Factors that have Influenced Low Adoption of Watermelon Growing in Ngariam County, Katakwi District

BY

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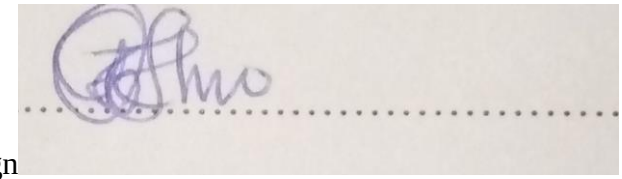
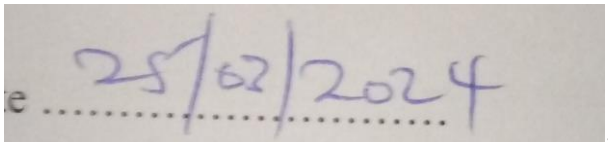
December 2023.

DECLARATION

I **OPIO MACKAY** do declare that the information in this report is true and it's my original work and it has not been submitted by any other person to any institution for any academic award

Sign  ……Date……

e  ……

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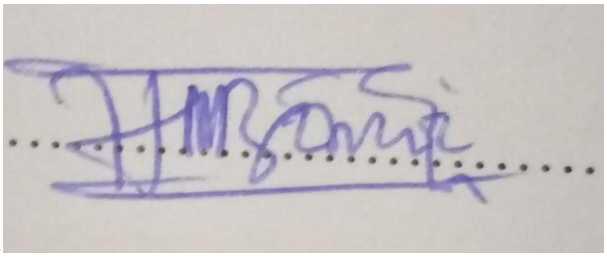
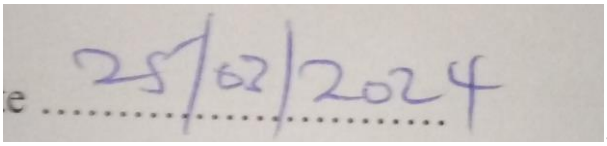
APPROVAL

This dissertation titled “Factors influencing low adoption of water melon growing in Ngariam county, Katakwi district” was written by Opio Mackay under our guidance and supervision and meets the requirements set by Busitema University for award of Bachelor of Science Education. It has been submitted with approval of a University sor

Sign …  ……. Date ……  ……

Mr. Otema Patrick Ben Emoi

(Supervisor)

DEDICATION

First and foremost, I would like to send my sincere gratitude to my beloved parents (OTIM JAMES BENARD FLORENCE AND JAMES FLORENCE AMUGE) , my dear brothers (o. Jimmy Mary, Mary j,A. Florence, A . Caroline, A. Mourice, Peterson Amodoi, beloved sisters, in-laws, guardians, our beloved siblings (B. Faith,B. Favor, B. Fortunate ,W . Franklin, N. Florian, Babirye & Nakato, O. James, O. Jacob) and my critic friends (dear Mum Florence Amuge, Otim J Mary, Mr. Bwiso Florence

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NGO – ***Non-Governmental Organization***

FAO - ***The Food and Agriculture Organization***

SPSS -***Statistical Package for Social Sciences***

NARO (National Agriculture Research Organization**)**

ABSTRACT

This study investigated the factors influencing watermelon growing in Ngariam county, Katakwi district, Uganda. The study employed a cross sectional research design and 20 respondents were involved. Data was collected using questionnaire and presented in form of frequency tables and charts both pie charts and graphs. The findings revealed factors influencing watermelon cultivation such as shortage of land, poor transport, inadequate extension services, harsh climatic conditions, lack of access to credit, price fluctuation, pests and diseases. The agronomic practices to increase the yield of the fruit among farmers included; planting improved seed variety, application of fertilizers, control of pests and diseases, timely planting and harvesting. The approaches for increased adoption of the fruit according to the findings were; improvement of transport, increasing access to credit, provision of effective extension services and provision of improved seeds, provision of fertilizers and pesticides.

CHAPTER ONE

1.1 Introduction

Watermelon *(lanatus) Citrullus* is a flowering plant species of the *Cucurbitaceae* family and the name of its edible fruit. A scrambling and trailing vine-like plant, it is a highly cultivated fruit worldwide, with more than 1,000 varieties. (Matsum. & Nakai, 2022)

The fruit is a juicy and delicious that has been cultivated for thousands of years. Its origin can be traced back to ancient civilization of Africa and Asia, where it was grown as early as 4000 BCE.

The first watermelon fruit was first introduced to Europe by the Moors in the 12th century and was later brought to Americas by European colonizers. Today, watermelon is grown in many parts of the world, with the USA, China and Brazil being the top producers.

Watermelon is a member of *Cucurbitaceae* family, which includes other fruits such as cucumbers, squash and melons. It is a vine grown fruit that requires a long growing season, and its typically harvested in the summer months. The fruit has a thick rind that is green or yellow on the outside and a juicy pink or red flesh on the inside. The fruit is a rich source of vitamin A and C, and potassium and lycopene, an antioxidant that has been linked to several health benefits. (The history of watermelon by the Watermelon Association 2020)

Watermelon farming has a long history that dates back thousands of years. The cultivation of watermelons can be traced to ancient civilizations in Africa, specifically in the region that is now known as Sudan. Over time, watermelon farming spread to other parts of the world, including Asia, Europe, and the Americas.

The original wild watermelons were domesticated by native tribes in ancient Africa, which is where watermelon farming got its start. These tribes recognized the potential of this fruit and began cultivating it for its sweet and refreshing taste. The cultivation of watermelons in Africa can be dated back as early as 5,000 years ago. (Abbo & Peleg, 2014)

The Egyptians utilized watermelons for religious and funeral purposes in addition to eating them; they also adapted watermelon cultivation techniques and planted the fruit along the Nile River. Watermelons were often placed in tombs as a source of nourishment for the deceased in the afterlife.

The cultivation of watermelons in ancient Egypt was well-documented, with evidence found in hieroglyphics and tomb paintings. Watermelons were highly regarded by the Egyptians, and they even left watermelon seeds in the tombs of pharaohs such as Tutankhamun. This demonstrates the cultural significance and value placed on watermelons during that time.

From Egypt, watermelon farming techniques spread to other parts of the Mediterranean region and eventually reached Europe during the Roman Empire. The Romans appreciated watermelons for their juicy flesh and used them as a dessert fruit. They also introduced watermelon cultivation to regions such as Spain and France.

Europe's adoption of watermelon farming was greatly aided by the Romans. They actively encouraged the fruit's production within their borders after realizing the fruit's potential. Watermelon farming became popular among Roman farmers, who developed various techniques to improve yield and quality. As a result, watermelon consumption became widespread in Europe during the Roman Empire.

The cultivation of watermelon was also brought to Asia, where it rose to prominence as a crop in nations like China and India. Since watermelons were first grown in China in the tenth century, the fruit has been associated with wealth and good fortune. Chinese farmers developed different varieties of watermelons, including the famous "crimson sweet" variety.

Records of watermelon cultivation date back to the Song Dynasty (960–1279 AD), which occurred a long time ago in China. In Chinese culture, watermelons were highly prized and were given as gifts on significant occasions. Chinese farmers created a number of

methods, such as hybridization and grafting, to increase the output of watermelons. These advancements contributed to the diversity of watermelon varieties found in China today.

Eventually, fruit cultivation reached the Americas as a result of European colonialism. Watermelons were brought to the New World by Spanish explorers, and Native American tribes took to them right away. These days, watermelon cultivation is common throughout North and South America, with significant producers being the United States, Mexico, Brazil, and Argentina.

Cultivation of the fruit in the Americas began during the Age of Exploration when Spanish explorers brought watermelon seeds to the New World. Native American tribes readily adopted watermelon farming techniques and incorporated this fruit into their diets. The popularity of watermelons continued to grow over time, and it eventually became an important crop for both domestic consumption and exportation in countries like the United States and Mexico.

In current times, watermelon farming has become more advanced with the use of technology and scientific research. Farmers now have access to improved varieties that offer better yield, disease resistance, and taste. Additionally, advancements in irrigation systems and agricultural practices have allowed for more efficient watermelon production.

The agricultural revolution brought about by technological breakthroughs has helped modern watermelon farming. The creation of seedless watermelon types through genetic engineering has resulted in their widespread cultivation. Convenience and reliable quality have made these seedless watermelons more and more popular. Furthermore, the use of precision farming techniques, such as drip irrigation and controlled environment agriculture, has allowed farmers to optimize watermelon production and reduce resource wastage.

The fruit is an annual crop that has a prostrate or climbing habit. Stems are up to 3 metres (10 feet) long and new growth has yellow or brown hairs. Leaves are 60 to 200 millimeters (2+1⁄4 to 7+3⁄4 inches) long and 40 to 150 mm (1+1⁄2 to 6 in) wide (S. S. Rana &

Rana, 2016). These usually have three lobes that are lobed or doubly lobed. Young growth is densely woolly with yellowish-brown hairs which disappear as the plant ages. Like all but one species in the genus *Citruatehbranching.*

1.2 Watermelon Production

Production of watermelon The US grew over 100,000 acres of watermelons in 2020, yielding 38 million pounds, according to the USDA Economic Research Service. (Garvin et al., 2023)

The history of watermelon cultivation dates back to ancient times, when native cultures domesticated wild watermelons. These tribes started growing this fruit because they could see its potential and enjoyed it's refreshing and sweet flavor. Watermelons have been cultivated for as long as 5,000 years worldwide.

Park et al (2022), the average watermelon yield per acre in the U.S in 2020 was 39,704 pounds. In terms of production, watermelon is one of the three top crops produced in the US, along with onions and head lettuce. All but about 24 percent of domestic consumption of watermelons comes from U.S. growers; the rest comes primarily from Mexico or the nations of Central America.

According to Lucier (2006), the percentage of seedless watermelons in US watermelon shipments rose from 51% in 2003 to almost 85% in 2014, a result of growing consumer demand for seedless varietals. More careful maintenance is needed for seedless types, which are usually started as transplants instead of direct seeding, and the cost differences are normally apparent at retail. In 2016, watermelons brought in $578.8 million in cash in the United States.

Watermelon Growing in Africa

Later, ancient Egyptians who farmed watermelon near the Nile River adopted these farming practices. In addition to eating them, watermelons were utilized by the Egyptians in religion and for burial. In order to provide the dead with food in the afterlife, watermelons were frequently buried with other people.

Evidence of the fruit's cultivation in ancient Egypt can be discovered in tomb murals and hieroglyphic writing. The Egyptians held watermelons in such high respect that they placed watermelon seeds in the tombs of pharaohs like Tutankhamun. This later illustrated the watermelons' cultural significance and value at that time.

Watermelon cultivation practices originated in Egypt and subsequently extended throughout the Mediterranean region and Europe during the Roman Empire. Watermelons were prized for their luscious flesh and were utilized as a fruit for dessert by the Romans. Additionally, they brought the cultivation of watermelon to areas like France and Spain.

Watermelon Growing in East Africa

East Africa's pepo farming industry has grown significantly in the last several years, bolstering both the agricultural and economic development of the region. East Africa is the best place to grow watermelon because of its great climate and soil. This thorough answer will cover a wide range of topics related to watermelon farming in East Africa, such as market trends, production figures, growing techniques, farmer difficulties, and the industry's overall index.

Production Statistics:

The fruit's popularity has been steadily rising across East Africa over time. The Food and Agriculture Organization (FAO) said that in 2019, watermelon output in East Africa was

estimated to have reached 2.5 million metric tons. This indicates a significant increase over prior years, underscoring the expanding significance of watermelon cultivation in the area.

Cultivation Practices:

In East Africa, watermelons are usually farmed as annual crops. Different farming techniques are used by farmers to guarantee the best possible development and yield. Choosing the right kinds is essential, considering things like market demand, taste, and disease resistance. East African watermelon growers frequently cultivate Sugar Baby, Charleston Gray, Crimson Sweet, and Jubilee.

Watermelon Growing in Uganda

In Uganda, watermelon, or *Citrullus lanatus*, is a significant fruit crop. The nation cultivates a number of watermelon types, each with distinct qualities and the capacity to adapt to various growing environments. Uganda primarily grows the Sukari F1, Charleston Gray, Sugar Baby, Crimson Sweet, and Jubilee watermelon types.

1.**Sukari F1**: Sukari F1 is a popular watermelon variety grown in Uganda. It is a hybrid variety known for its high yield potential and excellent fruit quality. This variety has a dark green rind with distinct stripes and a sweet, crisp, and juicy red flesh. Sukari F1 is highly resistant to diseases such as Fusarium wilt and anthracnose, making it suitable for cultivation in various regions of Uganda. It has a good shelf life and can be stored for longer periods after harvest (Keyes, 2017).

The harvest index or yield index of Sukari F1 refers to the ratio of the edible portion (fruit weight) to the total plant weight at harvest. This index provides an indication of the efficiency of converting plant biomass into marketable fruit.

2. **Charleston Gray:** Charleston Gray is another popular watermelon variety grown in Uganda. It is an open-pollinated variety known for its large size and sweet flavor. The rind of Charleston Gray is light green with dark green stripes, while the flesh is deep red and

juicy. This variety has good disease resistance and can tolerate hot weather conditions, making it suitable for cultivation in Uganda. (Ssekyewa et al. 2020)

3. **Sugar Baby:** Sugar Baby is a popular variety cultivated in Uganda due to its small size and sweet, juicy flesh. It is an open-pollinated variety known for its compact size and high sugar content. The rind of Sugar Baby is dark green, almost black, and the flesh is deep red and very sweet. This variety matures early, allowing farmers to have an early harvest. (Namanya & Kikulwe., 2018)

4. **Crimson Sweet:** Crimson Sweet is a popular watermelon variety grown in Uganda. It is an open-pollinated variety known for its large size and sweet flavor. The rind of Crimson Sweet is light green with dark green stripes, and the flesh is deep red and juicy. This variety has good disease resistance and can tolerate a wide range of growing conditions. (Nankinga et al. 2019)

5. **Jubilee:** Jubilee is another watermelon variety cultivated in Uganda. It is an open-pollinated variety known for its large size and sweet taste. The rind of Jubilee is light green with dark green stripes, while the flesh is bright red and juicy. This variety has good disease resistance and can adapt well to different growing conditions. (Opolot et al. 2017)

Major Watermelon Areas in Uganda

Uganda is well-known for having a pleasant climate and rich soils that are ideal for growing a variety of crops, including watermelons. In Uganda, the majority of watermelon production takes place in a few areas with ideal growing conditions. Uganda's key watermelon growing regions include;

1. **Eastern Region:** The Eastern Region of Uganda is one of the major watermelon production areas in the country. This region comprises districts such as Mbale, Soroti, Katakwi, Tororo, and Busia. The region’s fertile soils, coupled with its favorable climate

conditions, support the cultivation of high-quality watermelons. (Nakandi & Ssemakula 2013).

2. **Central Region:** In the Central Region of Uganda, watermelon farming is predominant, especially in the districts of Wakiso, Mukono, and Kampala. The fertile soils and favorable climate conditions in this region support the growth of watermelon. Farmers in this area take advantage of the abundant rainfall and well-drained soils to produce high-quality watermelons for both local consumption and export. (Mugume, J. 2016).

3.**Northern Region:** The Northern Region of Uganda also contributes to the country's watermelon production. Districts like Gulu, Lira, Kitgum, and Apac have suitable agro-ecological conditions for watermelon cultivation. The region experiences a bimodal rainfall pattern, which provides sufficient moisture for crop growth.

4. **Western Region:** The Western Region of Uganda, particularly the districts of Hoima, Masindi, and Kyankwanzi, is another significant watermelon-growing area. The region’s fertile volcanic soils and favorable climate conditions contribute to the successful cultivation of watermelon. Additionally, the area’s proximity to the capital city, Kampala, enables farmers to easily transport their produce to the markets. (Mugume & Ssemakula 2015).

It is important to note that the major growing regions of watermelon in Uganda include the Central, Western, and Eastern Regions, with each region offering unique opportunities and challenges for watermelon farmers. These regions benefit from their fertile soils, favorable climate conditions, and proximity to markets, both local and international.

Harvest Index in Tonnes

A study conducted by the International Institute of Tropical Agriculture and Makerere University in Uganda found that the watermelon harvest index in the country ranged from 25

to 40%, with the highest values being observed in areas with fertile soils and favorable climatic conditions. These results indicate that there is significant potential to improve watermelon yields in Uganda through better management practices and variety selection.

One of the most important factors affecting the watermelon harvest index in Uganda is the availability of water. Watermelons are sensitive to water stress, and a lack of water can lead to lower yields and poorer quality fruits. In Uganda, watermelon production often takes place during the dry season, when water resources are scarce. To improve the watermelon harvest index, farmers should focus on implementing irrigation systems that can efficiently deliver water to their crops, as well as adopting drought-tolerant cultivars. (Nantongo & Kakembo 2018)

1.3 Problem Statement

According to NARO (2016), watermelon is more commonly grown in different parts of Uganda where it has spread to different parts of the country like Katakwi, Soroti, Mbale among others, The fruit has been adopted highly in other districts due favourable conditions which include both socioeconomic factors like fertile soils, Reliable rainfall, ready market and cool climatic conditions ,but its adoption in Katakwi District Ngariam county is at low rate due to a number of factors affecting its cultivation. This serves as a basis for this research to establish the gaps limiting adoption of watermelon farming, formulation of the solutions and recommendations to address the factors for its low adoption by many local farmers and foreign investors in Katakwi district.

1.4 Main Objective

To examine the factors that influence low adoption of watermelon farming in Katakwi district in Ngariam County in parishes like Alukucok ,Akoboi.

1.5 Specific Objectives

1. To examine the factors influencing low adoption of watermelon farming in Ngariam County.
2. To assess the agronomic management practices carried in watermelon farming to increase on the fruit yield.
3. To determine the approaches to address the factors influencing low adoption of watermelon cultivation in Ngariam County.

1.6 Research Questions

1. What are the factors which have limited watermelon cultivation among farmers in Ngariam County, Katakwi district?
2. What are some of the agronomic management practices farmers have to apply to increase in the quality and quantity of watermelon?
3. What approaches should be employed to increase the adoption watermelon cultivation by farmers in Ngariam county Katakwi district?

1.7 Hypotheses

Social economic factors have a great influence on farmer's decision to adopt watermelon farming as well as Farmer's characteristics significantly influence their decision to adopt the cultivation of the fruit. For example; low-income status of many farmers, lack of awareness, limited to credit facilities, limited government support, inadequate extension services, among others.

1.8 Justification

There are some constraints that affect the adoption of watermelon farming which constitute mainly of the use of indigenous varieties of watermelon which lead to a decrease in the level of output as the fruit crop. This is also stimulated by the fact that most local

smallholder farmers carry out watermelon farming in small scale in order sustainable cultivation of food crops in other pieces of land hence ensuring food security in the parishes like Akoboi and Alukucok.

Farmers face a challenge in access to agricultural research facilities and organizations such as NARO (National Agriculture Research Organizatin) which is located far away hence minimizing the dissemination of new technologies and innovations to the farmers. This has contributed to levels of adoption experienced in the country despite the high demand from foreign market. (Dzama & Mapiye., 2021)

1.9 Significance of The Study

In the research study significance, it pertains to the planned study's importance and pertinence. It is an essential part of the research proposal since it explains the value of the study and how it will advance the body of information already known in the area. A research proposal's significance is typically determined by showcasing the study's possible influence on theory, practice, or policy as well as its potential benefits to the academic community and society at large.

This research study will act as a base for transformation of small holder farmers to commercial farming as the fruit has acted as a basis of diversification hence increasing the income levels of local farmers.

1.10 Scope of The Study

The research was conducted in two parishes, i.e Alukucok and Akoboi Parish of Ngariam Sub County in Katakwi District, Eastern Uganda.

The study was assessing factors limiting the increase adoption watermelon fruit in selected parishes mentioned above under the scheduled time interval between 17/11/2023 to 30/11/2023

1.11 Conceptual Framework

The theoretical framework that directs the study's progress is referred to as the conceptual framework in a research proposal. It acts as a guide for the technique, data gathering, and analysis as well as a framework for comprehending the research problem. In order to help researchers identify important factors, clarify their thoughts, and establish the linkages between these variables, the conceptual framework is essential in research proposals.

Cultivating watermelon plants with the intention of harvesting their fruits is known as watermelon farming. A clear conceptual framework covering a range of topics, including land preparation, seed selection, planting techniques, irrigation methods, pest and disease management, fertilization practices, harvesting procedures, and post-harvest handling, is crucial for the establishment of a profitable watermelon farming business.

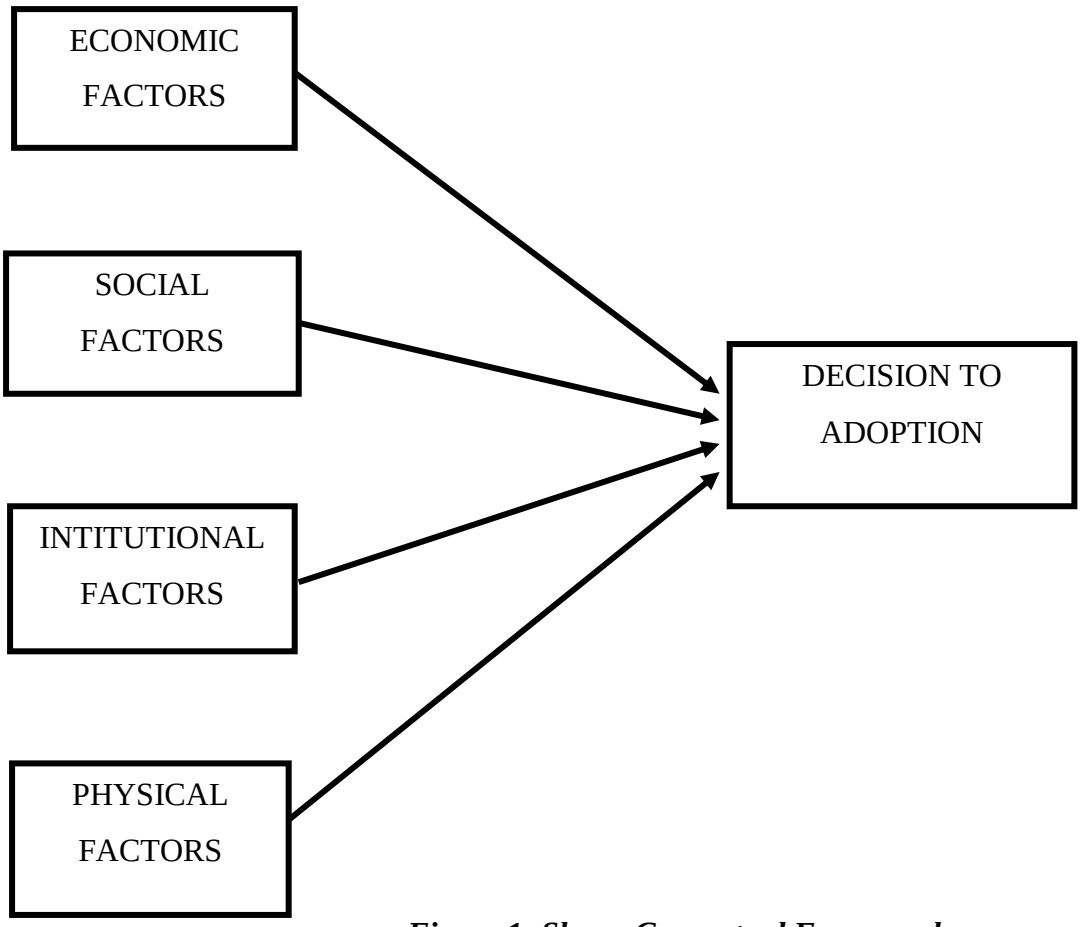

Figure 1: Shows Conceptual Framework

CHAPTER TWO

2.1 Literature Review

A critical and thorough examination of the body of information currently available on a particular subject or research issue is what a literature review in a research proposal is. It provides a framework for the new research and demonstrates the researcher's comprehension of pertinent scholarly literature, which forms the basis of the proposed study. A research proposal's literature evaluation primarily serves to highlight knowledge gaps, support the necessity of the proposed study, and lay the theoretical and conceptual groundwork for the investigation.

Citrullus lanatus, or watermelon as it is scientifically termed (Rajput & Batta, 2021), is a tasty and refreshing fruit that is enjoyed by people all over the world. We shall examine the history of watermelon as well as its production index in tons in this in-depth analysis.(He et al., 2023)

The exact origin of watermelon is still a subject of debate among researchers(Zhao et al., 2019). However, it is widely believed to have originated in Africa, specifically in the Kalahari Desert region(Wilkins, 2021). Wild watermelons can still be found growing in this area today. The fruit was later cultivated and spread to other parts of the world through trade routes and exploration.(Duan & Yang, 2022)

The cultivation of watermelon goes back thousands of years, and ancient Egyptian tombs have proof of its usage.(Schaefer & Renner, 2020). The fruit was highly valued by the Egyptians, as depicted in wall paintings and hieroglyphics. It is believed that watermelons were cultivated along the Nile River and were used not only as a food source but also for their hydrating properties.(Nayik & Muzaffar, 2020)

Watermelon growing originated in Egypt and extended throughout Africa, especially to Sudan and Libya. After then, it traveled to the Mediterranean, where the Greeks and

Romans started to use it. During their conquests, the Romans brought watermelon to Europe, where it progressively grew in popularity. (Pilcher, 2023)

Perennial plants are watermelons. For outdoor cultivation, they need between 100 to 120 days from seeding to harvesting. But if you plan to grow watermelon from seed, there are a few things you should know. First, the soil needs to be at least 18 °C (65 °F) in order for watermelon seeds to germinate. It is vital that the seed has the proper moisture content for sprouting. Overdrafts can be harmful. Some farmers wait to water again until the seeds begin to sprout after thoroughly irrigating the soil the day before they are to be sown. (Winch, 2021)However, if the soil is excessively sandy and has trouble holding onto enough available water, this strategy is not recommended.

Watermelon seeds germinate easily in 6-10 days depending on the weather and soil conditions. In areas with a danger of frost, growers prefer to sow the seeds in seed beds under controlled conditions and then transplanting them into their final positions. They most commonly use turf as substrate for optimum aeration (Dutta & Mishra, 2021)

If done intelligently and on a scalable basis, watermelon farming can be a lucrative endeavor (Connock, 2022). In a nutshell, the majority of commercial watermelon growers begin the harvest from seeds (hybrids) in a climate-controlled indoor space (Le, 2018). They prepare the field as they wait for the young seedlings to mature and be ready for transplanting. In addition to tilling the ground and creating beds or furrows, they also insert black plastic film between the rows. The black plastic covering inhibits weed growth in addition to warming the soil. Additionally, they plan and install the drip irrigation system. When the seedlings are ready to be transplanted, they drill tiny holes in the plastic film and place the seeds there. In most situations, fertilization, drip irrigation, and weed control are used. Additionally, thinning is used. Commercial farmers of watermelons remove the stunted or misshapen fruit to urge the plant to focus its energy on producing fewer, larger, and more delicious fruit.

2.2 Factors that have Influenced Low Adoption of Watermelon Farming in Ngariam County

There are a number of reasons why watermelon production has not taken off in Ngariam County, factors that have affected the decisions made by the local farmers. The absence of adequate technology and infrastructure for watermelon farming is one of the main contributing reasons. Watermelon production requires a lot of water, so it's possible that Ngariam County lacks the irrigation infrastructure that is required. Furthermore, the lack of contemporary agricultural tools and methods may make it more difficult to grow watermelons effectively, which would deter local farmers from cultivating them. (Garcia & Zeller., 2016)

Another significant factor is the environmental conditions and soil quality in Ngariam county. Watermelon cultivation requires specific environmental conditions such as well-drained soils, ample sunlight, and warm temperatures. If these conditions are not met in Ngariam county, it can deter farmers from investing in watermelon farming due to the risk of poor yields and crop failure. Soil quality is also a critical factor, as watermelons thrive in fertile soils with good organic matter content. If the soil in Ngariam county is not suitable for watermelon cultivation, it can discourage farmers from engaging in this type of agriculture. (Bhattachary & Saha., 2016)

Demand and market accessibility are key factors in the uptake of watermelon farming. Farmers may choose to grow other crops with more market value and demand if watermelons are hard to come by or if there is little appetite for them in Ngariam County or the nearby areas. Cultivating watermelons may also be hampered by inadequate infrastructure and marketing channels that do not carry the fruit to prospective markets. (Oliveira & Leal, 2014)

Furthermore, local farmers' expertise and awareness of watermelon growth techniques can influence its uptake. Farmers could be reluctant to engage in watermelon farming if there

are no training programs, extension services, or resources available regarding best practices. Low adoption rates can also be attributed to a lack of knowledge about contemporary farming methods, pest control, and disease prevention unique to watermelons.

The acceptance of watermelon growing in Ngariam County can be greatly influenced by government regulations and encouragement. Farmers may be discouraged from considering watermelon farming as a feasible alternative if there are obstacles such as excessive taxes on watermelon production or insufficient government support in the form of subsidies, technical help, or research and development projects. (Khandker & Square., 2011)

In conclusion, a number of factors, such as poor infrastructure and technology, unsuitable environmental conditions and soil quality, restricted market access and demand, a lack of knowledge and awareness among farmers, and government policies, can be blamed for the low adoption of watermelon cultivation in Ngariam County.

2.3 Assessing the Agronomic Management Practices Carried in Watermelon Farming

Citrullus lanatus, or watermelon, is a warm-season crop that needs particular conditions to grow well and yield delicious fruits. These prerequisites include an appropriate climate, the properties of the soil, the management of water, the availability of nutrients, and pest control. We will go into great depth about each of these growth requirements in this extensive response.

Soil Management

Well-prepared soil with proper nutrient levels is vital for watermelon growth. Soil testing, liming, and fertilization are essential steps in preparing the soil for planting. For best growth, the pH of the soil should be between 6.0 and 7.5. Loamy or sandy loam soils work

best because they retain enough moisture and allow for good drainage. Avoid heavy clay soils as they might cause water logging and poor root development issues. (Havlin & Kemper., 2009).

Water Management

Since watermelon plants have huge leaf surfaces and luscious fruits, they demand a lot of water. Throughout the growth season, enough irrigation is essential, but it is especially important during the stages of fruit development, flowering, and fruit set. Watermelons need about 1-2 inches (2.5–5 cm) of water per week, which can be provided by additional irrigation or rainfall. However, it's critical to maintain adequate drainage because too much moisture can cause illnesses like root rot. (Havlin & Kemper., 2009).

Fertilizer application

Since watermelons are heavy feeders, they need a balanced diet rich in nutrients to grow and produce as many fruits as possible. It is advised to carry out a soil test prior to planting in order to ascertain the nutrient levels and, if required, make the necessary amendments. Nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg) are essential elements for watermelon crops. Whereas potassium and phosphorus encourage the growth of flowers and fruits, nitrogen is especially crucial for vegetative growth.

Pest and Disease Management

Watermelons are vulnerable to a range of pests and illnesses that can have a substantial effect on crop quality and output. Aphids, cucumber beetles, spider mites, and whiteflies are examples of common pests. It is recommended to apply Integrated Pest Management (IPM) techniques, which may involve biological and cultural treatments as well

as the sparing application of pesticides as needed. It is crucial to conduct routine crop monitoring and scouting in order to identify pest infestations early on and take appropriate action. (Hanna & Hoffman., 2009)

Weed Management

Early weed control is vital to maintaining a healthy and productive watermelon crop. Various methods, such as cultural, mechanical, and chemical control, can be employed to manage weeds. (Havlin & Kemper., 2009)

Postharvest Handling and Storage

Proper postharvest handling and storage techniques can help maintain watermelon quality and extend shelf life. (Havlin & Kemper., 2009)

2.4 Approaches to Adoption of Watermelon Farming

There are three types of watermelon farming: seed-based, non-grafted, and grafted crops. For a long time, watermelons are grown. They require, on average, 100 to 120 days from seed to harvest when grown outside. However, there are several things you should be aware of if you intend to produce watermelon from seed. First, for watermelon seeds to germinate, the soil must be at least 18 °C (65 °F). Second, for the seed to sprout, the ideal moisture content must be reached. Overwatering a plant can be dangerous.

Watermelon seeds germinate easily in 6-10 days depending on the weather and soil conditions. In areas with a danger of frost, growers prefer to sow the seeds in seed beds under controlled conditions and then transplanting them into their final positions. They most commonly use turf as substrate for optimum aeration.

Growing watermelons from non-grafted seedlings

Another commonly used method is growing watermelons from non-grafted plants. If we follow this method, it is crucial to choose carefully the variety of watermelon we are going to plant. If -for example- the fields in our area have problems with diseases, pests, lower or higher pH or salinity levels, then not all varieties can thrive. Some varieties are tolerant to some of those factors, while others are not. The most commonly used varieties are: Charleston Gray, Crimson Sweet, Jubilee, Allsweet, Royal Sweet, Sangria, triplo

Growing Watermelons from Grafted Seedlings

Growing watermelon –if done rationally and on a scalable basis- can be a good source of income. In a few words, most commercial watermelon growers start the crop from seeds (hybrids) in an indoor protected environment

CHAPTER THREE

Methodology

3.1 Introduction

This chapter mainly describes how the research will be carried out on the topic of the study. It covers the area of study, research design, the population of study, sampling design, sample size and its determination and data collection and management.

3.2 Research Design

This is the overarching plan or technique a researcher employs to logically and cogently integrate the various study components. It is an essential component of every research project since it describes the procedures and methods that will be followed in order to gather and evaluate data, guaranteeing that the study is carried out in an organized and exacting way. A research design includes a number of components, including the kind of study (qualitative, quantitative, mixed-methods, etc.), participant selection, data collection strategies, and data analysis procedures. The research topic, goals, and characteristics of the phenomenon under study all influence the choice of research design.

I used a combination of methodologies in my study design. The research will include both quantitative and qualitative approaches; they are regarded as complementary in accordance with Dey (1993), who asserts that accurate conceptualization is necessary for enumeration and that numbers cannot be ignored.

According to Marshall and Rossman (1989), the study will mostly be qualitative. Since accuracy is essential to this type of research, a qualitative design will be used. It increases the trustworthiness of the results while minimizing bias. Both men and women will be chosen for the gender-focused study.

3.3 Research Area

The research was conducted in Ngariam sub county in Katakwi District in two parishes, i.e Alukucok and Akoboi Parish in Katakwi District .

3.4 Target Population

The target population was mainly farmer practicing both cash and food crops cultivation in Ngariam subcounty and from the selected two parishes

3.5 Sampling

Selection of parishes

The parishes were selected from seven parish with in Ngariam Sub County Katakwi District.

Selection of respondents

The farmers were randomly selected from each parish, the opportunity was given to all farmers irrespective of their level of education and then 10 farmers were randomly selected from each parish for the survey, resulting in a total of 20 farmers and including 1 extension worker, local leaders.

Sample size

A sample of 20 respondents were selected from the target population including one, extension worker, two local leaders, and 17 farmers

3.6 Data Collection

The data was collected in November, 2023, from 20 randomly selected farmers, extension worker and local leaders in Ngariam sub county Katakwi district through individual interviews using a structured and close ended questionnaire.

The households were selected from 2 parishes based on their location sub county.

. I consulted the parish leadership about the research and the aim of the study and expressed the need to conduct an interview with farmers in their areas. Selected participants were visited by the researcher to seek their willingness to participate in the study.

The methods of data collection were; questionnaires, interviews and observations.

I. Interviews

Face to face and telephone interviews was carried out with respondents who participated in the study as key informants.

This was mainly to target the key respondents like local leaders, agricultural leaders and community development officials.

II. Observations

In addition to the above methods, observations was also used. Where by the researcher moved around the two parishes with the intention of getting access to cultivation sites of those farmers practicing watermelon production.

III. Data Analysis

The data was analyzed using Microsoft Excel and Statistical Package for Social Sciences (SPSS) and finally a report was written and submitted to the department of agriculture Busitema University.

CHAPTER FOUR

Data Presentation and Discussion

4.0 Introduction

This chapter shows the results and the discussion of the data that was collected in the field. It includes demographic characteristics i.e. (gender, age, level of education, religion and source of income of the respondents), activities engaged by the respondents and their outcomes, challenges women face while participating in agricultural activities and the strategies to overcome these challenges.

4.1 Demographic Characteristics

4.1.0 Gender of Respondents

Gender	Number
Male	16
Female	04
Total	20

Table 1: Shows the gender of the respondents

From table 1 above, 96% of the respondents were males and 4% were females. This gender distribution of the respondents purposely intended for the farmers, specifically males to take the highest percentage as the research was intended to assess the factors influencing the reduced cultivation of watermelon. Females were included to confirm the male's suggestions and also to air out some factors men may not be able to air out during the session

4.1.1 Age of the Respondents

Age (years)	Percentage (%)
15-25	20
25-35	50
35-45	20
45-above	10
Total	**100**

Table 2: Shows the age of the respondents

The results shown in table 2 above indicates that 20% of the respondents were aged between 15-25 years, 50% of the respondents were aged between 25-35 years, 20% of the respondents were aged between 35-45 years and 10% were aged 45 years and above.

This shows that most of the respondents were aged between 25-35 years where they are most likely to be economically stable. These study findings are in line with (Makombe, 2006) who found out that most of the people involved in informal economic activities were aged between 20 and 49 years.

4.1.2 Level of Education of the Respondents

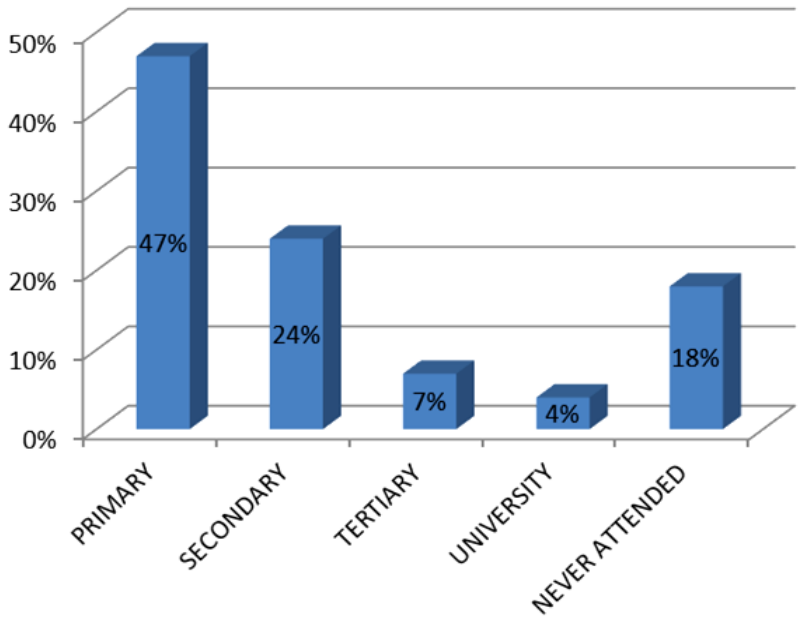

Figure 2: Shows level of education of the respondents

The figure above shows the level of education of the respondents. The level of education was divided into primary (47%), secondary (24%), tertiary (7%), and university (4%) and never attended (18%).

This shows that the majority of the respondents had attained education up to the primary level and probably dropped out of school and went into marriage and finally got involved in subsistence agriculture as a way of deriving livelihood. This is disadvantageous in relation to acquisition of economic resources like credit and market information. However, these research findings are lower than those reported by (Mjema, 2014) who found out that 71.7% of the respondents had attained primary level education.

4.1.3 Source of Income of the Respondents (Other than Growing Watermelon)

Source	Percentage (%)
Salary	15
Business	48
Others	37

Table 3: Shows the source of income of the respondents (other than agriculture)

From table 3 above, other than watermelon growing, the majority of the respondents (48%) derive their source of income from Business, followed by other sources (37%) and then salary (15%). This proves that most of the respondents attained low level of education mostly primary level and did not join tertiary institution in which they could enroll for some courses to get them jobs and eventually earn a living. Lastly one of the respondents said that they obtain their source of income from business activities and other sources. (Benjamin, & winters etal. 2009)

4.2 Economic Activities Farmers Have Been Engaged in Besides Cultivating Watermelon

4.2.0 Activities Engaged by the Respondents

Activity	Percentage of farmers involved
Crop growing (cereals, legumes and root crops)	54%
Livestock rearing	30%
Mixed farming (crop growing and animal rearing	20%
Business	6%

Table 4: Shows activities engaged by the respondents

From the table above, many of the respondents (54%) were involved in crop growing, followed by 30% who were involved in livestock rearing, the 20% for mixed farming g and finally 6% who were involved in business. This has indicated that majority of the respondents were involved in crop growing and animal rearing which they could perform with the minimal capital and local knowledge and also the market for these products is readily available, thus the respondents were able to engage in these activities amidst the existing challenges like limited funds, pests and diseases.

(Jahnke, 1982) stated that there is a big link between crop and livestock production, this is because crops provide by-products and unmarketable surpluses which livestock convert into high value products like milk, manure and meat. Therefore, this explains high involvement of the participants in cereal, root crops, legume growing and animal rearing hence failure to pick interest in watermelon growing.

4.2.1 Farmers Attendance to Trainings for Agricultural Commercialization

Sex	Number	Number of farmers who attended the training
Male	16	4
Female	04	2
Total	20	6

Table 5: Shows the number of farmers (respondents) who attended training with agriculture extension worker.

In the table above, 82% of the respondents did not attend to any of the extension service and only 18% of the respondents had ever attended to at least one extension service, this explains that majority of the respondents' lack knowledge concerning the different aspects in commercializing agriculture, this is due to lack of enough extension officers allocated to Ngariam county to deliver the necessary services to local famers at large.

Two of the respondents said that whenever there is any agriculture related training, they are eliminated by their local leaders who choose people of their interest leaving them some of outside.

4.2.2 Farmers' Marketing Strategies

Farmers mainly sell their watermelon in groups since mostly they bargain money according to the quality of watermelon, box body of vehicle, most of price determination is done by brokers or middlemen who mostly tend cheat the farmers. This is simply these buyers are from outside countries like Kenya who cannot speak the local language.

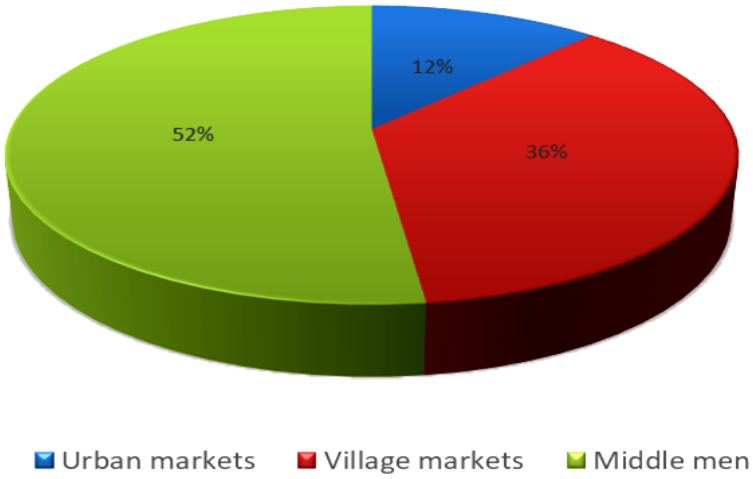

Figure 3: Shows strategies how farmers market their watermelon

From the pie chart above, 52% of the respondents sell their produce via middle men who act as brokers in village setting connecting farmers with to outside buyers, 36% in village markets and 12% in urban markets like Kampala city, Jinja city, Soroti city, Mbale city among others. This indicates that majority of the respondents (52%) sold their produce via middle men which is associated to short comings like low prices for the watermelon where farmers are often cheated. This is as a result of poorly developed transport routes, low quality and quantity of the watermelon produced, lack of market information, language barrier. 36% of the respondents who sold their melon in village markets are the ones who cultivated in poor melon varieties which could be routinely eaten in the village but in low quantities due to its poor quality.

4.2.3 Access of Respondents to Loans in the Saving Groups

According to my data analysis, I found that majority of the respondents were not able to access loans in the saving groups despite their involvement in the saving groups in the villages. This is because there is a minimum amount each individual is expected to have saved in order to access any loan, of which some members are not able to reach that minimum amount that could allow them to qualify the loan hence leading to reduced cultivation of the fruit.

Also, if an individual is to get a loan, he or she should have guarantors to stand in for them, where by some respondents mostly women do not easily get these guarantors because they are assumed that they may fail to pay back the loan.

4.3 Challenges Faced by Farmers Which Have Led to Reduced Cultivation of the Fruit

Challenge	Percentage (%)
Poor roads to transport the melon produce to the market center	33
Lack of access to credit facilities	17
Price fluctuation in market	16
Inadequate extension Services rendered to farmers	09
Shortage of land for fruit cultivation	5
Harsh climatic conditions, like prolonged drought.	20
Total	**100**

Table 6: Shows challenges faced while doing agricultural activities

4.3.0 Poor Roads to Transport Melon Produce to the Market

According to findings from the study, I noticed that, the poor state of roads in Ngariam county was the major challenge as accounted by 33% of the respondents. Poor roads make it difficult for farmers to transport their produce to the market for sale as well as buyers to access the melon fields in the cultivation areas like Alukucok and Akoboi.

4.3.1 Lack of Access to Credit

From table 6 above, 17% of the respondents suggested that lack of access to credit denies them opportunities to boost their agricultural activities mainly for increased melon cultivation. Farmers had limited access to credit because most financial institutions were

located far away from rural areas and most of these financial institutions required collateral security like land, mostly located in Soroti city and Katakwi town making farmers dificulity to access financial support.

4.3.2 Price Fluctuation

From table 6 above, 16% of the respondents said that they face the problem of price fluctuation; this was due to poor roads to transport the link the buyers and the farmers , the poor quality produce due to pests and diseases, inadequate storage facilities which make the produce to get spoilt before marketing.

4.3.3 Inadequate Extension Services

I my field study, I observed that inappropriate extension service delivery was another factor influencing reduced cultivation of the melon as accounted by 9% of the respondents.

At my field study, most of the respondents were men who suggested that it is rare to see training programs meant to advice farmers on how to shift from subsistence farming to commercial agricultural activities like cultivation of high income yielding crops like watermelon, and sometimes even if those programs are brought, women rarely attend because they had to attend to their domestic responsibilities at their respective homes.

This was in line with the study made by Kechero, (2007) where he found out that compared to women, men have easier access to technology and trainings because of being top heads of the households and greater access to off-farm mobility at local setting.

4.3.4 Shortage of Land

Shortage of land was a great hindering factor affecting cultivation of watermelon in Ngariam County as suggested by 5% of the respondents in table 6 above. Farmers who engage in most of the agricultural activities normally bring the need to hire the land for

agriculture which therefore increases the cost of production and hence discourages their involvement in agriculture. These results are supported by the study carried out by IFAD, (2005) who found out that women owned plots of 0.5 to 0.8 with small size of land that's why the number of female respondents were few in number.

4.4 Strategies to Address the Challenges that have Influenced Low Cultivation Activities of Pepo.

Strategy	Percentage (%)
Improvement of transport	40
Increasing access to loans	25
Provision of effective extension services	24
Provision of improved seeds	11
Total	100

Table 7: Shows the strategies to manage the challenges faced by women while doing agricultural activities

4.4.0 Improvement of Transport

In my field findings, I observed that there is need to improve on transport this will help farmers to easily transport their watermelon produce to the market and hence fetch better prices for their produce which in turn encourages most farmers to engage in fruit cultivation.

(Abdulrahee & Adefare et al. 2021) stated that transport is essential to carry produce from the farm to the market and therefore enhancing the livelihood opportunities of the local farmers.

4.4.1 Increasing Access to Loans

According to my findings, 25% of the respondents cited that increasing access to loans would encourage farmer's participation towards watermelon growing as they would be able to use the credit for acquiring inputs like seeds, labor, and pesticides among others.

Credit is an important component that would help tackle productivity problems and reduce extreme poverty, supporting the development of self-employment in rural sector farming and non-farming activities for the investment in working capital (Asante-Addo, Mockshell et al. 2017)

4.4.2 Provision of Effective Extension Services

During my findings, 24% of the respondents aired out that provision of training services for the different activities they engage in would encourage their participation in agricultural improvement from substance to commercial farming. This was further strengthened by one of the local leaders that effective extension services would help both male farmers and female farmers to identify different strategies to improve on their farming activities towards achieving expected yields from agriculture produce, like how to control pests and diseases, timely planting, time of harvesting periods of fruit.

(Utami & Indrianto et al. 2019) who stated that extension services equip the farmers and other people involved in agriculture with the information and education about farming activities so that they can boost their agricultural practices and enhance their technical skills.

4.4.3 Provision of Improved Seeds

However, there is also need to provide farmers with improved seeds which would enable them to get high yields which would in turn to fetch for good prices in the market

hence providing them with money to boost their agricultural activities as said by the majority of the respondents in different villages in selected two parishes

This is in line with (Tsegaye & Frans etal. 2017) who stated that agricultural productivity relies on the use and availability of better agricultural technologies including improved seeds. Quality seed is the major technology package required to boost agricultural production, food production and rural development.

CHAPTER FIVE

Summary, Conclusions and Recommendations

5.0 Introduction

This chapter consists of summary of the findings, conclusions of the study and recommendations of the study for further study in line with each objective.

5.1 Summary of the Findings

This study was carried out to assess the factors influencing low adoption of watermelon cultivation in Ngariam county Katakwi district so as to find ways of encouraging farmers to participate in the cultivation of the fruit.

5.1.0 Factors Influencing Low Adoption of Watermelon Cultivation

The study found out that the major factors influencing low adoption of watermelon cultivation included the following;

- Lack of enough land where a majority of the respondents had land between 1-3 acres which was associated to low agricultural production.
- Inadequate credit to facilitate agricultural activities.
- Also, inadequate market information.
- Poor roads which makes transportation of melon produce to markets.
- Lastly, inadequate extension services in Ngariam County was another factor that influenced reduced cultivation of the fruit, training of the farmers.
- Dangerous pests and diseases which attack and destroy the fruit like blight.

5.1.1 Strategies to Encourage Farmers to Adopt the Cultivation of Watermelon Fruit

According to the study, 40% of the respondents stated that improvement of transport is very important in improving farmers' participation in melon cultivation activities. 25% suggested that increasing access to loans can encourage farmers to cultivate watermelon. 24% of the respondents said provision of effective extension services would still encourage large number of farmers to cultivate the fruit and finally 11% of the respondents stated that provision of improved farming inputs like improved seeds, fertilizers among others would encourage farmers to participate in watermelon cultivation as it leads to improved quality and quantity of fruit produced by farmers for international market.

5.2 Conclusion

Increased cultivation of watermelon by farmers has potential to improve on food nutritive diet as well as increasing the income levels of local farmers in Ngariam County and even in Uganda as a whole, therefore, it was important to identify the factors that have influenced reduced cultivation of watermelon and point out ways of encouraging farmers participation in towards the production of the fruit.

5.3 Recommendations

In relation to the findings of the study in Ngariam County, I put forward the following recommendations:

There is need for the government to improve on the roads in Ngariam County to facilitate easy transportation of melon produce to appropriate markets where they can get higher prices.

Farmers should be educated on proper ways of carrying out management activities that they should carry out during fruit cultivation like; growing practices, prevalent pests and diseases and how to prevent and control them. This can be done through effective provision of extension services to the farmers.

Government and other private financial institutions should give low interest loans to farmers to enable them to improve and enlarge their watermelon enterprises.

Farmers should be encouraged to grow high yielding melon varieties; this can be done through giving farmers improved seeds.

Extension services should also be offered at increasing the level of awareness among farmers, these trainings make farmers aware of their obligations to use the credit and to repay it at the right time best management practices that increase the yield.

There is need for Non- Government Organizations (NGO) together with the government to provide equipment to farmers and also to sensitize them how best they can market their agricultural produce.

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APPENDICES

Appendix 1

Work Plan

WEEK	ACTIVITY
ONE 17/11/2023-20/11/2023	Feasibility study of the selected área. This will be under the guidance of local leaders like lc1 ,youth councellors Identification of farmers participating in watermelon growing. gathering the materials and equipment to use and identification of the methods for data collection
TWO 21/11/2023-25/11/2023	Home farm visit and Data collection
THREE 26/11/2023	Discussion of data with my supervisor, data analysis and interpretation
FOUR 27/11/2023-29/11/2023	Report writing
FIVE 30/11/2023	Submitting the report

Appendix 2

Budget

CONCEPT	COST IN UG SHILLINGS
Equipment	50,000
Transport expense	100,000
Participants/ Respondents	50,000
Accommodation and feeding	200,000
TOTAL	400,000

Research Questionnaire

I am **Opio Mackay**, a student of **Busitema University** in the faculty of Science and Education pursuing Bachelors of Science and Education. I am doing a research Titled, Factors **That Have Influenced Low Adoption of Watermelon Growing in Ngariam County, Katakwi District**. This research is purely academic and I have no intentions of making the issues of confidentiality known to anyone outside the research line. This questionnaire is subdivided into sections, i.e. A, B, C, and D.

Please I am kindly requesting you to tick that alternative response that fits your opinion and give responses to a few structured questions in the spaces provided.

SECTION A

Demographic Characteristics of Respondents

1. What is your sex, tick from the following options?

    4. Female ☐ (b) Male ☐

2. What could be your age group?

    - 18-28 years ☐ (b) 29- 39 years ☐ (c) 40-60 years ☐

3. Did you go to school ?

4. Yes ☐

5. No ☐

4. Which education level did you end

(a) I ended in Primary ☐

(b) I stopped in Secondary ☐

(c) I attended Tertiary/University ☐

SECTION B

Ascertaining the Factors that Have Influenced Low Adoption of Watermelon Farming in Ngariam County

4. State your view on each of the following statements by ticking; No; Not Sure; or Yes.

N	Question	No	Not Sure	Yes
•	In your own suggestion, do farmer's low level of income limited the adoption of Watermelon farming in your village?			
•	Is it true that the harsh climatic conditions of your community like prolonged drought affect the cultivation of Watermelon?			
•	Do you think the soil type in your community has contributed reduced cultivation of watermelon fruit?			

5. If there are other factors responsible for low adoption of Watermelon cultivation in your community list them in the spaces provided below?

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SECTION C

Assessing the Agronomic Management Practices Carried Out in Watermelon Farming

6. What do you think are some of agronomic management practices farmers fail to carryout in their gardens to increase the yield of watermelon in your village?

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SECTION D

Approaches Used for Increased Adoption of Watermelon Farming in Ngariam County

7. In your own suggestion, list down any five challenges limiting many people in your community to carry out watermelon cultivation?

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8. State in your own view, the different approaches that farmers should employ to address those factors limiting the adoption of Watermelon growing in your community.

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END