FACTORS INFLUENCING THE ADOPTION OF ORGANIC FARMING PRACTICES IN THE BANANA CROPPING SYSTEM IN KAJARA COUNTY, NTUNGAMO DISTRICT

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DECLARATION

I hereby declare that this dissertation is my original work and has never been submitted to any institution for any award and all sources quoted and referred to herein have been acknowledged through full reference.

Signed……... Date……

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APPROVAL

This is to certify that this dissertation entitled, “Factors influencing the adoption of organic farming practices in the banana cropping system in Kajara County, Ntungamo District**”** has been done under our supervision and is now submitted for examination with our approval.

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DEDICATION

This dissertation is dedicated to Ampaire Catherine, Arinaitwe Darlen, Atwine Jeremiah Daniels, Ainomugisha Gabriel Demario, and Apedeit Catherine

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ACRONYMS

CFM:	Conventional Farming Practices
FAO	Food and Agriculture Organization
FREQ.	Frequency
IFOAM	International Federation for Organic Agricultural Movements
NAADS	National Agricultural Advisory Services
NOGAMU	National Organic Agricultural Movement of Uganda
OFP	Organic Farming Practices
OWC	Operation Wealth Creation
UBOS	Uganda Bureau of Statistics

DEFINITION OF OPERATIONAL TERMS

Organic farming is a form of agriculture that excludes the use of synthetic fertilizers, pesticides, and plant growth regulators. Adesope, e tal; (2012).

Organic farming practices refer to the several approaches to sustainable agriculture like inter-cropping, rotation of crops, double-digging, mulching, integration of crops and livestock) are practiced.

Adoption refers to the integration of new technology into existing practice and is usually

proceeded by a period of 'trying' and some degree of adaptation (Loevinsohn et al 2013).

Smallholder farmers are defined as those farmers owning small-based plots of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labour. Aaron, J. (2012). Smallholders refer to those farming less than five hectares of land (Glover, 2007)

ABSTRACT

This study was carried out in Kajara County, Ntungamo District aimed at identifying and characterising the existing organic farming practices used by smallholder farmers; establishing the socio-economic and institutional factors influencing adoption of organic farming practices in the banana cropping system.

To achieve the above objectives systematic and purposive sampling the study adopted a cross sectional research design whereby data was collected from 357 farmers through household surveys using questionnaires, and key informant interviews. Quantitative data was analysed with the help of SPSS, whereby descriptive statistics such as frequencies and percentages were determined, chi-square tests were run to examine whether there were significant differences between adopters and non-adopters in relation to the adoption of organic farming practices.

Study findings show that, mulching was highly organic farming practice employed followed by weed management, use of farmyard manure, pest management, use of crop residues and use of cover crops as the least utilised practice; chi-square test results revealed that there were significant differences between adopters and non-adopters with regard to, age of the household head, gender , household size, years of farming experience, ownership of land, off-farm income, number of extension contacts, membership to farmer groups and access to credit significantly influenced the use of organic farming practices. On the other hand, there were no significant differences between adopters and non-adopters of organic farming practices concerning the education level and marital status thus did not influence the rate of adoption.

Therefore, this study recommends interventions that enhance farmers' awareness through agricultural advisory services with a focus on organic farming practices, increased access to credit facilities, and secure land tenure.

Keywords: Adoption, Organic farming practices, bananas, Ntungamo District

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Over the past decades, the level of produced food has decreased dramatically in Africa, particularly in Sub–Saharan Africa (SSA) resulting in general deterioration of the populations standard of living FAO,2009). Generally, the decline has resulted in increasing rural poverty, rising food prices, wide spread famines and increased food imports. According to Chauvin, et al;(2012), agricultural productivity in Sub-Saharan Africa remains low and is falling further behind other regions of the world despite being the source of livelihoods for more than 75% of the population that practice subsistence and traditional agriculture.

However, agricultural output growth in the region has accelerated since the 1990s, but this has been primarily due to resource expansion rather than to higher productivity yet there is evidence that agricultural productivity growth has improved in some countries Fuglie and Rada,. (2013).

In many parts of the world, soil depletion and imbalanced nutrient use have become serious hindrances to agricultural development, in turn affecting food security and environmental stability. Studies by Wu and Ma (2015) Powlson, et al. (2011) argue that the soil management techniques used in organic agriculture maintain a stable soil and nutrient balance in the environment, thereby making it a more sustainable way of exploiting the natural resource base. The absence of chemical inputs also implies less of a cost for the farmer since the manufactured fertilizers and pesticides that are usually imported will not be purchased. Organic products are noted to pose lesser health to the farmer and consumers as observed in studies by Cha and Lee (2014) where it is estimated that globally more than 350,000 people die from pesticide poisoning each year.

Dessart, et al., (2019), Liu, et., (2018) have concluded the organic farming systems are suitable for smallholder farmers given that they rely on locally available resources and build on indigenous knowledge which allows for the development of highly productive farming systems that yield a variety of products and services to sustain the livelihood of farmers and also increases the food security of farmers' families while the international market for organic agricultural produce offers good value for their products. Apart from the financial gains of exports, organic production has several benefits for the producer country most importantly; it is a mode of production that puts less of a strain on the natural environment than conventional production. Organic production standards prohibit the use of inorganic inputs like artificial fertilizers and pes-

ticides in growing crops, which implies that poisonous chemicals are not introduced into the ecosystem.

The only disadvantage of organic farming is that it necessitates large chunks of land than conventional farming meaning that countries with population density problems could have difficulties promoting organic agriculture on a larger scale. Also, organic farming yields tend to be lower than in conventional farming due to less artificial inputs used but Schrama (2018) argues that this could be outweighed by the fact that organic yields are more stable as well as more resistant to extreme weather than conventionally grown crops.

Organic agriculture is practiced in 181 countries, and 69.8 million hectares of agricultural land are managed organically by approximately 2.9 million farmers and the global sales of organic food and drink reached 97 billion US Dollars in 2017 Willer, and Lernoud, J. (2019). What ought to be noted is that although many organic goods are produced in the developed world, the current production in these countries is not sufficient to meet the current demand. This is because many of the organic products cannot be efficiently cultivated in the global Northern countries as they require warm weather or are labour intensive. Hallam, D. (2003), observed that organic farming is highly labour-intensive compared to conventional farming which disadvantages many developed countries since it increases the production costs. However, this is contrary to the case in developing countries that usually have a large surplus of labour consequently reducing the costs of farming. This is the comparative advantage developing countries have over the developed world about the labour costs in organic farming and as such, developed countries require imports to satisfy this excess demand. This creates the need for developing countries to adopt organic farming to increase the supply of their organic products whose market is assured in developed countries.

Despite the excess demand for organic products in developed countries, Collier and Dercon, (2014) noted that African countries have not been able to expand the agricultural sector and benefit from agriculture the way other developing countries in Asia and Latin America have over the last 50 years. The areas that many Sub-Saharan African countries have not managed to address are; ways of increasing crop yields, efficient land use, improved irrigation practices, and development of infrastructures and as such organic farmers currently have trouble keeping up with demand which implies a gap in the supply and demand for organic products. The question is therefore how this trend of agricultural stagnation can be turned around to foster positive and sustainable development.

According to United Nations Conference on Trade and Development 2015, there are almost 2.1 million hectares of organic agricultural land representing is 0.2 percent of the continent's total agricultural area and three percent of the global organic agricultural area has increased from 52,000 hectares in 2000. In Africa, Uganda is the largest producer of organic commodities with about 210,352 organic farmers cultivating 19,052 hectares of land representing 32.7% of arable land. Concerning banana production Uganda ranked among the top ten banana-producing countries worldwide, down from the top five in the early 2000s, production is recorded to have reduced over time from 10.5 million tonnes in 2002 to 4.3 million tonnes in 2016 (FAOSTAT, 2016)

Bananas in Uganda are one of the organically grown crops though at a small scale many times in association with other crops at low densities as shade trees for perennials like coffee or in commercial plantations at high density in a monoculture system. They further noted that the most widely grown cultivators are the cooking varieties that belong to the highland banana EAHB) subgroup including the desert species locally known as "Sukali ndizi" and "Bogoya" other varieties are those for roasting "Gonja" and "Kivuuyu" while "Kayinja" and "Kisubi" are mainly for making local beer (Tumutegyereize et al., 2011). The EAHB cooking banana (AAA-EA group) locally known as "matooke" is the leading staple food in Uganda with an annual production of over six million tonnes (Kayongo et al., 2015)

Despite the increased demand for organic products and the existing comparative advantage in organic products production, it is not clear about the proportion of banana farmers the have tapped into this form of farming and what factors have influenced the tapping. This justifies the need to investigate the factors influencing the adoption of organic farming practices in the banana cropping system in Kajara County, Ntungamo District.

1.2 Statement of the problem

Organic farming has now become popular due to the increasing demand for organic food products especially in the developed countries (Peng, 2019). Banana as a staple food in Uganda, grown by a significant populn and consumed by 70% of the members in South Western Uganda (Sato et al., 2018), has the potential to improve the livelihoods of many people by taking the opportunity of global excess demand for organic products. Despite this high demand, actual banana production in Uganda (5-20 $mg^{-1}ha^{-1}yr^{-1}$) is still below the estimated potential output (100 mg-1yr-1), empirical evidence shows that use of organic farming practices like mulching caused an increase in banana production in western Uganda up to 32 $mg^{-1}ha^{-1}yr^{-1}$ compared to the use of inorganic fertilizers that only caused an increase to 23 $mg^{-1}ha^{-1}yr^{-1}$ (Wairegi, 2010).

Despite the dominance of banana farming in western Uganda and Ntungamo in particular, data on the scale of organic farming in the banana cropping system and the factors that affect the choice of organic farming practice is scanty.

Studies conducted on banana farming systems in Ntungamo district have focused on the effects of organic farming on banana weevils (Masanza et al., 2005; Gold et al., 2006); the role of agricultural extension services in ensuring food security in banana communities (Ninsiima, 2018). None of these studies has focused on understudying organic farming practices yet this information is vital in determining the sustainability of farming in the banana cropping system. The current study, therefore, characterized the existing organic farming practices and analysed the factors influencing their adoption by smallholder farmers in the banana cropping system in Kajara county, Ntungamo district

1.3 Objectives of the study

1.3.1 Purpose of the study

The purpose of the study was to study factors influencing the adoption of organic farming practices in the banana cropping system in Kajara County, Ntungamo District.

1.3.2 **Specific objectives**

i. To identify and characterise the existing organic farming practices in the banana cropping system.
ii. To establish the relationship between socioeconomic factors influencing the adoption of organic farming practices.
iii. To examine the relationship between institutional factors influencing the adoption of organic farming practices.

1.4 Research Questions

i. What were the existing organic farming practices among organic smallholder banana farmers in Kajara County?
ii. What were the socio-economic attributes of adopters and non-adopters of organic farming practices banana cropping system in Kajara County?
iii. What were the institutional attributes of adopters and non-adopters of organic farming in the banana cropping system in Kajara County?

1.5 Significance

The farmers will benefit by exploring factors constraining them from adopting the different organic farming practices, they shall be equipped with information that will provide advice on how to address the challenges and benefits from improved organic banana-growing practices. This will eventually enable them to engage in improved farming techniques and increased incomes, as well as food security.

As part of the Millennium Development Goals, Hunger and extreme poverty can be addressed through improving agricultural practices. Therefore, it is imperative for the people involved in the agricultural sector development to understand the challenges facing the farmers and farming practices.

Agricultural extension service providers and farming agencies involved in agricultural development need to understand the factors affecting access to and utilisation of organic banana-growing practices and understand the gaps to take remedial strategies.

1.6 Scope of the study

The study was carried out in the Ntungamo district, Kajara County in the Sub counties of Bwongyera and Ihunga, parishes of Nyabubare, Rwanda, Kitondo, and Butanda. The two sub-counties of the study were chosen because they are less urbanised, possess similarities in terrain (Fig. 3.2), and were characterised by extensive smallholder organic banana farming.

The study specifically identified, characterised the existing organic farming practices, and analysed the factors influencing their adoption by smallholder farmers in Kajara County.

Data collection was conducted during February and March 2020 which is a rainy season in Kajara County.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter comprises literature review that is relevant to the research topic and includes the empirical literature on the factors influencing the use of organic farming practices among smallholder farmers; use of cover crops, green manuring, weed management, and pest management. It also looks at productivity and benefits under organic farming practices, a comparison between conventional and organic farming practices; and farmers' perceptions towards organic farming practices. The growth of bananas in Uganda is also discussed in detail. The purpose of the literature review is to disclose the knowledge gaps which the current study sought to fill.

2.2 Organic Farming

IFOAM (2005) defines organic agriculture as a production system that sustains the health of the soils, ecosystems, and people. It relies on the ecological process, biodiversity, and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation, and science to benefit the shared environment and promote fair relationships and good quality of life for all involved.

Sartaj, et al; (2013) described organic farming as a holistic production management system, which promotes and enhances agro- encourages the adoption of management practices compared to the use of off-farm inputs taking ecosystem health, including biodiversity, biological cycles, and soil biological activity. It into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system

It is a form of agriculture that relies on sustainable practices to enhance the natural fertility of a farm, including crop rotation, companion planting, biological pest control, and naturally sourced fertilizers such as compost, manure, green manure, and bone meal. Pest-control measures such as mixed crops and fostering natural insect predators are employed, while it excludes the use of synthetic petrochemical fertilizers and pesticides, plant growth regulators such as hormones, antibiotic use in livestock, genetically modified organisms, human sewage sludge, and nonmaterial. The agricultural approach emphasizes sustainability, openness, independence, health, and safety.

Organic farming is based on inadequate off-farm inputs and on management practices that reinstate, preserve, and enhance the environment Schrama, et al; (2018). It analyses the whole system used to produce and distribute the product to the consumer. Organic agriculture practices ensure that agricultural products are entirely free of all impurities. Nevertheless, it is sometimes impossible for agricultural activities to avoid pollution from the soil, water, and air.

2.3 Conventional Farming

Conventional farming often also called industrial or high-input agriculture is strongly associated with the Green Revolution. This has sought to massively increase productivity through promoting "modern" farming inputs, high-yielding seed varieties and hybrids, chemical fertilizers and pesticides, and a big focus on irrigation Kilby (2019).

A crop can be classified as conventional if synthetic chemicals are used to maintain the plants. A significant amount of chemical and energy input is required in conventional agriculture to produce the highest possible yield of crops. The goal of conventional agriculture is to ensure a high level of crop yield through the application of synthetic chemicals, the use of genetically modified organisms, and other industrial products Patel, and Champaneri, (2020). In upholding a conventional system, biodiversity, soil fertility, and ecosystems health are compromised Kazimierczak, et al; (2019)

Maintenance is made easy for farmers as conventional farming typically involves mono cropping, but is also very expensive. In a conventional system, farmers will designate entire fields to just one crop, which creates uniformity. Uniformity can determine both the success and failure of conventional systems. According to Gabriel, et al; (2013). A uniform crop is ideal because it reduces labor costs and makes harvesting easy, but it can also impact biodiversity and make crops susceptible to pathogens

In a conventional system, farmers can apply pesticides and herbicides to crops at a much more efficient rate if they are made up of just one type of plant, but this has several unintended consequences. Bourn et al., (2002) noted that the goal of conventional agriculture is to maximize yields; environmental health and biodiversity are usually not preserved

2.4. Comparison of Organic and Conventional Farming.

In a comparison of organic and conventional farming, there are numerous areas of focus; biodiversity, production, soil composition, erosion, water use, energy use, and greenhouse gas emissions. The environmental impact and production levels of each method will determine its overall viability as a solution to growing trends. It is necessary to make these comparisons to

identify the best agricultural method that can sustainably meet the needs of the current population. Although these comparisons are based on technical data, there is much more research that needs to be done to make a conclusive judgment.

To serve the demands of the current population requires a remarkable number of resources. Not taking into account the environmental damage associated with intense production, conventional agriculture is a feasible way to provide for more people; "population growth and increasing consumption of calorie- and meat-intensive diets are expected to roughly double human food demand by 2050" Mueller, et al; (2012). In addressing this rapid growth, production levels become a serious point of comparison. "Organic yields are globally on average 25% lower than conventional yields according to a recent meta-analysis, although this varies with crop types and species and depends on the comparability of farming systems" Gabriel, et al (2013). Most research indicates that organic crops produce much less than conventional systems.

Organic agriculture is associated with many environmental benefits, but its production capacity is limited. In general, organic agriculture fails to match up to conventional agriculture in terms of production. This result varies though, and in some instances, organic crops are the best conventional crops. For example, under drought conditions organic crops tend to produce higher yields because they typically retain more water; "As part of the Rodale Institute Farming System Trial from 1981 to 2002, Pimentel *et al.*, (2005) found that during 1999, a year of extreme drought, (with total rainfall between April and August of 224 mm, compared with an average of 500 mm) the organic animal system had significantly higher corn yield (1,511 kg per ha) than either organic legume (412 kg per ha) or the conventional (1,100 kg per ha)" Gomiero, et al (2011). Although certain conditions may favour organic crops, conventional agriculture is designed to produce the highest yields possible.

Many factors contribute to this difference in production. Conventional crops are designed specifically to produce maximal yields; therefore, the difference should be expected. Typically, conventional crops are genetically modified to perform better under certain conditions than organic crops Carpenter (2011). However, these crops are also sprayed with toxic pesticides and herbicides to make up for their uniformity. Some research has been done to determine whether increased biodiversity is related to increased yields; "…farmland biodiversity is typically negatively related to crop yield; generally, organic farming *per se* does not have an effect other than via reducing yields and therefore increasing biodiversity" Gabriel, et al (2013). Although levels of production are reduced in organic agriculture, studies show that higher levels of biodiversity are related to healthier crops.

Biodiversity plays a prime part in this comparison because it is a determinant of agricultural health and performance. The greater the biodiversity, the more immune plants are to pests and disease Gomiero, et al (2011). This is important to highlight because conventional agriculture discourages biodiversity and instead relies on synthetic chemicals to maintain crop health. Over 940 million pounds of pesticides are being applied annually with only 10% of that reaching the desired target, a number that could be greatly reduced if conventional agriculture were to implement organic alternatives. Practices such as integrated pest management and intercropping could be applied to conventional systems and in turn promote biodiversity Knapp and van der Heijden, (2018)

High biodiversity is important to organic farming because it enhances the performance of the ecological cycles that the crops depend upon. Organic agricultural systems are typically much richer in nutrients and diverse in organisms than conventional systems; "…organic farming is usually associated with a significantly higher level of biological activity, represented by bacteria, fungi, springtails, mites, and earthworms, due to its versatile crop rotations, reduced applications of nutrients, and the ban on pesticides." Gomiero, et al; (2011). It is important to encourage high nutrient levels and biodiversity as these two factors contribute significantly to the health of the crops and the landscape. Altieri (2010) revealed that although biodiversity does not directly regulate crop yield, it does play a major role in the health and permanence of organic farms

Despite the impacts conventional methods have on agricultural land, not all conventional farms degrade biodiversity. There are many ways farmers can reduce the number of chemicals and energy they use by implementing low input alternatives; "Overall, the review finds that currently commercialized hereditarily modified crops have reduced the impacts of agriculture on biodiversity, through enhanced adoption of conservation tillage practices, reduction of insecticide use and use of more environmentally herbicides and increasing yields to alleviate pressure to convert additional land into agricultural use" (Carpenter 2011). The global impact agriculture has can be significantly reduced if conventional farmers adopt organic practices.

In addition to higher levels of biodiversity, organic farming improves soil quality. Organic farms have stronger soil ecology because they stimulate biodiversity rather than uniformity; "The results confirm that higher levels of total and organic carbon, total nutrient and soluble organic carbon are observed in all of the organic soil" Barral et al; (2015). The increased concentrations of these nutrients can be contributed to the depth of the food web and the amount of biomass in organic systems. "In a seven-year experiment in Italy, Marinari et al. (2006) com-

pared two adjacent farms, one organic and one conventional, and found that the fields under organic management showed significantly better soil nutritional and microbiological conditions; with an increased level of total nitrogen, nitrate and available phosphorus, and an increased microbial biomass content, and enzymatic activities. Organic crops are more enduring than conventional crops because they are adaptive to the landscape rather than drain it of nutrients and biomass.

Soil management is vital for existing farms because agricultural production is increasing globally and land is becoming less available to accommodate this growth. Conventional systems can improve soil quality by practicing organic methods like no-tillage farming, agroforestry, and integrated pest management, but organic agriculture is the most effective form of food production in terms of maintaining soil conditions. "Establishing trees on agricultural land can help to mitigate many of the negative impacts of agriculture, for example by regulating soil, water, and air quality, supporting biodiversity, reducing inputs by natural regulation of pests and more efficient nutrient cycling, and by modifying local and global climates" Smith, et al., (2012). Again, research shows that an increase in biodiversity and a reduction of chemical input can result in conventional farms with more healthy soils and improved crop performance.

A major problem concerning agriculture is soil erosion caused by nutrient loss, run-off, salinity, and drought. Soil erosion presents a threat to the growth of agriculture because, "Intensive farming exacerbates these phenomena, which are frightening the future sustainability of crop production on a global scale, especially under extreme climatic events such as droughts". Organic systems enhance soil composition as well as prevent soil erosion due to the greater amount of plant material and biomass in the soil. Conventional systems manipulate the landscape rather than adapt to it; "…soils under organic management showed <75% soil loss compared to the supreme tolerance value in the region (the maximum rate of soil erosion that can occur without compromising long-term crop productivity or environmental quality −11.2 t ha^{-1} yr^{-1}), while in conventional soil a rate of soil loss three times the maximum tolerance value was recorded". Compared to organic farming, conventional crops are inefficient at upholding the integrity of agricultural landscapes. Conventional agriculture is, therefore, unable to meet the demands of the growing populations without consuming a substantial amount of land and non-renewable Gomiero, et al (2011).

Globally, water is a renewable resource that can serve the needs of our current population locally, however, water is a scarce resource and must be appropriated efficiently. The amount of

freshwater available for consumption globally is small, but regional constraints make accessing that water even more hard for many millions of people.

Organic soil typically retains much more water than conventional soil. This is due to the abundance of flora and fauna in organic systems, this increased retention rate enables organic agricultural systems to produce much higher yields than conventional systems during drought conditions. Arden-Clarke and Hodges, (1988) cited by Gomiero, et al (2011). This is a desirable characteristic in agricultural land as it allows crops to be more tolerable to changing climate. "In heavy loess soils in a temperate climate in Switzerland water holding capacity was reported being 20 to 40% higher in organically managed soils than in conventional ones. The primary reason for higher yield in organic crops is thought to be due to the higher water-holding capacity of the soils under organic management" Seufert, et al (2012). To manage available water resources, organic agriculture is the more efficient approach to feeding the world.

A gap exists between current production rates and potential production rates of crops. Through better management of water and soil, much greater yields can be produced. Increasing efficiency to 100% is not entirely feasible, but implementing organic farming practices would conserve resources and improve crop performance; "Globally, we find that closing yield gaps to 100% of attainable yields could increase worldwide crop production by 45% to 70% for most major crops (with 64%, 71% and 47% increases for maize, wheat, and rice, respectively)" Mueller, et al (2012). Meeting future food demands is a dynamic problem that requires consideration of all things, but most importantly water and soil conservation.

Organic agriculture depends mostly on natural processes for input and recycles nutrients onsite to eliminate the use of non-renewable resources. Otherwise, conventional agriculture requires an incredible amount of energy to produce, prepare, and transport food. Energy efficiency is important to agriculture as it can decrease greenhouse gas emissions and lower costs of production; "Agricultural activities (not including forest conversion) account for approximately 5% of anthropogenic emissions of CO_2 and the 10–12% of total global anthropogenic emissions of greenhouse gases (5.1 to 6.1 Gt CO_2 eq. yr^{-1} in 2005), accounting for nearly all the anthropogenic methane and one to two-thirds of all anthropogenic nitrous oxide emissions are due to agricultural activities.". Agriculture is responsible for a significant percentage of greenhouse gas emissions, but can also mitigate this impact using organic methods. Better management of agricultural land is required to reduce the effects of crop production (Nordin, and Nordin, 2017).

Organic agriculture can offset global greenhouse emissions at a greater rate than conventional agriculture because it is more permanent and does not require much input to produce food. Conventional systems are inefficient at capturing carbon because of soil composition, constant production, and how much energy is being used to maintain the crops. "We use so much machinery, pesticides, irrigation, processing, and transportation that for every calorie that comes to the table, 10 calories or energy have been expended." However, some measures can be taken to increase energy efficiency. "This carbon can be stored in as organic matter and by aboveground biomass through processes such as adopting rotations with cover crops and green manures to increase soil organic matter, agroforestry, and conservation-tillage systems." Muller, et al; (2017).

2.5 Bananas growing in Uganda

Banana (*Musa sp; family: Musaceae*) is the most popular commercial soft fruit crop grown in equatorial and subtropical regions of the world and also serves as a staple food since the dawn of recorded history in many countries (FAO, 2012). It has bounties of significance to human beings and is one of the fourth most important food in the world after rice, wheat, and maize. Musa species grow in a wide range of environments ranging from the edible bananas and plantains of the tropics to cold-hardy fiber and ornamental plants. They thrive well in an average annual temperature of 20°C and well-distributed rainfall of 200 cm per year (Shankar, et al; 2016) quoting Simmonds, (1959); Wardlaw, (1961).

Banana is a large, perennial, monocotyledonous herb 2-9 m in height that arises from large, subterranean rhizomes called 'corms. Musa fruits are variable in size, shape, and colour. They are generally elongate cylindrically, straight to strongly curved, 7-40 cm long, and2-8 cm in diameter. The fruit apex is an important attribute in variety identification.

In Uganda, bananas occupy the largest cultivated area among staple food crops and are primarily grown on small subsistence farms (plots of less than 0.5 ha). In addition to being a major staple food, bananas are an important source of income, with excess production sold in local markets. The average per capita annual consumption of bananas in Uganda is the highest in the world, estimated at close to 1kg per person per day. Bananas are consumed as fruit; prepared by cooking, roasting, or drying, and fermented for the production of banana juice and alcoholic beverages in form of beer, wine, and gin (Kaur et al., 2019).

Most of the banana varieties grown in Uganda are indigenous to the East African highlands a region recognized as a secondary centre of banana diversity. The East African highland banana

is a unique genomic group, selected over the centuries by farmers. As many as 84 distinct varieties of endemic East African highland bananas, classified into five clone sets, are grown by farmers in the region. In addition; several unimproved, exotic banana varieties from Southeast Asia and a few recently developed hybrids are also locally grown. Differences between endemic and non-endemic varieties are associated with differences in observable characteristics, genome, and common use, but not with improvement status (Gafuma, and Bazirake, 2018).

The biological diversity of bananas in Uganda is understood at the taxonomic levels of the genomic group, use group, and variety. This diversity is impressive at all geographical scales of analysis the household farm, the village, and the region. Although banana specialists in East Africa have long made this observation, the sample survey accepted as part of the research described here establishes this fact statistically for the major banana-growing regions of the country.

There are three main groups of banana plants in Uganda;

a) The East African Highland Banana; is the most dominant in Uganda and includes the cooking type (Matooke) and the brewing type (*middle*) and these two types are physically similar.
b) The plantains**;** like; Gonja that are mostly grown in the highlands like Kasese however the crop is not widely grown and is eaten roasted.
c) The cultivars of the East African coast; include the edible (*Sukalindizi)* dessert banana eaten ripe, *kisubi* a brewing type, *kayinja* also a brewing type and*kivuvu* a cooking and brewing type.

Many products come from bananas including the following; factory or locally processed (*waragi)*, locally processed banana wine (*tonto*), Roasting Banana plantain (*Gonj*a), Pancakes (*Kabalagala*), Banana juice, Banana flavourings/essences, Cosmetics use in body soap products, replacement flour in bakery products, banana flour used as a constituent in baby/weaning food. The banana plant has many uses namely; suckers for replanting, fibers as a roofing material, making mats, ropes for making baskets, mats, art pieces, and other crafts, fibers, and leaves are used as wrapping materials. The leaves are used for cooking and among other uses; stems and leaves as crop residues are used for mulching the plantation, thatching shelters, and can as well be used as animal food during the dry seasons.

2.6 Organic Farming practices

2.6.1 Use of cover crops

A cover crop planted during a fallow period to provide ecosystem benefits may include soil cover to reduce soil erosion, inputs to soil organic carbon, weed suppression, nutrient retention, and pollinator benefits Archer, et al (2018). Cover crops are either annual, biennial or perennial herbaceous plants grown in a pure or diverse stand during all or part of the year. Cover crop cultivation can improve crop yield, soil, and environmental quality. Cover crops are multifunctional and contribute to soil quality by improving soil physical, chemical, and biological properties. The crops also enhance organic matter and increase nutrient release, suppress weeds, and control pests, thus, the inclusion of cover crops provides extra opportunities to increase the yield of lower intensity production systems and contribute to ecological strengthening.

2.6.2 Farmyard Manures

Farmyard manure is a varying mixture of animal manure, urine, bedding material, fodder residues, and other components is the most common form of organic manure Mahmood, F et al; (2017). Farmyard manure has a high proportion of organic material which nurtures soil organisms and is essential in maintaining active soil life Animal manure can be pelleted (or granularized) using various processes such as die and roller, extruder or granulator, alone or in combination with other organic or inorganic additives, binding agents, or synthetic fertilizer. Manure application for food and feed production provides immediate and delayed nutrient supply, modifies soil pH, improves soil structure, and enhances soil biological activity.

Farmyard manure is a valuable soil improver that enhances and restores a range of natural properties of the soil. Related to this Järvan et al (2017) reported that farmyard manure is one of the more valuable organic fertilizers maintaining soil fertility in the systems of alternative agriculture. Maintenance and improvement of soil potential fertility are closely related to the maintenance of soil organic matter and organic carbon balance. However, farmers should have the soil verified before adding either raw composted or manures.

2.6.3 Weed Management.

Rana and Rana (2016) quoting Crafts and Robbins, (1973) defined weeds as those plants which are out of place, unwanted, non-useful, often prolific and persistent, competitive, harmful, even poisonous which interfere with agricultural operation, increase labour, add to costs, reduce yields and detract from comforts of life.

Weed management is the combination of the techniques of prevention, eradication, and control to manage weeds in a crop, cropping system, or environment including crop rotations, removing weeds before seed set and reproduction, and not allowing weeds onto the farm, can also be used to reduce weed populations. Mulches help suppress weeds by preventing light from reaching them or by drastically decreasing the amount or quality of light reaching the weed seed or leaf. Certain mulches with naturally occurring chemicals can help prevent the sprouting of weed seeds Bhatt et al (2017).

2.6.4 Pest Management.

Maintaining an ecological balance is the chief goal under the organic system instead of the complete eradication of pests. Ecological balance is maintained through the use of beneficial insects, predatory or parasitic mites, and spiders to keep pest populations down. "Beneficial" insects include lady beetles and various wasps, as well as certain nematodes that are used for insect control Tooker, et al; (2020). Where severe infestations occur, farmers use harmless pesticides that are not as harsh as conventional pesticides. These non-toxic pesticides include soaps, pheromones (used as bait for traps and to disrupt mating cycles), botanical plant extracts such as neem, and sulphur for control of foliar diseases Van Bruggen, e tal (2016).

2.6.5 Mulching

Mulching is a soil and water-conserving and weed management practice through soil solarisation also in which any suitable material is used to spread over the ground between rows of crops or around the tree trunks. This practice helps to retain soil moisture, prevents weed growth, and enhances soil structure. There are various types of mulching such as surface mulching, vertical mulching, polythene mulching, pebble mulching, dust mulching live vegetative barriers, straw mulching Prosdocimi et al (2016). Mulching has demonstrated efficacy to enhance soil health by reducing evaporation, increasing moisture retention, regulating temperature, enhancing nutrient availability and root absorption, suppressing weeds, decreasing salinity, encouraging biological activity, and controlling crop pests and diseases. Organic mulch materials are is commonly used in arable systems to improve soil health, but the use of inorganic plastic mulch has gained global importance in recent decades. Nonetheless, the extensive use of inorganic plastic mulch can cause a series of soil and environmental effects that may affect agricultural productivity and jeopardise sustainable development Ngosong, et al; (2019).

However, these results were in characterisation of organic farming practices, and less is being written about their influence concerning terrain, therefore this study will be significant in finding out which organic farming practices are employed on which terrain and why.

2.6.6 Use of crop residues

Crop residues are valuable assets for sustainable management in cropping systems. Residues offer the following; a physical barrier against soil erosion (wind or water), a way to manage greenhouse gas emissions, retention of soil moisture at the soil surface; prevention of germination of weeds, snow catchment, and a source of photosynthesized carbon and soil organic matter Mehra et al;2018 Therefore, effective distribution of crop residues and correct incorporation of them can greatly benefit not only soil biological activities but also can improve soil structure, water infiltration, and workability of the soil and protect it from soil erosion and compaction. Studies by Sparks, (2012) also emphasized the importance of Crop residues in building soil organic matter, nutrient recycling, and improving the soil physical environment. He further notes that, the long-term sustainability of a cropping system depends on its carbon inputs, outputs, and carbon-use efficiency. Incorporation of crop residues into soil is known to improve soil structure, reduce bulk density, and increase the porosity and infiltration rate of soil

2.7 Factors influencing the adoption of organic farming practices

According to Levisohn et al. (2013), farmers' decisions about whether and how to adopt new technology are conditioned by the dynamic interaction between the characteristics of the technology itself and the array of conditions and circumstances. Diffusion itself results from a series of individual decisions to begin using the new technology, decisions which are often the result of a comparison of the uncertain benefits of the new invention with the uncertain costs of adopting it. Hall and Khan, (2002) noted that an understanding of the factors influencing this choice is essential both for economists studying the determinants of growth and for the generators and disseminators of such technologies

2.7.1 Socio-Economic factors.

The social-economic factors that significantly affect the adoption of organic farming practices include education of farmers, household family size, farmers' experience, and economic conditions of the farmers' household as discussed below;

2.7.1.1 Age

Age is also assumed to be a determinant of the adoption of new technology. Older farmers are assumed to have gained knowledge and practice over time and are better able to evaluate

technical information than younger farmers (Kariyasa and Dewi 2011). On the contrary, age has been found to have a negative relationship with the adoption of technology. This relationship is explained by Adesina and Zinnah (1993) that as farmers grow older, there is an increase in risk aversion and a decreased interest in long-term investment in the farm. On the other hand, younger farmers are typically less risk-averse and are more willing to try new technologies. For instance, Alexander and Van Mellor (2005) found that adoption of genetically modified maize increased with age for younger farmers as they gain experience and increase their stock of human capital but declines with age for those farmers closer to retirement.

2.7.1.2 Gender

Gender issues in agricultural technology adoption have been investigated for a long time and most studies have reported mixed evidence regarding the different roles men and women play in technology adoption. In analysing the impact of gender on technology adoption, Morris and (Doss 1999) had found no significant association between gender and probability to adopt improved maize in Ghana. They concluded that technology adoption choices depend primarily on access to resources, rather than on gender and if the adoption of improved maize depends on access to land, labour, or other resources, and if in a particular context man tend to have better access to these resources than women, then in that context the technologies will not benefit men and women equally.

On the other hand, gender may have a significant influence on some technologies. Gender affects technology adoption since the head of the household is the primary decision-maker and men have more access to land control over vital production resources than women due to socio-cultural values and norms as noted by (Omonona et al.,2006); Mignouna et al., (2011). Furthermore, a study by Obisesan (2014) on the adoption of technology found that gender had a significant and positive influence on the adoption of improved cassava production in Nigeria.

2.7.1.3 Marital Status

Married farmers benefit from increased productivity and the efficiency of the household through couples' specialization in specific skills and duties. The second is that the total product of a married couple is larger than the sum of the outputs of each produced separately. The third is that the requirements and expectations of married (versus single) life may encourage people to buy a house, save for children's education, and acquire cars and other assets.

Several studies have shown that marriage has a large effect on reducing the risk of poverty. They show that unmarried individuals and single-parent families are more likely to live in pov-

erty than their married counterparts Anyanwu (2014) quoting Blank, 1997; Furstenberg, 1990; White and Rogers, 2000). This is because, compared to unmarried couples, married people save much higher portions of their income and accumulate more assets. Consequently, married couple households engage significantly in organised farming than other types of households.
In addition, married couples may be more easily able to draw on relatives for help in difficult situations like the need for labour to engage in agriculture.

2.7.1.4 Household size.

Labour is an important constraint in the adoption of new technologies particularly those technologies that are labour-intensive. Using a binary logit, Palacios-Lopez (2015) found that the proportion of household members accessible to provide labour positively influenced the adoption of soil fertility management practices. Due to the high labour demand for applying animal manure, households with a high number of members working on the farm are more effective since household labour is the most important source of labour supply for smallholder households, given that low incomes pressure hiring labour. Moreover, there are moral hazards associated with hired labour calling for considerable supervision which raises the real cost of household labour beyond the observed wage rate. Therefore, lack of adequate labour accompanied by the inability to hire labour can seriously hinder participation in soil fertility management practices.

2.7.1.5 Education level

According to Salaya et al; (2007); the level of education of the farmer influences the degree to which a peasant farmer would adopt new technologies. He adds that formal education provides important general knowledge which when added with practical skills acquired through specialized training, forms the essential foundation for farming. For example, education and human capital grants affect the adoption of such technologies in different ways. First, it enhances the likelihood of farmers perceiving resource degradation as a problem. Second, it increases the likelihood of farmers obtaining and process information about a technology that can solve the problem by increasing their managerial ability.

Nabalegwa et al., (2019) quoting IFPRI (2004) indicated that households who are poor in terms of access to education invest less in most inputs and land management technologies. This is in agreement with Chaduri (1975) who found that variations in cropping systems in India were a result of differences in education. On the other hand, advanced levels of education under certain conditions may raise the opportunity cost of family labour in agriculture and allocates it into other activities that offer higher returns, (for example migration and non-

agricultural wage employment) Shiferaw et al., (2006). This means that in certain cases if people are educated, they will abandon farming except they can earn an adequate income from it to justify the expense of their training.

2.7.1.6 Off-farm employment opportunities.

An interesting relationship is the effect of off-farm and non-farm employment on the adoption and adaptation of sustainable and organic farming interventions. The empirical findings are mixed (Holden et al., 2004; Pender and Kerr, (1998); Reardon and Vosti, (1997). In the case of parts of the Ethiopian highlands where on-farm gains to family labour are low, (Holden et al. 2004) showed that increased availability of opportunities for off-farm employment had a positive effect on household welfare which negatively affected organic farming investments.

The reasons that are always given in the literature for the negative outcome are, first, under some situations, household workers face higher opportunity costs and prefer to allocate family labour into off-farm activities, where it fetches higher returns than on-farm organic farming. Second, off-farm employment often directly overlaps with season conservation activities and reduces the labour available for the adoption and maintenance of conservation practices. Therefore, when opportunities for off-farm employment exist, they not only affect the decision to adopt conservation technologies but also the degree of adoption as well as the maintenance of conservation structures once they are in place (Pender et al., 2004).

2.7.2 Institutional factors

Institutional factors that significantly affect the use of organic farming are not only limited to social belonging, access to extension services, (Knowledge access and acquisition, Social grouping, land tenure, and access to credit as discussed below;

2.7.2.1 Social Groupings.

Belonging to a social group enhances social capital allowing trust, ideas, and information exchange Mignouna et al., (2011). Farmers within a social group learn from each other the benefits and usage of new technology, social network effects are important for individual decisions, and that, in the particular context of agricultural innovations, farmers share information and learn from each other. Bekuma, et al; (2018) quoting Katungi and Akankwasa (2010) studied the effect of a community-based organization in the adoption of corm-paired banana technology in Uganda, found that farmers who participated more in community-based organizations were likely to engage in social learning about the technology hence raising their likelihood to adopt the technologies.

2.7.2.2 Agricultural Extension Services.

Agricultural extension models can take several forms. The most common approaches are training and visit, farmer field schools, and fee-for-service. In the training and visit approach, specialists and field staff provide technical information and village visits to selected communities. In many cases, the field agents train and work directly with "contact farmers", or farmers who have successfully adopted new technologies and can train others. Farm field schools were specifically designed to diffuse integrated pest management methods in Asia, they also utilize contact farmers, relying on participatory training methods that build farmer capacities. The fee-for-service extension comprises both public and private initiatives with some public funding. In these programs, farmer groups contract extension agents with specific information and service request Anderson et al; (2007).

Contact with extension services gives farmers access to information on innovations, advice on inputs and their use, and management of technologies Menale *et al*., (2009). In most cases, extension workers establish demonstration plots where farmers get hands-on experience and experiment with new farm technologies. Consequently, access to extension is often used as an indicator of access to data Adesina *et al*., (2000). Acquisition of information about new technology is another factor that controls the adoption of technology. It enables farmers to learn the existence as well as the effective use of technology and this facilitates its adoption. Farmers will only adopt the technology they are aware of or have heard about it. Whereas access to information reduces the uncertainty about a technology's performance hence may change an individual's valuation from purely subjective to objective over time Bonabana-Wabbi, (2002). However, access to information about technology does not necessarily mean it will be adopted by all farmers. This simply implies that farmers may observe the technology and subjectively evaluate it differently than scientists.

2.7.2.3 Access to Credit

It is believed that access to credit promotes the adoption of risky technologies through relaxation of the liquidity constraint as well as through the boosting of households risk-bearing ability Simtowe and Zeller, (2006). This is because, with an option of borrowing, a household can do away with risk-reducing but inefficient income diversification strategies and concentrate on more risky but efficient investments. However, access to credit is gender-biased in some countries where female-headed households are discriminated against by credit institutions, and as such they are unable to finance yield-raising technologies, leading to low adoption rates Muzari et al., (2013).

There is, therefore, a need for policymakers to improve current smallholder credit systems to ensure that a wider spectrum of smallholders can have access to credit, more especially female-headed households Simtowe and Zeller, (2006). This may, in certain cases, necessitate designing credit packages that are tailored to meet the needs of specific target groups (Muzari et al., 2013). For instance, in Kenya, the government has started a program that offers free interest loans to youths and women (UWEZO fund). This will help empower women and enable them to adopt agricultural technologies hence enhancing economic growth.

Several studies have examined the factors influencing adoption of the organic practices among farmers in various cropping systems in Uganda with minimal emphasis on the smallholder in the banana cropping system. There was, therefore, a need for a comprehensive assessment of the influence of the socio-economic and institutional factors among banana farmers in Kajara County.

2.8 Conceptual Framework

The conceptual framework for this study shows the link between population increase, land utilisation, and factors influencing the adoption of organic farming practices shown in Figure 2.1.
From this figure, it is hypothesized that increased population growth rates impact hilly landscapes of inadequate land leading to continuous tilling to be able to meet the food requirements. This results in unsustainable farming practices that pre-empt smallholder farmers either to take on organic farming practices to ensure increased production.
The choice of farming is influenced by both institutional factors like social groupings, extension services, credit access and socio-economic factors such as age, household size, level of education, accessibility to markets, off-farm employment opportunities which make people either adopt or not to adopt the organic farming practices. Adoption of organic farming practices would lead to high farm productivity, food security, and increased household incomes whereas the farmers that adopt conventional practices incur considerable straight and indirect costs due to heavy reliance on chemical fertilizers with detrimental effects on soil health, human health, and the ecosystem at large and food insecurity in the long run.
To address the challenges farmer have been encouraged by stakeholders to join farming social groups, and leaders focus on training and motivation practices through farm extension services, improving access to markets, and improving social-economic infrastructure.

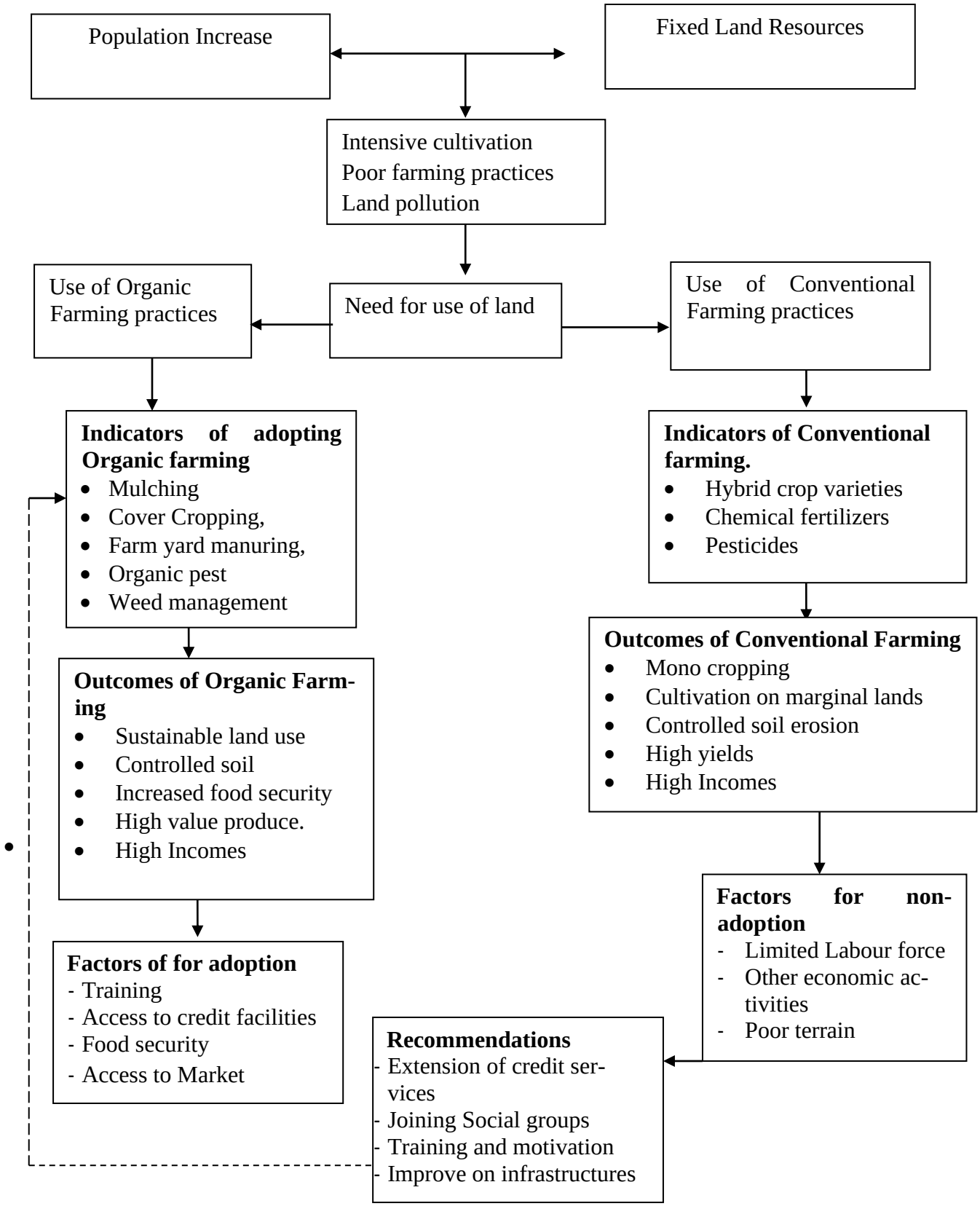

Figure 2. 1 Conceptual framework

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter focuses on research design and methodology, therefore, has the following sub-topics; Research design, study location, target population, sample and sampling procedure, research instruments, validity and reliability, the procedure for data collection, data analysis, and ethical consideration.

3.2 Description of the Study area

Description of the study area included a description of the location, climate, relief, drainage, vegetation, soils, land use activities, population, and ethnicity.

3.2.1 Location

The study was carried out in one of the four counties of Ntungamo district in South Western Uganda. Kajara County is located on the west of Ntungamo town by road, on the all-weather highway between Ntungamo, Rukungiri, and Mitooma districts which passes through the centre of Kagarama town and Nyamunuka - Kahengye town councils and North -West direction as shown in

Kajara county was purposively selected because banana is a major food crop for most households followed by other crops such as beans, sweet potatoes, cassava, millet, sorghum (Ntungamo District Local Government 2015). Moreover, empirical evidence shows Kajara county has the largest area under banana production (URT,2003)

The specific study areas selected were the villages of Kacuragyenyi, Nyabikiri, Kagorogoro, Karuka of Nyabubare parish, Karama, Kiina, Nyarubira, Bituntu in Rwanda parish in Bwongyera Sub County and Omurutu, Kinyamoozi, Nyampikye, Nyamatongo, Bitokozi, and Kyabugimbi in Kitondo parish and villages of Katunga East, Kitojo, Namirembe, Kyamajumba and Kyenkuku in Butanda parish in Ihunga Sub County where banana-growing specifically where organic farming practices are evident.

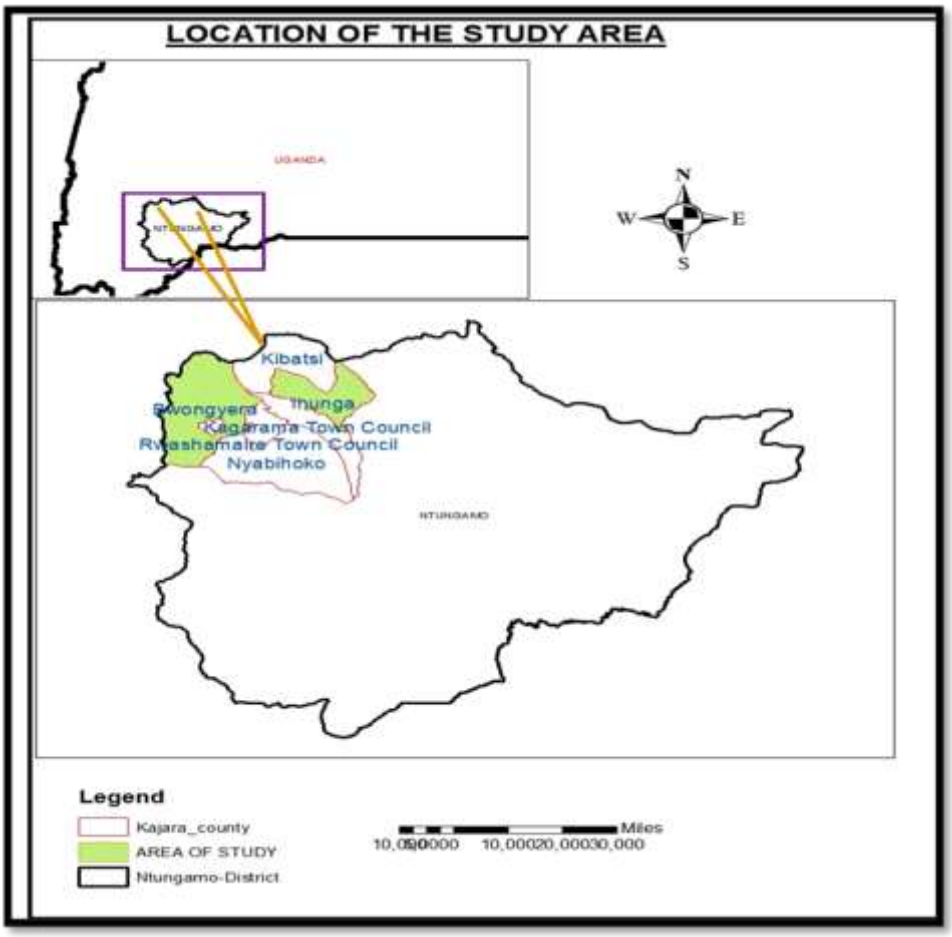

Figure 3. 1: Location of Kajara County.

3.2.2 Climate

The study area is located in the Ankole-South Uganda Climatic Zone. The rainfall received is mainly convectional and averages about 900mm per annum. Two rainfall regimes are associated with the equatorial trough; one season begins in March to May and the other in August to November which is the largest. Two dry seasons occur, with a pronounced one in June-July and a less severe one and often interrupted by scattered showers between December and February. However, as evidenced from the table below; rainfall levels have generally decreased since 2002; a pattern that is attributed to increasing environmental degradation. The trend has significant implications for current farming practices undertaken in the area.

The study area experiences a mean annual temperature of 26^{o}c and a mean annual minimum of 14.5^{0}C. High temperatures are recorded in January – February and June- August which correspond to dry spells. The relative humidity ranges from 93 - 85% in the morning and decreases to 60 - 45% in the afternoon depending on the time of the year and other weather conditions occurring at that particular time. There is an average of 5-7 hours of sunshine daily. Maximum

hours occur in June reaching 7 hours that in turn induces high evaporation. Relative humidity ranges between 80 - 90% in the morning and decreases to between 61- 66% percent in the afternoons during January and May.

The long-term wind speed records from the East African Meteorological Department (1975) indicate average annual wind speeds of 3 knots and 5 knots at 0600 hours and 1200 hours. The wind speed values indicated, therefore, represent conditions of moderate to strong or turbulent conditions. The average number of calms experienced in the area are indicated to be experienced for 99days at 0600 hours, and 27 days at 1200 hours, respectively. The general conclusion from these climatic figures is that for most of the year, Kajara experiences moderate to strong and gusty winds, increasing in the afternoon.

3.2.3 Relief

Kajara County forms part of the plateau whereby the physiographic area is characterized by highlands, flatlands, and valleys with underlying impervious rocks. The county is deeply incised in some areas within the rift ward drainage. The rise from the central region to the western parts represents a long and continued deformation of the plateau by warping. This area has been dissected by rejuvenated drainage on a gently undulating surface as seen in figure 3.2.

3.2.4 Drainage

Kajara County is well endowed with water resources and has reliable underground aquifers which have the potential for providing water for human consumption and agricultural use though sustainability is being cast in doubt due to greater demands, due to population growth, and more modern activities which require more water. The amount of water sources that can be protected is nearing capacity resulting in some protected water supplies drying for part of the year. Rainwater harvesting and other water conservation techniques are necessary to sustain the water cycle in the wake of increasing temperature rise and rainfall reduction.

The more pronounced natural water resources in the area include; Lakes Nyabihoko (Karengye) and Nyakiyanja adjacent to each other at the boundary of Rushenyi and Kajara counties.

Kasharara - Nyamugoye - Kahengye River: This River forms a boundary between Ntungamo and Rukungiri District (The name of the river changes at different points depending on the geographical location).

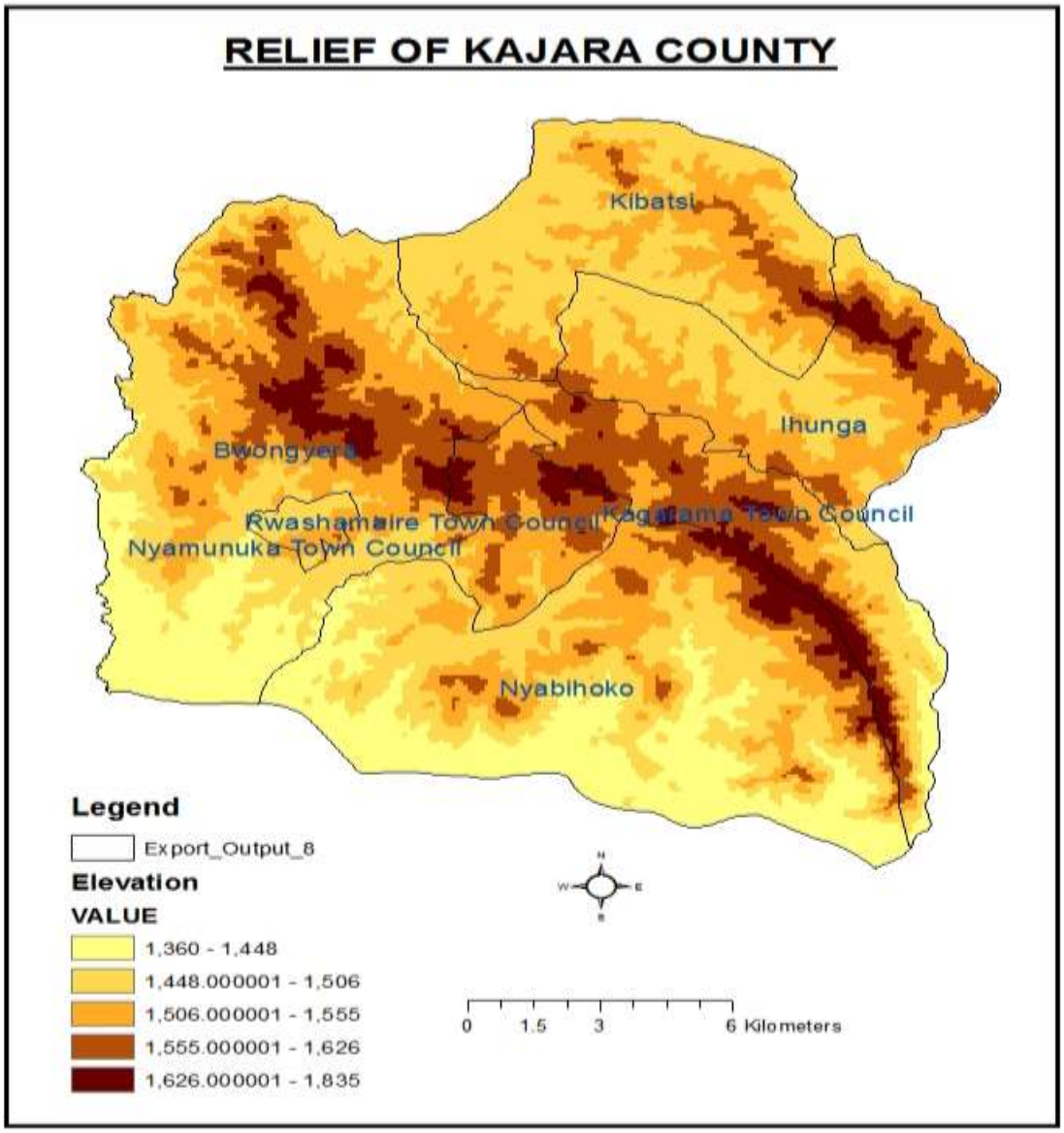

Figure 3. 2: Relief map of Kajara County.

3.2.5 Vegetation

The vegetation in the study can be broadly classified into three types namely Grassland Savannah, characterised by scattered shrubs that range from 2-5m in height, grasslands with trees of open canopy that range in height from 4-12 meters Wooded savannah is disappearing at a high rate due to charcoal burning, overgrazing and wetland conversion. Cultivated vegetation includes bananas, coffee, fruit trees, cassava, eucalyptus, and pine.

3.2.6 Geology and Soils

Soils are diverse and are subjective to several factors such as parent rock, age of formation, and climate especially the amount of moisture and its fluctuations during the process of weathering. These soils belong to the Karagwe-Ankolean system. They are indeed very old and are in their

last stages of development with very few mineral reserves left. Their productivity, therefore, depends on the nutrient recycling propagated by the vegetation cover and its rooting system and are generally classified as soils of low to medium productivity; supporting few perennial crops like coffee, bananas, and other annual crops where they are low in productivity.

Dominant soil types are reddish clay loams, shallow, dark-brown, sandy loams, yellowish-red clay loams, podsolised black sandy loams, stony loams, and sandy to plastic clays which are hydromorphic, derived from the weathering of KA phyllites, Karagwe Ankolean schist's, sandstone and quartzite, granites and hydromorphic/alluvial soils in areas under permanent waterlogged or impeded drainage conditions. The district is endowed with a wide variety of soil types. There are five main soil types as indicated in the table below however, soil types rarely correspond with sub-county boundaries hence one sub-county often has several different soil types.

3.2.7 Land use activities

The main form of land use in Kajara County is crop cultivation and livestock rearing. Crop farming involves mainly food crops such as banana, maize, cassava, sweet potatoes, millet, matooke, beans, soya peas, groundnuts whereas the animals reared under livestock include cattle, goats, sheep, and poultry UBOS (2014. Agricultural production has enabled trade and commerce to flourish in these areas which are also favoured by the location along Rukungiri - Mbarara – Kampala highly way. Kajara County area boasts four town councils with retail shops mainly dealing in food kinds of stuff including diaries. Cultivation of grains like maize and millet has enabled the establishment of grain milling factories in the area.

3.2.8 Population and Ethnicity

According to the National Population and Housing Census (2014) provisional results, Kajara County had a total population of 110,697 people. Results also showed that the distribution as Bwongyera 7,173 households 35,167 people, Ihunga 5,697 households 26,315 people, Kibatsi 4,871 households 19,632people, Nyabihoko 4,387 household 21,895people and Rwashamaire Town Council 1742 households 7,688 people.

The county hosts a rich cultural heritage, consisting of several ethnic groups which include the Banyankole, Bahima, Banyarwanda, and Bakiga. However, the Banyakole form the most dominant ethnic grouping thus the ankole culture reigns over the rest. The main language spoken is Runyankole - Rukiga and the staple food is Matooke (bananas). In terms of religion, the two Sub-Counties host a mixture of religious denominations but the major ones being Catholics and Anglicans in the study area.

3.2 Research Design

This study adopted a cross-sectional research design where data was collected at a single point and time (Bob and Liz 2010). The design was chosen it was cost-effective, less time-consuming and a lot of information is collected in a relatively short time. This cross-sectional design is recommended for this kind of study involving descriptive studies and, more specifically, for studies that analyse the relationships between and among variables. as it sought to provide insights and understanding of the factors influencing the use of organic farming practices among smallholder farmers in Kajara County. This study also tested specific hypotheses and examined relationships between socio-economic and institutional attributes and organic farming practices.

3.4 Area Sample

Field surveys were carried out in Kajara County where two sub-counties, Bwongyera (35,167 people) and Ihunga (26,315 people) were selected, Nyabubare and Rwanda parishes in Bwongyera, Butanda, and Kitondo parishes were considered out of which five villages (V) were selected as indicated in **Figure 3.3**. The parishes villages were purposively selected on basis of having to be highly populated smallholder banana plantations, less urbanised, and presence of organic farming practices in the banana cropping system.

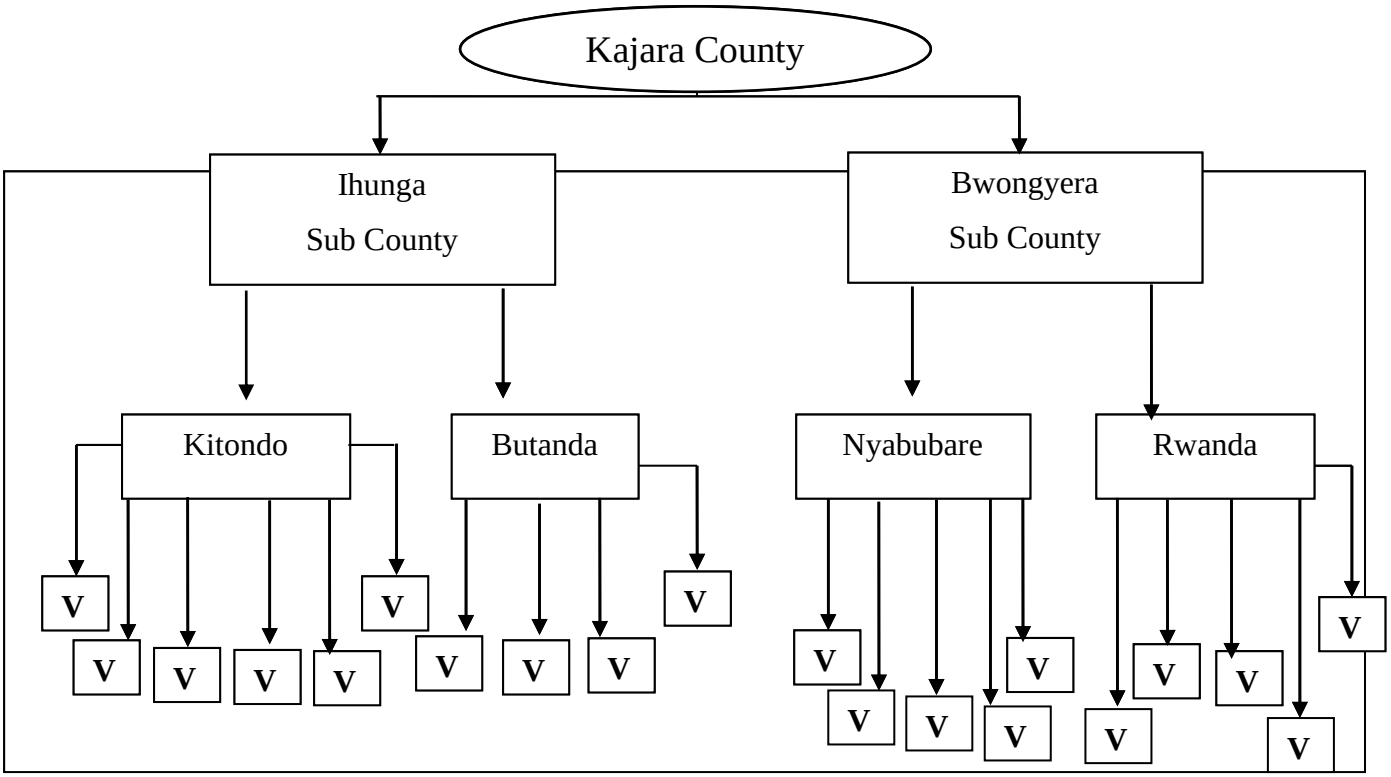

Figure 3:3 Sampling scheme adopted in the study

3.5 Sampling Technique and Sample Size

The study's population included all banana farmers in Kajara county engaged in small-scale banana production. However, to get a representative sample of the above, a multistage sampling technique was adopted whereby purposive sampling was used to select the sub-counties of Ihunga and Bwongyera sub-counties from which four parishes of Nyabubare, Rwanda, Kitondo, and Ihunga were selected based on the availability of organic and non-organic banana growers. The reason for using multistage sampling was to increase research precision by ensuring that key subjects are represented in the sample (Garson 2012). Thereafter, a stratified random sampling technique was used to select six villages, two from each parish

For the case of Ihunga Sub-County, 136 farmers were identified in each village and assigned numbers from 1-136. The farmer who fell in position 1 and any number after two digits was included in the study. Then for the Bwongyera sub-county, 224 farmers were identified in every village and assigned numbers from 1-224, the ones who fell in position 1 and any number after two digits were included in the study thereby ensuring proportionate sampling in the different strata (villages) since Bwongyera Sub-County (35,167 people) is more populated compared to Ihunga Sub- County (26,315) people.

For the sampled household, the head or his representative was interviewed. Therefore, the study covered a total of 363 individuals, of which 3 were key informants (2 Subcounty extension officers and 1 District Agricultural Officer).

3.6 Data collection Methods

Primary data were collected in the field using observation schedules, questionnaires, and interviews as detailed in the sub-sections below.

3.6.1 Observation.

The researcher used the observation method to collect data on the visible aspects of the study that is; materials, plants used in the organic farming practices employed in the banana plantations. Data obtained was recorded referring to the observation checklist (**Appendix D).**

3.6.2 Questionnaires.

The questionnaire method was the main data collection method in this study. It was used to collect data on organic farming practices employed by smallholder farmers and the factors influencing their adoption. The questionnaires were semi-structured and contained several questions from which responses would be indicated by ticking and/or writing short notes (**Appendix B**).

3.6.3 Interview.

The interview method was used to collect data from key informants namely, the District Agricultural Officer, and Sub County Agricultural Extension Officers. It involved a face-to-face interaction between the researcher and the officer on a given matter of discussion with the help of a questionnaire guide. The specific data collected by this method was in line with the organic banana farming practices and the factors affecting their use in the areas under the respondents' jurisdiction (Appendix B). The method was preferred because it enabled the capture of more information from within a short period besides helping to clarify data obtained by other methods. The responses to the questions during interviews were recorded in a field notebook from which it was analysed in line with the farmers' responses.

3.7 Data Analysis

To achieve the study objectives, data obtained by questionnaires were computer coded and analysed using both qualitative and quantitative techniques.

To characterize the dominant organic farming practices employed by smallholder banana farmers, a multivariate analysis was used to code responses obtained from the respondents measured on a nominal scale. It was used to compare the strength of the dependent variables, organic farming practices before they were grouped.

To determine the socio-economic and institutional factors influencing the adoption of organic farming, descriptive summary statistics in form of frequencies and percentages were derived.

Chi-square tests were run to ascertain whether there were significant differences between adopters and non-adopters in terms of their socio-economic and institutional attributes.

3.8 Data Quality control

To attain completeness of the study, the researcher employed various data collection methods and data obtained was thereafter was triangulated.

Data was collected using questionnaires that the researcher and his assistants hand-delivered to the respondents who dully answered before handing them back. This data was also checked by visual inspection of banana plantations where organic farming practices were applied. The responses obtained using questionnaires were also compared with those obtained during key informant interviews.

3.9. Ethical Considerations.

The researcher indicated the purpose of the study on to the questionnaires and also obtained an introduction letter from the Department of Geography and SST which served as an assurance of the information provided by the respondents would be only used for the particular research. The researcher also

3.10 Limitations

The study did not consider the influence of physical factors on the adoption of farming practices. This has been recommended as an area of further study.

CHAPTER FOUR

RESULTS ANALYSIS, PRESENTATION, AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter entails data presentation, interpretation, and discussion of the study findings as in line with the study objectives.

4.2 Characterization of the existing organic farming practices in Kajara County.

The first objective of this study was to identify and dominant characterise the organic farming practices employed by the smallholder banana farmers in Kajara County. Several Organic farming practices were identified in this study and presented in Table 4.1

Table 4.1 Farming Practices and number of banana farmers employing them.

SNo.	**Adoption of organic farming practice**	**Frequency of responses n=357**	**Percent**
	Adopter	224	62.7
	Non-Adopter	133	37.3
	Total	**357**	**100**
SNo	**Farming practice**	**Frequency of responses n=224**	**Percent**
1	Mulching	99	44.0
2	Weed Management	38	16.8
3	Farmyard Manure	34	15.4
4	Pest Management	20	9.0
5	Crop Residues	19	8.7
6	Use of Cover Crops	14	6.2

Source: Field data

Table 4.1 reveals that 44.0% of the respondents were using mulching, 16.8% Weed management, 15.4% Farmyard manure, 9.0% Pest management, 8.7% Crop Residues, and 6.2% Use of cover crops. These results mean that mulching is widely adopted by the small-scale banana farmers in Kajara County. It is important to note that out of the six organic farming practices that were emphasized in the study, crop rotation as an organic farming practice was not being employed by any of the farmers reached during the study given that ananas were perennial plants.

It is also important to note that whereas the total number of smallholder farmers involved in the study was 357 (Table 4.1), this number does not represent the total number of adopters. As ob-

served in Table 4.2, the total number of adopters was found to be 224 and that of non-adopters was 133 farmers. So, from this we can see that the number of adopters is higher than the non-adopters, this is so because some farmers were found employing more than one organic farming practice.

Table 4.2: Distribution of Organic farming practices employed in each parish.

		Farm Yard Manure		**Weed Management**		**Pest Management**		**Mulching**		**Use of Cover Crops**		**Crop residue**		**Total**	
Sub County	**Parish**	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Bwongyera	Rwanda	9	27.3	15	38.3	5	25.0	21	21.7	3	22.7	5	25.8	**58**	**26.1**
	Nyabubare	16	47.3	10	26.7	4	21.9	31	31.2	5	36.4	4	19.4	**70**	**31.4**
Ihunga	Butanda	4	10.9	8	20.0	6	28.1	27	27.4	4	27.3	7	35.5	**55**	**24.4**
	Kitondo	5	14.5	6	15.0	5	25.0	20	19.7	2	13.6	4	19.4	**41**	**18.2**
		34		**38**		**20**		**99**		**14**		**19**		**224**	

Source: Field data

Table 4.2 shows the distribution of organic farming practices employed by smallholder bananas farmers per parish. The smallholder banana farmers that adopted organic farming practices were distributed as follows; 26.1% in Rwanda,31.4 % in Nyabubare, 24.4% in Butanda, and 18.2% in Kitondo Parish. These results mean that more farmers were adopting organic farming practices in Bwongyera sub-county 57.4% as compared to 42.6% in Ihunga sub-county, Kajara County.

4.2.1 Mulching

Mulching refers to the process of covering the topsoil with plant material such as leaves, grass, twigs, straw, Gomez and Thivant (2017). Mulch cover enhances the activity of soil organisms such as earthworms that help to create a soil structure with plenty of smaller and larger pores through which rainwater can easily infiltrate into the soil, thus reducing surface runoff. Additionally, as the mulch material decomposes, it increases the content of organic matter in the soil creating a crumb structure. Thus, the soil particles will not be easily carried away by water hence vital in preventing soil erosion.

Mulching was revealed as the most commonly used organic farming practice employed by 44% of smallholder banana farmers in Kajara County and distributed in the parishes as Nyabubare 31.2% and 27.4% in Butanda 21.7% in Rwanda and 19.7% in Kitondo. The materials that farmers used to mulch their plantations included; maize and sorghum straws, grass and tree clippings, twigs, papyrus, reeds, elephant, spear grasses. as shown below in **Plate 1**.

Plate 1: Mulches (papyrus and maize straws) applied in the banana plantation of Mr. Tibesigwa David of Kiina, Nyabubare Parish, Bwongyera Sub County.

4.2.2 Weed Management

Weed Management in organic farming refers to biological and mechanical management practices like pasturing, mulching, intercropping, crop rotation, use of green living cover aimed at keeping the weed population at a level that does not result in an economic loss of the crop cultivation or harm its quality Gallandt, (2014). The goal is not to completely eradicate all weeds, as they also have a role to play on the farm, for example, weeds provide cover that reduces soil erosion, provide habitat for both beneficial biocontrol insects and mycorrhiza fungi by availing pollen and nectar, hence allow biocontrol insects to maintain their populations and, therefore, serve as a valuable instrument in controlling pests.

The study established that 16.8% of the organic smallholder banana farmers in Kajara County used this method 38.3% in Rwanda parish, Nyabubare 26.7% and 20% in Butanda 20% and 15% in Kitondo parish as reflected in table 4.2. In Plate 2 some of the ways of organic weed management practices are illustrated.

Plate 2: Weed Management through mulching and early spot weeding as seen at the plantation Mr. Baguma Protazio in Rwanda Parish, Bwongyera Subcounty.

4.2.3 Use of Farm Yard Manure

Farmyard manure refers to the decomposed mixture of dung, excreta, and urine of farm animals along with litter and left-over material from roughages or fodder. This manure is used for building up and maintaining organic matter in the soil to conserve fertility and as well as soil physical condition (tilth) and used to improve soil productivity by correcting soil physical, chemical, and biological properties. Khaliq et al (2004)

In this study, 34 farmers were found extensively employing farmyard manure in the banana plantations which translated to 15.4% of the adopting respondents. The organic manure used as cattle, goat, sheep, and pig dung, also used were poultry droppings and was dominant in Nyabubare 47.3%, Rwanda 27.3%, Kitondo 14.5%, and Butanda 10.9% as reflected in Table 4.2 and sown in **Plate 3.**

Plate 3: Dry animal manure heaps in a banana plantation of Mr. Katongole Livingstone in Nyamatongo village Kitondo parish, Ihunga Sub County.

4.2.4 Pest Management

Pest management in Organic farming refers to the careful associations and management of plants and animals to prevent pest and disease outbreaks Gomez and Thivant (2017). Pest management as an organic farming practice in Kajara county was employed by 15.4% of the adopting smallholder

banana farmers 28.1% in Butanda parish, 25% in Rwanda, and Kitondo parish at 25% and was least applied in Nyabubare parish by 21.9% as reflected in Table 4.2. **Plate 4** shows a farmer preparing a local organic pesticide concoction used in pest management in banana plantations.

Plate 4: Mrs. Naturinda Agatha preparing a local herbicide concoction in Rukoni village, Nyabubare parish Bwongyera sub county.

4.2.5 Use crop of residues.

Crop residues refer to the materials left on cultivated land after the crop has been harvested Steven and Clark, (2013). The findings of the study showed that use of crop residues was largely employed by the farmers in Butanda 35.5%, Rwanda 25.8%, Nyabubare and Kitondo at 19.4%. On the overall use of /crop residues were extensively employed 8.7% of the organic smallholder banana farmers in Kajara county as shown in Table 4.2. The retained crop residues included banana stems, fibers, and leaves as illustrated in Plate 5.

Plate 5: Banana residue of stems and leaves for mulching used in the banana plantation of Tumwesigye Robert in Namirembe - East Village, Butanda parish**.**

4.2.6 Use of Cover Crops

Cover crops refer to any plant which covers the soil and improves soil fertility Kaspar, et al; (2011) These are mainly leguminous plants rapid rate of growth and be the ability to cover the soil in a short time, resistant against pests and diseases potential of producing large amounts of organic matter and dry material, fixing of nitrogen from the air and provide it to the soil, possession of de-compacting root systems able to regenerate degraded soils. The study findings indicated that the use of cover crops was the least used organic farming practice employed by organic banana smallholder farmers in Kajara County at 6.2%, its usage in the parishes was as follows; Nyabubare 36.4%, Butanda 27.3%, Rwanda 22.7%, and Kitondo 13.6% as reflected in Table 4.2. Crops usually planted included sweet potatoes, beans, tomatoes mainly on the edges of terraces as shown in **Plate 6.**

Plate 6: Beans and Sweet potatoes planted as cover crops in the banana plantation of Ms. Orishaba Consolanta in Rwanda parish, Bwongyera Sub County**.**

4.3 Factors Affecting the adoption of organic farming practices.

The second objective of this study was to establish the relationship between socioeconomic factors and the adoption of organic farming practices. This was assessed using chi-square tests of independence. Decisions of significance were made at 5% level.

The socio-economic factors that were analysed in this research included, age of the farmer, gender, marital status, household size, level of education, land ownership, farming experience, and off-farm income. They were tested against the adoption of organic farming practices as follows;

4.3.1 Age of household head

The study considered age to be one of the factors to influence the adoption of farming practices. Varying age groups of household heads were engaged. The results presented in Table 4.3 below show the relationship between the age of the household head and the adoption of farming practices.

Table 4.3: Relationship between the age of the household head and adoption of farming practices.

		Age of the household head				Total
		<30 Years	31-40 years	41-50 years	Above 50 years	
Non-Adopter	Count	26	32	39	36	133
	%	19.5%	24.1%	29.3%	27.1%	100.0%
Adopter	Count	22	66	107	29	224
	%	9.8%	29.5%	47.8%	12.9%	100.0%
Total	Count	48	98	146	65	357
	%	13.4%	27.5%	40.9%	18.2%	100.0%

Results in table 4.3 above revealed that amongst the adopters 9.8% were below 30 years, 29.5% were aged between 31 and 40 years, 47.8% were between 41 and 50 years, and 12.9% were aged above 50 years. On the other hand, 19.5% of the non-adopters were below 30 years, 24.1% were between 31-40 years, 29.3% were 41-50 years and 27.1% were above 50 years. The results, therefore, indicate that the highest proportion of adopters belong to the age group 41-50 years (47.8%) and the youngest farmers (below 30 years) account for the smallest proportion of adopters (9.8%).

A chi-square test was thus run to test whether there were differences between adopters and non-adopters in terms of their age and whether those differences significantly affected their responses to the adoption of farming practices. The chi-square results are presented in Table 4.4

Table 4.4: Chi-Square test results for Age of the household head.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.842[a]	3	.000
Likelihood Ratio	22.609	3	.000
Linear-by-Linear Association	.000	1	.994
N of Valid Cases	357		

Table 4.4 shows a chi-square test significance value of 0.000 for age. This value is below the significance level of 5% which means that there are significant differences between adopters and non-adopters in terms of age. This means that adopters and non-adopters differ in terms of age.

4.3.2 Gender of the household head.

Gender of the household head was considered a factor influencing the adoption of farming practices. The results presented in Table 4.5 below show the relationship between the gender of the household head and the adoption of farming practices.

Table 4.5: Gender of household head and adoption of farming practices.

		Gender of household head		Total
		Female	Male	
Non-Adopter	Count	48	85	133
	%	36.1%	63.9%	100.0%
Adopter	Count	111	113	224
	%	49.6%	50.4%	100.0%
Total	Count	159	198	357
	%	44.5%	55.5%	100.0%

Results of the study reflected in table 4.5 showed that 49.6% and 50.4 % of the adopters were female and male respectively however, amongst the non-adopters 36.1% were female and 63.9% were male.

The results also indicate that the highest proportions of adopters belong to the families headed by males (50.4%) and the female-headed households account for the smallest proportion of adopters (49.6%). This shows that households headed by the male are more likely to adopt given farming practices than the female-headed household.

A chi-square test was thus run to test whether there were differences between adopters and non-adopters in terms of their sex and whether those differences significantly affected their responses to the adoption of farming practices. The chi-square results are presented in Table 4.6

Table 4.6: Chi-Square test results for the gender of household head

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.124[a]	1	.013
Continuity Correction[b]	5.591	1	.018
Likelihood Ratio	6.179	1	.013
Linear-by-Linear Association	6.107	1	.013
N of Valid Cases	357		

The chi-square test showed a significance value of 0.013 for the gender of the household head (Table 4.6). This value is below the significance level of 5% which means that there are significant differences between adopters and non-adopters in terms of the gender of the family head. This means that adopters and non-adopters differ in terms of the gender of the household head.

4.3.3 Marital status

In terms of marital status, two categories were considered that is married and single, As presented below in Table 4.7, out of the 357 respondents 69 were single and 288 were married.

Table 4.7: Marital status and adoption of farming practices.

		Marital Status of Respondents		Total
		Single	Married	
Non-Adopter	Count	36	97	133
	%	27.1%	72.9%	100.0%
Adopter	Count	33	191	224
	%	14.7%	85.3%	100.0%
Total	Count	69	288	357
	%	19.3%	80.7%	100.0%

As observed in Table 4.7, 85.3% of the adopting respondents were married and only 14.7% were single. However, amongst the non-adopters 72.9% were married and 27.1% were single. The results also indicate that the highest proportions of adopters belong to the married farmers (85.3%) and the unmarried farmers account for the smallest proportion of adopters (14.7%). To test whether there were differences between adopters and non-adopters in terms of their levels of marital status and whether those differences significantly affected their responses to farming practices a chi-square test was thus run. The chi-square results are presented in Table 4.8

Table 4.8: Chi-Square test results for marital status

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.144[a]	1	.004
Continuity Correction[b]	7.372	1	.007
Likelihood Ratio	7.926	1	.005
Linear-by-Linear Association	8.121	1	.004
N of Valid Cases	357		

The results revealed a chi-square test significance value of 0.004 for marital status (Table 4.8). This value is below the significance level of 5% which means that there are significant differences between adopters and non-adopters in terms of marital status. This means that adopters and non-adopters differ in terms of marital status.

4.3.4 Education level

In terms of education levels, farmers in Kajara county like any other rural community in Uganda exhibits low education levels. As observed in Table 4.9, out of the 357 respondents 70.6% had basic primary education, while 19.0% had secondary education and 10.4% had tertiary education.

Table 4.9: Education status of the respondent and adoption of farming practices.

		Education status of the respondent			Total
		Primary Level	Secondary Level	Tertiary Institution	
Non-Adopter	Count	79	34	20	133
	%	59.4%	25.6%	15.0%	100.0%
Adopter	Count	173	34	17	224
	%	77.2%	15.2%	7.6%	100.0%
Total	Count	252	68	37	357
	%	70.6%	19.0%	10.4%	100.0%

Amongst the adopters 77.2% had had basic primary education, 15.2% had secondary level and 7.6% had tertiary education. On the other hand, 59.4%,25.6% and 15.0% of the non-adopters had primary, secondary and tertiary level education respectively. The results also indicate that the highest proportions of adopters belong to the farmers that have attained basic primary education (77.2%). A chi-square test was thus run to test whether the differences between the adopters and non-adopters concerning the level of education significantly affected their responses to farming practices.

Table 4.10: Chi-Square test results for Education status

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.952[a]	2	.002
Likelihood Ratio	12.715	2	.002
Linear-by-Linear Association	11.904	1	.001
N of Valid Cases	357		

Table 4.10 shows a chi-square test significance value of 0.002 for education level. This value is below the significance level of 5% which means that there are significant differences between adopters and non-adopters in terms of education levels. This means that adopters and non-adopters differ in terms of education levels.

4.3.5 Household size

In this study household size in terms of the number of members was one of the factors thought to influence the adoption of farming practices and therefore assessed accordingly. The results for the analysis are shown in Table 4.11

Table 4.11: Household size and adoption of farming practices.

		Household size				Total
		1-5 members	6-10 members	11-15 members	Above 15 members	
Non-Adopter	Count	13	66	35	19	133
	%	9.8%	49.6%	26.3%	14.3%	100.0%
Adopter	Count	11	130	67	16	224
	%	4.9%	58.0%	29.9%	7.1%	100.0%
Total	Count	24	196	102	35	357
	%	6.7%	54.9%	28.6%	9.8%	100.0%

From the analysis in Table 4.11, it was found that amongst the adopters; 4.9%, 58.0%, 29.9%, 7.1% were in households with 1-5 members, 6-10 members, 11-15 members, and Above 15 members respectively. Amongst the non-adopters however, 9.8%, 49.6%, 26.3%, and 14.3% had households with 1-5 members, 6-10 members, 11-15 members

, and Above 15 members respectively. The results also indicate that the highest proportions of adopters belong to the farmers with 6-10 members per household (58.0%) and the farmers with a small number of persons per household that is 1-5 embers account for the smallest proportion of adopters (4.9%).

A chi-square test was thus run to test whether the differences between adopters and non-adopters in relation to a household size significantly affected farmer`s adoption of farming practices Table 4.12.

Table 4.12: Chi-Square test results for Household size

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.732[a]	3	.033
Likelihood Ratio	8.467	3	.037
Linear-by-Linear Association	.493	1	.483
N of Valid Cases	357		

Table 4.12 shows a chi-square test significance value of 0.033 for household size. This value is below the significance level of 5% which means that there are significant differences between

adopters and non-adopters in terms of marital status. This means that adopters and non-adopters differ in terms of household size.

4.3.6 Off-farm income of the family head

In terms of off-farm income of the family head and how it influences the adoption of farming practices, this study found that 33.1% of the respondents were earning less than Uganda Shillings 300,000/=, 43.7% earning (300,001-600,000/=), 18.2% (600,001-900,000/=), and 5.0% (Above 900,000/=) as shown in Table 4.13.

Table 4.13: Off-farm income of the family head and Adoption of farming practices.

		Off-farm Income of Family Head				Total
		<300,000/=	300,001-600,000/=	600,001-900,000/=	Above 900,000/=	
Non-Adopter	Count	39	47	36	11	133
	%	29.3%	35.3%	27.1%	8.3%	100.0%
Adopter	Count	79	109	29	7	224
	%	35.3%	48.7%	12.9%	3.1%	100.0%
Total	Count	118	156	65	18	357
	%	33.1%	43.7%	18.2%	5.0%	100.0%

Table 4.13 shows that within the adopters, 35.3% had off-farm income of less than 300,000, 48.7% were earning 300,001-600,000/=, 12.9% 600,001-900,000/= and 3.1% had above 900,000/= non-farm income. However, amongst the non-adopters, 29.3% had off-farm income of less than 300,000/=, 35.3% were earning 300,001-600,000/=, 27.1% were 600,001-900,000/= and 8.3% had above 900,000/=non-farm income.

The results also indicate that the highest proportions of adopters belong to the farmers whose off-farm income ranges from shs 300,000 to shs 600,000 (48.7%) and the farmers whose off-farm income of the family head is above shs 900,000 account for the smallest proportion of adopters (3.1%).

To test whether the differences between adopters and non-adopters in relation to off-farm income significantly affected farmer`s adoption of farming practices a chi-square test was thus run and the results in table 4.14 below;

Table 4.14: Chi-Square test results for Off-farm income of the family head

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.804[a]	3	.000
Likelihood Ratio	17.364	3	.001
Linear-by-Linear Association	10.771	1	.001
N of Valid Cases	357		

Table 4.14 shows a chi-square test significance value of 0.000 for the off-farm income of the family head. This value is below the significance level of 5% which means that there are significant differences between adopters and non-adopters in terms of the of-farm income of the family head. This means that adopters and non-adopters differ in terms of off-farm income earned by the family head.

4.3.7 Land ownership

Land ownership in terms of rented land and owned land was also considered to influence the adoption of farming practices. The results presented in Table 4.15 show that 27.5% had rented land and 72.5% owned land.

Table 4.15: Land ownership and adoption of farming practices.

		Land Ownership		Total
		Rented land	Owned Land	
Non-Adopter	Count	53	80	133
	%	39.8%	60.2%	100.0%
Adopter	Count	45	179	224
	%	20.1%	79.9%	100.0%
Total	Count	98	259	357
	%	27.5%	72.5%	100.0%

The results in table 4.15 show that amongst the adopters; 79.9% owned land and only 20.1% rented land. While, amongst the non-adopters, 60.9% and 39.8 owned land and rented land respectively. The results also indicate that the highest proportions of adopters belong to farmers who had their land (79.9%) and the farmers with rented land account for the smallest proportion of adopters (20.1%).

To test whether the differences between adopters and non-adopters in relation to land ownership significantly affected farmer`s adoption of farming practices a chi-square test was thus run and the results in table 4.16 below;

Table 4.16: Chi-Square test results for land ownership

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.362[a]	1	.000
Continuity Correction[b]	15.385	1	.000
Likelihood Ratio	16.021	1	.000
Linear-by-Linear Association	16.316	1	.000
N of Valid Cases	357		

A chi-square test significance value of 0.000 for land ownership was shown (Table 4.16). This value is below the significance level of 5% which means that there are significant differences between adopters and non-adopters in terms of land ownership. This means that adopters and non-adopters differ in terms of the nature of land ownership.

4.3.8 Years of experience in the current farming system.

In terms of How many years, respondents had been in the current farming system, the study established that 3.6% had spent less than 5 years, 9.5% (6-10 years), 28.9% (11-15 Years), 31.9% (16.20 years and 26.1% had spent over 21 years. How the years of experience influences the adoption of farming practices is presented in table 4.17 below;

Table 4.17: Years of experience and adoption of farming practices.

		How many years have you been in the current farming system?					Total
		< 5 years	6-10 years	11-15 years	16-20 years	Above 21 years	
Non-Adopter	Count	8	18	34	37	36	133
	%	6.0%	13.5%	25.6%	27.8%	27.1%	100.0%
Adopter	Count	5	16	69	77	57	224
	%	2.2%	7.1%	30.8%	34.4%	25.4%	100.0%
Total	Count	13	34	103	114	93	357
	%	3.6%	9.5%	28.9%	31.9%	26.1%	100.0%

The results in table 4.17 show that amongst the adopters, 2.2% had taken less than 5 years, 7.1% had spent 6-10 years with 30.8 taking 11-15 years and 34.4% and 25.4% taking 16-20 years and above 21 years respectively. On the other hand, the non-adopters, 6.0%, 13.5%, 25.6%, 27.8%, 27.1% had respectively taken < 5 years, 6-10 years, 11-15 years, 16-20 years and above 21 years.

The results thus indicate that majority of the adopters had 16-20 years of experience in their farming practices.

To test whether the differences between adopters and non-adopters in relation to years of experience significantly affected farmer`s adoption of farming practices a chi-square test was thus run and the results in table 4.18 below;

Table 4.18: Chi-Square test results for Years of experience in the current farming system

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.860[a]	4	.065
Likelihood Ratio	8.617	4	.071
Linear-by-Linear Association	2.158	1	.142
N of Valid Cases	357		

Table 4.18 shows a chi-square test significance value of 0.65 for years of experience. This value is above the significance level of 5% which means that there are no significant differences between adopters and non-adopters in relation to years of farming experience. This implies that adopters and non-adopters do not differ in terms of years of farming experience.

4.5 Institutional factors influencing the adoption of organic farming practices in Kajara County.

To examine the institutional factors affecting farmers` adoption of organic farming practices, chi-square tests were run to test whether the differences between adopters and non-adopters, concerning the institutional factors. In this study, the institutional factors that were analysed included, membership of farmer groups, access to credit facilities, contact with agricultural extension services, availability of information and training as seen in the following subsections;

4.5.1 Agricultural training

In the current study, respondents were asked if they had received any agricultural training services. Results presented in Table 4.19 below shows that 59.1% of the respondents had received and 40.9% had not received any training. How agriculture training influences the adoption of farming practices is given below;

Table 4.19: Agricultural training and adoption of farming practices

		Agricultural training services		Total
		Yes	No	
Non-Adopter	Count	87	46	133
	%	65.4%	34.6%	100.0%
Adopter	Count	124	100	224
	%	55.4%	44.6%	100.0%
Total	Count	211	146	357
	%	59.1%	40.9%	100.0%

As evidenced in Table 4.19 above, among the adopters, 55.4% of the respondents had received training while 44.6% had not received agricultural training. Among the non-adopters, 65.4% had received training and 34.6% had not.

The results also indicate that the highest proportions of adopters of organic farming agreed that agricultural training influenced their adoption of farming practices (55.4%) while a smaller proportion (44.6%) of organic farmers disregarded that view that agricultural training has enabled them to adopt organic farming in Kajara County.

The study run a chi-square test whether the differences between adopters and non-adopters in relation to receiving agricultural training significantly affected farmer`s adoption of farming practices and the results in table 4.20 below

Table 4.20: Chi-Square test results for Agricultural training.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.492[a]	1	.062
Continuity Correction[b]	3.088	1	.079
Likelihood Ratio	3.523	1	.061
Linear-by-Linear Association	3.482	1	.062
N of Valid Cases	357		

Table 4.20 shows a chi-square test significance value of 0.062 for agricultural training. This value is above the significance level of 5% which means that there are no significant differences between adopters and non-adopters in relation to access to agricultural training services. This implies that adopters and non-adopters do not differ in terms of their agricultural training access.

4.5.2 Member of Association

The study asked respondents whether they were members of associations. Results showed that 59.1% were members and 40.9% were not members of any association. How the membership influences the adoption of the farming practices is given in table 4.21 below,

Table 4.21: Member of Association and adoption of farming practices

		Member of Association		Total
		Yes	No	
Non-Adopter	Count	87	46	133
	%	65.4%	34.6%	100.0%
Adopter	Count	124	100	224
	%	55.4%	44.6%	100.0%
Total	Count	211	146	357
	%	59.1%	40.9%	100.0%

The results show that amongst the adopters, 55.4% were members of associations and 44.6% were non-members. However, for the non-adopters, 65.4% were members and 34.6% were not members of the associations.

The results also indicate that the highest proportions of adopters of organic farming agreed that access to agricultural extension services influenced their adoption of organic farming (55.4%) while a smaller proportion (44.6%) of organic farmers disregarded that view that access to agricultural extension services has enabled them to adopt organic farming in Kajara County.

The study run a chi-square test whether the differences between adopters and non-adopters in relation to being members of association significantly affected farmer`s adoption of farming practices and the results in table 4.22 below

Table 4.22: Chi-Square test results for a member of an association.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.492[a]	1	.062
Continuity Correction	3.088	1	.079
Likelihood Ratio	3.523	1	.061
Linear-by-Linear Association	3.482	1	.062
N of Valid Cases	357		

Table 4.4 shows a chi-square test significance value of 0.062 for membership of an association. This value is above the significance level of 5% which means that there are no significant differences between adopters and non-adopters in relation to access to membership of an association. This implies that adopters and non-adopters do not differ in terms of their membership in an association.

4.5.3 Agricultural extension services

The researcher engaged respondents in whether they had received agricultural extension services. Results confirm that 59.1% had received the extension services and 40.9% had not. How receiving extension services has affected the adoption of farming practices is summarised in Table 4.23;

Table 4.23: Agricultural extension services and adoption of farming practices

		Ariculture extension contact		Total
		Yes	No	
Non-Adopter	Count	87	46	133
	%	65.4%	34.6%	100.0%
Adopter	Count	124	100	224
	%	55.4%	44.6%	100.0%
Total	Count	211	146	357
	%	59.1%	40.9%	100.0%

The results show that, amongst the adopters, 55.4% of the respondents had received extensions services contact and 44.6% had not received. On the other hand, for the non-adopters, 65.4% had received the extension services and 34.6% had not.

The results indicate the biggest proportion of the adopters were those who had received agricultural extension services contact.

The study run a chi-square test whether the differences between adopters and non-adopters in relation to received agriculture extension contact significantly affected farmer`s adoption of farming practices and the results in table 4.24 below

Table 4.24: Chi-Square test results for Agricultural extension services

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.492[a]	1	.062
Continuity Correction	3.088	1	.079
Likelihood Ratio	3.523	1	.061
Linear-by-Linear Association	3.482	1	.062
N of Valid Cases	357		

Table 4.24 shows a chi-square test significance value of 0.062 for access to agricultural extension services. This value is above the significance level of 5% which means that there are no significant differences between adopters and non-adopters in relation to access to agricultural extension services. This implies that adopters and non-adopters do not differ in terms of their access to agricultural extension services.

4.5.4 Access to credit

The study asked the respondents if they had received Credit Services for farming. The findings show that 75.4% had not received credit for farming and only 24.6% had received access to

credit. Table 4.25 shows the relationship between access to credit and adoption of farming practices;

Table 4.25: Access to credit and adoption of farming practices

		Credit Services for farming		Total
		Yes	No	
Non-Adopter	Count	50	83	133
	%	37.6%	62.4%	100.0%
Adopter	Count	38	186	224
	%	17.0%	83.0%	100.0%
Total	Count	88	269	357
	%	24.6%	75.4%	100.0%

The results in table 4.25 show that amongst the adopters, 83.0% had not received credit for farming and only 17.0% had done. However, for the non-adopters, 62.4% had not received credit for farming but 37.0% had done. The results also indicate that the highest proportions of adopters of organic farming agreed that access to credit did not influence the adoption of organic farming (83%) while a smaller proportion (17%) of organic farmers supported that view that access to agricultural extension services has enabled them to adopt organic farming in Kajara County.

A chi-square test was run to check whether the differences between adopters and non-adopters in relation to access to credit significantly affected farmer`s adoption of farming practices and the results in table 4.26 below

Table 4.26: Chi-Square test results for access to credit.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.121[a]	1	.000
Continuity Correction[b]	18.027	1	.000
Likelihood Ratio	18.651	1	.000
Linear-by-Linear Association	19.068	1	.000
N of Valid Cases	357		

Table 4.26 shows a chi-square test significance value of 0.000 for access to credit. This value is below the significance level of 5% which means that there are significant differences between adopters and non-adopters in terms of access to credit. This means that adopters and non-adopters differ in terms of access to credit.

4.6 Discussion of the Results

This sub-section presents the discussion of findings on the characterization of the existing organic farming practices, socio-economic factors, and the institutional factors influencing the adoption of organic farming practices in Kajara County.

4.6.1 Identification and characterization of the existing organic farming practices.

The organic farming practices identified in the banana cropping system in Kajara County included; mulching, weed management, use of farmyard manure, pest management, use of crop residues, and use of cover crops.

Mulching was the most dominant practice employed by smallholder banana farmers in Kajara county. Many of the farmers attributed the high usage to; availability of cheap sources of mulching materials and the advantages of the mulches to maintain moisture in the soil, suppress weeds in the plantations and also turning into fertilizers when they decompose thus maintaining soil fertility and conserving soil moisture for the shallow rooting banana crop. This is in agreement with studies by (Bekunda,1999, Jemieson and Stevens, 2006) emphasized the importance of mulching in supporting

infiltration of runoff and protecting the soil from the impact of raindrops hence maintaining moisture in the soil for long periods. This, therefore, confirms the importance of mulching as an organic farming practice vital in the sustainable growth of bananas in Kajara County.

The farmers and extension workers explained that mulches are applied 60-90cm from the pseudostem to limit the vertical growth of roots, only allowing the plant root to uptake nutrients and moisture from a distance, and as a result, the plant held firm in the ground.

Weed management was the second most employed organic farming practice employed by the organic smallholder banana farmers in Kajara county. It involved the mechanical removing of unwanted plants that compete with the banana plant for nutrients, moisture and acting as a habitat for pathogens. The use of weed management means in the banana cropping was emphasized by (Brainard et al; 2013), who articulated the importance of mechanical and physical weed control practices used on organic farms involving tillage to remove existing weed growth at early stages before they grow fruits that form seeds like blackjack and preparing pits where rhizome weeds like galinsoga and also agree with Melander et al; (2017) who concluded that organic weed management promotes weed suppression, rather than weed elimination by reducing crop competition and phytotoxic effects of weeds. Therefore, this method is seen as an efficient practice that should be promoted in the banana cropping system.

The use of farmyard manure was the third most employed organic farming practice among smallholder banana farmers in Kajara County and involved the used animal excreta (cattle, goat, and sheep) and poultry, which farmers regarded vital in nurturing soil organisms and essential in maintaining an active soil life. These findings correspond with studies by Vanilarasu, and Bal, (2014) who suggested that organic manures gave better quality and post-harvest life of fruits when comparing to inorganic sources of nutrients, they assert that organic manures contain macro and micronutrients, plant growth-promoting substances like auxins, gibberellins, and cytokinins. Similarly, studies by Koroto, et al; 2011 indicated considerable in the weights of banana bunches, hands, number of fingers, and earlier times of flowering in plantations where poultry manure was applied. With these above findings, the researcher, therefore, recommends the use of farmyard manure in the growing of bananas in the study area.

Pest Management was found out to be the fourth most applied organic farming practice among the smallholder banana farmers in Kajara County. Farmers used, early pruning of the dead leaves and fibers as means to destroy the nests for pests like weevils and nematodes and also brewed a local organic herbicide concoction; comprising of animal dung, urine, red pepper, and ash that would be fermented for at least two weeks and latter applied around the pseudo banana stems. The farmers argued that animal and human urine were rich in nitrogen that plants need as fertilizers but also was used to deter weevils and other diseases spreading nematodes.

Farmers reported that most of the banana diseases were transmitted by farm tools and insects pollinating the male bud. Therefore, extension workers recommended that the use of forked sticks to break the male bud (bell) off the plant, and in cases where they used tools like knives and pangas, these were to thoroughly cleaned either with disinfectants or passed over fire every after use to prevent widespread of the diseases like xanthomas bacterial wilt from plant to plant and farm to farm. The study findings concur with studies by Pretty and Bharucha, (2015) which indicated that integrated pest management was a leading complement and alternative to synthetic pesticides and a sustainable intensification with particular importance for tropical smallholder farmers. Rapisarda and Cocuzza (2017) too emphasized the use of a combination of biological, cultural, and physical tools as a sustainable approach in the management of pests. The use of crop residues is one of the least employed organic farming practices among smallholder banana farmers in Kajara County. This involved the banana pseudostems and leave cuttings, maize, millet, sorghum stalks, bean, and groundnut husks. Farmers argued that crop residues are often applied on the soil surface soon after harvesting to provide soil cover that buffers the soil against extreme temperatures thereby reducing soil evaporation, help fix carbon di-

oxide in the soil, cushions the soil against traffic, and considered to be an effective anti-erosion measure. Earlier studies by Noack, et al., (2014) when analysing how the management of crop residues affects the transfer of phosphorus to plant and soil pools noted that the release of nutrients, including phosphorous from litters and crop residues, was an important potential source of nutrients for subsequent crops, they also asserted that the total phosphorous in plant material ranges between 0.5 and 10 g kg−1. The above assertions concur with studies by Damon, et.al, (2014) that inorganic orthophosphate, which is the preferred source of phosphorous to plants, is also the major form of P found in green crops (60–80% of total P) during vegetative growth. This can be conclusively agreed that retention of crop residues after harvesting was considered to be an effective anti-erosion measure, improve soil structure, increase organic matter content in the soil, reduce evaporation, which is vital for the sustainable growth of organic bananas.

The use of cover crops was the least employed organic farming practice employed smallholder banana farmers in Kajara County. This practice was common among farmers with plantations of less than one year old occasionally those older, the farmers argued that cover crops mainly legumes like, beans, groundnuts was acted as living mulching and when tilled into the soil, helped add organic matter and nutrients. The results of this study are consistent with findings by Witter, et al; (2017) that cover crop effects on crop yield were highest in the organic system with reduced-tillage (+24%), intermediate in the organic system with tillage (+13%), and in the conventional system with no-tillage (+8%) and lowest in the conventional system with tillage (+2%). The importance of cover crops had been earlier emphasized by Liebl *et al.* (1992) demonstrated that the use of a rye cover crop in conjunction with minimum tillage was a highly effective approach for limiting weed competition in soybean. This is therefore to emphasize that cover crops are essential to maintaining a certain yield level when soil tillage intensity is reduced under conservation agriculture, or when production is converted to organic agriculture. Thus, the inclusion of cover crops provides additional opportunities to increase the yield of lower intensity production systems and contribute to ecological intensification.

4.6.2 Socioeconomic factors affecting the adoption of farming practices

This subsection presents the discussion of finding on the socio factors that affect the adoption of organic farming practices in Kajara County.

The context of age coefficient showed a positive and significant relationship between farmer's age and organic farming practices which implied that older banana farmers are more likely to adopt organic farming practices. The farmers revealed that children and older people could not handle all the manual activities involved in organic farming practice, unlike the young adults.

This is because older groups of farmers are more driven by the need to be more efficient in farming practice, have the physical strength and commitment to apply organic farming practices unlike old people above 50 years and children below 18 years of age who are among the vulnerable groups or dependents.

These findings resonate with studies by (Mwangi, and Kariuki. 2015) that older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate farming practice information than younger farmers. On the contrary, age has been found to have a negative relationship with the adoption of farming practice in studies by Niehaves, et.al, (2014) that as farmers grow older, there is an increase in risk aversion and a decreased interest in long term investments farming. On the other hand, younger farmers are typically less risk-averse and are more willing to try new innovations in farming.

Many households in the study area were male-headed, this is not surprising because, in a traditional African society, households are headed by men. Gender co-efficient was positively related to the probability of adoption of organic farming. This is particularly true in a traditional African setup where key decisions in the households are made by men and women have limited control over land and property rights in sub-Saharan Africa. This collaborates with the findings of (Doss et al, 2014) that women only have rights to use and access land through men, especially in the customary land tenure system. In addition, male-headed households are more likely to get information about innovations and undertake risky businesses than female-headed households.

Farmer's responses revealed that marital status also influences organic farming practices where 80.3% of the respondents were married, who emphasized the importance of complementarity of married people in the management of activities involved in organic farming practices, unlike the widows, singles, and divorced families. Results of the study indicated a positive relationship between marital status and adoption of organic farming practices., differences were observed in abilities of married families or single or widowed households wherein the heap family labour in married people homesteads contributed greatly to l than other statuses. These findings concur with studies by (Tisdell, (2014) who reported that married farmers work more hours than unmarried ones, working not only cash food crops but also on non-food cash crops.

Organic farming is highly labour intensive and households with a higher number of members comprised of active youth have more chances of applying organic farming practices in their banana plantations compared to those comprised of children and old people. This was the

greatest impediment to most farmers as they lacked reliable and cheap labour to help in applying the organic farming practice in their banana plantations. Most of them would employ 1-3 external workers to assist in looking after the banana plantations. Most of the households interviewed comprised children who were schooling and would wait for them to come home for the holidays to carry out most of the farm work in the banana plantations like weeding, pruning, mulching, and manure application. In conclusion, there was a positive relationship between the numbers of members in the household and Organic farming practices.

The coefficient of farming experience had a positive and significant sign, a plausible explanation for this result is that farmers with many years of farming experience are more likely to be aware of the negative impact of conventional farming, which resulted in changes in climatic conditions, hence, are most likely to adopt organic farming due to perceived environmental stability. This is in line with the findings of (Amusa, et al., 2015), which showed a positive relationship between farming experience and adoption of soil conservation practices in Ekiti State, Nigeria.

Regarding land ownership, there were significant differences between the adopters and non-adopters**.** In this study, 72.5 % of the respondents interviewed revealed that they owned land where they practiced banana farming, it was also noted that land in the rural areas was owned or inherited by private individuals. However, some large chunks of land are owned by institutions like the catholic church from whom 27.5% of smallholder farmers rented land to carry out banana farming. These results tally with findings by (Michler and Shively, 2015, Kassie et, al. 2009) who noted that ownership of farmland increases the assurance of future access to the returns of investment thus increasing the probability of adopting organic farming practices. However, these results contrast findings (FAO 2001) which indicated that privatization of land does not automatically increase investment in more sustainable agricultural practices.

In terms of the level of education, results in chi-square test analysis revealed no significant differences between adopters and non-adopters concerning the use of organic farming practices. These results disagree with a study by Weir and Knight (2000) that concluded that a household's level of education influenced the level of adoption of farming practices. In addition, a study by IFPRI (2004), indicated that households that were poor in terms of access to education invested less in most inputs and land management technologies which is the reverse concerning the smallholder farmers in Kajara County. Similarly, studies by Shiferaw et al. (2006) revealed that increased levels of education under certain conditions may increase the chances of allocating family labour to other off-farm activities that often offer higher returns. This means that in

certain instances if people when educated, they would abandon farming unless they earned adequate income from it to justify the expenses of their training. Indeed, this is in agreement with this study's findings that the more educated farmers were not embracing organic farming practices instead opted for off-farm employment opportunities.

Off-farm income was found to have a positive significant influence on the adoption of organic farming practices, meaning that the more farmers engaged in other activities the more they got supplementary incomes to invest in farming practices. This confirms findings by (Reardonetal, (2007) which concluded that off-farm income acted as a substitute for borrowed capital in rural economies where credit markets were either missing or dysfunctional. According to (Diiro, 2009), off-farm income was expected to provide farmers an alternative source of liquid capital for purchasing farm inputs like improved seeds and fertilizers. It should be noted that not all techniques have shown a positive relationship between off-farm income and their adoption. Goodwin, et al., 2005, observed that the pursuit of off-farm income by farmers may undermine their adoption of modern technology by reducing the amount of household labour allocated to the farming enterprises.

4.6.3 Institutional factors affecting the adoption of farming practices

The third objective was to examine the institutional factors influencing the adoption of organic farming practices in Kajara County. The factors that were examined included agricultural extension services, membership to farmer group (s), access to credit, availability of information and training. They were tested against the adoption of organic farming practices as follows;
The study findings indicated that most of the smallholder organic banana farmers belonged to at least a farmer's group. This result agrees with studies by Hennessy and Heanue;(2012) which revealed that belonging to farmers' groups or cooperatives had a positive impact and was statistically significant to food production, and that prevalence of poverty is higher among non-members of farming cooperatives or groups. This was also reported by Wollni and Anderson (2014), that belonging to a farming cooperative increased organic farming in Honduras. Thus, results assumed that collective action by farmers would enhance the adoption of organic farming practices as farmers would collectively address challenges related to information, training, access to credit, and the produce market. Therefore, belonging to a farming cooperative to a large extent enabled farmers to address challenges of finance and advisory services among the farming households.

The study findings indicated that many of the organic smallholder banana farmers had accessed information and training on agricultural farming practices compared to those who had been exposed to incidental learning or no training about organic agricultural practices. The training was mainly availed members of farmers groups when trying to harness increased banana production. These results correspond to studies by Uaiene et al., (2009) who observed that access to information helped in reducing the uncertainty about a given farming practice's performance consequently changing farmer's assessment from purely subjective to objective over time. It can therefore be deduced that relevant information was vital in the promotion of organic farming in rural communities like Kajara communities.

Bonabana-Wabbi, 2002, noted that where farming experience within the general population about a specific farming practice was limited, sharing available information induced negative attitudes towards its adoption, probably because more information exposed an even bigger knowledge vacuum hence increased the risk associated with it. Therefore, it is important to ensure that information availed to the farmer is reliable, consistent, and accurate, farmers need to be sensitized about the existence of the practice, its benefits, and its usage for them to adopt.

In this study, it was reported that the smallest percentage of the respondents had access to credit services, from the chi-square the p-value of 0.00 implying that it had a significant influence on the farmer`s adoption of organic farming practices. This can be explained by the understanding that access to credit enables farmers to procure the required labour force, organic agricultural inputs like mulches, compost thus increasing their ability to practice organic farming.

These findings concur with a study by Bhan and Behera, (2014) who asserted that accessibility to credit was crucial in helping acquire basic farming inputs required for adoption of conservation farming, In relation, Nabalegwa et, al (2019) in their study on the adoption of soil conservation techniques in the Rwenzori Mountains, found out that the more farmers accessed credit, the more they adopted soil conservation technologies, (Bekele 2019) explained that, when farmers acquire money on credit they are motivated by the desire to pay back and as such, they invest more in high yielding activities such as soil conservation like mulching to tap into sustainable yields.

Whereas access to credit was found to be a significant factor influencing organic farming, it should also be noted that the largest percentage of farmers reported having not access credit services which therefore calls for improvements in credit infrastructures as a strategy for enhancing organic farming among banana farmers.

Interaction with farmers about their experiences with agricultural extension workers revealed that many of the farmers had been visited by the agricultural extension workers. This confirms findings from studies by (Akudugu et al., 2012, Sserunkuuma, 2005) who elaborated the relevance of agricultural extension agents act as a link between the promoters of the practice and farmer targeting specific farmers who they interact with hence exerting a direct or indirect influence overall population of farmers in their respective areas. The influence of extension agents can counterbalance the negative effect of ambiguity associated with new farming practices.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study was carried out to identify the existing organic farming practices employed in the banana cropping system and the factors that influence their adoption by smallholder farmers in Kajara county. Based on the study findings the following conclusions can be made;

The study revealed that mulching is the most highly applied organic farming practice were followed by pest management, weed management, use of farmyard manure, and use of crop residue employed by smallholder banana farmers in Kajara County.

Among the socio-economic and institutional factors that were considered in this study including age, gender, marital status, household size, level of education, level of off-farm income, land ownership, agricultural extension services, membership to farmer groups, access to credit, availability of information and training, it was revealed that income of family head and age of the farmers had the greatest influence on the farmers' response to organic farming practices.

The study revealed that agricultural training, membership to an association, and access to agricultural extension services increase the adoption of organic farming practices. However, access to credit by framers reduces the adoption of organic farming thus farmers with limited access to credit facilities adopt organic farming practices in Kajara county.

5.2 Recommendations.

As was revealed by the study findings, that the rate of adoption of organic farming practices in Kajara County was low, there is a need for sustained emphasis on training of the farmers at local levels to equip farmers with information on organic farming practices for sustainable banana farming.

There is a need to boost the income of the household head and absorption of the mature age into organic farming by National Agricultural Advisory Services (NAADS) and other stakeholders like Operation Wealth Creation the Ntungamo District Local Government.

Local authorities should intensify the training of farmers and extend agricultural extension services to local farmers. This should be done as well as encouraging them to join farming groups to increase the adoption of organic farming to feed the growing population and foreign market.

Although the access to markets was not analysed in this study, many farmers cited it as a factor influencing the adoption of organic farming practices, therefore studies need to be carried out to ascertain the influence of produce markets and segmentation on the adoption of organic farming practices.

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APPENDICES

Appendix A: Questionnaire administered by Researcher.

1. What organic farming practices are utilized in banana growing Ihunga and Bwongyera sub-counties?
2. Which are the dominant organic farming practices in Ihunga and Bwongyera Sub Counties?

   b) Why do you think they are the dominant organic farming practices in the area?
3. How do you the level of adoption in the area? Very high, High, Moderate, or Very low?
4. Who is responsible for ensuring effective use of these organic farming practices in the district/sub-county?
5. Is there any assistance given to farmers to facilitate organic farming practices?
6. What type of assistance is given to them and by who?
7. State the factors that explain why some farmers have adopted organic farming practices and others have not?
8. Which policies are in place to guide organic farming practices in Ntungamo district?
9. What are the challenges faced in ensuring the adoption of organic farming practices in Ntungamo district?
10. What is your assessment of the level of adoption of organic farming practices in this area?
11. What recommendation do you give to ensure the adoption of technically efficient, economically viable, and socially acceptable organic farming practices?

Appendix B: Questionnaire for smallholder banana farmers

Dear Sir/Madam,

I Atwijukye Dunstan wish to introduce myself to you as a student of Kyambogo University pursuing a Master of Arts degree in Geography and am requested to carry out this research as part of my course. This research is purely for academic purposes, it is my humble request that your answers to the questions should be honest and without any fear. *I give you assurance to keep your responses confidential and all or part of it will never be used for any other purpose other than this research.*

I wish to thank you in advance for sparing your precious time answering this questionnaire. May God/Allah bless you.

This study intends to assess the factors influencing the use of organic farming practices within the banana farming system in Kajara County of Ntungamo district.

The information you provided will be treated as private, highly confidential only to be used for this study.

Identification

Parish.....Village .....…… Sub-county……..……

Name of respondent…….…… Date ……

Type of farmer ***(Tick)*** Organic ☐ Conventional ☐

A. Background

A.1 Gender Female ☐ Male ☐

A.2 What is the occupation of the household head?.....

A.3 Age of the household head……

A.4 How many years have you been practicing banana farming? ……

B. Organic Farming Practices

B.1 Types of farming practices (*Tick*)

Organic Inorganic

B.2 What types of organic farming practices are you engaged in?

	Organic farming technique	**Reason** (Why)	**Description** How is it done
1.	Use of cover crops		

2.	Use of farmyard manure		
3.	Weed management		
4.	Pest Management		
5.	Mulching		
6.	Use of cover crops		
7.	Incorporating crop residues		
8.	Others (specify)……		

B.3 If yes in (B.1), What attracted you to organic farming practices?

……

B.4 If yes in (B.1), what challenges have you experience with organic farming practices?

.....

B.5 If No. in (B.1), Mention the reasons for not using organic farming practices?

.....

B.6. What can be done to enable you to engage in organic farming?

……..……..

B.7 In your view, how has organic farming benefited you?

……

B.8 How do you rate your banana yields after the adoption of Organic farming practices?

Increased..... Declined.....

Remained the same.....

B.9 How do you find disease and pest attacks after the adoption of Organic farming practices?…….....……..

C Socio-Economic Factors:

C1. **Farm Size**

C1.1 What is the size of the land on which you practice crop farming? .....acres

C1.2 What acreage is under banana production? ……acres

C1.3 What acreage is under organic banana production? ……acres

C1.4 Is your farm Consolidated .....or Fragmented? ……

C1.5 If fragmented, how many plots.....

C.2 Off-farm Income

C2.1 Apart from farm income, do you receive income from other sources?

Yes No

C2.2 If yes, please indicate details on other sources of income

Type of earning(income)	**No. of months earned**	**Average monthly income (UgShs.)**
Salary/wages		
Transfer earnings from relatives		
Renting Land		
Commercial and Residential		
Motor vehicle hire		
Other incomes (specify) ……		

C2.4 How much of this income do you allocate to banana production?

Ug Shs …….

C3: House Hold size

C3.1 What is your household size (*number of people living and eating together)* ……

C3.2 How many are (a) Adults..... (b) Children

C3.3 How many are in School .....

C4. Labour

C4.1 Please tell us about the labour allocation concerning farming activities

Activity	**Type of labour**
Mulching	
Weeding	
Compost Preparation (FYM)	
Others (Specify)	

C5: Education

C5.1 What is the level of the education level of the household head.

a) No formal education b)Primary level c) Secondary level ..... d). Tertiary Institution .....

C5.1 State the level of education of other household members.

Activity	**Number**
No Formal Education	

Primary	
Secondary	
Tertiary	

C6. Distance from the homestead

C6.1 How far is the organic farm from your home in Kilometres.....

D Institutional Factors:

D1. Extension Services

D1.1 Have you been visited by agricultural extension officers in the past year?

Yes No

D1.2 If yes, fill in the details in the table

Extension services offered	Provider	Number of times

D1.3 If yes in (D1.1) How have you benefited from their services?

……

D1.4 If No in (D1.1) what are your recommendations?

.....

D2 Training and Motivation

D2.1 have you attended any agricultural training in the last year?

Yes No

D2.2 If yes in (7.1), then complete the table below

Nature Training (	Number of times	Venue	Organiser

D 2.3 In your opinion, as an organic farmer, what benefits have you attained?

.....

D1.3 If No in (D2.3) What are your proposals?

.....

D3. Access to Credit

D3.1 Have you accessed credit services in the last 12 months?

Yes No

D3.2 If yes, fill the table below:

Credit firm	Amount requested	Purpose of credit

D3.3, If **No**, Why?

.....

D4. Group Membership

D4.1 Are you a member of an agricultural-related group or association?

Yes No

D4.2.If Yes in (4.1), which type of group?

Self-help welfare group (*kweyamba*) Cooperative Society

Other (specify).....

D4.3 If Yes in (D4.2), in what ways has the group benefited you as a member?

.....

Appendix C: **Observation Check List**

1. **Organic Farming Practices.**
    A. Mulching -------*Materials Used*

    B. Pest management ……*Practices*

    C. Weed management……. *Practices/methods*

    D. Use of Farmyard manure…. *Materials used*

    E. Use of Residues……*Materials used*

    F. Use of cover crops……*Plants used*

Appendix D: List of Farmers engaged in the Research findings

SNo.	Farmer	Gender	Parish	Subcounty	Date Interviewed
1	Kokundeka Esther	Female	Nyabubare	Bwongyera	4th February 2020
2	Mukundane God	Male	Nyabubare	Bwongyera	4th February 2020
3	Nuwagaba Bridget	Female	Nyabubare	Bwongyera	4th February 2020
4	Tumusiime Joan	Female	Nyabubare	Bwongyera	4th February 2020
5	Agaba Deborah	Female	Rwanda	Bwongyera	4th February 2020
6	Ampaire Suzan	Female	Rwanda	Bwongyera	4th February 2020
7	Atwine Richard	Male	Rwanda	Bwongyera	4th February 2020
8	Byayesu Joseph	Male	Rwanda	Bwongyera	4th February 2020
9	Kiiza Hillary	Male	Rwanda	Bwongyera	4th February 2020
10	Muhumuza Moses	Male	Rwanda	Bwongyera	4th February 2020
11	Ngabirano Feristo	Male	Rwanda	Bwongyera	4th February 2020
12	Tugume Thereza	Female	Rwanda	Bwongyera	4th February 2020
13	Wamala Samuel	Male	Rwanda	Bwongyera	4th February 2020
14	Kakuuru Steven	Male	Nyabubare	Bwongyera	5th February 2020
15	Kyarimpa Barbra	Female	Nyabubare	Bwongyera	5th February 2020
16	Musinguzi Joshua	Male	Nyabubare	Bwongyera	5th February 2020
17	Nuwagira Nice	Female	Nyabubare	Bwongyera	5th February 2020
18	Tumusiimire Frank	Male	Nyabubare	Bwongyera	5th February 2020
19	Agaba Wilson	Male	Rwanda	Bwongyera	5th February 2020
20	Ampurire Juliet	Female	Rwanda	Bwongyera	5th February 2020
21	Bagambaana Deus	Male	Rwanda	Bwongyera	5th February 2020
22	Kabazi Norah	Female	Rwanda	Bwongyera	5th February 2020
23	Kwerinda Rodgers	Male	Rwanda	Bwongyera	5th February 2020
24	Mukasa Edward	Male	Rwanda	Bwongyera	5th February 2020
25	Ninsiima Shivan	Female	Rwanda	Bwongyera	5th February 2020
26	Tumuhairwe Allan	Male	Rwanda	Bwongyera	5th February 2020
27	Ahimbise Promise	Female	Nyabubare	Bwongyera	6th February 2020
28	Aranaitwe Arthur	Male	Nyabubare	Bwongyera	6th February 2020
29	Bakyeta Jennifer	Female	Nyabubare	Bwongyera	6th February 2020
30	Kamukama Ismail	Male	Nyabubare	Bwongyera	6th February 2020
31	Kyomugisha Anne	Female	Nyabubare	Bwongyera	6th February 2020

32	Mutasa Yusuf	Male	Nyabubare	Bwongyera	6th February 2020
33	Owomugisha Tito	Male	Nyabubare	Bwongyera	6th February 2020
34	Tumwine Geoffrey	Male	Nyabubare	Bwongyera	6th February 2020
35	Aheebwa Rose	Female	Rwanda	Bwongyera	6th February 2020
36	Ankunda Justine	Female	Rwanda	Bwongyera	6th February 2020
37	Baguma Protazio	Male	Rwanda	Bwongyera	6th February 2020
38	Kajagiro Susan	Female	Rwanda	Bwongyera	6th February 2020
39	Kwetegyeka Robert	Male	Rwanda	Bwongyera	6th February 2020
40	Muramuzi Robert	Male	Rwanda	Bwongyera	6th February 2020
41	Niwatuhereza Elia	Male	Rwanda	Bwongyera	6th February 2020
42	Tumusabe Pulnari	Male	Rwanda	Bwongyera	6th February 2020
43	Ahimbisibwe Rose	Female	Nyabubare	Bwongyera	7th February 2020
44	Aruho Joseph	Male	Nyabubare	Bwongyera	7th February 2020
45	Barireta Jovanis	Female	Nyabubare	Bwongyera	7th February 2020
46	Kangume Nicholas	Male	Nyabubare	Bwongyera	7th February 2020
47	Magyezi Tom	Male	Nyabubare	Bwongyera	7th February 2020
48	Mwebesa Andrew	Male	Nyabubare	Bwongyera	7th February 2020
49	Rubazonzya Adrian	Male	Nyabubare	Bwongyera	7th February 2020
50	Turyahikayo Ambrose	Male	Nyabubare	Bwongyera	7th February 2020
51	Ahimbisibwe Sheila	Female	Rwanda	Bwongyera	7th February 2020
52	Arinaitwe Anthony	Male	Rwanda	Bwongyera	7th February 2020
53	Bamwine JohnFrancis	Male	Rwanda	Bwongyera	7th February 2020
54	Kamanyire Patrick	Male	Rwanda	Bwongyera	7th February 2020
55	kyomugisha Evarline	Female	Rwanda	Bwongyera	7th February 2020
56	Musinguzi Josephat	Male	Rwanda	Bwongyera	7th February 2020
57	Ntobobo Isaac	Male	Rwanda	Bwongyera	7th February 2020
58	Tumusiime Henry	Male	Rwanda	Bwongyera	7th February 2020
59	Ainebyoona Audrey	Female	Nyabubare	Bwongyera	8th February 2020
60	Ashaba Rose	Female	Nyabubare	Bwongyera	8th February 2020
61	Barugahare Leonard	Male	Nyabubare	Bwongyera	8th February 2020
62	Kansime Evelyn	Female	Nyabubare	Bwongyera	8th February 2020
63	Matovu Hakim	Male	Nyabubare	Bwongyera	8th February 2020
64	Mwesigwa Emmanuel	Male	Nyabubare	Bwongyera	8th February 2020
65	Rutalo Godffrey	Male	Nyabubare	Bwongyera	8th February 2020

66	Tusiime Joan	Female	Nyabubare	Bwongyera	8th February 2020
67	Ahumuza Betty	Female	Rwanda	Bwongyera	8th February 2020
68	Arineitwe Mariam	Female	Rwanda	Bwongyera	8th February 2020
69	Bariho Isaac	Male	Rwanda	Bwongyera	8th February 2020
70	Kanshabe Joan	Female	Rwanda	Bwongyera	8th February 2020
71	Magyezi Patrick	Male	Rwanda	Bwongyera	8th February 2020
72	Mutunda Francis	Male	Rwanda	Bwongyera	8th February 2020
73	Nuwamanya Peter	Male	Rwanda	Bwongyera	8th February 2020
74	Tumwebaze Julius	Male	Rwanda	Bwongyera	8th February 2020
75	Ainemababzi Judith	Female	Nyabubare	Bwongyera	9th February 2020
76	Asiimwe Leonard	Male	Nyabubare	Bwongyera	9th February 2020
77	Bekunda May	Female	Nyabubare	Bwongyera	9th February 2020
78	Kanyerere Didan	Male	Nyabubare	Bwongyera	9th February 2020
79	Mugenyi Apollo	Male	Nyabubare	Bwongyera	9th February 2020
80	Namara Edison	Male	Nyabubare	Bwongyera	9th February 2020
81	Rwakishaya Mathew	Male	Nyabubare	Bwongyera	9th February 2020
82	Twebaze Ambrose	Male	Nyabubare	Bwongyera	9th February 2020
83	Ainembabazi Dinah	Female	Rwanda	Bwongyera	9th February 2020
84	Asiimwe Miriam	Female	Rwanda	Bwongyera	9th February 2020
85	Basiima Duncan	Male	Rwanda	Bwongyera	9th February 2020
86	Kansiime Sharotte	Female	Rwanda	Bwongyera	9th February 2020
87	Mbabazi Ruth	Female	Rwanda	Bwongyera	9th February 2020
88	Muwonge Francis	Male	Rwanda	Bwongyera	9th February 2020
89	Orishaba Consolanta	Female	Rwanda	Bwongyera	9th February 2020
90	Tumwine Beatrice	Female	Rwanda	Bwongyera	9th February 2020
91	Ainomugisha Justine	Female	Nyabubare	Bwongyera	10th February 2020
92	Asiimwe Miriam	Female	Nyabubare	Bwongyera	10th February 2020
93	Betuma Richard	Male	Nyabubare	Bwongyera	10th February 2020
94	Kato Emmanuel	Male	Nyabubare	Bwongyera	10th February 2020
95	Mugisha Henry	Male	Nyabubare	Bwongyera	10th February 2020
96	Nankunda Florence	Female	Nyabubare	Bwongyera	10th February 2020
97	Tamwesigire Faith	Female	Nyabubare	Bwongyera	10th February 2020
98	Twinomuhwezi Donah	Female	Nyabubare	Bwongyera	10th February 2020
99	Ainembabazi Robert	Male	Rwanda	Bwongyera	10th February 2020

100	Asiimwe Josephine	Male	Rwanda	Bwongyera	10th February 2020
101	Beinomugisha Polly	Male	Rwanda	Bwongyera	10th February 2020
102	Karazarwe David	Male	Rwanda	Bwongyera	10th February 2020
103	Mucunguzi Ampumwize	Female	Rwanda	Bwongyera	10th February 2020
104	Nabasa Monica	Female	Rwanda	Bwongyera	10th February 2020
105	Ruhemba Edson	Male	Rwanda	Bwongyera	10th February 2020
106	Turyasingura Felix	Male	Rwanda	Bwongyera	10th February 2020
107	Akampurira Arnold	Male	Nyabubare	Bwongyera	12th February 2020
108	Atuhaire Winfred	Female	Nyabubare	Bwongyera	12th February 2020
109	Busingy Bonny	Male	Nyabubare	Bwongyera	12th February 2020
110	Katongole Joseph	Male	Nyabubare	Bwongyera	12th February 2020
111	Muhame Andrew	Male	Nyabubare	Bwongyera	12th February 2020
112	Naturinda Agatha	Female	Nyabubare	Bwongyera	12th February 2020
113	Tibesigwa David	Male	Nyabubare	Bwongyera	12th February 2020
114	Twongyeirwe Jackline	Female	Nyabubare	Bwongyera	12th February 2020
115	Akampurira Julian	Female	Rwanda	Bwongyera	12th February 2020
116	Atuhaire Anifah	Female	Rwanda	Bwongyera	12th February 2020
117	Birungi Patrick	Male	Rwanda	Bwongyera	12th February 2020
118	Kasigwa Immaculate	Female	Rwanda	Bwongyera	12th February 2020
119	Mugarura David	Male	Rwanda	Bwongyera	12th February 2020
120	Namanya Ronald	Male	Rwanda	Bwongyera	12th February 2020
121	Rutahwire Deosduit	Male	Rwanda	Bwongyera	12th February 2020
122	Tusiime Grace	Female	Rwanda	Bwongyera	12th February 2020
123	Akankwasa Faridah	Female	Nyabubare	Bwongyera	13th February 2020
124	Atukwatse Edwin	Male	Nyabubare	Bwongyera	13th February 2020
125	Buteka Irene	Female	Nyabubare	Bwongyera	13th February 2020
126	Kembabazi Ritah	Female	Nyabubare	Bwongyera	13th February 2020
127	Muhanguzi scovia	Female	Nyabubare	Bwongyera	13th February 2020
128	Nayebare Gorette	Female	Nyabubare	Bwongyera	13th February 2020
129	Tiwangye Allan	Male	Nyabubare	Bwongyera	13th February 2020
130	Zinkanga Armstrong	Male	Nyabubare	Bwongyera	13th February 2020
131	Akankunda Talent	Female	Rwanda	Bwongyera	13th February 2020
132	Atuhaire Lydia	Female	Rwanda	Bwongyera	13th February 2020
133	Birungi Sarah	Female	Rwanda	Bwongyera	13th February 2020

134	Katushabe Evelyne	Female	Rwanda	Bwongyera	13th February 2020
135	Mugisha John	Male	Rwanda	Bwongyera	13th February 2020
136	Natuhwera Provia	Female	Rwanda	Bwongyera	13th February 2020
137	Rwozi Amos	Male	Rwanda	Bwongyera	13th February 2020
138	Twesigye Charles	Male	Rwanda	Bwongyera	13th February 2020
139	Akankwasa Ronah	Female	Nyabubare	Bwongyera	14th February 2020
140	Atwijukire Lonisa	Female	Nyabubare	Bwongyera	14th February 2020
141	Gumisiriza Gloria	Female	Nyabubare	Bwongyera	14th February 2020
142	Kenkondo Mary	Female	Nyabubare	Bwongyera	14th February 2020
143	Muhumuza Bernard	Male	Nyabubare	Bwongyera	14th February 2020
144	Ninsima Angella	Female	Nyabubare	Bwongyera	14th February 2020
145	Tumuhaise Venansio	Male	Nyabubare	Bwongyera	14th February 2020
146	Agaba Doreen	Female	Nyabubare	Bwongyera	14th February 2020
147	Ampumuza Gladys	Female	Nyabubare	Bwongyera	14th February 2020
148	Ayebazibwe Tom	Male	Nyabubare	Bwongyera	14th February 2020
149	Kakooza Ivan	Male	Nyabubare	Bwongyera	14th February 2020
150	Agaba Zeridah	Female	Rwanda	Bwongyera	14th February 2020
151	Akunda Beth	Female	Rwanda	Bwongyera	14th February 2020
152	Aturinde Hillary	Male	Rwanda	Bwongyera	14th February 2020
153	Byamugisha Geoffrey	Male	Rwanda	Bwongyera	14th February 2020
154	Kebirungi Rose	Female	Rwanda	Bwongyera	14th February 2020
155	Mugyenyi Patrick	Male	Rwanda	Bwongyera	14th February 2020
156	Natumanya Annet	Female	Rwanda	Bwongyera	14th February 2020
157	Tabaro Emmanuel	Male	Rwanda	Bwongyera	14th February 2020
158	Twikirize Juliet	Female	Rwanda	Bwongyera	14th February 2020
159	Ampeire Roselyn	Female	Nyabubare	Bwongyera	15th February 2020
160	Atwine Deborah	Female	Nyabubare	Bwongyera	15th February 2020
161	Isanyu George	Male	Nyabubare	Bwongyera	15th February 2020
162	Kiyemba Gilbert	Male	Nyabubare	Bwongyera	15th February 2020
163	Mukasa Ismail	Male	Nyabubare	Bwongyera	15th February 2020
164	Niwamanya Winston	Male	Nyabubare	Bwongyera	15th February 2020
165	Tumuramye Geoffrey	Male	Nyabubare	Bwongyera	15th February 2020
166	Agaba Hilda	Female	Nyabubare	Bwongyera	15th February 2020
167	Antumanya Annet	Female	Nyabubare	Bwongyera	15th February 2020

168	Bainomugisha Susan	Female	Nyabubare	Bwongyera	15th February 2020
169	Ainebyoona Christine	Female	Rwanda	Bwongyera	15th February 2020
170	Amanya Roselyn	Female	Rwanda	Bwongyera	15th February 2020
171	Atwiine Sharon	Female	Rwanda	Bwongyera	15th February 2020
172	Byarugaba George	Male	Rwanda	Bwongyera	15th February 2020
173	Kentaro Daphine	Female	Rwanda	Bwongyera	15th February 2020
174	Muhanguzi Richard	Male	Rwanda	Bwongyera	15th February 2020
175	Natumanya Daphine	Female	Rwanda	Bwongyera	15th February 2020
176	Tibesigwa Schola	Female	Rwanda	Bwongyera	15th February 2020
177	Twinobusasi Penlope	Female	Rwanda	Bwongyera	15th February 2020
178	Yerindabo Francis	Male	Rwanda	Bwongyera	15th February 2020
179	Kashaija Vicent	Male	Butanda	Ihunga	18th February 2020
180	Mujjuzi Henry	Male	Butanda	Ihunga	18th February 2020
181	Nyakabara Francis	Male	Butanda	Ihunga	18th February 2020
182	Turyareeba Betty	Female	Butanda	Ihunga	18th February 2020
183	Akankwasa Joan	Female	Kitondo	Ihunga	18th February 2020
184	Ayebazibwe Shivan	Female	Kitondo	Ihunga	18th February 2020
185	Kamugisha Robert	Male	Kitondo	Ihunga	18th February 2020
186	Mbabazi Tadeo	Male	Kitondo	Ihunga	18th February 2020
187	Ngarosha Golden	Male	Kitondo	Ihunga	18th February 2020
188	Tumushabe Beatrice	Female	Kitondo	Ihunga	18th February 2020
189	Katongole Livingstone	Male	Butanda	Ihunga	19th February 2020
190	Muramuzi Josephat	Male	Butanda	Ihunga	19th February 2020
191	Rubazonzya James	Male	Butanda	Ihunga	19th February 2020
192	Tushemereirwe Bosco	Male	Butanda	Ihunga	19th February 2020
193	Akunda Timothy	Male	Kitondo	Ihunga	19th February 2020
194	Bagambana Lovence	Female	Kitondo	Ihunga	19th February 2020
195	Kangaho Samuel	Male	Kitondo	Ihunga	19th February 2020
196	Mugimya Paddy	Male	Kitondo	Ihunga	19th February 2020
197	Niwamanya Richard	Male	Kitondo	Ihunga	19th February 2020
198	Tumusiime Morris	Male	Kitondo	Ihunga	19th February 2020
199	Kayondo Rapheal	Male	Butanda	Ihunga	20th February 2020
200	Musinguzi Edgar	Male	Butanda	Ihunga	20th February 2020
201	Rukundo Moreen	Female	Butanda	Ihunga	20th February 2020

202	Tweheyo Robert	Male	Butanda	Ihunga	20th February 2020
203	Ampeire Rosette	Female	Kitondo	Ihunga	20th February 2020
204	Bakamuturaki Ronald	Male	Kitondo	Ihunga	20th February 2020
205	Kansiime Justin	Female	Kitondo	Ihunga	20th February 2020
206	Mugisha Obed	Male	Kitondo	Ihunga	20th February 2020
207	Nkabigumira Fred	Male	Kitondo	Ihunga	20th February 2020
208	Tumwesigye Ben	Male	Kitondo	Ihunga	20th February 2020
209	Ahumuza Annet	Female	Butanda	Ihunga	21st February 2020
210	Atuhaire Lovince	Male	Butanda	Ihunga	21st February 2020
211	Bwengye Innocent	Male	Butanda	Ihunga	21st February 2020
212	Kentaro Christine	Female	Butanda	Ihunga	21st February 2020
213	Mutebi Ronald	Male	Butanda	Ihunga	21st February 2020
214	Rwentaro Yunusu	Male	Butanda	Ihunga	21st February 2020
215	Twijukye Susan	Female	Butanda	Ihunga	21st February 2020
216	Ankunda Anneb	Female	Kitondo	Ihunga	21st February 2020
217	Bandiho Caleb	Male	Kitondo	Ihunga	21st February 2020
218	Kanyamurwa Denis	Male	Kitondo	Ihunga	21st February 2020
219	Muhumuza Albert	Male	Kitondo	Ihunga	21st February 2020
220	Nuwagaba Ephraim	Male	Kitondo	Ihunga	21st February 2020
221	Turinawe Caroline	Female	Kitondo	Ihunga	21st February 2020
222	Ainemamtsiko Reagan	Male	Butanda	Ihunga	22nd February 2020
223	Aturinda Schola	Female	Butanda	Ihunga	22nd February 2020
224	Byamukama Nicholas	Male	Butanda	Ihunga	22nd February 2020
225	Kigambo Jimmy	Male	Butanda	Ihunga	22nd February 2020
226	Mutyaba Nuhu	Male	Butanda	Ihunga	22nd February 2020
227	Serenziyo Godfrey	Male	Butanda	Ihunga	22nd February 2020
228	Twikirize Cosmas	Male	Butanda	Ihunga	22nd February 2020
229	Anyijukire Edwin	Male	Kitondo	Ihunga	22nd February 2020
230	Barugahare George	Male	Kitondo	Ihunga	22nd February 2020
231	Karugaba Musa	Male	Kitondo	Ihunga	22nd February 2020
232	Muhwezi Paddy	Male	Kitondo	Ihunga	22nd February 2020
233	Nuwarinda Edson	Male	Kitondo	Ihunga	22nd February 2020
234	Tusaasirwe Felix	Male	Kitondo	Ihunga	22nd February 2020
235	Ainembabazi Loyce	Female	Butanda	Ihunga	23rd February 2020

236	Atwiine Dorreck	Female	Butanda	Ihunga	23rd February 2020
237	Byarugaba Benon	Male	Butanda	Ihunga	23rd February 2020
238	Ktomugisha Peace	Female	Butanda	Ihunga	23rd February 2020
239	Mwesigye Simon Peter	Male	Butanda	Ihunga	23rd February 2020
240	Tibesigwa Emmanuel	Female	Butanda	Ihunga	23rd February 2020
241	Twinamatsiko Scovia	Female	Butanda	Ihunga	23rd February 2020
242	Arinda Christopher	Male	Kitondo	Ihunga	23rd February 2020
243	Begumisa Robinah	Female	Kitondo	Ihunga	23rd February 2020
244	Kato Jordan	Male	Kitondo	Ihunga	23rd February 2020
245	Mukasa Joseph	Male	Kitondo	Ihunga	23rd February 2020
246	Oyebazibwe James	Male	Kitondo	Ihunga	23rd February 2020
247	Tusiime Judith	Female	Kitondo	Ihunga	23rd February 2020
248	Akampurira Hellen	Female	Butanda	Ihunga	24th February 2020
249	Atwine Jackline	Female	Butanda	Ihunga	24th February 2020
250	Byaruhanga Benard	Male	Butanda	Ihunga	24th February 2020
251	Kwesigwa Patrick	Male	Butanda	Ihunga	24th February 2020
252	Nakamya Jonah	Male	Butanda	Ihunga	24th February 2020
253	Tibigambwa Tarsis	Male	Butanda	Ihunga	24th February 2020
254	Twongyeirwe Moses	Male	Butanda	Ihunga	24th February 2020
255	Ashaba Hellen	Female	Kitondo	Ihunga	24th February 2020
256	Betaho Raymond	Male	Kitondo	Ihunga	24th February 2020
257	Katushabe Julian	Female	Kitondo	Ihunga	24th February 2020
258	Musiime Richard	Male	Kitondo	Ihunga	24th February 2020
259	Rukamba Joshua	Male	Kitondo	Ihunga	24th February 2020
260	Twesigye Stella	Female	Kitondo	Ihunga	24th February 2020
261	Akankunda Prossy	Female	Butanda	Ihunga	25th February 2020
262	Ayebazibwe Jenipher	Female	Butanda	Ihunga	25th February 2020
263	Kabagambe Musa	Male	Butanda	Ihunga	25th February 2020
264	Kyomugisha Claire	Female	Butanda	Ihunga	25th February 2020
265	Nasasira Edgar	Male	Butanda	Ihunga	25th February 2020
266	Tugume Cyprian	Male	Butanda	Ihunga	25th February 2020
267	Wigabire Agatha	Female	Butanda	Ihunga	25th February 2020
268	Asiimwe Jimmy	Male	Kitondo	Ihunga	25th February 2020
269	Birungi Regina	Female	Kitondo	Ihunga	25th February 2020

270	Kengoro Annet	Female	Kitondo	Ihunga	25th February 2020
271	Musinguzi Robert	Male	Kitondo	Ihunga	25th February 2020
272	Rwabatabazi Robert	Male	Kitondo	Ihunga	25th February 2020
273	Twinamatsiko Jonathan	Male	Kitondo	Ihunga	25th February 2020
274	Akanwasa Gertrude	Female	Butanda	Ihunga	26th February 2020
275	Babyoroza Zephania	Male	Butanda	Ihunga	26th February 2020
276	Kajagiro Perepetwa	Female	Butanda	Ihunga	26th February 2020
277	Magara Edwin	Male	Butanda	Ihunga	26th February 2020
278	Natukunda Robinah	Female	Butanda	Ihunga	26th February 2020
279	Tummwesigye Willy	Male	Butanda	Ihunga	26th February 2020
280	Agaba Gloria	Female	Kitondo	Ihunga	26th February 2020
281	Asiimwe Lynet	Female	Kitondo	Ihunga	26th February 2020
282	Busingye Anita	Female	Kitondo	Ihunga	26th February 2020
283	Keshaha Judith	Female	Kitondo	Ihunga	26th February 2020
284	Mutungi Emmanuel	Male	Kitondo	Ihunga	26th February 2020
285	Segujja Salim	Male	Kitondo	Ihunga	26th February 2020
286	Twongyeirwe Andrew	Male	Kitondo	Ihunga	26th February 2020
287	Amanya Florence	Female	Butanda	Ihunga	27th February 2020
288	Baguma Innocent	Female	Butanda	Ihunga	27th February 2020
289	Kalule Lawrence	Male	Butanda	Ihunga	27th February 2020
290	Mazima Edmond	Male	Butanda	Ihunga	27th February 2020
291	Ndyamwihuraki Vicent	Male	Butanda	Ihunga	27th February 2020
292	Tumuramye Lydia	Female	Butanda	Ihunga	27th February 2020
293	Ahimbisibwe Moreen	Female	Kitondo	Ihunga	27th February 2020
294	Atuhaire Brenda	Female	Kitondo	Ihunga	27th February 2020
295	Byamugisha John	Male	Kitondo	Ihunga	27th February 2020
296	Kokundeka Cecilia	Female	Kitondo	Ihunga	27th February 2020
297	Mwerinde Marvin	Male	Kitondo	Ihunga	27th February 2020
298	Tamwesigire Frugencia	Female	Kitondo	Ihunga	27th February 2020
299	Wembabzi Esther	Female	Kitondo	Ihunga	27th February 2020
300	Ampumuza Grace	Female	Butanda	Ihunga	28th February 2020
301	Bamuturaki Robert	Male	Butanda	Ihunga	28th February 2020
302	Kamugisha William	Male	Butanda	Ihunga	28th February 2020
303	Migisha Belinda	Female	Butanda	Ihunga	28th February 2020

304	Ninsiima Racheal	Female	Butanda	Ihunga	28th February 2020
305	Tumushabe Julius	Male	Butanda	Ihunga	28th February 2020
306	Ahirirwe Scovia	Female	Kitondo	Ihunga	28th February 2020
307	Atukwase Suzan	Female	Kitondo	Ihunga	28th February 2020
308	Byarugaba William	Male	Kitondo	Ihunga	28th February 2020
309	Kwesigabo Mark	Male	Kitondo	Ihunga	28th February 2020
310	Nahwera Loyce	Female	Kitondo	Ihunga	28th February 2020
311	Tibesigwa Teopista	Female	Kitondo	Ihunga	28th February 2020
312	Zinkuratire Lwanga	Male	Kitondo	Ihunga	28th February 2020
313	Agaba Pauline	Female	Butanda	Ihunga	1st March 2020
314	Ahebwa Irene	Female	Butanda	Ihunga	1st March 2020
315	Ankunda Edrine	Female	Butanda	Ihunga	1st March 2020
316	Barigye Edgar	Male	Butanda	Ihunga	1st March 2020
317	Kansabe Agnes	Female	Butanda	Ihunga	1st March 2020
318	Mugisha Isaac	Male	Butanda	Ihunga	1st March 2020
319	Niwareeba Ronald	Male	Butanda	Ihunga	1st March 2020
320	Tumusiime Chris	Male	Butanda	Ihunga	1st March 2020
321	Ahimbisibwe Shallon	Female	Butanda	Ihunga	1st March 2020
322	Ainembabazi linda	Female	Kitondo	Ihunga	1st March 2020
323	Atwiine Dereck	Male	Kitondo	Ihunga	1st March 2020
324	Ingabire Irene	Female	Kitondo	Ihunga	1st March 2020
325	Kyarisiima Emilly	Female	Kitondo	Ihunga	1st March 2020
326	Namara Susan	Female	Kitondo	Ihunga	1st March 2020
327	Tibuhaburwa Emmanuel	Male	Kitondo	Ihunga	1st March 2020
328	Asiima Noeline	Female	Butanda	Ihunga	2nd March 2020
329	Asiimwe Johnathan	Male	Butanda	Ihunga	2nd March 2020
330	Asiimwe Richard	Male	Butanda	Ihunga	2nd March 2020
331	Ariho Jonas	Female	Butanda	Ihunga	2nd March 2020
332	Barigye Peter	Male	Butanda	Ihunga	2nd March 2020
333	Kansiime Sarah	Female	Butanda	Ihunga	2nd March 2020
334	Mugizi Edmond	Male	Butanda	Ihunga	2nd March 2020
335	Nkwasibwe Ronah	Female	Butanda	Ihunga	2nd March 2020
336	Tumusimire Raphael	Male	Butanda	Ihunga	2nd March 2020
337	Ainomugisha Coleb	Male	Kitondo	Ihunga	2nd March 2020

338	Atwijukire Victo	Male	Kitondo	Ihunga	2nd March 2020
339	Kaijuka Domaro	Male	Kitondo	Ihunga	2nd March 2020
340	Kyomuhendo Theresa	Female	Kitondo	Ihunga	2nd March 2020
341	Natukunda Faridah	Female	Kitondo	Ihunga	2nd March 2020
342	Tuhirwe Brenda	Female	Kitondo	Ihunga	2nd March 2020
343	Beinomugisha Edson	Male	Butanda	Ihunga	3rd March 2020
344	Bihandiko Roland	Male	Butanda	Ihunga	3rd March 2020
345	Birungi Sandra	Female	Butanda	Ihunga	3rd March 2020
346	Arineitwe Joan	Female	Butanda	Ihunga	3rd March 2020
347	Baryakareba Taitu	Male	Butanda	Ihunga	3rd March 2020
348	Kanyerere Joseph	Male	Butanda	Ihunga	3rd March 2020
349	Muhumuza Daniel	Male	Butanda	Ihunga	3rd March 2020
350	Nuwahereza Darius	Male	Butanda	Ihunga	3rd March 2020
351	Tumwesigye Robert	Male	Butanda	Ihunga	3rd March 2020
352	Akandwanaho Aggrey	Male	Kitondo	Ihunga	3rd March 2020
353	Ayebazibwe Irene	Female	Kitondo	Ihunga	3rd March 2020
354	Kakuru John mary	Male	Kitondo	Ihunga	3rd March 2020
355	Mandela Nelson	Male	Kitondo	Ihunga	3rd March 2020
356	Naturinda Naume	Female	Kitondo	Ihunga	3rd March 2020
357	Tumukunde Mary	Female	Kitondo	Ihunga	3rd March 2020

Appendix E: Introduction Letter

KYAMBOGO UNIVERSITY

P. O. BOX 1 KYAMBOGO
FACULTY OF ARTS AND SOCIAL SCIENCES
DEPARTMENT OF GEOGRAPHY AND SOCIAL STUDIES

24th January 2020

TO WHOM IT MAY CONCERN

ATWIJUKYE DUNSTAN
2009/U / HD /142/MAG

This is to introduce to you the above named student who is pursuing a Master of Arts in Geography degree course at Kyambogo University.

He would like to be assisted in data collection to write on the factors influencing adoption of organic farming practices in the banana cropping system in Kajara County, Ntungamo District.

Any assistance accorded to her will be highly appreciated.

Thank you.

Dr. Turyabanawe Loy Gumisiriza
RESEARCH COORDINATOR