughout this study. I am further grateful to my lecturers, friends, relatives and well-wishers for being there for me. I am highly indebted to my supervisor Ms Florence Nassimbwa for her tireless efforts in the supervision of this research. May God bless you abundantly.

In a special way, I want to thank the following people for their enormous support, Peter Wyswa for encouraging me to go for further studies, my dear wife Christine and son Claver for all the support and joy they provided, my family for being on my side always, Alex Atuyamba for the encouragement and support that I can always make it, Angel , Cleophus and Hon George for their generosity and shelter, I will always cherish the moments we had together, I also acknowledge the support from the 2015 Master of Science Agro-Ecology class. Special thanks go to David, Christine, Doreen, Roseline, Paschal, Joshua and Peter for always making those my weekends during the study memorable.

I am thankful to Nuwagaba Tamson for your support during the data analysis process. You really helped me greatly and may God bless you abundantly. I am further grateful to Doreen Atwongeire for your tireless efforts in ensuring that I produce a better dissertation. I am grateful to Stephen Odhiambo MHM for accepting to proof read my work, may God bless your vocation.

I also extend my heartfelt thanks to the *Send a Cow Uganda* family for giving me a job. In a special way I am thankful to my work supervisor Roselyn Emuna Akiiki for her support and encouragement during my studies. Appreciation to all the stakeholders involved in this research and specifically the respondents for the hospitality given and cooperation shown during the data collection period. May God always bless your gardens and may you live to reap a thousand returns from your efforts.

Table of contents

List of figures

List of tables

Abbreviations

AEW	-	Agriculture Extension Worker
CDO	-	Community Development Officer
CRS	-	Catholic Relief Services
FAO	-	Food and Agriculture Organization
IFAD	-	International Fund for Agriculture Development
LC	-	Local Council
OPM	-	Office of the Prime Minister
SACU	-	Send a Cow Uganda
SDG	-	Sustainable Development Goal
UBOS	-	Uganda Bureau of statistics

Abstract

The study assessed the contribution of backyard gardening towards food availability in Nabigasa Sub County. The purpose of the study was to evaluate if backyard gardening has had any positive contribution towards food availability so that mechanisms for scaling up the farming system can be devised for enhancing food security in the district. The study was guided by three objectives which included; establishing the backyard gardening designs used in Nabigasa Sub County, comparing food availability levels among adopters and non-adopters and exploring mechanisms for scaling up backyard gardening in rural households.
The study employed cross sectional comparative and case study research designs. A sample size of 223 respondents was selected using snow ball and purposive sampling techniques. Data was collected using non-participant observation, key informant interviews and questionnaire survey. Data was analyzed using Statistical Package for Social Scientists (SPSS) version 20.

It was established that several backyard gardening designs were adopted including key hole, mandala, basket, sunken, double dug and raised bed designs. These were introduced by Send a Cow Uganda. It was further established that backyard gardening has a significant effect on food availability, with adopters of backyard gardening being more food secure compared to those that are not practicing it. The variables were analysed at the confidence interval of 95% with 5% standard error. From the results generated by the paired samples test there was a confirmation that there is a statistical significant difference between adopters and non – adopters in food availability since all p-values Sig. (2-tailed) in parameters measured are less than 5%.

Proposals for scaling up backyard gardening were also advanced by the farmers including formation of backyard gardening groups, enacting laws, peer based backyard gardening and extensive rural based services. Conclusively, backyard gardening has a positive effect on food availability and should therefore be adopted by all rural households for enhanced food availability. Enhanced research and clear stakeholder analysis should be made for effective backyard gardening.
Key Words: Adopters, Backyard Gardening, Food Availability, Food Security, Non-Adopters

CHAPTER ONE

GENERAL INTRODUCTION

1.0 Introduction

The research focused on assessing the contribution of backyard gardening on food availability in Nabigasa Sub County-Kyotera district and is presented in five chapters. Chapter one of this study covers the background, problem statement, objectives of the study, research hypotheses, scope and significance of the study. It further presents the definition of key terms and conceptual frame work of the study

1.1Background of the Study

Asaduzzaman (2011) asserts thatbackyard or home gardens play an important role in improving food security for the resource poor rural households in developing countries such as Uganda. Backyard gardens further use low cost inputs and technologies and thus help in reducing the gap of productivity between the technical potential and actual production levels of food crops (Tittonell, 2012). Backyard gardens are essential in enabling communities and households to produce food throughout the year thus helping feed their respective communities.

Furthermore, Talukder *et al* (2000) underlined that homestead production of fruits and vegetables enables households to have direct access to vital nutrients that may not be readily available or within their economic reach. Thus, backyard gardening is a good means of improving household food security and more so food availability.

According to Talukder *et al* (2000), backyard gardening is an important source of additional income since households can sell a portion of the garden's produce. This additional income is essential in purchasing complementary food items thus boosting the diversification of the family's diet.

In Kyotera District, Nabigasa Sub County, backyard gardening was established by Send a Cow Uganda (SACU) to boost the food security of orphaned and vulnerable households. Before the project, households were food insecure with 92% of the households reporting to be moderately or severely food insecure (SACU, 2015). Thus, it is important to assess how this intervention has helped in boosting food security of households.

1.2 Problem Statement

Food availability is the capacity of an agro ecological system to meet general demand for food. This entails physical existence of food, whether from the household's own farm or garden production or from domestic or international markets. Food availability is when sufficient quantity is consistently available to all individuals through household production, domestic output, commercial imports or food assistance.

With the increasing global population, the greatest question is how to ensure food security and conservation of the world's natural resources for sustainable agricultural production. Today, the increasing effects of climate change, have increased uncertainty in rain-fed agriculture practiced by majority of rural households. This has led to low food production and rise in food prices thus limiting the poor rural households from accessing enough and nutritious food.

Food insecurity has become one of the biggest challenges in Nabigasa Sub-County, with many people either having one meal or no meal a day while others do not have meals that meet most of their dietary needs. This therefore necessitated innovations that can address this concern. Undoubtedly, backyard gardening is part of the solution to this problem**.** Thus, it is important that this study was done to assess the contribution of the backyard gardening intervention towards household food availability so as to support its scaling up especially in rural areas where land for agriculture is becoming scarce and in many cases losing fertility.

1.3 Objectives of the Study

1.3.1 Major Objective

The overall objective of this study was to assess the contribution of backyard gardening on food availability in Nabigasa Sub County, Kyotera District.

1.3.2 Specific objectives

i. To establish the backyard gardening designs used in Nabigasa Sub County
ii. To compare food availability levels between households that have adopted backyard gardening and those that have not adopted.
iii. To explore mechanisms for scaling up backyard gardening in rural households

1.3 Research Questions

This study was guided by the following research questions

i. What are the backyard gardening designs used in Nabigasa Sub County?
ii. Compare food availability among adopters and non-adopters of backyard gardening?
iii. What mechanisms can be applied to scale up backyard gardening in rural households?

1.5 Scope of the Study

1.5.1 Geographic Scope

The study was conducted in Nabigasa Sub County, Kyotera District, and Central Uganda. The study covered four parishes of Nabigasa Sub County which are: Bethlehem, Kyasimbi, Nabigasa and Kijjejja. The study area is a relatively flat area with shrubs, some swamps and trees. The choice of this particular study site was informed by the presence of households that have adopted backyard gardening model of farming. The study area is located on geographical coordinates of 0°37'54.0"S, 31°32'36.0"E.

1.5.2 Content Scope

The study assessed the contribution of backyard gardening on food availability in Nabigasa Sub County, Kyotera District. Backyard gardening was the independent variable and food availability the dependent variable. Parameters such as backyard gardening designs, food quantity, dietary content and food quality were examined.

The study was guided by three objectives which included establishing the backyard gardening designs used in Nabigasa Sub County, comparing food availability levels before and after the introduction of backyard gardening and exploring mechanisms for scaling up backyard gardening in rural households. This content scope was chosen because food availability mostly among vulnerable rural communities has become one of the biggest challenges hence exploring ways through which this can be solved is very vital.

1.5.3 Time Scope

The study covered the period between 2016 and 2018. The researcher particularly chose this time scope because it is adequate enough to clearly assess the contribution of backyard gardening on food availability.

1.6 Significance of the Study

Findings from this study will be vital to different categories of people and organisations. The information generated will act as a baseline data that can greatly facilitate not only the understanding and creation of awareness about backyard gardening but may also provide key results that may be useful in planning and establishment of backyard gardens in the countryside.

The study will support informed decision making in designing appropriate poverty and hunger reduction programmes and projects. The findings will further be key in attracting different funding organisations that are interested in supporting communities with projects meant for food security promotion.

The study will also work as baseline for further research related to backyard gardening. The researcher will also be awarded with a MSc Agro Ecology at the completion of this study.

1.7 Justification of the study

Kyotera District is one of the areas in Uganda that was greatly affected by the HIV scourge in the late 1970s and early 1980s. This left several widows and many orphans, poor and vulnerable children. Food insecurity became the order of the day since the orphans were too young to bring food to their table. Additionally, given the widespread and prolonged

droughts, the severe famine that have devastated communities year in and year out, and more so, the increasing threat of climate change have made it hard for households to have a steady source of food for the entire especially in dry spells.

Thus this study helps in understanding the contribution of the backyard gardening intervention in achieving food availability amidst the identified challenges and evaluating the level of significance of these interventions towards enhancing food security and particularly availability to the vulnerable communities in Nabigasa Sub County.

1.8 Definition of Key Terms

1.8.1 Backyard gardening

This is a garden where vegetables and herbs are grown around the homestead for household use. Backyard gardening is also known as home gardening and some refer to it as kitchen gardening.

1.8.2 Food Security

All people having sufficient physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Food security has 4 major pillars which are availability, Access, utilization and stability.

1.8.3 Food availability

Food availability is the capacity of an agro ecological system to meet overall demand for food. This entails physical existence of food, whether from the household's own farm or garden production or from domestic or international markets (Faaij, 2008).

1.9 Conceptual Framework

This sub section illustrates the conceptual framework of the study and provides a discussion of the main areas of focus as depicted in Figure 1 below.

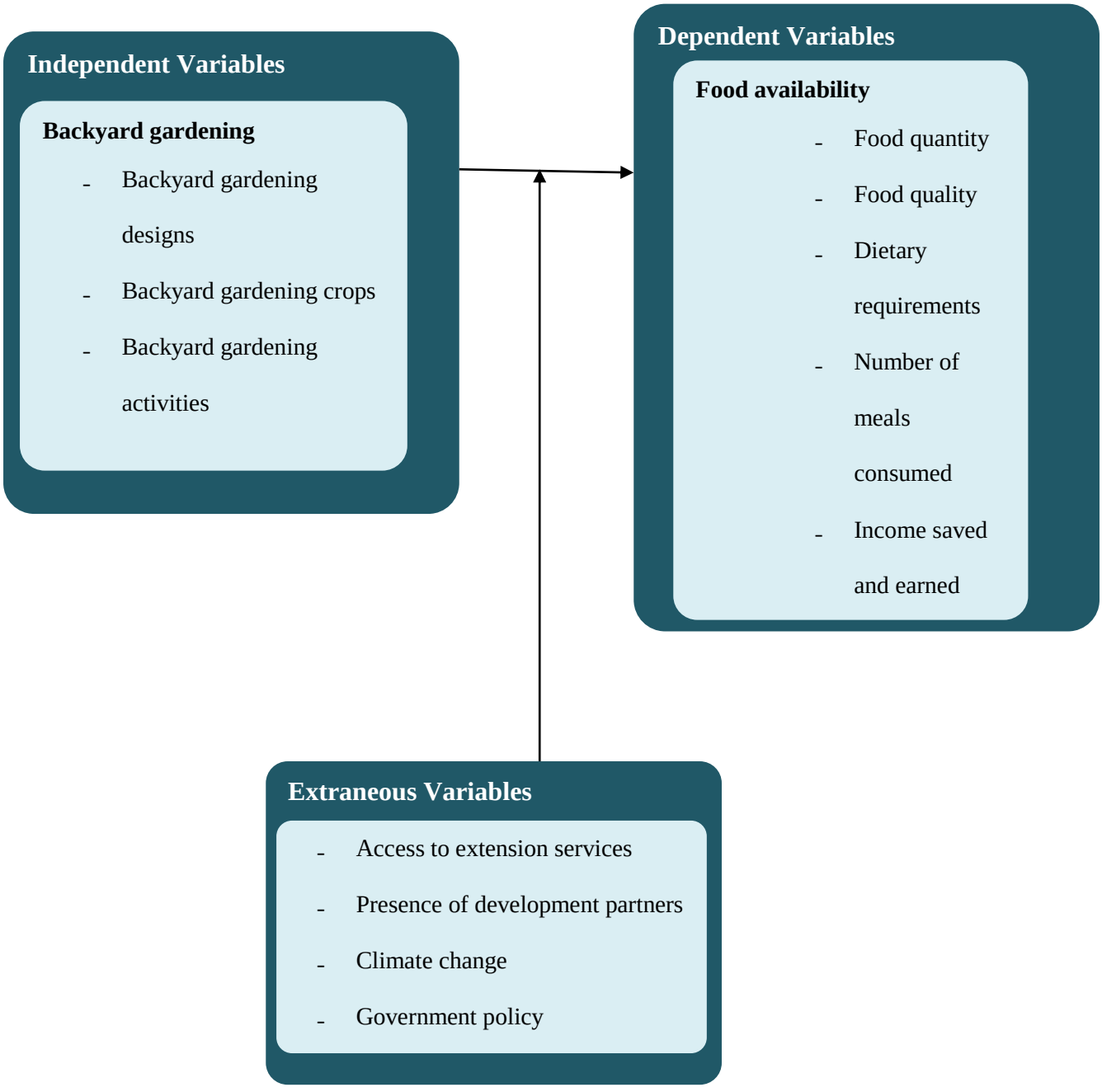

Figure 1: Conceptual Framework

The above conceptual framework in figure 1 depicts the effect of backyard gardening on household food availability. It shows how backyard gardening in terms of the. The different backyard garden designs include Mandala, Raised bed, Sunken, Kitchen garden, and double dug. These are the common designs that are practiced in the area of study.

These designs allow growing of different crops especially vegetables and cereals. These include Sukumawiki, Carrots, cabbages, spinach and Gobe. The different backyard gardening activities include setting up backyard gardening demos, mobilizing and training of households on backyard gardening, supplying these households with affordable inputs and continuous on spot monitoring and extension services.

These contribute to improved food supply to the household in terms of quantities, quality and diversity. These also lead to improved incomes through earning from excess food sales and reduced expenditure on food purchases. Backyard gardening ensures that the farm resources are conserved and used sustainably to meet the current food needs of the households and uphold their capacity to provide for the future. Indeed, according to IFAD (2015), for farmers to respond to the increasing demand for food and other agricultural services and products, there must be a secure and productive asset base.

Furthermore, the intervening variables of access to extension services, presence of development agencies, climate change and government policy will also influence food availability. Through trainings, favourable climatic conditions, development agencies proving inputs and government policy through provision of government support will improve household food among the farmers.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter digs into literature drawn from the findings and arguments of some of the previous studies on the contribution of backyard gardening towards food availability in communities.

2.1 Backyard Gardening Designs

Backyard gardening refers to the cultivation of a small portion of land which may be around the household or within walking distance from the family home (Odebode, 2006). It is a mixed cropping system that encompasses vegetables, fruits, plantation crops, spices, herbs, ornamental and medicinal plants as well as livestock that can serve as a supplementary source of food and income. Backyard gardening involves the growth of vegetables and herbs around the house particularly for household use.

Home gardens are found in both rural and urban areas in primarily small-scale subsistence agricultural systems (Nair, 1993). The very beginning of modern agriculture can be dated back to subsistence production systems that arose in small garden plots near the household. These gardens have tirelessly bore the test of time and continue to play an important role in providing food and income for the family (Marsh, 1998).

According to Eyzaguirre and Linares (2010), a backyard garden is multi-storied and multi-use area near the family dwelling that serves as a small-scale supplementary food production system maintained by the household members, and one that encompasses a diverse array of plant and animal species that mimic the natural eco-system. Indeed, aavailability of food is

not just about the inadequacy and the immediate entitlement but has to do with paucity of the household as without assets to liquidate and buy food one will go hungry (Maxwell, 1992).

Since the time immemorial, backyard gardening has been part of a family farming and local food system. Backyard gardens are internationally known as a supplemental source of food enhancing food security and livelihoods (Dilrukshi*et al*, 2013). Indeed from the history of humankind, the gardens that are meant to produce flavouring plant and vegetables are known as backyard gardens. Such gardens include shrub trees and fruit trees which require regular attention. They are usually put around the homestead and most especially near the backyard.

Backyard gardens are part of the bio-intensive participatory innovations which have the capacity of enhancing all year round food availability from the various food crops grown (Wanjek, 2005). Undoubtedly, for a household to be healthy, it is vital that it gets a balanced or mixed diet. This can be achieved by growing a variety of crops including vegetables and fruits which are some of the crops mostly grown in backyard gardening (BMZ, 2016).

Backyard gardening adoption is still a challenge in some communities and it is constrained by limited access to suitable land to grow food, lack of technical know-how, lack of awareness and knowledge regarding gardening (Sethy *et al*. 2010; Chauhan, 2012). However, Backyard gardening can be done on a small piece of land. It is possible for a farmer to produce for both their households and the market. The gardens are easy to manage since they are near the homestead and can be done jointly with other domestic work. The availability of seeds and seedlings as well as space can increase backyard gardening adoption hence food availability among the adopters (Gomes *et al*. 2017).

In the design of backyard gardens, several principles have to be followed. Firstly, lay out should allow access to all parts of the garden. Secondary, it should be put preferably at the backyard. Thirdly, quick growing fruit trees should be grown at the north side of the garden while climbers can be retained on the fence. Fourthly, the design should allow several sowings or succession of sowing of one particular crop. Additionally, ridges that separate beds should be utilised for growing root vegetables and inter-space of slow growing crops (Major and Dhaliwal 2007).

According to Mugisa*et.al* (2016), there are several backyard designs and these include.

2.1.1 Sack and Polythene Gardens

These are made in numerous sizes by doubling or tripling polythene or sack layers. In this, bigger sack garden is made by sewing different sacks together horizontally and at the edges. This allows planting on both sides of the sack. This requires good soil fertility and the drainage must at all times so as to get a good harvest.

2.1.2 Container and Box Gardens

Several containers can be used in this style of backyard gardening such as buckets, wooden boxes, pots, jerry cans, plastic bottles and woven baskets. Depending on one's preference and the available space, these can be modeled into different shapes and sizes.

2.1.3 Hanging Gardens

These are gardens that are suspended in air. This allows growing of vegetables e.g. tomatoes without reducing on the already inadequate space. This is often adopted by those who totally lack where to grow vegetables but have interest in growing crops.

2.1.4 Ridges and Flower Beds (Raised Bed)

Raised beds are done by heaping soil (10-20cm) on the ground. Notwithstanding its difficulty, raised beds facilitate better drainage since water runoff flows easily between the ridges. Such ridges further favour growing of vegetables since the soil is generally more fertile and thus vegetables grow well and flourish.

2.2 Food Availability Levels Between Households that have Adopted Backyard Gardening and those that have not

According to FAO (2013) food availability refers to the physical existence of food, be it from own production, from markets or free food donations by relatives, neighbors of food relief programmes. Food availability is key role in the food security parameters. This is looked at the household and national level. Nationally, food availability is a combination of domestic food stocks, commercial food imports, food aid, domestic food production as well as the underlying determinants of each these factors. However, the term is applied most commonly in reference to food supplies at the regional or national level.

According to Sijm (1997) food availability entails key essential determinants in terms of availability through domestic production, storage and/or imports as well as the ability to acquire food through subsistence production, market activities, and food and/or income transfers. In determining food security, it is done based on indicators and outcome indicators. Furthermore, Kracht and schluz (1999) looks at food sufficient as enough food for life, health and growth of the young and for productive effort and further defines sufficiency food, as that, which is enough to supply the energy needed for all family members to live healthy, active and productive lives. Oxfarm (2015) looks at food availability at the household level as including foods from owns production and that bought from local markets,

According to Maxwell and Frankenberger (1992), there are process indicators which include variables that reflect food supply by providing information on the likelihood of a shock or disaster that will adversely affect household food security. These put into consideration issues such as provision of inputs, agro-meteorological data, having access to natural resources and development of support structures. According to FAO (2003) for a person to claim to have enough food he/she must be able to least eat a minimum of kilocalories 2250 per day.

At the household level, food availability indicators are congregated into direct and indirect indicators. In this, direct indicators of food security include those, which are close to food consumption rather than to marketing channel information or medical status. Under, indirect indicators is where direct ones are either unavailable or too costly in terms of time and money to collect such food. The main direct indicators of food security are money spent on food and kilocalories contained in the foods eaten, perceptions of households on food security and extent of self-provision whereby people are asked whether they have access to their culturally accepted food and the number of months their food produce lasted.

Food frequency is also considered and in this case people are asked about the number of meals per day and about the frequency of consuming specific food items Furthermore, Maxwell and Frankenberger (1992) explain that, indirect indicators of food security are food storage estimates and comparing the amounts stored with the amounts specified to be sufficient per household per year, subsistence potential ratio in households which produce most of their food, which is a ratio of the amount of food produced at the household level in terms of energy to the amount of energy requirements of the household per year. However, according to Maxwell and Frankenberger (1992) food availability may be constrained by

inappropriate agricultural knowledge, technology, policies, inadequate agricultural inputs and family size (Hoddinott, 1995)

According to Holben (2002) food security at the individual level requires deliberation on the biological utilization of food, ability of the human body to convert food into energy which is either used or stored. Food utilization requires not only an adequate diet but also a healthy physical environment, including safe drinking water, adequate sanitary facilities and an understanding of proper health care, food preparation, and storage processes.

Furthermore Danso&Veehuizen (2007) assert that food self-producing households achieve greater nutritional status than non-farming urban households. Children of self-producing low incomes farming households are nutritionally better off than those of children of the same status but not involved in farming. Indeed according to Mercy Corps (2009) assert that availability is when sufficient quantity is consistently available to all individuals through household production, domestic output, commercial imports or food assistance. Nell *et al (*2000) noted that home garden is a piece of land in a homestead (can be in front or behind the house) that is used mainly for agricultural production and own consumption.

According to Vhurumuku (2014) the key indicators of food availability include availability of basic foods and their nutritional component. These are staple foods and their respective substitutes. Then another indicator is the location of the household in the agro ecological zones. It further indicates the amount of food expenditure as a key indicator of food availability. This portrayed in terms of how much is spent on food purchases. Mercy Corps (2009) asserts that food availability is when sufficient quantity is consistently available to all

individuals through household production, domestic output, commercial imports or food assistance.

According to Faaij, A (2008) food availability is the capacity of an agro ecological system to meet overall demand for food. This entails physical existence of food, whether from the household's own farm or garden production or from domestic or international markets. Furthermore, Food security is determined by individual characteristics such as education which has implications on household income generation and food production possibilities because it promotes the development of cognitive skills that are likely to support income generation and food production (World Food Programme& Stanford University Press, 2006).

Growing food around the household provides convenient access to different varieties of affordable and nutritious foods and provides an important support for community food security (Kotright, 2011). With the global population expected to reach over 9 billion by 2050, there is a continuous need to increase food production and buffer stocks (IFAD, 2015). Currently more than 20% of the World's population is on average food-insecure due to climate change and variability (Wheeler *et. al*, 2013).

Indeed, aaccording to Brown (1992) to improve food security of the poor there has to be an increase availability and access of foods in the local and community markets. Furthermore, Majority of people in the developing world, home-based gardening remains the most important technique of food production. The daily nutrition and healthy food required by household members can be obtained from home garden production. Home-based gardens, therefore, play a significant role to household food security (Musotsi *et al.* (2008). According

to the World Bank (2007) increasing and stabilizing domestic production is essential for food security

According to Pinstrup-Anderson (2009) food availability alone is not enough to determine food security but rather the ability of an individual access the available food. This requires distribution of such food. According to Ericksen, (2008) distribution refers to how food for consumption is physically moved to be available, what form, when and to whom determined by transportation and infrastructure, public safety nets and storage. According to Gliessman (2007) a more sustainable food system requires fewer links in the food supply chains. These are face to face and direct farmer to buyer interactions. They occur in pick-your-own farms and farm stores. These reduce the distance food travels and contributes to the relationship between the producer and the consumer. Household production translates into consumption which affects the nutritional status of farmers as they are able to eat part of what they produce (Doward, 2013).

In response to this, countries around the world, especially developing countries that are prone to hunger and food scarcity are resorting to various counter strategies to meet the growing demand and prevent food insecurity and famine (Galhena *et al*, 2013). The cost of food has been pushed upwards world over due to vulgaries of weather, high population and rural-urban migration (Silvia 2012).

Growing food crops contributes to food availability at all income levels by encouraging a more nutritious diet (Mugisa *et al*, 2016; Kotright, 2011). Nutritional wellbeing requires access to enough and safe food to meet the dietary needs of all members of the household all the time (Chauhan, 2012). Indeed according to CRS (2008), food production near houses

helps farmers manage their crops and spaces of food production without having to travel long distances and allows growth of many crops which promotes diversified diets among households

The sustainability of household food sourcing and gardeners' overall health and well-being also increase with food production (Kotright, 2011). Globally, home gardens have been documented as an important supplemental source contributing to food and nutritional security for livelihoods (Khatri-Chhetri, *et al*. 2016). This is because backyard gardening ensures production all year round hence constant supply of fruits and vegetables (Mugisa *et al*, 2016).According to Ericksen (2008) nutritional value entails how much of the daily requirements of calories, vitamins, protein, and micronutrients are provided by the food consumed determined by the diversity of consumed food, type of primary protein, education, facilities for cooking and preparing food.

Over the recent years there has been a growing interest in strengthening and intensifying local food production in order to mitigate the adverse effect of global food shocks and food price volatilities (Marsh *et al,* 1998). Consequently, there is much attention towards home gardens as a strategy to enhance household food security and nutrition (Taylor and Lovell, 2014). In India and USA, backyard gardening was adopted as the best option for improving the dietary needs of their communities (Sethy *et al,* 2010). Home gardens are an integral part of local food systems and the agricultural landscape of developing countries and have endured the test of time (Galhena *et al*. 2013).

Backyard gardening is a local strategy that is widely adopted and practiced by local communities with limited resources (Galhena *et al,* 2013). It is evident from the literature that

home gardens are a part of the agriculture and food production systems in many developing countries and are widely used as a remedy to alleviate hunger and malnutrition in the face of a global food crisis (Johnson-Welch *et al*, 2000; Mugisa *et al*, 2016).

Indeed according to FAO (2010) home gardens enhances households food security directly by enabling families to have a diversity of nutritionally rich food, increased purchasing power from savings on food bills and income from sales of garden products as well as fall-back food provision during seasonal lean periods. Furthermore, Gliessman (2007) explains that greater diversity allows better resource use efficiency in an agro ecosystem which helps farmers to reduce on risks especially when having many enterprises

According to Houx*et.al* (2009), backyard gardens are planned to have a rich biodiversity that is stable and produces vegetation and crops all the year round. Nzira (2008) argues that dealing in backyard gardening empowers people to take control of household food production as much as possible. This provides them with nutritious foods such as fresh fruits and vegetables that build healthy immune systems. According to the World Bank (2007) increasing and stabilizing domestic production is essential for food security. This is because it eliminates the recurrent habit of food aid. Thus, backyard gardening builds the sovereignty of households in food production.

Furthermore, Clynewood and Wright (2010) affirms that multifunctional designs as emphasized in backyard gardening leads to more yields and outputs from the different elements at the farm as each element supports the other thus creating stability and resilience in food supply. Preserving the productivity of agricultural land requires sustainable food

production that can only be achieved through agricultural practices which appreciate ecological processes and on-farm yields (Gliessman, 2007).

Backyard gardens are now a common sight in most of the homes in rural areas where households grow traditional vegetables like cabbages, carrots, tomatoes and spices. In fact, some districts in Uganda have resorted to backyard gardening to address the problem of food shortage. According to Njuguna (2013), backyard gardening can be part of a solution for food sustainability given the food demand challenge that the green revolution and rain-fed agriculture have failed to meet. Furthermore, According to Koyenikan (2007), households that have set up home gardens enjoy benefits that include increases in household food production, improved health status of the household, generation of income and boost in their nutrition.

Home gardens are an essential component of household farming practice world over (FAO, 2014). This is because these gardens ensure direct access to healthier foods such as fruit and vegetable and they can alleviate the problem of limited access to affordable food (FAO, 2014). Fruits and vegetables produced in home gardens contribute in the prevention of chronic non-communicable diseases such as cardiovascular disease, cancer, diabetes, and obesity and the consumption of these foods has been widely recommended (WHO, 2003). In Addition, According to Finerman and Sackett (2003) home gardens have a significant contribution towards enhanced household food security since they supplement household food baskets, provide income, employment and the other related benefits attained from home gardening

As stated byAliamo*et.al* (2008), backyard gardens have the potential of increasing production thus meeting challenges of malnutrition associated with lack of vegetables and fruits.Fruit and vegetable gardens have led to a significant increase in fruit and vegetable consumption among children and adults and also in the household food availability (Heim *et al.* 2011). Trees planted in backyard gardens are used as fuel for cooking, wood for building, medicinal plants, and spices. Thus, Gautam *et al* (2004) explains that owning backyard gardens is important to both urban and rural households since food insecurity and poverty affect households of both locations.

Backyard gardens are important in the domestic economy of the marginalized but because they are relatively not immediately obvious and less visually impressive than field systems, they tend to be overlooked and their contribution to survival of mankind underrated (Kimber, 2012) Backyard gardens have been found to lower these barriers as the cost of production is low as the participants invest their own labor and other production functions like land and organic fertilizer (Dibsdall, 2011).

Furthermore, Backyard gardens are a source of income for households and act as social areas for meetings in the community (Mugisa *et al*. 2016; Galhena *et al.* 2013).These gardens contribute to food availability, community development, cultural reproduction, and resilience at multiple scales; conserve agro biodiversity; and support biodiversity (Galhena *et al.* 2013; Kotright, 2012). According to Nzira (2008) water wastage is never an option in backyard gardening as water from the kitchen bathroom and other wasted water is recycled and used in the backyard gardens or even feeding the livestock.

Home gardens make a greater contribution to food budgets and furnish livelihoods for households through the sale of garden products (Taylor and Lovell, 2014). Gardens provide access to healthy food for low-income families who cannot afford fresh produce. Backyard gardeners reportedly consume more servings of fresh fruit and vegetables each day than non-gardeners (Alaimo *et al*. 2008; Twiss *et al*. 2003). Home gardens contribute to food security at the household and community by making diverse and nutritious foods readily accessible to household residents and community members (Kortright, 2011).

Home gardens provide multiple environmental and ecological benefits. They serve as the primary unit that initiates and utilizes ecologically friendly approaches for food production while conserving biodiversity and natural resources (Galhena *et al,* 2013). Home gardens also help in improving soil fertility which encourages high yields ensuring food availability. In addition, in backyard gardens, water harvesting is done with ease for use in the gardens and waste water from the backyard can also be put to use. There is minimal man-animal conflict and this makes gardens less susceptible to other kinds of conflict hence stability.

Furthermore, Talukder*et.al* (2000) HKI's indicate that in rural Bangladesh, children of households without a backyard gardens were at greater risk of vitamin A deficiency than children of households with a home garden, especially when neither of them had not recently received a high-dose vitamin A capsule. Thus, the usefulness of backyard gardening towards healthy child up brining is paramount and crucial to the health of such children who are from households that may not manage to purchase enough nutritious foods.

According to Gliessman (2007) a more sustainable food system requires fewer links in the food supply chains. These are face to face and direct farmer to buyer interactions. They occur

in pick-your-own farms and farm stores. These reduce the distance food travels and contributes to the relationship between the producer and the consumer. Household production translates into consumption which affects the nutritional status of farmers as they are able to eat part of what they produce (Doward, 2013).

According to Rahman *et al* (2008), backyard gardening has the potential to improve the household welfare by providing constant supply of vegetables through the dry season and years of drought. Mitchell and Hanstad (2004) state that home gardens contribute to household financial well-being where garden products are sold to earn additional income. Further, the savings from consuming home grown food products lead to more income that can be used to meet other home needs. Chirinda *et al* (2002) explains that the small but steady income from backyard gardens are a dependable socioeconomic safety net for household food security.

2.4 Mechanisms for Scaling up Backyard Gardening in Rural Households

There are several issues that hinder adoption, promotion and scaling up of backyard gardening which include among others poor governance structures and systems, limited sectoral coordination, lack of multi sectoral policies, and limited integrations of backyard gardening in government policies and programmes. Knowledge and skills gaps as concerns backyard gardening skills, information and technologies is also another big challenge (FAO, 2015). Therefore, in order to scale up backyard gardening, building capacity of farmers in production, post-harvest handling, and value addition are key. This can be done through strengthening partnership with agricultural institutions (CABI, 2014).

Acquisition of information about a new technology demystifies it and makes it more available to farmers. Information reduces the uncertainty about a technology's performance hence may change individual's assessment from purely subjective to objective over time (Caswell et al., 2001). Exposure to information about new technologies as such significantly affects farmers' choices about it.

CABI (2014) further submits that strengthening tertiary agricultural education through bringing different universities and academic institutions in the region on board. This can be strengthened by equipping the agricultural graduates with skills in backyard gardening and its management. FAO (2015) expounds that research activities and integrated food production systems for dietary diversification should be promoted. In addition, backyard gardening should be recognized as a sustainable food production system.It is imperative that agricultural training and extension programmes be intensive enough to promote adoption not only of improved yield-raising technologies, such as improved seeds, but also of fertility-restoring and conservation technologies (Caswell *et.al*, 2001)

According to Adesiina and Baidu-Forson, (1995) increased information induces its adoption. However, in the case where experience within the general population about a specific technology is limited, more information induces negative attitudes towards its adoption, probably because more information exposes an even bigger information vacuum hence increasing the risk associated with it. Information is acquired through informal sources like the media, extension personnel, visits, meetings, and farm organizations and through formal education. It is important that this information be reliable, consistent and accurate. Thus, the right mix of information properties for a particular technology is needed for effectiveness in its impact on adoption.

FAO (2015) further submits that creating awareness on the importance of backyard gardening, linking research institutions with extension services and creation of support groups for technical advice can enhance scaling up backyard gardening. Additionally, Support services in terms of skills and technologies, planting materials, fertilizers, packing materials marketing facilities and market information (Landon, 2011). According to Caswell *et.al,* 2001) good extension programs and contacts with producers are a key aspect in technology dissemination and adoption. A recent publication stated that "a new technology is only as good as the mechanism of its dissemination" to farmers.

Furthermore, communication of down to earth messages so as to disseminate backyard gardening technologies and building capacity through trainer of trainees' workshops in backyard gardening technologies (CABI, 2014). Most studies analyzing this variable in the context of agricultural technology show its strong positive influence on adoption (Caswell *et.al,* 2001) show that its influence can counter balance the negative effect of lack of years of formal education in the overall decision to adopt some technologies.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter provides a description of the methodology that was used in the study.

3.1 Research Design

This study applied two research designs, namely cross sectional-case study design and comparative survey design. Nabigasa Sub County was used as a case study and the findings obtained were used to generalise the study situation in the whole of Nabigasa Sub County. Data on backyard gardening and food availability was collected during the study period at one point. Additionally, comparison between households that have adopted backyard gardening and those that have not adopted was aided by a comparative survey design.

3.2 Area of Study

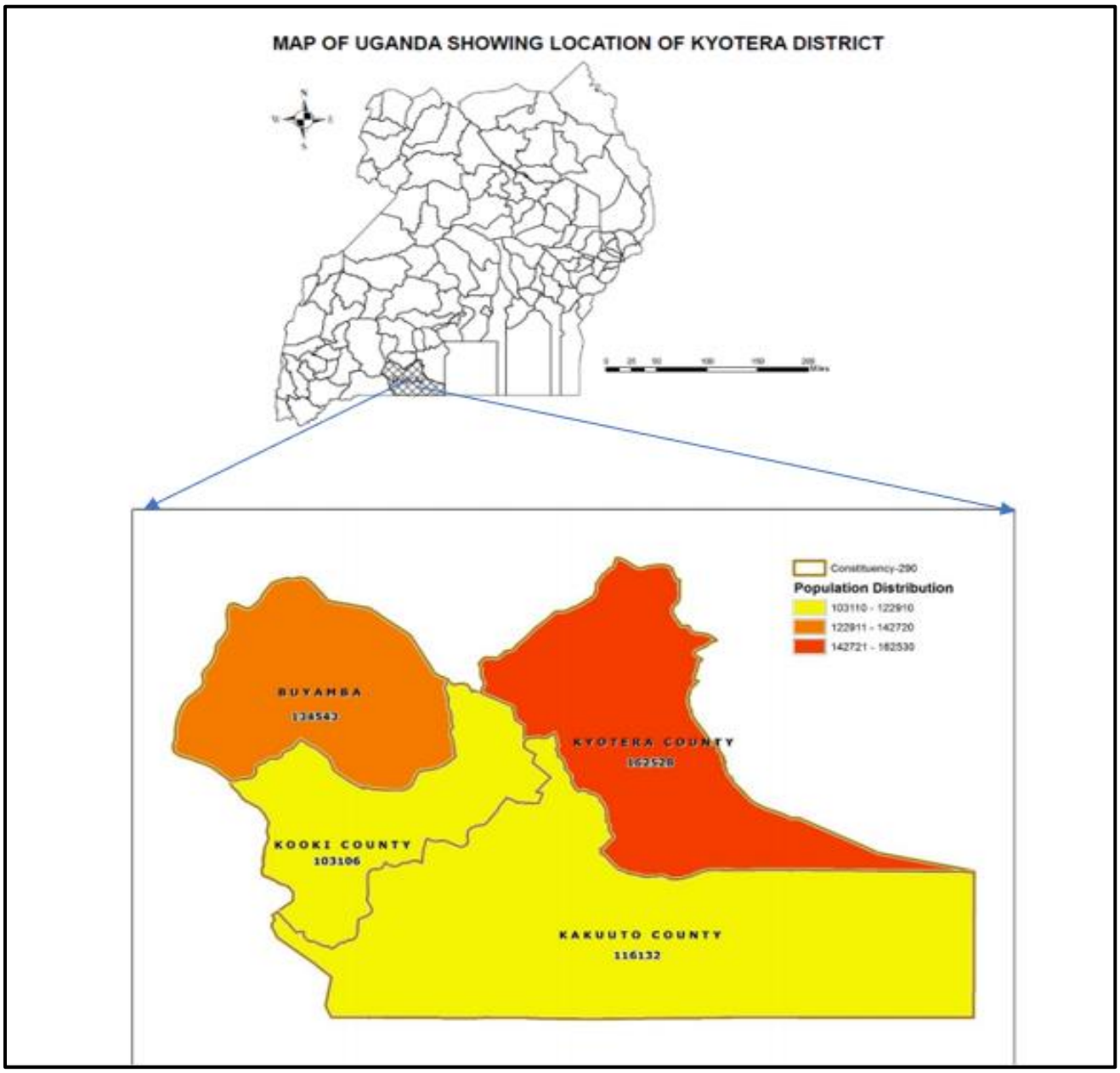

Figure 2: Map of Uganda showing the location of Kyotera District (Modified from UBOS, 2017)

This study was carried out in Nabigasa Sub County. This is located in the rural central Ugandan District of Kyotera about 190kilometres from Uganda's capital Kampala. This is part of the greater Rakai where Kyotera District became operational as an Independent District in July 2017. According to UBOS (2016) the sub-county has a total population of

20,616 people. The area has high dependency on subsistence agriculture. The area of study is located along the geographical coordinates of 0°37'54.0"S, 31°32'36.0"E.

3.3 Study Population

According to Neuman (2014), study population is a large group of many cases through which a researcher draws a sample and to which results from a sample is generalized. The study engaged those farmers who had adopted backyard gardening and those that have not adopted Backyard gardening. The study further engaged Agricultural Extension Worker (AEW), Community Development Officer (CDO) and Chairman Local Council III. A total of 223 respondents was used as a study population where 110 were those that have adopted backyard gardening, 110 have not adopted and 3 are key informants.

3.4 Sampling Procedures

3.4.1 Sample Size

The sample size for the respondents who had adopted backyard gardening was arrived at using the formula derived from Yamane (1971) in determining the sample size. The formula is provided below where N=Population size, e=margin of error and n=sample size to be obtained.

$$n = \frac{N}{1+N(e)^2}$$

From the List of 152 households that have actively adopted backyard gardening from the Rakai orphans project as provided by the AEW, we assume the error (e) to be 0.05 so that

$$n = \frac{152}{1+152(0.05)^2} = \frac{152}{1+152(0.0025)} = \frac{152}{1.38} = 110 \text{ adopters}$$

To get non-adopters, I had to select the same sample size as was arrived at in the adopters. And thus the study in general involved the sample size of 223 respondents which are the 110 adopters and 110 non-adopters. The other 3 are key informant who were purposively selected due to their technical abilities.

3.4.2 Sampling Techniques

Non probability sampling was applied. This applied both purposive and snowball sampling to select the respondents for the study.

3.4.2.1 Purposive Sampling

This is deliberately choosing potential settings, persons or events to provide the needed information that cannot be obtained from other sources (Wilson, 2010). This study thus considered those beneficiaries of the Rakai Orphans Project as who had adopted backyard gardening, those who had not adopted and the extension staff at Send a Cow Uganda (SACU) who promote backyard gardening, the CDO and Chairman LC III.

3.4.2.2 Snowball Sampling

The researcher used snowball sampling where respondents helped locate and identify other respondents during this study. According to Bhattacherjee (2012) snow ball involves identifying a few respondents that match the criteria for inclusion in the study and ask them to recommend others they know who meet the same criteria. Respondents would help directing the researcher to other respondents of the same to be involved in the study.

3.5 Data Collection Methods and Instruments

3.5.1 Non Participant Observation

This method was used to observe the backyard gardening designs that the farmers use in crop production. It was used with the help of observation checklist which had a number of key areas that were to be observed. The camera was further used to capture photos of the different backyard gardening designs.

3.5.2. Key Informant Interviews

According to Bhattacherjee (2012), interviews help the researcher to clarify on issue being raised by the respondent, allows further probing and an opportunity for follow-up questions. The interviews were conducted with the key informants and these were the AEW, CDO and the Chairman LC III of the study area. These provided a deeper insight and an avenue for verification of information gathered from the questionnaires and observations.

3.5.3. Questionnaire Survey

This was done with the help of a questionnaire to collect field data which formed primary data. The questionnaire was composed of both structured and unstructured questions. This questionnaire was researcher administered. The structured questions allowed respondents to select an answer from a set of choices given while unstructured questions allowed respondents to provide answers in their own words. Some questions about food availability were adopted from the household food insecurity access scale (HFIAS) where a food secure household experiences none of the food insecurity access. The same questionnaire was administered to both adopters and non-adopters.

3.6 Quality Control Methods

This is about the accuracy and worthiness of information collected. It is concerned with processes in which data is captured, verified and analysed to meet reasonable standards of research reporting. This was ensured by following set guidelines and tools in uniformity for all respondents.

The research questionnaire was pre-tested on five SACU staff at Kyotera office. This allowed the interviewer to get clearly acquainted with the questionnaire and further identified necessary collections that were incorporated into the final questionnaire. This enhanced the validity and reliability of the questionnaire.

Furthermore, the researcher employed multiple sources to collect data which provided an avenue for verifying the data collected from the different respondents. These included key informant interviews, non-participant observation and questionnaires.

3.7 Data Management and Processing

Data from questionnaires was entered into the Microsoft Office Excel while data from the interviews was always written down during the interface to eliminate any chances of forgetting any important data. On the other hand, data from the non-participant observation was noted on the checklist and further supported with the use of the camera that captured images relevant to the study. Data collected from the field was properly kept to avoid any loses and then coded into themes in relation to the objectives of the study.

3.8 Data Analysis

The study used mixed methods for data analysis. Both quantitative and qualitative methods were used. Mixed methods help in clarifying and explaining relationships found between variables which allows in-depth examination of variables (Fraenkel&Wallen, 2000). Qualitative data collected from the field was coded into themes in relation to the study objectives and research questions. This created topics for discussions and analysis using the thematic analysis method.

Quantitative data was entered and analysed using the Statistical Package software computer program (IBM SPSS Statistics version 20) to present data in descriptive statistics inform of frequencies, percentages, graphs, tables, which allowed meaningful description of scores and generation of conclusions.

Furthermore, the researcher also used the same software to run paired sample test to confirm whether there is statistical significant difference in food availability among backyard gardening adopters and non–adopters. Paired Sample Test was used to generate mean, standard Deviation and the P – Values (Sig.2 tailed) to test for statistical significance in the variables measured in the study.

3.9 Ethical Considerations

The informed consent of all the respondents was sought with an assurance that their consent id voluntary. This was beefed up by informing them of the objectives of the study and a promise of anonymity of their names. Additionally, their views and ideas were used for academic purposes while ensuring high levels of confidentiality. The researcher further sought for clearance from the local leaders who permitted the study.

There was voluntary participation in the study. No respondent was forced to take part in the study. Equal treatment was given to all the respondents. No gifts were given to any of the respondents. There was no plagiarism of any information or data. All the secondary information used in the study is cited and recognized as references. No falsification of data was done. The data that was collected from the field was analysed and presented without any manipulation.

3.10 Limitations of the Study

The researcher faced a challenge of financial difficulties as the study required a lot of money, especially to facilitate movements, to make phone calls and also to purchase stationery. However, this was managed by being economical and using the available resources efficiently.

On the other hand, some respondents were not comfortable disclosing some information but this was managed by assuring them that this study was entirely for academic purposes and that it was to be treated with utmost confidentiality.

CHAPTER FOUR

PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.0. Introduction

This section presents how the data that was collected from the two samples was analysed. Data was collected from adopters and non-adopters of backyard gardening and was analysed using SPSS Version 20 to test whether backyard gardening has improved on food availability among adopters in comparison with non-adopters in the study. This chapter contains demographic characteristics of the respondents and the major findings of the study in relation to the study objectives.

4.1. Biographic Characteristics of Respondents

This section shows characteristics of the respondents involved in the study. It contains sex, gender, education level and family size of both adopters and non – adopters. These were considered important since they helped the researcher to understand the respondents involved in the study.

4.1.1 Gender of Respondents

This sub-section shows gender of the respondents that were involved in the study. It was one of the variables that were considered in the study. This helped the researcher to know how many male and female respondents were involved in the study. The data on gender of both adopters and non – adopter is shown in the table 1 below.

Table 1: Gender of the Respondents

Gender	Frequency(Percent)	Frequency(Percent)
	Adopters	Non – Adopters
Male	37(33.6)	43(39.1)
Female	73(66.4)	67(60.9)
Total	110(100)	110(100)

The results show that 33.6% of the respondents were males and 66.4% were females among adopters. This indicates that females were the majority of the respondents of adopters compared to males. Furthermore, the results show that 39.1% of the respondents were males while 60.9% were females among non – adopters.

This indicates that females were the majority of the respondents of both adopters and non-adopters in the study. According to the OPM (2017), female headed households are more likely to be faced with food insecurity than male headed households. Indeed, according to the AEW during the interview, he acknowledged that females are the majority involved in agriculture and often are the early adopters since its women who mostly bear the burden of feeding their families.

Additionally, Adestina and Baid-Forson (1995) expound that gender roles and dynamics tend to locally specific, so methodologies that benefit women in one setting may have no effect in other settings. The distributional consequences of new technologies are therefore difficult to

predict. However, when women are able to overcome their resource constraints, they may be at least as likely to adopt agricultural technologies that are suitable for them

Indeed according Talukder *et.al* (2000) backyard gardening activities are mostly done by women. It is further expounded that this increases the income for women which in the end results into better use of resources at the household and women empowerment. This empowerment of women further addresses a key priority area of poverty alleviation and provides important socio-economic returns through lower health and welfare costs, lower fertility, and lower maternal and infant mortality rates. Thus, contribution of backyard gardening programs in terms of giving women a development platform and promoting their complete involvement in domestic life can make an important contribution to the overall development of communities that have fully embraced their involvement in day to day household planning and management of affairs.

4.1.2. Age of the Respondents

This section shows the age among adopters and non – adopters who were involved in the study as shown in table 2 below. The ages were clustered into years. Age is important in adoption of such techniques since it's the old people that are mostly household heads and thus will need to work for the young ones who are mostly in school.

Table 2: Age of the Respondents among Adopters and Non – Adopters in the Study

Age group (Years)	Frequency (Percent) Non – Adopters	Frequency(Percent) Adopters
19 – 28	2(1.8)	0(0)
29 – 38	11(10)	16(14.5)
39 -48	37(33.6)	36(32.7)
49 – 58	29(26.4)	28(25.5)
59 and above	31(28.2)	30(27.3)
Total	110(100.0)	110(100.0)

Source: Primary Data, 2018

The results from table 2 above show that 1.8% of non – adopters were in the ages between 19-28 whereas no respondent among the adopters was in this age bracket. 10% and 14.5% of the respondents among non – adopters and adopters respectively were in the ages between 29-38, 33.6% and 32.7% among non – adopter and adopters were between 39 – 48 respectively, 26.4% and 25.5% among non – adopters and adopters were between 49 – 58 respectively, and 28.2% and 27.3% among non – adopter and adopters were from 59 years and above respectively. This indicates that the majority of the respondents of both adopters and non-adopters in the study were 39 years and above. This age is important considering that these ages are people who head the households and thus will need to look for options of ensuring they meet the household food needs of the household members.

4.1.3. Education Level

This section shows the education level of the respondents involved in the study. In defining education level, no-formal education is for those respondents who never went to any school training meaning those participants who have never stepped in any class, primary education is for those participants have ever enrolled in pre-secondary education while secondary level is for those participants who have attended post-primary level of education. This is shown in figures3&4 below.

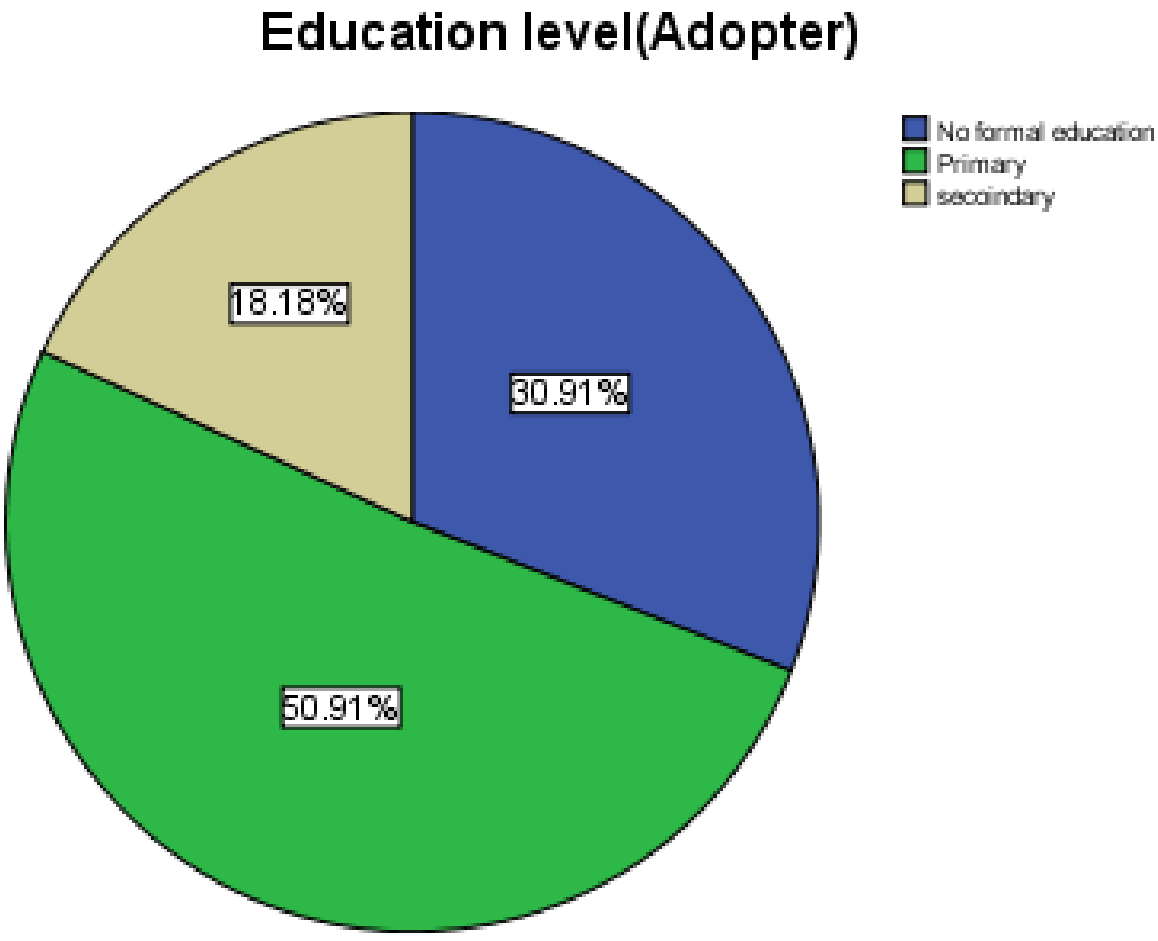

Figure 3: Education Level among Adopters in the Study [Primary Data, 2018]

Figure 3 shows education level among the adopters in the study. The results show that 30.9% of the respondents have no formal education, 50.9% have primary education, and 18.18% have secondary education. This indicates that majority of the respondents of adopters in the study have primary level of education. This is in agreement with In addition, Enyedi &Volgyes, (2016) urges that education is important in agricultural transformation where it enhance the farmers' ability to receive, decode, and understand information. The level of farmers‘ education is believed to influence the use of improved technology in agriculture and, hence, farm productivity

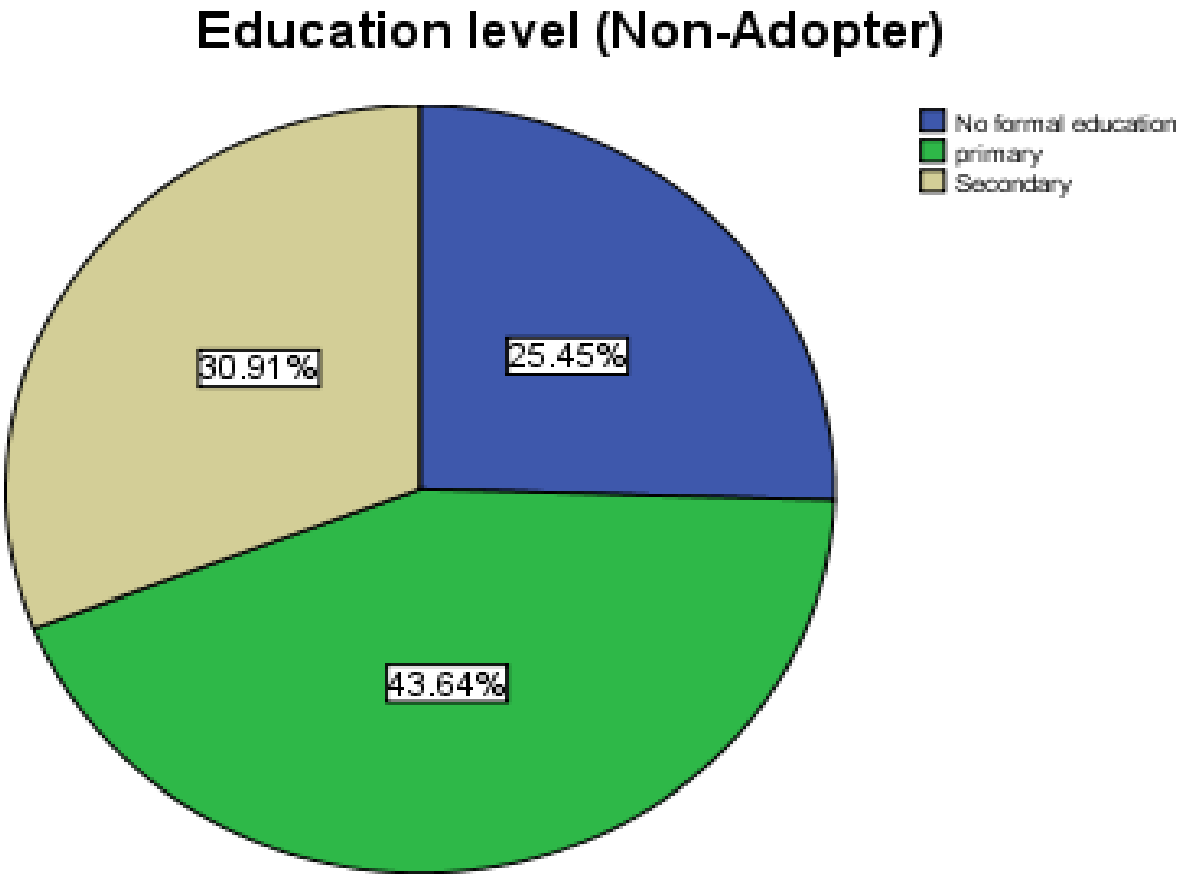

Figure 4: Education Level among Non – Adopters in the Study [Primary data, 2018]

Figure 4above shows education level among non – adopters in the study. The results show that 25.45% of the respondents have no formal education, 43.64% have primary education,

and 30.91% of the respondents among Non – Adopters have secondary education. This indicates that majority of Non – Adopters in the study have primary level of education. Primary level is important since it allows easy understanding ideas that are being presented and allows adoption of such techniques.

4.1.4. Family size among Adopters and Non – Adopters in the study

The study also looked at the size of the household. This was looked into taking focus on the number of people living in the household and shares the same food. The number of members in the household is for members who are living under the same roof and often share the same meal. This is presented in table 3 below.

Table 3: Family Size of the Respondents

Family size (Number of people)	**Frequency(Percent) Adopters**	**Frequency(Percent) Non-Adopters**
1 -3	13(11.8)	29(26.4)
4 -7	37(33.6)	41(37.3)
8 – 11	43(39.1)	29(26.4)
12 and above	17(15.5)	11(10)
Total	**110(100.0)**	**110(100.0)**

Source: Primary Data, 2018

Table 3 shows the family size among adopters and non – adopters in the study. The findings show that 11.8% and 26.4% of the respondents among the adopters and non – adopters have a family size of 1 – 3 members respectively, 33.6% and 37.3% have a family size of 4 – 7 members, 39.1% and 26.4% have family size of 8 – 11 members and 15.5% and 10% have family size of 12and above members. This shows that the majority of the respondents among adopters and non – adopters in the study have a family size of 4 and above members. Indeed, we have to appreciate that such big numbers can be a resource especially when all are actively involved in farming practices. Farming in rural areas mostly depends on family labor and thus many household members also translate into many mouth to feed.

This indicates that households that have adopted backyard gardening have a higher family size composition and thus need to look at ways ensuring sustainable food supply to the big numbers of family members. Indeed according to OPM (2017) households with smaller number of members are less likely to be face food insecurity as compared to larger families. This explains why household with larger family members to be leading in adoption since they need stable sources of food to feed the many household members.

4.2 Backyard Gardening approach and Types Crops in Backyard

4.2.1 Backyard Gardening Approaches

The findings show as in table 5 show the different approaches that adopters use in backyard gardening. The results show that 30.9% of the adopters practice single crop backyard gardening and 69.1% use mixed crop backyard gardens. This indicates that most of the farmers grow more than one crop in their backyard gardens. These findings are in line with farmers BMZ (2016) which submits that backyard gardening is a mixed cropping system that encompasses vegetables, fruits, plantation crops, spices, herbs, ornamental and medicinal

plants as well as livestock. Indeed from the observations during the field visit, many farmers were growing more than one crop in their backyards. Indeed the AEW, in an interview explained that *"households often prefer to have different types of foods to be able to have a balanced diet"*

Table 4:Backyard Gardening Approach

Backyard Gardening Approach	**Frequency(Percent)**
Single crop backyard garden	34(30.9)
Mixed crop backyard garden	76(69.1)
Total	**110(100.0)**

Source: Primary Data, 2018

The findings are in agreement with Eyzaguirre and Linares (2010) who wrote that a backyard garden is multi-storied and multi-use area near the family dwelling that serves as a small-scale supplementary food production system maintained by the household members, and one that encompasses a diverse array of plant and animal species that mimic the natural eco-system.These crops provide a diversified source of food and income to the adopters. Indeed according to FAO (2012) a community with different crops and livestock at different stages of production leads to continuous supply of produce for trade in local markets which supports the viability of local markets and this provides growers with sales outlets that earns them income for long periods of time.

4.2.2 Categories of Crops Grown

The findings show that 80.9% of the crops are grown in backyard gardens are vegetables while 19.1% are cereals in backyard gardens as shown in table 6. Indeed the findings are in agreement with BMZ (2016) which submits that for a household to be healthy, it is vital that it gets a balanced or mixed diet. This can be achieved by growing a variety of crops including vegetables and fruits which are some of the crops mostly grown in backyard gardening in Nabigasa sub-county.

Table 5: Categories of crops grown in backyard gardening

Types of crops grown in backyard gardens	**Frequency(Percent)**
Vegetables	89(80.9)
Cereals	21(19.1)
Total	**110(100.0)**

Source: Primary Data, 2018

4.3Backyard Gardening Designs

This section presents findings on the backyard gardening designs used by farmers in Nabigasa Sub County. The findings from the study that were collected by observation, questionnaire survey and key informant interviews indicate that there are different designs of backyard gardens that are being practiced in the area of study. This is presented in table6 below and discussed in detail

Table 6: Backyard Gardening Designs

Backyard gardens designs used by Adopters	**Number(Percent)**
Raised bed	22(20.0)
Key hole	12(10.9)
Sunken	9(8.2)
Sack Mound	21(19.1)
Double dug	46(41.8)
Total	**110(100.0)**

Source: Primary Data, 2018

Table 6 shows the designs of backyard gardens used by adopters in Nabigasa Sub County. The findings show that 20% use raised bed, 10.9% use key hole, 8.2% use sunken, 19.1% use sack mound and 41.8% use double dug backyard garden design. This indicates that most of the farmers use double dug design in their backyard gardens.

Some of the findings on backyard gardening designs were captured using non participatory observation, photographs were taken and recorded. Below is the description of the different designs and some of the photographs taken during the process of data collection.

4.2.1 Raised bed garden

According to the AEW, in an interview, a raised bed is made by digging the soil to about 2ft from the ground level and about 3ft wide. The length depends on the number of seedlings the

farmer has. Make a boarder using bricks of banana stems. This avoids run off. The garden is then mulched and planting is done after one week

Figure 5:**Raised bed backyard gardening design[Primary Data, 2018]**

4.2.2 Basket Garden

According to the AEW in interview, the basket garden is made by digging a small round shaped hole of approximately 1ft diameter; drive the first 2 pegs across each other (x-shape) until when they are firm in the ground. Other pegs are then wiven surrounding the x-shape 2 pegs in a circular form. In this type of garden, strings are used to strengthen the pegs by rolling them from the bottom to the top of the pegs. Then a mix of soil and manure is put in the basket.

Figure 6: **Basket gardening design[Primary Data, 2018]**

4.2.3 Keyhole garden

According to the AEW, the keyhole garden is also known as kitchen garden. The first step is to find an area near the kitchen with sun and shade. Secondly, a circle about 2ft across is marked out. This is followed by making a hill inside the circle. Then, pegs are put in the ground around the circle to make the compost basket. The border of the kitchen garden is then made by making a bigger circle around the basket with stones or banana stems. After this, a V-shaped path to the compost basket is made with the pegs.

Soil is then heaped around the compost basket. This is made in the form of a hill in the middle and slopping down to the border. The garden is left to settle for a week and then the

seeds or vegetable seeds are planted in rows 1 ft apart. Lastly, kitchen waste is added to the compost basket. This should be watered daily during the dry spell.

Figure 7: **Keyhole Gardening Design[Primary Data, 2018]**

4.2.4 Sack Mound (using a sack or polythene)

According to the AEW, sack mound can be made by using either a sack or polythene. Make the base of the sack mound (find an area near the house or a tree with sun and shade, put some soil and compost in the bottom of the sack to make a base, put the tin without bottom in the centre. The tin is then filled with small stones. Filling around the tin with soil and compost, then tin is then lifted putting it on top of the stones. It is again filled with small stones again. The procedure is again repeated until when the bag is full. Drive the pegs into the ground next to the sack mound. Then plant seeds on top, and seedling on the sides

Figure 8: **Containers/ sack mound design [Primary data, 2018]**

4.2.5 Mandala Garden

According to the AEW, a Mandala garden is made by digging a hole and then making a raised bed around the hole. This is supported by a barrier created by bricks. There has to be a space for allowing water flow to the hole. This design stops soil and nutrient runoff. Importantly, one can establish many layers and grow different crops in such layers. The hole in the mandala holds water.

Figure 9: **Mandala backyard gardening design[primary data, 2018]**

4.3 Comparison of Food Availability between Adopters and Non – Adopters

This section discusses the findings of the comparison of food availability among adopters and non-adopters. This is based on the responses that were acquired using selected questions from the household food insecurity access score. This section shows the mean comparison in food availability between Adopters and Non – Adopters. This was measured by analysing the worry not to have enough food, worry not to eat a certain kind of food, eat a limited variety of food, eat food you don't want and no food to eat among adopters and non – adopters.

Data was collected on the variables and analysed. A paired sample test was run to generate mean values, standard deviation, and P – values to show whether there is statistical significant difference between the two samples (Adopters and Non – Adopters) in food availability. In this, mean value is less than 3 and standard deviation near to Zero show no statistical significant difference unlike a mean value greater than 3, and standard deviation close to 1. P – value (Sig.2 tailed) greater than 5% indicate no statistical significant difference between Adopters and Non – Adopters in food availability unlike the P – value less than 5%, indicate that, there is a statistical significant difference between the variables measured. Although the mean value can show the value less than 3, the P – value is the one that confirms whether it is significant or not.

This intends to show whether the statistical significant difference in food availability is statistically significant or not between Adopters and Non – Adopters. This is shown on table 7 below and discussed. This is to provide statistical data of the difference that backyard gardening creates between adopters and non-adopters.

Table 7: Mean comparison in Food Availability between Adopters and Non – Adopters

Paired Samples Tests					
Mean comparison in food availability between Adopters and Non – Adopters	Paired Differences		T	Df	Sig. (2-tailed)
	Mean	Std. Deviation			
Worry not to have enough food(Adopter) – Worry not to have enough food(Non Adopter)	-1.15455	0.94029	-12.878	109	0.000
Worry not to eat kind of food(Adopter) – Worry not to eat kind of food(Non - Adopter)	-0.88182	0.73861	-12.522	109	0.000
Eat a limited variety of food(Adopter) – Eat a limited variety of food(Non - Adopter)	-1.11818	0.84302	-13.911	109	0.000
Eat food you don't want(Adopter) – Eat food you don't want (Non -Adopter)	-0.72727	0.70267	-10.855	109	0.000
No food to eat any kind (Adopter) – No food to eat any kind (Non -Adopter)	-0.41818	0.65500	-6.696	109	0.000

Source: Primary Data, 2018

Table 7 shows a mean comparison in food availability between Adopters and Non – Adopters. The variables were analyzed at the confidence interval of 95% with 5% standard error. The results on Worry not to have enough food between Adopters and Non-Adopters,

the mean value is -1.15455 less than 3 which shows that there is no statistical significant difference between Adopters and Non-Adopters. However, the Standard deviation is 0.94029 closer to 1, T- value is -12.878 and the P–Value is 0.000 less than 5% standard error. This confirms that there is a statistical significant difference in Worry not to have enough food between Adopters and Non-Adopters. This means that Adopters have no much worry of not having enough food compared to Non-Adopters. This agrees with (Doward, 2013) that household food production translates into consumption which affects the nutritional status of farmers as they are able to eat part of what they produce. Furthermore the results are in agreement with Talukder*et.al* (2000) that backyard gardening is important in overcoming seasonal availability of foods and promotes household self-sufficiency when it comes to meeting household feeding needs.

Based on the results, Worry not to eat kind of food between Adopters and Non-Adopters, the mean value is -0.88182 less than 3 which show that there is no statistical significant difference between Adopters and Non-Adopters. However, the standard deviation is 0.73861 close to 1, T- value is -12.522 and the P–Value is 0.000 less than 5% standard error. This confirms that there is a statistical significant difference in Worry not to eat kind of food between Adopters and Non Adopters. This means that Adopters have no much Worry not to eat kind of food compared to Non-Adopters.

The findings on the Worry of Eating a limited variety of food between Adopters and Non-Adopters, the mean value is -1.11818 less than 3 which show that there is no statistical significant difference between Adopters and Non-Adopters. However, the standard deviation is 0.84302 closer to 1, T- value is -13.911 and the P–Value is 0.000 less than 5% standard error. This confirms that there is a statistical significant difference in Eat a limited variety of

food between Adopters and Non-Adopters. This means that Adopters have no much Eat a limited variety of food compared to Non-Adopters.

The results on eating of food people don't want between Adopters and Non- Adopters show the mean value of -0.72727. This value is less than 3 which thus it means there is no statistical significant difference between Adopters and Non-Adopters. However, the standard deviation is 0.70267 close to 1, T- value is -10.855 and the P–Value is 0.000 less than 5% standard error. Therefore, this confirms that there is a statistical significant difference in eating food people don't want between Adopters and Non-Adopters. This means that Adopters have no much worry of eating food people don't want compared to Non-Adopters. This agrees with Litt (2011) that backyard gardens are known to increase local opportunities to eat better for households engaged in backyard gardening.

On the other hand, findings on worry of no food to eat any kind of food between Adopters and Non- Adopters, the mean value is -0.41818 less than 3 which shows that there is no significant statistical difference between Adopters and Non-Adopters. However, the Standard deviation is 0.65500 close to 1, T- value is -6.696 and the P–Value is 0.000 less than 5% standard error. This confirms that there is a statistical significant difference in worry of no food to eat any kind between Adopters and Non–Adopters. This means that Adopters have no much worry of no food to eat any kind compared to Non-Adopters.

The above findings on worry of no food to eat of any kind are in agreement withWaterford (2015) who explains that in the 5-10 days of vegetable movement from the farm to table, 30-50% of nutritional loss occurs, especially vitamins such as ascorbic acid and thiamin. These households just take a few meters and harvest the kind of food they need and thus there is no

or few nutrients are lost meaning that adopting households eat more nutritious foods than anon-adopting households.

This confirms that, there is sufficient evidence that backyard gardening has contributed much to food availability among Adopters compared to Non-Adopters in Nabigasa sub county. This means that Adopters have no much worry of not having enough food, not to eat kind of food, eat of a limited variety of food, eat food they don't want, and No food to eat compared to Non – Adopters. The findings are in agreement with (Mugisa *et al*, 2016; Kotright, 2011) in their submission that growing food contributes to food availability for all income levels by encouraging a more nutritious diet. Furthermore, the findings affirm the assertion of Wiggins & Keats (2013) that home gardens have the potential to address micronutrient deficits among the rural populations of developing world especially with production of vegetables, fruits and medicinal plants.

The findings also agree with (Chauhan, 2012) in his study which established that nutritional wellbeing requires access to enough and safe food to meet the dietary needs of all members of the household all the time. Furthermore the findings agree with Rahman *et al*, (2008) that backyard gardening has the potential to improve the household welfare by providing constant supply of vegetables through the dry season and years of drought.

Furthermore, the findings are in line with Kotright, (2007) that the sustainability of household food sourcing and gardeners' overall health and well-being also increase with food production. Furthermore Ericksen (2008) affirms that nutritional value entails how much of the daily requirements of calories, vitamins, protein, and micronutrients are provided by the

food consumed determined by the diversity of consumed food, type of primary protein, education, facilities for cooking and preparing food.

The study findings also agree with a submission of Alaimo *et al* (2008) and Twiss*et al* (2003) that backyard gardeners reportedly consume more servings of fresh fruit and vegetables each day than non-gardeners. Additionally, the findings are in agreement with Kortright (2011) that home gardens contribute to food security at the household and community levels by making diverse and nutritious foods readily accessible to household residents and community members.

Indeed in an interview with the CDO, he explains *"households that have adopted backyard gardening have a steady supply of food since it's just a few meters from their houses as compared to households that do not have backyards".* This is in agreement withWorld Bank (2007) that increasing and stabilizing domestic production is essential for food security and eliminates the recurrent habit of food aid.

4.3.1 Mean Comparison in Meals Consumed per day Between Adopters and Non – Adopters

This section shows the mean comparison in meals consumed per day between Adopters and Non – Adopters. This intends to show whether there is statistically significant or not in meals consumed per day between adopters and non – adopters. This is shown on table 9 below.

Table 8: Mean comparison in meals consumed per day between Adopters and Non – Adopters

Paired Samples Test					
Mean comparison in meals consumed per day	Paired Differences		T	Df	Sig.(2-tailed)
	Mean	Std. Deviation			
Meals consumed (Adopter) – Meals consumed(Non- Adopter)	0.49091	0.50221	10.252	109	0.000

Source: Primary Data, 2018

Table 9 shows a mean comparison in meals consumed between Adopters and Non – Adopters per day. The variable was analysed at the confidence interval of 95% with 5% standard error. The results generated by the paired sample test show the mean value of0.49091. This mean is less than 3 hence it shows that there is no statistical significant difference between Adopters and Non – Adopters in meals consumed. However, the standard deviation is 0.50221 while the P – Value is 0.000 which confirms that, there is a statistical significant difference between Adopters and Non – Adopters in meals consumed since the p-value (Sig. (2-tailed) is less than 5%. This confirms that, there is sufficient evidence that backyard gardening has contributed much to meals consumed per day among Adopters compared to Non – Adopters in Nabigasa Sub county. This means that Adopters consumed more than two meals per day than compared to Non – Adopters. These findings conform to the assertion of Khatri-Chhetri, et al. 2016; Taylor and Lovell (2013) that home gardens have been documented as an important supplemental source contributing to food and nutritional security.

Furthermore, the findings are also in line with the study findings of Mugisa *et al.* (2016) that backyard gardening ensures production all year round hence constant supply of fruits and vegetables. Findings from India and USA indicate that backyard gardening was adopted as the best option for improving the dietary needs of their communities (Sethy *et al.,* 2010). The findings are in line with Njuguna (2013) who wrote that backyard gardening can be part of a solution for food sustainability given the food demand challenge that the green revolution and rain-fed agriculture have failed to meet.

The findings are further in agreement with Heim *et al*. (2011) in their submission that fruit and vegetable gardens have led to a significant increase in fruit and vegetable consumption among children and adults and also in the household food availability. The findings are also in agreement with Aliamo *et al* (2008) who submits that backyard gardens have the potential of increasing production thus meeting challenges of malnutrition associated with lack of vegetables and fruits.

Indeed, in an interview, the chairman LC III was grateful that households that had adopted backyard gardening have access to nutritious foods at an affordable or at no cost since as they produce it in their homes. Nutritional diversity focuses on the diversity of the food consumption to maintain overall health and energy to do work and live healthy. This is in agreement with Remans (2003) a thathuman diet requires at least 51 nutrients in adequate amounts consistently for good health

4.3.2 Mean Comparison in Income from Crops between Adopters and Non – Adopters

This section discusses the mean comparison and the deviation from the mean in income earned from crops between Adopters and Non – Adopters. This intends to show whether the

mean difference (Mean Adopter – Mean Non-Adopter) in income is statistically significant or not. This is shown on table 9 below and discussed.

Table 9: Mean comparison in income earned from crops between Adopters and Non – Adopters

Paired Samples Test					
Mean comparison in income earned from crops between Adopters and Non – Adopters	Paired Differences		T	Df	Sig. (2-tailed)
	Mean	Std. Deviation			
Income earned (Adopter) – Income earned (Non - Adopter)	0.41818	0.49552	8.851	109	0.000

Source: Primary Data, 2018

Table 9 above shows a mean comparison in income between Adopters and Non – Adopters of backyard gardening. The variable was analysed at the confidence interval of 95% with 5% standard error. The results generated by the paired sample test show that mean value of 0.41818 which is less than 3, standard deviation of 0.49552 near to zero, which indicates there is a statistical significant difference in income between Adopters and Non – Adopters. However, the p –value (Sig. (2-tailed) is 0.000 less than 5% standard error, confirms that, there is a statistical significant difference in income between Adopters and Non – Adopters. This confirms that, there is sufficient evidence that backyard gardening has contributed much to income among Adopters compared to Non – Adopters.

The findings are in agreement with Mitchell and Hanstad (2004) that home gardens contribute to household financial well-being where garden products are sold to earn additional income. This further agrees with the findings of Chirinda *et al* (2002) that the savings from consuming home grown food products lead to more income that can be used to meet other home needs. They further explain that the small but steady income from backyard gardens is a dependable socioeconomic safety net for household food security.

Additionally, World Bank (2007) emphasizes that majority of people who came out of poverty diversified their farming practices by growing food crops for home consumption and non-traditional crops and livestock. Backyard gardens further provide and supplement subsistence requirements and generate secondary direct or indirect income for households that have adopted backyard gardens (Ninez, 1984). According to Simatele (2006) incomes amassed in a household can be invested in agriculture allowing the farmer to tend to the production needs which increases yields and food availability at the household level.

4.3.4 Mean Comparison in Income Saved between Adopters and Non – Adopters

This section shows the mean comparison in income saved between Adopters and Non – Adopters. This intends to show whether there is statistical significant difference in income saved between Adopters and Non – Adopters or not. Income was measured in the amount of how much Ugandan shillings the household was saving as a result of consuming own produced food as a result of backyard gardening. Household income especially in terms of saving on food is one of the key indicators of food availability. This is shown on table 10below and discussed.

Table 10: Mean comparison in income saved between Adopters and Non – Adopters

Paired Samples Test					
Mean comparison in income saved between Adopters and Non – Adopters	Paired Differences		T	Df	Sig. (2-tailed)
	Mean	Std. Deviation			
Income saved(Adopter) – Income saved(Non - Adopter)	0.87273	0.49044	18.663	109	0.000

Source: Primary Data, 2018

Table 10 shows a mean comparison in income saved between Adopters and Non – Adopters. The variable was analysed at the confidence interval of 95% with 5% standard error. The findings generated by the paired sample test show that mean value is 0.87273 less than 3, standard deviation 0.49044 near zero, show that there is no statistical significant difference in income saved between Adopters and Non – Adopters. However, the p –value (Sig. (2-tailed) is 0.000 less than 5% standard error, thus confirming that, there is a statistical significant difference in income saved between Adopters and Non – Adopters. This confirms that, there is sufficient evidence that backyard gardening has contributed much to income saved among Adopters compared to Non – Adopters.

The findings are in line with Mugisa *et al (*2016) Galhena *et al* (2013) submission that backyard garden trees are a source of income for households and act as social areas for

meetings. The study findings are further in agreement with Taylor and Lovell (2014) that backyard gardens make a greater contribution to food budgets and may be more likely to furnish livelihoods for households through the sale of garden products Gardens provide access to healthy food for low-income families who cannot afford fresh produce.

Indeed in interview with the AEW, he expounded that, non-adopters are the people providing market to households that have adopted backyard gardening. He explains that *"for households that adopted, they earn and save from their backyards as the non-adopters spend".* The adopters of backyard gardening rarely buy food since they produce most of the food that they eat and thus save the money they would have used in buying such home grown foods. They thus buy few other that they do not produce.

Indeed Danso and Veehuizeen (2007) affirm that self-production of food reduces on the monthly expenditures for food. Thus, it's clear that backyard enables households to have a stable source of income all year round. Indeed according Aliber (2009) realistic evidence in South Africa shows that poor rural households spend a huge proportion of their income on food and this is given to the households that are selling their food to such poor households not able to produce own food. Indeed according to Nzira (2008) backyard gardening promotes food consumption close to the production source which cuts on energy costs associated with storage, long distances in transportation and loss of nutritional quality thus enabling easy access to food at the household

4.4 ways of scaling up backyard gardening in rural areas

This presents the views of respondents to check if they can suggest measures through which backyard gardening can be scaled up as in table 11below.

From the findings the respondents believe that there are ways through which backyard gardening can be scaled. Given that all the respondents agree, this is an indication that backyard gardening can be scaled up. The respondents suggested different ways to which they felt backyard gardening can be scaled up so as to consolidate the gains and also encourage the residents to also take up backyard gardening.

Table 11:Ways of scaling up backyard gardening

Ways of extending backyard gardening	**Frequency(Percent)**
Enact by laws	32(14.5)
Extensive local based extension services	70(31.8)
Peer based group gardens	24(10.9)
Formation of backyard gardening groups	28(12.7)
Provision of inputs to households	66(30.0)
Total	**220(100.0)**

Source: Primary Data, 2018

The findings from table 11 show that 14.5% of the respondents advance that enacting government laws is a way of extending backyard gardening. According to the chairman LC III, in interview, explained that enacting byelaws to compel all households to have backyards

would be a best starting point of scaling this technology since the authorities will have a legal backing for enforcements.

Indeed with a legal framework in place it becomes easy for enforcement as well enlightenment of the households of the need to have backyards in their homes. The CDO in an interview expressed the importance of bye-lays that it becomes to remind residents of the legal provisions concerning the intervention and the consequences of adopting backyard gardening. Thus, the bye-lays keep residents awake to the responsibility they have towards adopting backyard gardening.

It's often said that you can't give what you don't have, thus its paramount that households are enlightened what needs to be done to successfully adopt back yard gardening. From the study, 31.8% of the respondents advanced the need to have extensive local based extension services geared toward training and adopting of backyard gardening. Rural households need to be equipped with the skills and knowledge of backyard gardening so as to be able to easily adopt. This technical know-how will enable such households to set up quality and sustainable backyard gardens that will last for long periods and also sustainably feed such households.

The local based extension services are sustainable since the trainers are community members and are easily approachable for backyard gardening technical support. These findings are in agreement withCaswel*et.al* (2001) that adopting a provided a technology needs to be beefed up by increased information of its profitability thus inducing its adoption. In the cases where experience within the general population about a specific technology is limited, more information induces positivity towards its adoption.

Furthermore, the findings are agreement with Talukdeer *et al* (2000) households need the technical support especially when new gardening techniques are being promoted such as growing new or increased number of varieties or year-round vegetable production. This is encouraged to be done around a central demonstration garden attended by community members which will serve to demonstrate different varieties, hybrids or other important garden techniques such as live fencing, composting, use of natural pesticides, year round production to the participants.

From the study findings, 10.9% of the respondents advanced the develop peer based group gardening. Indeed the AEW in interview expressed the fear that despite backyard gardening being excellent in addressing food availability, he explained that backyard gardening is hard to establish on an individual basis. Thus there is a need for peer group that will support members in establishing such gardens especially in carrying manure and actual setting up of the gardens. It's important that community members work together for the good of everyone so that there is no begging for food since every community member is supported to set his or her own backyard garden.

Furthermore as stipulated in table 11, 12.7% of the respondents propose formation of backyard gardening groups. These are specific groups that have the common goal of establishing backyard gardens and ensuring that each member has backyard gardens back at home. Such groups are important and indeed according to the AEW, having such groups makes it easy to train community members on backyard gardening. Such groups will have leaders and thus it becomes easy to mobilise group members for the common good of other members.

The AEW further expressed the support that such groups will offer towards establishing group nursery beds where individual members will acquire seedlings for individual planting. He explained that it's often hard for households to establish and care for a nursery bed alone but when there is a combined effort, then it becomes easy to set up and manage a nursery bed which in turn acts as a multiplication garden for all the group members who will in turn transplant in their own gardens. This is in agreement with Gurven&Jaeggi (2015) who affirms that the sharing and exchange of food and knowledge in such groups enables neighbors, friends and relatives to foster harmony in the community which in turn, helps to reduce anti-social behaviour such as food thefts

Input provision is one the key drivers of adoption of backyard gardening. From the study, 30% of the respondents proposed the provision of input as mechanism for scaling up backyard gardening. Indeed according to the AEW, in an interview during the study he expressed the fruits of providing seed inputs to community members as an incentive that encourages them to adopt backyard gardening. He explains that the start-up inputs such as seeds and manure act as eye openers to community members who will realise the usefulness of adopting such practices towards their households and will thus use the savings and incomes to purchase other seeds and inputs to be able to continue producing even when the provided in-puts are finished since they have tested the usefulness of backyard gardening. According to the Chairman LC III, in interview, he expressed the desire that provision of in-puts is a hand up to such households. He further explains that such in-puts will encourage which adoption since the beneficiaries have known what inputs are needed and further have tested the different varieties provided which enables them to make an informed decision on which gardening designs to take on and what crops to grow.

These study findings are in agreement with Talkuder et.al (2010) who affirmed thathouseholds need to have easy access to the necessary inputs for gardening from a local and sustainable source as an important element for successful backyard gardening. These range from inputs such as seeds, seedlings, regular water supply, environmental friendly soil fertility enhancement techniques and pest control, and access to credit for startup inputs. .

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary of the study findings, conclusion and recommendations. It also presents areas related to the study which the researcher feels are necessary for other researchers to work on.

5.1. Summary of Findings

5.1.1 Backyard Gardening Designs in Nabigasa Sub County

Several backyard gardening designs are implemented by farmers that have adopted backyard gardening in Nabigasa Sub County, The most commonly used designs include: double dug, raised bed, sack mound, keyhole and sunken. From the observations, there is also a mandala backyard gardening design that is being applied in the area of study.

5.1.2Comparing Food Availability among Adopters and Non – Adopters

Adopters of backyard gardening were more food secure as compared to the non- adopters. This was confirmed by the number of meals they eat and the varieties of food eaten. The variables were analysed at the confidence interval of 95% with 5% standard error. From the results generated by the paired samples test there is a confirmation that there is a statistical significant difference between Adopters and Non – Adopters in food availability since all p-values (Sig. (2-tailed) in parameters measured are less than 5%.

Households that have adopted backyard gardening have easy access to food is readily available among households that have adopted backyard gardening as compared to non-

adopters. The adopters have more meals in a day compared to non-adopters. Furthermore, the adopters have no much worry of not having enough food, not eating the kind of food they want, eating of a limited variety of food and eating the food they don't want.

5.1.3 Mechanisms for Scaling up Backyard Gardening in the District

Both the adopters and non-adopters of backyard gardening advanced strategies for scaling up backyard gardening. They include enacting bye laws, formation of backyard gardening farmer groups, widespread local based backyard extension services and peer based group backyard gardening.

5.2 Conclusion

In conclusion, there are several backyard gardening designs being implemented in Nabigasa Sub County. These include Mandala, sack garden, Sunken, basket, key hole, double dug and raised bed backyard gardening designs.

There is a statistical significant difference in food availability levels among the farmers that have adopted backyard gardening and those that have not. This is manifested the number of meals, incomes earned and saved as well as households that have adopted backyard gardening not worrying going without food, eating a variety of food, having enough food and eating the food that they desire.

The study also found out that different mechanisms for scaling up backyard gardening in rural households in Nabigasa Sub County include setting up by-laws to provide a basis for enforcement of adoption, provision of inputs as start up for adoption and also forming peer based associations to ensure that households have the social capital to establish these gardens

since it’s hard for individuals to set up such gardens alone but rather a combined effort will ease the setting up of these gardens.

5.3 Recommendations

There should be massive awareness on the benefits of backyard gardening in enhancing food availability. This will be vital in attitude change mostly for the non-adopters who think that backyard gardening is not very important in promoting food availability. This has to take advantage of all available occasions such as church services, parties and even burials. A clear and focused messaging promoting backyard gardening has to be clearly designed and shared during such gatherings.

It is recommended that rural-based campaigns and building capacity of households in the use of backyard gardening as a farming system. This will equip community members with the knowledge and skills in setting up backyards gardens and sustaining them. This empowerment will accelerate adoption of backyard gardening since accelerated information sharing and campaigns will be received at several intervals and thus even late adopters will have an opportunity to adopt backyard gardening.

Bringing all stakeholders on board in the design and implementation of backyard gardening. Different prayers in addressing food security issues should be included in the design and implementation of food security programs. For example local governments, research and academic institutions, opinion leaders, religious leaders and farmers at the grassroots. This will allow community members to have technical and moral support in the process of adopting backyard gardening.

It is recommended that efforts be made to mobilize, sensitize and encourage the youth and males to get engaged in backyard gardening and other agricultural practices. This will create awareness about the benefits of backyard gardening so that all gender, sex, and age can be involved in agriculture. In fact, inclusive agriculture will play a vital role in revitalizing sustainable agriculture

It is recommended that more in terms of backyard gardening designs be introduced and especially those that are easily set up and do not require a lot of inputs. These will fill up the gaps left in homes and thus providing a big base for more food to be produced and excess be sold out for household income that will be used to meet other needs.

The study further recommends that more efficient water harvesting technologies be introduced in the area especially those that are covered to reduce on water evaporation. This will boost food availability especially in terms of production.

5.4 Suggestions for Further Research

Evaluating the contribution of backyard gardening towards other pillars of food security in Nabigasa Sub County. This will be important in that it will assess how other pillars are being influenced by backyard gardening.

Assessing the factors that influence farmer's choice of backyard gardening designs in Nabigasa Sub County. This will be important in knowing which designs can be scaled up to other communities.

Examining the role of extension services in scaling up backyard gardening in Nabigasa Sub County. This will be important in beefing up the extension services that will be critical in offering quality backyard gardening services to the communities.

There should be also a study the role played by household labor in adoption of interventions such as backyard gardening. This is because it's still hard o quantitatively get data on the energy invested in by household labor.

References

Adesiina, A.A. and Baidu-Forson, J. (1995). "Farmers' Perceptions and Adoption of New Agricultural Technology: Evidence from Analysis in Burkina Faso and Guinea, West Africa."*Journal of Agricultural Economics*.13:1-9.

Alaimo, K., E. Packnett, R. Miles, and Kruger, D. (2008). Fruit and Vegetable Intake Among Urban Community Gardeners. *Journal of Nutrition Education and Behaviour* 40(2): 94–101. doi:10.1016/j. jneb.2006.12.003. Accessed on: 12th July 2018

Aliber, M. (2009). Exploring Statistics South Africa's National Household Surveys as Sources of Information about Household-level Food Fecurity. Agrekon, 48(4), 384– 409.

Asaduzzaman, N. S. (2011). Benefit-Cost Assessment of Different Vegetable Gardening on improving Household Foood and Nutritional Security in Rural Bangladesh. Pittsburgh, Pensylvinia: *Agricultural & Applied Economics Association's* 2011 AAEA & NAREA. Available on: https://ageconsearch.umn.edu/bitstream/104525/2/13760.pdf. Accessed on 10th June 2018.

Asiema. (1994). Africa's Green Revolution. *Biotechnology and Development Monitor* (No. 19, p. 17-18.), No. 19, p. 17-18.

Bhattacherjee, A., (2012) *Social Science Research: Principles, Methods and Practices*. Available at: http://scholarcommons.usf.edu/textbooks/3 [Accessed on 20/5/2018]

BMZ (2016). *Farmer's Handbook on Basic Agriculture. A Holistic Perspective of Scientific Agriculture:* Desai Fruits & Vegetables Pvt. Ltd: Navsari, Gujarat India

Braun, J. (1992). Improving Food Security of the Poor: Concept, Policy, and Programs.

CABI (2014) AIV Backyard Gardening Fights Malnutrition. Available on:https://www.cabi.org/Uploads/CABI/about-us/4.4-global-locations/Kenya/CiA-newsletter-2013-14.pdf. Accessed on 14th June 2018.

Caswell, M., K. Fuglie., C. Ingram., S. Jans and Kascak, C. (2001). Adoption of Agricultural production practices: Lessons learned from the US. Department of Agriculture area studies project. Washington DC. US Department of Agriculture. Resource Economics Division, Economic Research service, Agriculture Economic Report No. 792.

Chauhan M. N (2012) *Impact and Constraints Faced by Tribal Farmwomen in Backyard Gardening.* Available on: http://www.rseeudaipur.org/wp-content/uploads/2013/02/223.pdf. Accessed on: 10th May 2018

Chauhan, N.M (2012); Impact and Constraints Faced by Tribal Farm Women in Kitchen gardening.

Chirinda, N., Muusha, M., Manyange, E., and Mbetu, J. (2002); *Contribution of Palustrine wetlands on livelihoods in semi-arid masvingo district of zimbabwe.*Unpublished paper. Masvingo State University.

Clynewood, J. & Wright, R., (2010) *Course Hand out for Introduction to Forest Gardening*.Available on: http://library.uniteddiversity.coop/Permaculture/Agroforestry/Forest_Gardens/ForestGardenHandout.pdf [Accessed on 9/8/2018]

Danso, G &Veehuizen, R.V (2007) *Profitability and Sustainability of Urban and Peri-urban Agriculture.* Rome: FAO

Dibsdall, L. B. (2011). Low-income Consumers' Attitudes and Behavior Towards Access, Availability and Motivation to eat Fruit and Vegetables. *American Journal of Public Health: August 2011, Vol. 101* , 159-168 .

Dilrukshi, H.G, Rusell, F &Maredia, K.M (2013) Home Gardens. A Promising Approach to Enhance Food Security and Well-Being.Available on: https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/2048-7010-2-8. [Accessed on 12/July 2018]

Doward, A (2013) How Can Agricultural Interventions Contribute in Improving Nutrition, Health and Achieving MDGS in Least Developed Countries*? Center for Development, Environment and Policy working Paper 2013*. Available on: DOI:10.1159/000354946. Accessed on: 10th May 2018

Doward, A., (2013) *How Can Agricultural Interventions Contribute in Improving Nutrition, Health and Achieving MDGS in Least Developed Countries*?. Center for Development, Environment and Policy Working Paper 2013.

Enyedi, G., &Volgyes, I. (2016). The Effect of Modern Agriculture on Rural Development: Comparative Rural Transformation Series. Elsevier. Accessed from https://play.google.com/store/books/details/The_Effect_of_Modern_Agriculture_on_Rural_Developm?id=wQjLBAAAQBAJ&hl=en_IE. Accessed on: 10th June 2018.

Ericksen, P. J. 2008. What is the Vulnerability of a Food System to Global Environmental Change? *Ecology and Society* **13**(2): 14. Available on. http://www.ecologyandsociety.org/vol13/iss2/art14/. Accessed on 12th June 2018

Eyzaguirre, P.B. and Linares, O.F. (2010). *Introduction: In Home Gardens and Agro Biodiversity*. Edited by Eyzaguirre, P.B. and Linares, O.F. Washington DC, USA: Smithsonian Books.

Faaij, A (2008) *Bioenergy and Global Food Security*. Utrecht University.

Fabio,D, S.G., Azavedo, E.S.,andRibeiro,D, C (2012):*Effect of Home Vegetable Gardening on the Household Availability of Fruits and Vegetables*. Available onhttp://dx.doi.org/10.1590/1678-98652017000200009. Accessed on 10th June 2018

FAO (2012). Improving Household Food Security and Nutrition through Kitchen Gardening. Available on: https://foodsecurityfoodjustice.com: Accessed on 5th Aug 2018.

FAO (2015); Promoting School Gardens and Home Gardens for Getter Nutrition in Asia and Pacific. Bangkok- Thailand.

Finerman R. and Sackett R. (2003). Using Home Gardens to Decipher Health and Healing in the Andes. Available On: http://www.ncbi.nlm.nih.gov/pubmed/14716919. Accessed On: 25 July 2018

Food and Agricultural Organization (FAO). 2010. Household food security and community nutrition. Available On: http://www.fao.org/householdfoodsecurity/V4807e/v4807e05.htm.

Food and Agriculture Organization of the United Nations, (2014) *Manual "A Vegetable Garden for all".* 5th ed. Rome: FAO.

Fraenkel, J.R.,&Wallen, N.E., (2000) *How to Design and Evaluate Research in Education*. New York: McGraw-Hill Publishing Co.

Galhena DH, Mikunthan G, Maredia KM (2012) *Home Gardens for Enhancing Food Security in Sri Lanka*. Available on: https://www.ileia.org/2012/06/23/home-gardens-enhancing-food-security-sri-lanka/: Accessed on 10th June 2018

Gliessman, S., (2007) *Agro ecology. The Ecology of Sustainable Food Systems*. 2ndedn. New York: CRC Press.

Gurven, M., &Jaeggi, A. V. (2015). Food sharing. Emerging Trends in the Social and Behavioral Sciences: An Interdisciplinary, Searchable, and Linkable Resource. Accessed from: http://onlinelibrary.wiley.com/doi/10.1002/9781118900772.etrds0133/full. Accessed on: 15th May 2018

Heim S, Bauer KW, Stang J, Ireland M (2011)*Can a Community-Based Intervention Improve the Home Food Environment? Parental Perspectives of the Influence of the Delicious and Nutritious Garden.* J NutrEducBehav. 2011;43 (2):130-4.https://doi.org/10.1016/j.jneb.201001.003

Hoddinolt, J (1995) Does Female Income Share Influence Household Expenditures? Evidence from Côte d'ivoire. Available on https://doi.org/10.1111/j.1468-0084.1995.tb00028.x. Accessed on 12th August 2018

Holben, D.A. (2002). An overview of food security and its measurement. *Nutrition Today*,

Houx, J.H., McGraw R.L., Fritschi,F.B, &Navarrete-Tindall N.E., (2009). *Effects of Shade on Growth and Nodulation of Three Native Legumes with Potential for Use in Agroforestry*. Native Plants Journal 10(3): 232–238.

http://www.statisticshowto.com/how-to-use-slovins-formula/ [Accessed on 13/6/2018]

IFAD, (2015) *Investing in Small Holder Farming Agriculture for Global Food Security and Nutrition.* IFAD Post-2015 Policy Brief 3. Available at: https://www.ifad.org/documents/10180/ad1f9fb1-b3f4-498b-bb82-077f4a8099cf [Accessed n 20/7/2018]

International Food Policy Research Institute D.C. 20036 U.S.A .

Johnson-Welch C, Alemu B, Msaki TP, Sengendo M, Kigutha H, Wolff A (2000): *Improving Household Food Security: Institutions, Gender and Integrated Approaches*. Davis CA, USA: Paper prepared for the Broadening Access and Strengthening Input Market Systems (BASIS) Collaborative Research Support Project (CRSP)

Khatri-Chhetri, A., Aryal, J.P., Sapkota, T.B., Khurana, R., (2016) *Economic Benefits of Climate-Smart Agricultural Practices to Smallholders' Farmers in the Indo-Gangetic*Plains of India. Curr. Sci. 110 (7), 1251–1256.

Kortright, R. (2011) *Edible Backyards: A Qualitative Study of Household Food Growing and its Contributions to Food Security*. Agr Hum Values. 2011; 28(1):39-53. https://doi.org/10.1007/s10 460-009-9254-1.

Kotright, R (2007). *Edible Backyards: Residential Land use for Food Security in Toronto*. Available on:http://www.cuhi.utoronto.ca/research/supportingdocs/EdibleBackyardsReport.pdf. Accesed on 10th June 2018.

Koyenikan, M. J. (2007). Perception of Home Garden Potential among Women in Edo South Ecological Zone, Nigeria. Available On: https://www.ajol.info/index.php/gab/article/view/23373. Accessed On: 05 AUGUST 2018.

Kracht, U. and M. Schulz (eds.) (1999). Food Security and Nutrition: The Global Challenge. *Munster and New York: Lit verlag and St. Martin's Press.*

Landon, C (2011) for FAO; FAO diversification booklet 2, 2nd Edition. Livelihoods Grow in Gardens. Rome.

Major. S and Dhaliwal (2007*); Types of vegetable gardens*. Punjab Agricultural University.

Marsh R. (1998) *Building on Traditional Gardening to Improve Household Food Security*. Food Nutr Agriculture. 1998; 22:4-14.

Marsh, R. (1998). Building on traditional gardening to improve household food security. *Food Nutrition and Agriculture*, 22: 4–14.

Maxwell, S &Frankenberger, T (1992). Household food security: concepts, indicators, and measurements: a technical review. New York, NY, USA and Rome, UNICEF and IFAD.

Mburu. J. N (2013). *The Role of Kitchen Gardens in Food Security and Nutritional Diversity*

Mercy Corps (2009) Food Security Sector Overview. Available on: https://www.mercycorps.org/sites/default/files/FoodSecuritySectorOverview.pdf. Accessed on 20th June 2018.

Mitchell, R., and Hanstad, T. (2004). *Small Home Garden plots and Sustainable Livelihoods for the Poor*. Working paper 11. Rome, Italy.

Mugisa, I.O., Molly, A., Muyinda, M., Gafabusa, R., Kituuka, G., Kyampeire, B., Atim, J., Nampeera, M., Nafula. R., Sseruwu, G., Kabanyoro, R., and Akello, B.O. (2016). *A farmers' guide to home gardening: how to establish and manage home gardens*. NARO- Mukono Zonal Agricultural Research and Development Institute, Uganda.

Musotsi, A.A., Sigot, A.J. and Onyango, M.O.A. 2008. The Role of Home gardens in household food security in Butere division of Western Kenya. *African Journal of Food, Agriculture, Nutrition and Development*. 8(4): 375-390. Available On: https://www.ajol.info/index.php/ajfand/article/view/19199/36629. Accessed on: 02 June 2018

Nair, R. (1993). *An Introduction to Agroforestry*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Nell W., Wessels B. Mokoka J. Machedi S. (2000). A Creative Multidisciplinary Approach

Neuman, W.L., (2014) *Social Research Methods: Qualitative and Quantitative Approaches* 7thedn. Edinburgh: Pearson Education Limited.

Ninez. (1984). Household Gardens. *Potatoes in Food System.* Available on: https://www.sciencedirect.com/science/article/pii/0308521X87900643 Accessed on 10th June 2018.

Njuguna, M.J (2013); *Role of Kitchen Gardens in Food Security and Nutrition*. University of Nairobi.

Nzira, J., (2008) *Permaculture Manual: Creating Sustainable Food and Medicinal Gardens*. Ukuvuna Permaculture Solutions.

Nzira, J., (2008) *Permaculture Manual: Creating Sustainable Food and Medicinal Gardens*. Ukuvuna Permaculture Solutions.

Odebode, O.S. (2006). Assessment of home gardening as a potential source of household income in Akinyele Local Government Area of Oyo State. *Nigeria Journal of Horticulture Science*, 2:47-55.

OPM (2017) *National Food Security Assessment*. Department of Relief, Disaster Preparedness and Management, Kampala.

Oxfarm. (2015).Market Access and Food Security in the Central Region. Available on http://www.fao.org/monitoringprogress/docs/WTO_2005.pdf. Accessed on: 10th August 2018.

Pinstrup-Andersen, P. (2009). Food security: definition and measurement. *Food security, 1*(1), 5-7.

Rahman, F. M. M., Rahman, M. G. G., and Rokonuzzaman, M. (2008). *Food Security through Homestead Vegetable Production in the Smallholder Agricultural Improvement Project* (SAIP) area. J. Bangladesh Agril. Univ., 6(2): 261–269.

Remans, F. D. (2003). Assessing Nutritional Diversity of Cropping Systems in African Villages. *Journal.pone.0021235* .

SACU (2015) *Send a Cow Baseline Survey: The Rakai Orphans Project.* Kampala.

Sethy. S, Sarkar. S, and M. Kumar (2010) Constraints in Adoption of Improved Techniques ofBackyard Gardening. *Journal of Community Mobilization and Sustainable Development*

Sijm, J (1997). *Food Security and Policy Interventions in Sub-Saharan Africa: Lessons from the Past two Decades*. Amsterdam: Thesis Publishers.

Silvia, N. A. (2012). *International Food Prices.* ROME: FAO, IFAD,WFP.

Stephan B and Christian I (2013). Urban gardens, agriculture, and water management: Sources of resilience for long-term food security in cities*: Ecological Economics* (86), 224-243.

Sthapit B.R., P. Shrestha and M.P. Upadhyay (eds) (2006). On-farm Management of Agricultural Biodiversity in Nepal: Good Practices. NARC/LI-BIRD/ Bioversity International, Nepal

Talukder, A.; Kiess, L.; Huq, N.; Pee, S. de; Darnton-Hill, I.; Bloem M, W. (2000): *Increasing the Production and Consumption of Vitamin A–rich Fruits and Vegetables: Programme to a National Scale. Lessons Learned in Taking the Bangladesh Homestead Gardening* 2 (21

Taylor, R.J & Lovell, S.T (2014) Urban Home Gardens in the Global North: A Mixed Methods Study of ethnic and migrant home gardens in Chicago, IL. Available on: https://doi.org/10.1017/S1742170514000180. Accessed on18th June 2018.

Tittonell, G. (2012). *When yield Gaps are Poverty traps; The Paradigm of Ecological Intensification In Africa Smallholder Agiculture.*Available on https://doi.org/10.1016/j.fcr.2012.10.007. Accesed on: 10th May 2018

Torimiro, D. O., Tselaesele, N. T., Seven, K., Ramorathudi, M. V., and Hulela, K. (2015). *Vulnerable Groups' Involvement in Small-scale Vegetable Production*: A Panacea for Poverty and Food Insecurity? International Journal of Vegetable Science, 1–23.

Towards the Development of Food Gardening. *Development debate and practice. DevelopmentSouthern Africa*. Volume 17, No 5. December 2000

Twiss, J., J. Dickinson, S. Duma, T. Kleinman, H. Paulsen, and L. Rilveria. (2003). Community gardens: Lessons learned from California healthy cities and communities. *American Journal of Public Health* 93(9): 1435–1438.

UBOS, (2016), *The National Population and Housing Census 2014 – Main Report*. Kampala, Uganda

UBOS, (2017) National Population and Housing Census 2014: Area Specific Profiles. Kampala, Uganda.

Vhurumuku, E (2014) Food Security Indicators: Integrating nutrition and food security programming for emergency response workshop. Available

on:http://www.fao.org/fileadmin/user_upload/food-security-capacity-building/docs/Nutrition/NairobiWorkshop/5.WFP_IndicatorsFSandNutIntegration.pdf

Accessed on: 10th July 2018

Wanjek, C (2005) Food at Work: Workplace Solution for Malnutrition, Obesity and chronic Diseases. Available on https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_publ_9221170152_en.pdf. Accessed on: 10th July 2018.

Wheeler. T (2013). Climate change impacts on global food security. Found at http://www.fao.org/fileadmin/templates/est/meetings/climate accessed on 6th August 2018 at 15 :20 HRS.

WHO (2003). *Expert Report on Diet, Nutrition and the Prevention of Chronic Diseases.* WHO Technical Report Series, nº 916. Geneva: WHO; 2003.

Wiggins, S & Keats, S (2012) *Smaller Holder Agriculture Contribution to Better Nutrition*. Over Seas Development in Institution.

Wilson, J., (2010) *Essentials of Business Research: A Guide to Doing Research Project*. Los Angeles: Sage

World Bank (2007) *World Development Report 2008: Agriculture for Development. New York: The International Bank for Reconstruction and Development*. Washington DC: The World Bank

World Bank (2007) *World Development Report 2008: Agriculture for Development. New York: The International Bank for Reconstruction and Development*. Washington DC: The World Bank

World Cancer Research Fund, American Institutefor Cancer Research (2009). *Policy and action for cancer prevention. Food, nutrition, and physical activity: A global perspective*. Washington (DC): AICR; 2009.

World Food Programme, & Stanford University Press. (2006). World Hunger Series 2006: Hunger and Learning. Rome and California: World Food Programme

Yamane, T. (1973). Statistics: An Introductory Analysis, 2nd Ed., New York: Harper and

Appendices

Appendix 1: Research questionnaire

I am Twesigye Francis, Reg. No. 2015-M152-20014 a student of Master of Science in Agro-Ecology at the Faculty of Agriculture, Uganda Martyrs University. I request for your time and ideas on the effect of Backyard gardening on food availability in this sub county. Your responses will be used for academic purposes with utmost confidentiality. Your responses are highly welcome.

Thanks

Questionnaire No…….

Section A: Bio Data of respondents

Gender of respondent 1- Male 2- Female

Age: 1. below 18, 2. 19-28, 3. 29-38, 4. 39-48, 5. 49-58, 6. 59-68, 7. 69 and above

Number of people in the household [Tick appropriate one]

1) 1-3 2.) 4-7 3) 8-11 4) above 12

Education levels: 1. No formal education 2. Primary 3. Secondary 4. Tertiary

Location

Parish …….

Village……

Section B: Backyard gardening designs

1. Do you practice Backyard gardening in your home?

Yes No

2. What Backyard gardening designs do you use in your home?

A) Raised bed B). Double dug C) key hole D) basket E) Sac mound F) sunken

G) Mention other designs……

3. Why did you choose to use this design?
4. Has this design in any way improved your food availability status?

   Yes No
5. If yes, how has it contributed to food availability?

Section C: Contribution of Backyard gardening towards food availability.

6. Give examples of crops that you grow under Backyard gardens
7. How often do you use these crops on meals in a week?
1. None 2. Rarely (once or twice) 3. Sometimes (three or four times) 4. Often (more than four times)
8. Have these crops contributed to your household food availability in any way?

   Yes No

   If yes, how?
9. How many meals do you consume daily

   I. One 2.Two 3.Three 4.Four
10. Has your house have to eat fewer meals because of lack of food 1=none, 2=Rarely {once or twice}, 3=sometimes { three or four times} 4= often {more than four times}

Section D: compare food availability levels between households that have adopted backyard gardening and those that have not.

11. Has your household adopted backyard gardening?

Yes No

12. If yes, when did you establish this garden?
13. Do you think that this garden places your household in better food availability position than those that do not have this garden?

Yes No

14. If yes, how? (The answers below are what places those who have adopted above those who have not adopted)

15. Incomes earned from selling of crops from the backyard 1= below 10.000, 2= 10000-20000, 3= 20000-30000, 4= above 30000 in the last month
16. How much money do you save due to consumption of own food from the backyard 1= below 2500, 2=2500-5000, 3= 5000-7500, 4=7500-10000, 5= above 10000
17. In the past four weeks, did you worry that you household would not have enough food
    1. None 2. Rarely (once or twice) 3. Sometimes (three or four times) 4. Often (more than four times)
18. In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of lack of resources.

1. None 2. Rarely (once or twice) 3. Sometimes (three or four times) 4. Often (more than four times)

19. In the past four weeks, did you or nay household member have to eat a limited variety of foods

1. None 2. Rarely (once or twice) 3. Sometimes (three or four times) 4. Often (more than four times)

20. In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of lack of resources to obtain other types of food

1. None 2. Rarely (once or twice) 3. Sometimes (three or four times) 4. Often (more than four times)

21. In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food

1. None 2. Rarely (once or twice) 3. Sometimes (three or four times) 4. Often (more than four times)

Section E: Mechanisms for scaling up backyard gardening in rural households

22. Are there ways through which other community members that are not practicing backyard gardening can be brought on board to participate in this activity?

Yes No

23. If yes, what are those ways?

Thanks a lot, May God bless your garden with sustainable and enough yields

Appendix II: Interview guide for Key informants i.e local leaders, Extension staff and FGD

Date of interview……Title……

Backyard gardening designs

- What are the backyard gardening designs used in this sub county?
- Which of these designs are most commonly used?
- What are the advantages of each of these designs?
- Who trains the farmers in these designs?
- How costly are the designs for the farmers? Answers were cross cutting

Contribution of backyard gardening towards food availability.

- Are the crops grown under backyard gardening perennial or annual in nature?
- Can any type of crop be grown under backyard gardening?

What are the mostly commonly grown crops under this system?

- How has this system contributed to food availability?

Comparing food availability levels between households that have adopted backyard gardening and those that have not.

- How many households have so far adapted the programme?
- How do you compare food availability levels among the households that have adopted and those that have not adopted backyard gardening?

Mechanisms for scaling up backyard gardening in rural households

- How's the rate of adoption of backyard gardening in the sub county?
- How can backyard gardening be scaled up?

Thanks you.

Appendix III: OBSERVATION CHECKLIST

S/No	Items	state/type	remarks
1	Backyard gardening designs		
2	Types of crops		
4	other observations		