

**PREVALENCE AND MANEGMENT OF CASSAVA SOIL BORNE DISEASES IN PAYA SUB COUNTY IN
TORORO DISTRICT, UGANDA.**

WAPAKALA DERICK

BU/UP/2021/3273

**THIS FINAL YEAR PROJECT REPOPRT IS SUIBMITTED TO THE DEPARTMENT OF AGRICULTURE IN
PARTIAL FULLFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF
BACHELOR OF SCIENCE IN EDUCATION**

SEPTEMBER, 2024

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SUPERVISOR

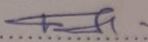
MR. DRAMADRI GERALD AFAYO

**THIS FINAL YEAR PROJECT REPOPRT IS SUIBMITTED TO THE DEPARTMENT
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THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN EDUCATION**

SEPTEMBER, 2024

DECLARATION

I **WAPAKALA DERICK** declare that this research report is my original work. It has not been submitted to any other University or higher institution for any award and where it is indebted to work for others.

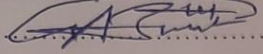
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WAPAKALA DERICK

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APPROVAL

This is to certify that the research report entitled prevalence and management of cassava soil borne diseases submitted in partial fulfillment of the requirement for the award of the degree of bachelor of science education of Busitema University is an authentic record of bonafied research carried out by Wapakala Derick (BU/UP/2021/3273) under my guidance and supervision. No part of this research report has been submitted for any other degree or diploma.

Signature:  Date: 01/10/2021

MR. DRAMADRI GERALD AFAYO
SUPERVISOR

DEDICATION

To my beloved parent Mr. Wamimbi Godfrey and Mrs. Namono Beatrice for their financial and all-round support towards my education.

May God reward them abundantly!

ACKNOWLEDGEMENTS

I thank the lord almighty for keeping, protecting and giving me good health during the course of my study.

I would like to appreciate the work of my supervisor Mr. Dramadri Gerald Afayo who diligently guided me during my research. May the Almighty reward him abundantly.

Special thanks go to my father, mother and all my siblings especially Miss. Lunyolo Winnie and my aunt Kisaka Immaculate, and my elder George William Wepukhulu, for their love and support in form of school fees for my education.

I would like to acknowledge my friends, Nabonoba Costa, Mukesi Rogers, and Kimaswa Philemon for their support throughout my research.

I also wish to thank my teachers for their advice, knowledge and guidance towards my education success. May God bless them!

LIST OF ACRONYMS AND ABBREVIATIONS

CBSD	Cassava Brown Streak Disease
CSBD.	Cassava Soil Borne Diseases
CMD.	Cassava Mosaic Disease
EARRNET	East Africa Root Crops Research Network
FAO.	Food Agricultural Organization.
IITA.	International Institute of Tropical Agriculture
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
NAADS	National Agricultural Advisory Services
NARO	National Agricultural Research Organization
NEMA.	National Environment Management Authority
NRCRI	National Root Crops Research Institute
SPSS	Statistical Package for the Social Sciences

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ABSTRACT

Introduction: Cassava soil borne diseases have been notably increasing and becoming a concern with significant implications on food security of the farmers and communities. The aim of this study was to investigate the prevalence and management of Cassava Soil Borne Diseases in Paya Sub-County in Tororo district, Uganda.

Materials and methods: The study employed a mixed-methods approach, combining both quantitative and qualitative methods. A questionnaire was developed to gather information on demographics, socio-economic status, and existing management strategies for CSBD. Literature reviews; including existing research articles, studies and reviews on CSBD were highly utilized to draw references during the study. Interviews were conducted with a subset of participants to obtain qualitative data on their experiences, perceptions, and challenges related to CSBD and its management. Soil sampling tools like; augers, shovels, soil cores and sampling tubes, and examination using light microscope and electron microscope, magnifying glasses, hand lenses and plant disease identification guide were used during the study. Data was analyzed using descriptive and thematic analysis.

Results: the study found out that there is a significant prevalence of CSBD in the community (78% of the surveyed fields) of the area of study; there is high overall awareness of risk factors which can be improved, particularly the managerial agronomic practices. The study finally found out that the most commonly perceived effective management strategies were crop rotation, resistant varieties, sanitation, organic amendments, application of fungicides and nematicides among others.

Conclusion: Research findings underscore the need for comprehensive interventions to address Cassava Soil Borne Diseases among fields in Paya Sub-County in Tororo district.

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CHAPTER ONE

INTRODUCTION.

1.0 Background

Cassava Soil Borne Diseases has become a global farming concern with a significant increase in prevalence over the past few decades. In the early 1990s, there were reports of high CBSD incidences in areas of Tanzania, Mozambique and Malawi (Hillocks and Jennings, 2003). Surveys revealed CBSD incidences reaching 36%–50% in cassava fields along coastal areas of Tanzania (Hillocks *et al.*, 1999; Legg and Raya, 1998). Similarly, CBSD incidences in Malawi reached 75% in many fields surrounding Lake Malawi and nearly all plants inspected in northern coastal areas of Mozambique expressed CBSD symptoms (Hillocks and Jennings, 2003; Hillocks *et al.*, 2002). In a control effort, virus-free CBSD-tolerant cultivars were distributed to farmers in Mozambique who depended heavily on CBSD-sensitive cassava cultivars for food security (Hillocks and Jennings, 2003). CBSD was also re-discovered in Uganda in 1994 at a site near Entebbe (Thresh *et al.*, 1994). This led researchers to call for concerted efforts to understand CBSD through improved surveillance (Hillocks and Jennings, 2003).

Infections of cassava plants showing CBSD symptoms at higher altitudes in Uganda were confirmed by RT-PCR. Coat protein sequences aligned to CBSV isolates from Mozambique and Tanzania with sequence identities from 77.0% to 82.9% (Alicai *et al.*, 2007). It is not known whether CBSD had been re-introduced to Uganda through infected cuttings or whether the disease had existed at a low level since it was first introduced in the 1940s (Alicai *et al.*, 2007). Shortly after this first report, the overall incidence of CBSD in Uganda increased from 12% in 2008 to 27% in 2011 (T. Alicai, year of personal communication, 2017).

It is difficult to obtain a truly accurate estimation of the economic damage caused by CBSD; however, an overall loss of US\$750 million a year has been estimated across Kenya, Tanzania, Uganda and Malawi (Hillocks and Maruthi, 2015). The dramatic increase in the impact of CBSD on food security is reflected in the increase in the number of papers, reports and reviews which refer to CBSD published from the mid-1990s to 2016. The expansion of the CBSD epidemic across the Great Lakes region of East and Central Africa has necessitated the rapid development and implementation of effective control strategies. Several important projects were initiated following CBSD re-emergence, which aimed to develop research, extension and policy capacity in the

countries affected. Key targets have been to breed or genetically engineer resistant cultivars, provide certified virus-clean planting material and improve viral surveillance and diagnosis (Legg *et al.*, 2014).

Paya Sub-County, located in Tororo District, Uganda, provides an important context for studying the prevalence and management of CSBD in the cassava fields in the region. The region has a vast number of homesteads which are at least engaging in growing of the crop from small scale to large scale. Tororo District, situated in Eastern Uganda, experiences rapid urbanization and lifestyle transitions, which may contribute to changes in farming habits (Mutuyaba & Muyingo, 2014). Limited research has been conducted specifically on the prevalence of CSBD in the fields of Paya Sub-County, making this study essential for understanding the local context and developing targeted interventions.

1.1 Problem statement

The prevalence of Cassava Soil Borne Diseases are increasing at an alarming rate globally, including in Uganda (Ntawuruhunga and Legg, 2007). However, there is limited research focusing specifically on the prevalence and management of CSBD in Paya Sub-County, located in Tororo District, Uganda. This knowledge gap hinders the development of targeted interventions to address and manage CSBD effectively within the community. Therefore, there is a need to investigate the prevalence of CSBD, identify associated risk factors, and propose evidence-based management strategies to mitigate the impact of the incidence on the cassava plants in Paya Sub-County in Tororo, Uganda.

1.2 Objectives

1.2.1 General objective

1. To investigate the prevalence of Cassava Soil Borne Diseases and to assess the management strategies employed in cassava fields in Paya Sub-County in Tororo district, Uganda.

1.2.2 Specific objectives

- i. To identify the significance and sensitize the community about growing of Cassava.
- ii. To foster decision making power towards cassava growing ventures among the local farmers

- iii. To identify the challenges farmers are facing in production of cassava in Paya Sub County.
- iv. To identify and establish disease and pest resistant cassava varieties that can adapt highly in the region.

1.3 Research questions

- i. What are the varieties of cassava farmers are growing in Paya sub County?
- ii. What are the different Soil Borne diseases affecting the growth of cassava in Paya sub County?
- iii. To what extent has disease infestation in cassava plantations affected the food security in Paya sub-county, Tororo District?
- iv. What are some of the management practices employed by the farmers in production of cassava in Paya sub County?

1.4 Significance of the study

Understanding the prevalence and management of Cassava Soil Borne Diseases is crucial for addressing the associated cassava growing risks and designing effective prevention and control strategies. This study has contributed to the knowledge base on the impact of CSBD on food security and the socio-economic outcomes from the venture.

1.5 Scope of the study

The study was aimed at investigating the prevalence of CSBD, risk factors and exploring the management strategies employed by the farmers. This study was carried out in Paya Sub-County found in Tororo district. Data was collected for two weeks from 12th August. The number of participating farmers was sufficient since I met the anticipated numbers.

1.7 Ethical Considerations

Ethical guidelines were strictly adhered to throughout the research process. Informed consent was obtained from all participants, and their confidentiality and privacy were ensured. The research protocol was submitted to the relevant ethical review board for approval before data collection begins.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Cassava Soil Borne Diseases have emerged as a global health concern, affecting both developed and developing nations. In recent years, the prevalence of CSBD has been steadily increasing in various places, including Paya Sub-County. This historical literature review aims to explore the prevalence and management of CSBD in Paya Sub-County in Tororo District, Uganda. By examining the evolution of research on this topic, we can gain insights into the factors contributing to CSBD, its consequences, and potential management strategies. The review will draw upon scholarly publications and empirical studies to provide a comprehensive understanding of the subject matter.

2.2 Prevalence of Cassava Soil Borne Diseases in Uganda:

Uganda, like many other African countries, has experienced a climatic transition marked by a shift towards a more varied weather conditions. This transition has contributed to an increase in CSBD prevalence across the country.

Cassava soil borne diseases have been a significant threat to cassava production in Uganda for a number of decades. Up to the year 2000, the trend according to studies have shown a steady increase in the prevalence of cassava soil borne diseases, particularly cassava brow streak disease (CBSB) and cassava mosaic disease (CMD), from 2000 to 2021 (Lozano, (1976)).

By 2010, CSBD and CMD had spread to most cassava growing regions in Uganda, with high incidence rates reported in eastern, then central and northern and western regions (Sseruwagi, (2011).)

In 2012, a new cassava soil borne disease, cassava red mottle disease (CRMD), was reported in Uganda (Tukamuhabwa, (2012))

The severity of cassava soil borne diseases has also increased over the years leading to significant yield losses and reduced tuber quality (Legg J. P., (2014).)

The increasing trend of cassava soil borne diseases has raised concerns about food security in Uganda, and as cassava is a staple food crop for millions of people (Ogwal, (2011)).

2.3 Factors Contributing to Cassava Soil Borne Diseases:

Several factors contribute to the development of CSBD among the cassava fields. These factors can be categorized into Environmental, agricultural practices, Biological factors, Nutritional factors and human determinants. Human determinants include; lack of knowledge about disease management and inadequate disease monitoring and surveillance (Tukamuhabwa, (2012)). Nutritional determinants encompass; soil nutrient deficiencies (nitrogen, potassium, etc.) (Legg et al., 2011). Environmental determinants involve the soil type and structure, moisture and temperature and climate change (Legg et al., 2011). Biological determinants include insect vectors (whiteflies, etc.) and soil borne pathogens (viruses, fungi, bacteria and so on). Agricultural practices include poor sanitation and hygiene, inadequate crop rotation and use of infected planting material (Legg J. P., (2014).)

Additionally, socio-economic factors, such as low income and limited access to modern farming knowledge, have been associated with CSBD in low-resource settings (Thresh et al., 1997, Howeler et al 2013).

2.4 Consequences of Cassava Soil Borne Diseases:

CSBD has significant implications, including an increased risk of food security. Cassava is a staple food for millions, and disease related yield losses compromise food availability (Sseruwagi et al., 2011). Moreover, CSBD can negatively impact livelihoods of farmers and their families, exacerbating poverty in the communities (Herrera Campo, (2011))

CSBD has detrimental effects on both yields and tuber quality reduction. It increases the risk of disease infections for tubers making them unsuitable for human consumption or industrial use (Bellotti A. C., 1999).

Furthermore, CSBD had led to soil degradation as a result of repetitive disease outbreaks which degrade soil health, reducing fertility and affecting future crops (NAADS, research institute develop disease-resistant cassava varieties, 2016) and at the same time over reliance on disease susceptible varieties would lead to loss of genetic diversity (Jeger et al., 2018)

And as farmers would opt to pesticides to control disease, this would pose environmental and health risks (Ngode et al., 2016).

2.5 Management Strategies:

Managing CSBD requires a multifaceted approach that integrates individual behavior change towards farming with environmental and policy interventions. Effective strategies include crop

rotation; where cassava is rotated with non-host crops to break disease cycles (Graziosi, 2016). Additionally, interventions aimed at employing wholesome Integrated Pest Management for effective disease control (Hillocks, (1997)). Promoting establishment of resistant varieties of cassava helps to combat the incidences of CSBD. Implementing soil amendment programs by adding organic matter to improve soil health and reduce disease susceptibility (Legg J. P., (2015)) A systematic study by (Legg J. P., Cassava virus diseases:, (2015)) highlights a reviewed current knowledge about cassava production pointing out some of the key diseases relative to those infesting cassava fields in Paya Sub-County like Cassava Brown Streak Disease. Several strategies have been proposed and implemented in various settings. For instance, a systematic review by (Thresh, (1997)) identified production factors as well as the strategies to grow and save cassava. Furthermore, community-based interventions that emphasize healthy lifestyles and provide support networks have shown promise in addressing CSBD incidences (Jeger et al., 2018). These strategies could be adapted to the context of Paya Sub-County to develop effective cassava soil borne diseases management programs. By understanding the literature context, contributing factors, consequences, and potential management strategies, this proposed research seeks to inform evidence-based interventions that can address the growing CSBD problem within the community of Paya.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Research Design

The primary objective of this was to investigate the prevalence of Cassava Soil Borne Diseases and explore the management strategies employed by the local farmers in Paya Sub-County in Tororo District, Uganda. This study was designed as a cross-sectional study. By collecting data at a specific point in time

3.1.1 The study area

This study focused on the specific location where I would easily access the farmers with their cassava fields in near and easy to reach places.

The study area was in villages of Patewo and Paragang and near Paya trading center in Paya Sub-County, which is located in Tororo District 38km from Tororo town towards Busolwe town council, Uganda. Tororo District is situated in the Eastern Region of Uganda and is known for its agricultural activities and diverse cultural heritage.

The locality is known for production of cassava and some bits of rice fields on the low lying valley places. The locals majorly depend on farming as a source of livelihood and with cassava being the major food crop grown.

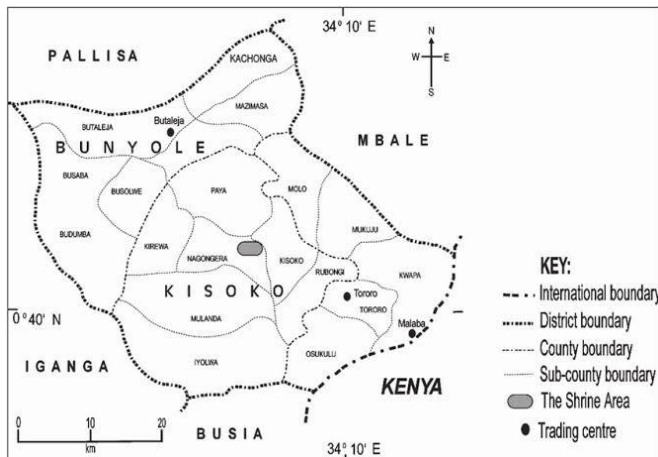


Figure 1 above shows the geographical location of the study area

3.1.2 Study Population

The population of interest for this research proposal includes majorly the farmers involved in cassava growing in Paya sub-county in Tororo district. This encompasses both literate and non-

literate individuals, as well as students who are still studying but when they participate in activities on their farm. The study area consisted of individuals from diverse backgrounds, including different age groups, genders, educational levels, and socioeconomic statuses. The prevalence and management of cassava soil borne diseases was investigated among this specific population.

3.1.3 Sample Selection

The study consisted of 40 individuals including all the anticipated categories.

3.3 Data collection methods

Multiple methods were utilized to collect data from the study population. Essential tools that used this study included; **structured questionnaires** (see appendix 1; designed to collect data on participants' demographics, socio-economic status, and knowledge about cassava soil borne diseases, and experiences with the locally employed strategies used in farming and specifically in dealing with cassava soil borne diseases. The questionnaire was administered to participants, through face-to-face interviews. These tools provided quantitative data for statistical analysis.

3.3.1 Epidemiological recordings/Measurements.

Different recordings were taken using a few tools and these included; Root and tuber inspection where the soil auger was used to carefully extract the cassava roots and tubers for visual inspection thus helping to identify disease symptoms. Furthermore, a microscope helped to examine root and tuber samples for signs of disease, such as, lesions, necrosis or fungal growth. And similarly the hand lens was used for the same purpose.

3.4 Preparing and taking Recordings.

Epidemiological recordings such as environmental factors, agricultural practices, biological variants, nutritional factors and human factors, were taken from the participants. For plant sampling, some cassava roots affected were picked and taken for examination by the magnifying lenses and light microscope to analyze and establish disease severity by the clones of the pathogens. The soil auger was helpful in extracting the cassava roots from the ground gently which were then taken for examination. The cutting knife was used to divide the cassava tubers such that the inside part could be seen and examined. The Enzyme-linked immunosorbent Assay was used in analyzing cassava soil borne diseases as it would ease detecting of the pathogens, providing quick results, being sensitive and above all the method is cost effective as compared to other diagnostic methods. These measurements provided objective data on participants' fields of cassava status based on the study conducted by (Legg et al., 2011).

In-depth **interviews** were conducted with a subset of participants to obtain qualitative data on their experiences, perceptions, and challenges related to cassava soil borne diseases and its management. These interviews offered valuable insights into the personal perspectives of the individuals and provided a deeper understanding of the issue. Relevant information from the previous related research articles and records databases were reviewed to gather additional data on CSBD-related diagnoses and management approaches. This will provided a comprehensive view of the aspect of CSBD management among the study population.

3.5 Data Analysis

The collected data was analyzed using appropriate statistical methods. Descriptive statistics was used to determine the prevalence of CSBD among the studied cassava fields. The qualitative data from interviews underwent thematic analysis to identify common themes and patterns.

CHAPTER FOUR: RESULTS

4.1.1 Prevalence of Cassava soil borne diseases in the sampled cassava plants.

The prevalence of CSBD among the cassava plants can be attributed to specific variables such as age, variety, socioeconomic status, cultural background, and farmer's knowledge of farming, soil factors and the differing weather seasons. These variables can contribute to differences in CSBD rates- within a specific cassava plants. The study I carried out evidenced different soil borne diseases of cassava which are caused by different pathogens. These included; cassava brown streak disease, cassava root rot,



Figure 2 showing root rot



Figure 3 showing cassava root rot



Figure 4 showing affected tuber

4.1.1.1 Overall prevalence of CSBD in sampled cassava fields.

This study assessed 29 heads out of 40 individuals involved. The prevalence of cassava soil borne diseases status was summarized by the different kinds of cassava plants within the sub-county of Paya as shown in the below.

Table 1 showing overall variation of CSBD prevalence in sampled fields from different age groups of farmers

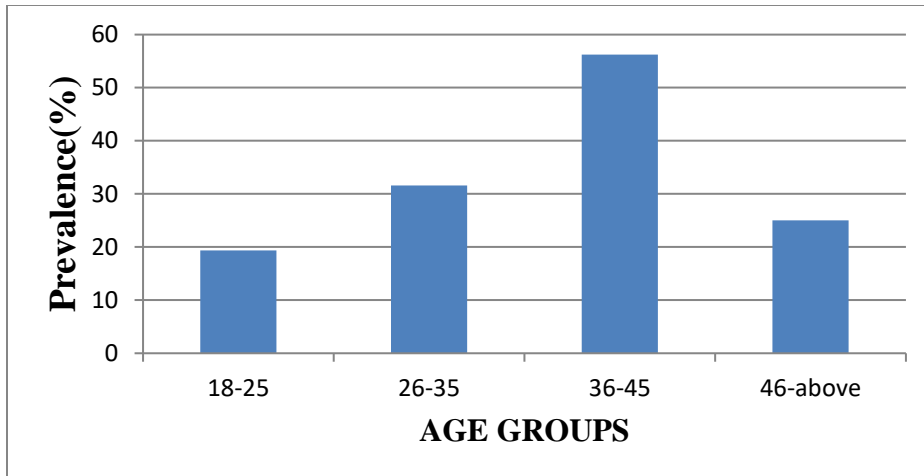
Age group	Number of farmers	Prevalence (%)
18-25	4	25
26-35	9	33
36-45	11	22
46-above	5	20
Total	29	100

The overall prevalence of CSBD among the sampled cassava plants was found to be 41% as shown in **table 1** above indicates that a significant proportion of the cassava planted in the locality is affected with cassava soil borne diseases.

4.1.1.3 Prevalence of cassava soil borne diseases among different age groups of farmers.

The study population was categorized into different age groups which included 18-25, 26-35, 36-45 and 46-above. These age groups were assessed for the CSBD status on their cassava plantations and the results of the study were presented in (fig. 4), bellow.

Figure 5 Showing prevalence of CSBD among different age groups engaged in cassava production in Paya sub County in Tororo district



The prevalence of CSBD varied significantly among different age groups. The highest prevalence was observed among individuals aged 36-45 years, with a prevalence rate of 56%, **see figure.5 above** suggests that this particular age group is more susceptible to cassava soil borne diseases.

4.1.1.4 Prevalence of CSBD among different genders

This study involved a total of 40 individuals of which, data from 29 participants was analyzed and results were that; 16 were Male and 13 female.

Table 2 showing variation in prevalence of CSBD among different gender of farmers.

Gender	Number of farmers affected with CSBD	Total number of farmers	Prevalence (%)
Male	16	18	18
Female	13	22	52
Total	29	40	31

The prevalence of CSBD was higher among females (52%) compared to males (18%), as seen in **table 2** above. This indicates that there is a gender difference in the prevalence of CSBD among the individuals growing cassava in Paya sub-County in Tororo district.

4.1.2 Awareness of the risk factors of CSBD among the farmers within Paya sub County.

From the study findings, all the individuals in Paya sub County are susceptible to risk factors of CSBD. Some common risk factors which were assessed in this study were based on a study conducted by (Fabres G. B., 1994) and (Jeger, (2018)) included the following: Soil type and structure: Cassava grown in sandy loams or clay soils are more susceptible to soil-borne diseases.

Moisture and temperature: High temperatures and excess moisture can exacerbate disease development. Poor sanitation and hygiene: Failure to remove infected plants and debris can lead to disease spread, Inadequate crop rotation: Continuous cassava production without rotation can lead to soil degradation and increased disease pressure, Use of infected planting material: Planting infected stem cuttings can spread disease to new areas. Insect vectors: Whiteflies and other insects can transmit disease-causing viruses. Soil nutrient deficiencies: Deficiencies in nutrients like nitrogen and potassium can weaken cassava plants, making them more susceptible to disease. Climate change: Changes in temperature and precipitation patterns can alter disease dynamics and distribution. Soil pH and salinity: Extreme soil pH and salinity levels can increase disease susceptibility. Poor agricultural practices: Inadequate irrigation, fertilization, and pest management can increase disease risk.

4.1.2.1 Overall awareness of the risk factors of CSBD.

Table 3 indicating awareness of the risky factors of the risky factors of CSBD in Paya sub-county.

Awareness Level	Number of individuals (%)
High	40
Moderate	40
Low	20
Total	100

The overall awareness of the risk factors of CSBD among the cassava fields was found to be relatively high, with only 40% of participants demonstrating adequate knowledge about the risk factors associated with CSBD as seen in **table 3** above. However, there are some individuals who have low awareness, indicating a need for education and information dissemination.

Table 4 indicating Awareness of specific risk factors among the cassava farmers.

Risk Factor	Low awareness (%)	Moderate awareness (%)	High awareness (%)
Soil type and structure	15	35	50
Soil moisture and temperature	20	40	40
Poor field sanitation	10	50	40
Inadequate crop rotation	25	30	45
Insect vectors	30	35	35
Soil nutrient deficiencies	60	36	4
Soil pH and salinity	57	23	20
Poor agricultural practices	17	48	35

While overall awareness of risk factors is high among the farmers, this study found out that specific factors such as soil nutrient deficiencies and soil pH and salinity as well as insect vectors have lower awareness as shown in **table 4** above. Therefore attention should be given to educating the farmers on these specific risk factors.

4.1.3 Effective strategies for the management of cassava soil borne diseases on the cassava fields in Paya sub-county.

A larger proportion of farmers can effectively manage cassava soil borne diseases on their cassava plantations.

Table 5 indicating the awareness and utilization of current management strategies among the farmers in Paya sub-county.

Management strategy	Awareness%	Utilization%
Crop rotation	40	40
Resistant varieties	40	36
Sanitation and hygiene	40	30
Soil amendment	30	10
Farmer training and education	28	36
Monitoring and early detection	40	38
Integrated Pest Management	40	37

The awareness and utilization of current management strategies among the farmers were found to be higher with crop rotation and utilization of resistant varieties as seen in table.5 above

Table 6 showing Perceived effectiveness of different management strategies among farmers

Management strategy	Very effective
Crop rotation	96
Resistant varieties	96
Monitoring and early detection	94

The study found out that the most commonly perceived effective strategies were crop rotation and planting resistant varieties. There was a preference for specific management strategies among the farmers basing on the above analysis in the table.6 above.

CHAPTER FIVE: DISCUSSION

Prevalence of cassava soil borne diseases among the cassava fields in Paya sub-county.

The research findings indicate a significant prevalence of cassava soil borne diseases in Paya sub County in Tororo district. The studied locality of Paya indicate 41% of the prevalence in fields of farmers who have attained education to S. 4 and below, relative to the study carried out and those above the education level of S. 6 with prevalence rates of 24% also similar to the findings of (Legg et al., 2015 & Howeler et al., 2011). Their study reveal that as the fields of the crops are left in an unhygienic conditions and poor sanity, this gives chance to the pathogens to spread and thus enabling their infestations and multiplication, this is similar to the results of this study showing higher prevalence rate among the low level educated farmers at 41% since they take more time ignoring the weeds and poorly surfacing cassava field conditions, in addition the less educated farmers tend to behave unwilling towards the new technologies which would render control of CSBDs effective.. According to the results of this research, highest prevalence was observed among individuals aged 36-45 years, with a prevalence rate of 56%.This suggests that cassava soil borne diseases increase with increase in age, relating to the results from a survey conducted by (Howeler, 2013) which found that the prevalence of CSBD among adults farmers in Uganda was 9.9%.This indicates the need for targeted interventions in this age group since it could seem expensive for the farmers to employ the modern improved strategies.

The prevalence of CSBD was higher among females (52%) compared to males (18%), as seen in **table 4**. This indicates that there is a gender difference in the prevalence of CSBD among the farmers within Paya sub County. This could be attributed to various factors such as poor agricultural practices, use of infected planting materials, poor sanitation in the fields (Houngue, (2018)). This could partly be due to the averse attitude of women towards innovation and limited access to information regarding production thus leaving them uninformed.

Awareness of the risk factors of cassava soil borne diseases in Paya sub-county.

Similar to highly educated farmers, low educated farmers have high overall awareness of risk factors 40% **see table 4**. However, there are some specific risk factors where awareness varied thus posing a need for improvement, particularly in the areas of Integrated Pest Management and monitoring growth and establishment of the cassava varieties grown. A study by (Hillocks et al.,

2002& Ngode et al., 2016) highlighted the role of planting infected materials and limited soil amendment programs, which may also be applicable to the context of Paya sub-county, since the prevalence of CSBD among the cassava fields is associated with the low awareness levels of soil nutrient deficiencies 15% and limited sensitization and education programs for farmers by the government 10% among the farmers **see table 5**,also soil nutrient deficiencies 15% and inadequate amendment programs to the soils 12% by the farmers **see table 6**

Another key finding is the low overall awareness of the risk factors of CSBD among the farmers 20% as **seen in table 4**. This lack of knowledge can contribute to the high prevalence rates and hinder effective prevention and management strategies. Efforts should be made to educate and increase awareness among the community.

Effective strategies for management of cassava soil borne diseases.

The research also reveals low utilization of current management strategies for CSBD among the farmers. This suggests a need for interventions that promote awareness and access to effective management strategies. Some of the management strategies documented in this study are crop rotation, planting resistant varieties and Integrated Pest Management, similar to the findings by Jegger et al. (2018) and Ngode et al. (2016). Crop rotation 60% and monitoring and early detection 70% emerged as preferred strategies similar to, Implementing biological control methods, promoting farmer training and education can also contribute to cassava soil borne disease management (Jagger et al., 2011) and Promoting breeding for resistance programs through regular government interventions by farming support initiatives and creating opportunities for active farmer's seminars, (Hillocks et al., 2002).

CHAPTER SIX: CONCLUSSION AND RECOMMENDATIONS

6.1 Conclusion

Overall, the research findings underscore the need for comprehensive interventions to address Cassava Soil Borne Diseases among the cassava fields of farmers in Paya sub-county in Tororo district. The overall prevalence of CSBD among the cassava fields for the less educated and highly educated farmers was found to be 41% and 24% respectively. This suggests that a considerable number of both less and highly educated farmers of cassava are affected by CSBD. While overall awareness of risk factors is high the farmers, this study found out that specific factors such as breeding for resistance and Soil amendment programs have lower awareness. Therefore attention should be given to educating staff on these specific risk factors. The awareness and utilization of current management strategies among the farmers were found to be low in some strategies like Soil solarization and breeding for resistance. These interventions should focus on increasing awareness, promoting effective management strategies, and addressing barriers to implementation.

6.2 Recommendation

Collaborate with research institutions like; Universities, colleges and research centers, extension services, agricultural ministries both government and non-governmental organizations and relatives farmer organization educational experts to develop tailored intervention programs for the cassava farmers. These programs should incorporate both education and practical tools for managing and preventing CSBD. Implement the intervention programs and measure their effectiveness through follow-up surveys, assessments, and evaluations.

Develop a long-term follow-up plan to monitor the success and sustainability of the CSBD management interventions. This could include; continued education and support programs, regular field monitoring, farmer surveys and interviews, capacity building and training as well as documentation and knowledge sharing. These interventions can help the farmer to

raise awareness about the prevalence of CSBD and the importance of its management. Use the data to advocate for policy changes and increased resources to address the issue effectively.

Consider publishing the study's findings in academic journals or presenting them at conferences to contribute to the existing body of knowledge on CSBD prevalence and management.

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APPENDIX.



Figure 6 showing the researcher inspecting different fields of cassava with farmers.

