# OPPORTUNITIES AND CHALLENGES IN ACCESSING AND UTILIZING INDIGENOUS VEGETABLES IN ARUA DISTRICT, WEST NILE AGRO-ECOLOGICAL ZONE, UGANDA

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**A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in Agricultural Extension and Rural Development of Masinde Muliro University of Science and Technology**

**OCTOBER, 2025**

## DECLARATION

I declare that this thesis is my original work and has not been submitted to any institution of learning for any educational award. Acknowledgment has been given where external sources have been used.

Signature …… Date ……

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## CERTIFICATION

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## ABSTRACT

Indigenous vegetables (IVs) play a critical role in enhancing food and nutrition security, yet they remain underutilized. In spite of their adaptability, nutritional value, and potential for income generation they still remain underutilized in Uganda. This study investigated the opportunities and challenges in accessing and utilizing indigenous vegetables in Arua District, West Nile agro-ecological zone. The specific objectives of the study were; To establish the influence of socio-economic factors on indigenous vegetable utilization among small-scale farmers in Arua District, Uganda, determine the level of awareness of the nutritive value of indigenous vegetables among among small-scale farmers in Arua District, Uganda and identify constraints hindering the utilization of indigenous vegetable utilization among small-scale farmers in Arua District, Uganda. A correlational survey design was employed, targeting 3,000 households, with a sample of 340 respondents selected using the Krejcie and Morgan (1970) formula. Data was collected through questionnaires, interviews, document analysis, and Focus group discussion and analysed using SPSS version 28, for quantitative data was analysed using univariate, bivariate and multivariate statistics while qualitative data was analysed thematically. Findings revealed that socio-economic factors were critical in the utilization oof indigenous vegetables ($r = .0.89$, $p \leq .01$), accounting for 89% in utilization of IVS. While 87% of respondents were aware of IVS and their nutritional benefits, awareness alone was not critical in the access and utilization of IVS. Key constraints included limited land, preference for exotic vegetables, limited access to certified seeds, inadequate market facilities, and weak extension support. The study concludes that socio-economic characteristics and structural challenges strongly shape IVS utilization, while awareness levels alone are insufficient to drive utilization. This study therefore recommends that the local government in conjunction other development partners should strengthen extension services, improve access to certified seeds, access to market avail credit facilities, and promoting nutrition education to increase IVS utilization, adoption and sustainability.

## TABLE OF CONTENTS

**DECLARATION** ..... **ii**

**COPYRIGHT** ..... **iii**

**ABSTRACT** ..... **iv**

**TABLE OF CONTENTS** ..... **v**

**LIST OF FIGURES** ..... **ix**

**LIST OF APPENDICES** ..... **x**

**ABBREVIATIONS AND ACRONYMS** ..... **xi**

**CHAPTER ONE: INTRODUCTION** ..... **1**

1.1 Background of the study ..... 1

1.2 Statement of the Problem ..... 3

1.3 General objective ..... 3

1.4 Specific Objectives ..... 3

1.5 Research hypotheses ..... 4

1.6 Significance of the study ..... 4

1.7 justification of the study ..... 4

1.8 Scope and coverage of the study ..... 6

**CHAPTER TWO: REVIEW OF LITERATURE** ..... **7**

2.0 Introduction ..... 7

2.1 Socioeconomic Factors and the Utilization of Indigenous Vegetables in Arua District. 7

2.1.2 Extension Services in the Utilization of Indigenous Vegetable Farming ..... 9

2.1.3 Income Generation through Indigenous Vegetable Farming.....11

2.2 Level of awareness of Nutritive Value of Indigenous Vegetables .....14

2.3 Challenges Hindering Indigenous Vegetable Farming.....17

2.4 Conceptual Framework.....20

**CHAPTER THREE: RESEARCH METHODOLOGY .....22**

3.0 Introduction.....22

3.2 Location of the Study.....22

3.1 Research Design.....23

3.3 Study Population.....24

3.4 Sample Size.....24

3.5 Sampling Techniques.....24

3.6 Research Instruments.....25

3.6.1 Reliability of the Instruments.....25

3.6.2 Validity of the Instruments .....26

3.7 Data Collection Procedure .....26

3.8 Data Analysis Techniques.....26

3.9 Ethical Considerations .....28

**CHAPTER FOUR: FINDINGS, DATA ANALYSIS AND DISCUSSIONS.....30**

4.0 Introduction.....30

4.1.1 Gender of the respondents .....30

4.1.2 Education level status of respondents.....31

4.1.3 Age of respondents .....32
4.1.4 Influence of Extension Services and Income on IVS Farming.....34
4.1.5 Correlation for Social Economic Factors and utilization of indigenous vegetables .39
4.1.6 Regression Analysis for Social Economic Factors and utilization of IVs .....40
4.1.7 The Regression Model .....41
4.2 The Level of Awareness of Nutritive Value of Indigenous Vegetables .....43
4.3 The Challenges that Hinder Utilization of IVs Farming Systems .....45

**CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS .51**
5.0 Introduction.....51
5.1 Summary of Findings.....51
5.2 Conclusion .....53
5.3 Recommendations.....53
5.4 Suggestions for Further Research .....54

**REFERENCES.....55**

**APPENDICES.....59**

## LIST OF TABLES

Table 4.1. Distribution by gender of Indigenous Vegetable Farmers in Arua District, Uganda……..…..31

Table 4.2: Distribution by education level of Indigenous Vegetable Farmers in Arua District, Uganda ..... 32

Table4.3: Distribution by age of Indigenous Vegetable Farmers in Arua District, Uganda……...33

Table 4.4: The Respondents Results ..... 34

Table 4.5: Correlation between Social Economic Factors and uptake of IVs ..... 39

Table 4.6: Model Summary ..... 40

Table 4.7: ANOVA of Social Economic Factors and uptake of Indigenous Vegetables . 40

Table 4.8: Coefficients of Regression Equations……..42

Table 4.9: Level of awareness of Nutritive Value of IVs ..... 43

Table 4.10: Challenges that hinder utilization of Indigenous Vegetable Farming System……46

## LIST OF FIGURES

Figure 2.1 conceptual framework…….21

Figure 4.1: Extension Officers (EO) Visits..... 39

## LIST OF APPENDICES

Appendix 1: Questionnaire..... 59

Appendix 2: Letter from Masinde Muliro University For Approval of Research ..... 63

Appendix 3: Letter from Research Ethics Committee for Protocal Submission List.... 64

Appendix 4: Application form for researcher wishing to carry out research in Uganda and to Use Government Archives..... 65

## ABBREVIATIONS AND ACRONYMS

**ASARECA** Association for Strengthening Agricultural Research in East Africa

**CBO** Community Based Organization

**CEO** Chief Executive Officer

**DAO** District Agriculture Officer

**ECA** East and Central Africa

**FAO** Food and Agricultural Organization

**FLSE** Farmer Led Seed Enterprises

**IVS** Indigenous Vegetables

**NAES** National Agricultural Extension Service

**NARO** National Agricultural Research Organization

**NGO** Non-Governmental Organization

**SSA** Sub Saharan Africa

**ToT** Trainer of Trainees

**VBSS** Vegetable Breeding and seed Systems

**WHO** World Health Organization

## OPERATIONALIZATION OF TERMS

**Indigenous Vegetables (IVs)**These refers to traditional leafy or non-leafy plant species that are native to Uganda and have been used by local communities for food and medicinal purposes in Arua District, Uganda.

**Indigenous Vegetable Farming Systems (IVFS)** refers to the combination of traditional practices, inputs, and management approaches employed by small-scale farmers in Arua District, Uganda to grow indigenous vegetables for household food security and income generation.

**Level of Awareness of Nutritive Value** Refers to the extent of farmers' knowledge understanding of the nutritional and health benefits associated with consuming indigenous vegetables in Arua District, Uganda.

**Socioeconomic Factors** refers to social and economic characteristics that influence the production and utilization of indigenous vegetables in Arua District, Uganda.

**Access and Utilization of Indigenous Vegetables** refer to the ability of farmers to obtain seeds, inputs, and markets for indigenous vegetables, while utilization refers to their cultivation, preparation, and household consumption in Arua District, Uganda.

**Challenges Hindering Utilization** refers to the barriers that limit the effective utilization of indigenous vegetables among farmers in Arua District, Uganda.

**Extension Services** Refers to the agricultural advisory support offered both government agencies and non-governmental organizations with an aim of enhancing the knowledge and skills of farmers in indigenous vegetable production in Arua District, Uganda.

**Income Level** Refers to the amount of money earned by farmers from the from the sale of indigenous vegetables in Arua District, Uganda.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of the study

The uptake of fruits and vegetables through consumption plays a fundamental role in shaping the nutritional status of populations (van der Lans *et al.,* 2012). Inadequate intake of fruits and vegetables is associated with non-communicable diseases (WHO, 2002, 2003, 2015; Smith and Eyzaguirre, 2007). It is recommended by World Health Organization that the intake of approximately 400 grams of fruits and vegetables per day (Ruel et al., 2005) is health for human health. Many studies however, indicate that individuals from vulnerable socioeconomic backgrounds tend to manifest the lowest intake of fruits and vegetables (van der Lans *et al.,*2012). 89% of households in Uganda consume fruits and vegetables, with an average intake of 63.5 kg in a year per person which far much below the global requirement of 146 kg per person annually (WHO, 2015). Thus, this provides a basis to leverage indigenous vegetables.

A study conducted by (Abukutsa, 2010), indicated that indigenous vegetables are rich in essential minerals, more specific calcium, iron, and phosphorus. Wemali, (2014) pointed out that the Plant Tesources of Tropical Africa identifies approximately 6,376 useful indigenous African vegetable species. The growth rate of these vegetables is rapid and quick, and are versatile to varied ecological conditions, and are highly nutritious. Daily intake of at least 400 grams of fruits and vegetables could prevent chronic diseases such

as heart disease, cancer, diabetes, and obesity, as well as prevent micronutrient deficiencies, especially in third world countries in Which Uganda is no exemption. Fruits and vegetables are critical in contributing essential nutrients which enhance food security as well serve as supplement diet necessary for managing nutrition-related illnesses. Indigenous vegetables are relatively easy to cultivate, they require little or no costly inputs like fertilizers or chemicals (Ochieng et al., 2019).

80% of the households in Arua District predominantly rely on agriculture (Uganda Investment Authority, 2017). Arua District has a strong foundation in terms of agricultural raw materials which supports the development of agro-processing industries. A study conducted by Huib *et al.,* (2019) found that cassava, beans, sesame (simsim), groundnuts, cowpeas, millet, maize, plantain (matooke), and sweet potatoes are commonly cultivated in Arua. These crops are majorly grown for primary consumption and any surplus is sold for income. Other crops that are widely grown also include tobacco, and the production honey which acts as the main source of income.

The region experiences micronutrient deficiencies despite its ability to support different crops. The demand of indigenous vegetables, and nutritional benefits is high. however, information on their production still remains scanty, particularly in Arua District, Uganda. Indigenous vegetables show a critical potential for improving food and nutrition, Bua and Onang, (2017). This study, therefore, leverages on the opportunities and constraints in accessing and utilizing IVS in Arua District, Uganda.

## 1.2 Statement of the Problem

According to Ntawuruhunga, 2016 indigenous vegetables have great nutritional benefits, yet they remain unexplored. Equally focus to exotic vegetables poses a challenge to their recognition. The role played by IVS is also not fully understood more especially in eradicating poverty in rural set ups. Creation of awareness through campaigns could uplift the state of IVS Aleni (2017). IVS possess wide nutritional benefits despite being disregarded and tagged as a sign of 'backwardness,' this leads to low prioritization in research related to IVS and developing markets related to them. In Arua District, focus has been shifted to some crops like cassava, maize, sweet potatoes, plantains, tobacco, and exotic vegetables for which are used for consumption in households and sales in local market (Huib *et al.,*2019). IVS have been given minimal attention despite their potential to generate income. The aim of this study therefore is to investigate the opportunities and challenges of utilizing IVS in Arua District.

## 1.3 General objective

The general objective of the study was;

To investigate opportunities and challenges in accessing and utilizing indigenous vegetables in Arua District, West Nile Agro-ecological Zone, Uganda.

### 1.4 Specific Objectives

i. To establish the influence of socio-economic factors on the indigenous vegetable farming among small-scale farmers in Arua District, Uganda.
ii. To determine the level of awareness of the nutritive value of indigenous vegetables among among small-scale farmers in Arua District, Uganda.
iii. To identify constraints hindering the utilization of indigenous vegetable farming among small-scale farmers in Arua District, Uganda.

### 1.5 Research hypotheses

i. $H_0$1 There is no statistically significant association between socio-economic factors and the practice of indigenous vegetable farming in Arua District, Uganda.
ii. $H_0$2 There is no statistically significant association between the level of nutritional awareness and the practice of indigenous vegetable farming in Arua District, Uganda.
iii. $H_0$3 There is no statistically significant association between challenges faced by farmers and the practice of indigenous vegetable farming in Arua District, Uganda.

### 1.6 Significance of the study

This study is important specifically to the farmers, policymakers, and development partners as it will provide an opportunity to evaluate the neglected IVS and prioritize it. This study could also unlock the potential of smallholder farmers socioeconomically of

by diversifying income sources and enhance food and nutrition security for households, given the high nutritional value of these crops.

### 1.7 justification of the study

To improve nutrition, IVS are inevitable. They are important in addressing nutrition, and livelihoods. Despite their potential they still remain underutilized in Uganda specifically Arua District. IVS have been overshadowed by exotic vegetables in spite of being rich in nutrients, affordable, and versatile to different climatic conditions. The micronutrient deficiencies have been compounded by continuous neglect which in turn limits opportunities for enhancing incomes in rural set ups and enhancing food security.

Majority of the households in Arua District depend on agriculture. It supports up-to 80% of population. In Arua district, a lot of emphasis has been put on cash crops and staple crops at the expense indigenous vegetables. Limited awareness on the nutritional, lack of quality seeds, poor market structures, and limited extension services are the key impediments on IVS farming and utilization (Uganda Investment Authority, 2017). Therefore, this study is important as it points out the urgent need to diversify diets in the households as well as creating economic empowerment of small-scale farmers by leveraging on the opportunities for integrating IVS into farming. In addition, it provides the key players (policymakers, researchers, and other partners) with empirical evidence on possible interventions that can reposition IVS from being an overlooked crop to a crop for food and nutrition security.

By investigating socio-economic factors, awareness level, and barriers to IVS utilization, this study brings a nexus between the gaps in terms of knowledge, agricultural extension and rural development.

### 1.8 Scope and coverage of the study

This study will be carried out in Arua district, Uganda. It will specifically investigate how factors on socio-economics, awareness level and the challenges faced by farmers influence utilization of IVS in Arua District, Uganda. This study will involve IVS farmers and extension officers.

# CHAPTER TWO

# REVIEW OF LITERATURE

## 2.0 Introduction

This chapter reviews existing literature related to the variables addressed in the research objectives. It examines key issues, including socio-economic factors, awareness of the nutritive value of indigenous vegetables, and the challenges associated with the utilization of indigenous vegetable farming, as outlined in the problem statement.

## 2.1 Socioeconomic Factors and the Utilization of Indigenous Vegetables in Arua District

In this section, socioeconomic factors like gender, age, access to extension services on utilization of indigenous vegetables, access to quality seeds and inputs and access to the market were reviewed.

### 2.1.1 Gender and indigenous vegetables farming

Gender and participation in crop farming for purposes of household food security are closely related. A study conducted by Finid *et al.,* 2022 on rice bean pointed out that women were more involved in its production. Involvement of men is evident in preparing land and raising nursery as with the case of many arable crops, while, for women their roles appear to be a myriad of activities ranging from harvesting, weeding, winnowing, threshing and storage of crops. Moreover, some occurrences male and female cost-share farm activities like application of fertilizer and crop harvesting. Generally, farm level

activities dominantly appear to be gendered. For example, in India, activities that includes; pesticide application, land preparation, planting, application of soil amendments and seedling transplanting in fields of rice were dominated by men as women were actively engaged in weeding, winnowing and threshing (Goldey and Varma, 2005). A study conducted by Bella *et al.,*2020 on haricot bean in Cameroon found that it had more of women face even though men dominated in its marketing. According to Njuki *et al.,* 2011 a crop is regarded as a woman crop when women are the ones domineering in providing labour force. In South Africa a study conducted by Takuji *et al.,* 2016 found that groundnuts was also a women crop as they dominated in the provision of labor force. In Kenya the production of banana was also dominated by women in the provision of labor, however their control over the income and ownership of land was still under subversion (Fischer *et al.,* 2012). A study conducted by Akter *et al.,* 2017 on women's empowerment and equity in agriculture found that men were more involved in crop production activities like land preparation and fertilizer application, that required energy and technical know-how. Study conducted by Fakoya *et al.,* (2006) indicated that socioeconomic characteristics such as education level, farm size, age, and ability to access extension services influenced farmers' participation in the farming of arable crops in Nigeria, Ogun State, while gender and marital status had no influence on cultivation and participation in arable crop production.

The level of involvement by each gender varies from one crop to another (Padmanabhanan, M.A., 2004). In most settings of agricultural activities such as weeding, winnowing, harvesting, drying of grains, storage and processing are linked to women (Chayal *et al.,* 2010). Accessibility to production resources such as land, labor,

credit, technology, fertilizers and information influence the participation of men and women in different crops and agriculture activities generally ( Emeya, S., 2014, Carr, E.R., 2007, Njuki, J.,*et al.,* 2011) The size of the farm, human capital, age, income level also influence the participation of men and women in crop farming Paudel, *et al.,*2018, Nakazi *et al.,* 2013, Bellemare, M.F. and Barrett, C.B., 2006). This underscores the need the investigate

### 2.1.2 Extension Services in the Utilization of Indigenous Vegetable Farming

The transformation in consumer behavior within East African communities is increasingly evident, with a growing emphasis on promoting the consumption of indigenous vegetables (IVs) for improved competition with traditional vegetables in supermarkets and retail outlets across East Africa. The demand for IVs could aggravate the entry into lucrative markets which could in turn improve the financial well-being of smallholder farmers who cultivate them. In both urban and rural markets of East Africa the most preferred vegetables include amaranth, okra, and spider plant. Equally increased awareness through extension services could enhance IVS commercialization (Kansiime *et al.,* 2016). In Arua, however, there still exists a significant gap in the effectiveness of extension services in the utilization of IVS, which poses a challenge to the commercialization of IVS.

IVS possess therapeutic properties and wide range of nutrients. Thus, understanding how IVS are used in people's diets can help mitigate malnutrition and some chronic illnesses. Improving the production, processing, and preservation of IVS could also boost food security and create employment opportunities, which in turn increase household income (Gido *et al.,* 2016). Globally, most households feed on IVS, especially where they are

found. These foods are regarded as having high nutritional value, which is important for good health. Unfortunately, the information regarding their consumption is scanty and not well recorded and occasionally overlooked in national surveys (Mbhenyane, 2017).

According to the Nutritional Education Program by Mushaphi *et al.,* (2017), many children (aged three to five) had information about IVS. After Education program, the consumption of IVS significantly increased. This change could be through the action of caregivers' who subjected them to these foods since they are more available in specific seasons. Leafy vegetables of African origin are rich in useful nutrients such as vitamins A and C, iron, zinc, and magnesium. Amaranth is also possessing protein, fiber, healthy fats, and bioactive compounds. They grow in dry environmental conditions. The leaves can also be used in various ways like condiments, vegetables, or in soups showing how versatile it is and its potential for wider farming (Mbhenyane, 2016).

In South Africa's Eastern Cape majority households were aware of IVS, (Taruvinga and Nengovhela, 2015). Additionally, age, access land, markets, and awareness may influence more consumption of vegetables. Similarly, attitudes strongly affect the willingness to buy and consume IVS in Kenya, Gakobo and Jere (2016). This indicated that interests in traditional foods is increasing, contrary to the perception that African consumers are less about IVS.

Good policies influence IVS positively Mushaphi *et al.,* (2017) to improve nutrition and health. Programs which are educative in nature can help raise awareness about potential benefits. In Uganda, decline in IVS consumption could be as a result of shift to imported

vegetables, Aleni (2017). Differences in cooking styles could also influence their consumption.

### 2.1.3 Income Generation through Indigenous Vegetable Farming

Globally, little attention is given to IVS, yet great potential exists in Urban which could generate income for small-scale farmers. More often low levels of production is a result of the perception that IVS lack commercial value (Byrnes, 2017). Growing IVS could give higher returns and greater profits per unit area compared to exotic crops like maize Kansiime *et al.,* (2016). This could indicate that IVS improves incomes in households and mitigates food insecurity. IVS have growth cycles which are shorter with minimal space thus more versatile than staple crops.

The IVS value chain stretches from inception, through various production stages (involving both physical transformation and the integration of diverse producer services), to a point where it reaches end customers for consumption (Omulo, 2016).a wide range of economic potential is also shown by IVS, this has led to gradual commercialization, which in turn offers benefits which enhance revenue and employment opportunities along the vegetable value chain (Gido, Bett, and Bokelmann, 2016). Critical role is played by vegetables in nutrition and food security. Significant economic opportunity in terms of solving rural unemployment and poverty could be as a result of cultivating vegetables. Vegetables supply essential vitamins which are necessary for human's well-being. Currently, the economic and nutritional significance of vegetables is not adequately acknowledged which is no exceptional to Arua District, Uganda. To tap the economic potential of vegetables, governments must intensify their investment in agricultural productivity of IVS, this encompasses enhanced varieties, alternatives approaches

controlling pests to chemical pesticides, and protected cultivation, as well as effective postharvest management, and market accessibility (Schreinemachers, Simmons, Wopereis, 2018). The policymakers and development mangers and partners in Sub-Saharan Africa must reassess and prioritize the disregarded production and consumption of IVS to improve nutrition, generate revenue, and ensure food security among small-scale farmers

Study by Aleni (2017) states that rural people primarily sourced their Indigenous veggies from the wild, while municipal households procured them from informal markets. Keatinge *et al.,* (2015) indicated that the market size of indigenous vegetables in Nairobi, Kenya, has been surging, accounting for approximately 30% of total vegetable sales. Similarly, the consumption of indigenous African green vegetables has been rising in various East African nations an indicator of increased nutritional awareness, however for the case of Uganda, specifically Arua District it is unclear, underscoring the need to conduct this study. In India, numerous indigenous vegetables are either derived from the wild or grown. Some are sold fresh during the harvesting season while some are dried for personal consumption during lean months, or marketed for income generating.

The donors and government should give priority to IVS in order to realize their full economic and nutrition potential Schreinemachers *et al.,* (2018). In order to enhance economic opportunities for small scale farmers, it is necessary to intensify resource allocation towards IVS. Farmers should be updated on the existing potential in terms of markets for sustainable production of IVS, this could in turn influence their perceptions positively towards the cultivation of IVS Kyamba *et al.,* (2014)

Unlocking IVS potential could undeniably address food insecurity and other nutritional challenges (Bua and Onang, 2017). In Uganda, however, there is limited information about the value chain of IVS. It is against this that this study investigates the opportunities and challenges in utilizing IVS in Arua District, West Nile Agro-ecological Zone, Uganda.

## 2.2 Nutritional awareness about IVS

IVS provide key micronutrients that includes vitamin A and C which are important in addressing various nutritional issues. IVS are faced by various obstacles despite their potential, some of the obstacles include, low recognition globally in comparison to other crops such as tomatoes, and cabbage which have been given more attention (Keatinge *et al.,* 2015). For sustainable food production, indigenous vegetables are critical, this is because the contribute to dietary diversity which in turn mitigates food insecurity globally, and to be specific in Africa and in Uganda in particular. The prevalence of IVS has been on decline as a result of dominance by exotic crops which dominates in the markets and reduced resource allocation towards them and even limited research about them Mbhenyane (2017). IVS exhibit the potential of addressing malnutrition, however limited awareness about their value is still a critical barrier to their global adoption.

For increased consumption of IVS, creation of awareness about their nutritional advantages is necessary Kansiime *et al., (*2017). Equally, the barriers in terms of knowledge, and negative perceptions should be addressed. This is because in Uganda, particularly in Arua district, there still exists consumer gaps in terms of knowledge and perceptions which could be detrimental to their integration in diets. This can also be reinforced by Afari-Sefa *et al.,* (2015) who noted that IVS remain largely unexplored due to negative perceptions and lack of awareness about their health-related benefits. In order to mitigate some of these pertinent barriers, it is imperative to create public awareness and develop education programs that are geared towards the same. Therefore,

investigating opportunities and challenges in accessing and utilizing indigenous vegetable farming systems in Arua district, West Nile agro-ecological zone, Uganda

The changes in consumer pattern in East African communities is increasingly manifesting, with an emphasis on promoting the consumption of IVS for improved nutrition and health. As it exists now, exotic vegetables pose a stiff competition on IVS, thus the only way of increasing uptake of IVS is through increasing awareness Kansiime *et al.,* (2016), this could couple up the demand of IVS and improve wellbeing financially among small scale farmers. In Uganda, Arua district, the demand for IVS still remain unclear, which could be a barrier to commercialization of IVS thus necessitating the need for this study.

IVs are rich in diverse nutrients and are widely recognized for their therapeutic and sociocultural benefits across communities. Improved comprehension of dietary practices around IVs could help mitigate malnutrition and chronic diseases. Additionally, enhanced IVS production, processing, and preservation could enhance food security, create more job opportunities, as well as increase income of households (Gido *et al.,* 2016). Studies in South Africa and globally shows that indigenous foods are frequently consumed by households, particularly in areas where these foods available readily, thus contributing to improved food security and diversity of diet. Many indigenous plants are known to nutritional value; however, the information about their consumption is scanty or overlooked in national dietary surveys (Mbhenyane, 2017), this situation is also manifested in Arua District, Uganda, thus the need to conduct this study.

In a pre-test post-test study by Mushaphi *et al.,* (2017) which implemented a Nutrition Education Intervention program. The result indicated that many children were familiar with indigenous foods at the baseline assessment, and the intake of these IVS significantly surged in the experimental group after the intervention, in contrast to the control group. This rise in consumption could be attributed to the intervention, alongside the occasional availability of these foods.

Most African leafy vegetables such as amaranth, are good sources of micronutrients such as vitamins A and C, iron, zinc, and magnesium, which are important for health. Amaranth, for example, is rich in protein, fiber, lipids, unsaturated fatty acids, and bioactive compounds, equally it is versatile to challenging environmental conditions. The leaves of IVS can be used in varied ways; condiments, vegetables, and sauces (Mbhenyane, 2016). In some countries in Africa such as South Africa, the level of awareness about IVS is high (Taruvinga and Nengovhela 2015), the high level of awareness was as a result of social-economic factors such as age, access to farmland, market availability, and health awareness. In Kenya, attitude influences the consumption of IVS Gakobo and Jere (2016). Policies in place also influences the consumption of IVS Mushaphi *et al.,* (2017) for example if the existing policies are favoring adoption of IVS, the uptake will also be high. The uptake also could be reinforced by education programs which are geared towards creating awareness.

## 2.3 Challenges Hindering Indigenous Vegetable Farming

For sustainable production of IVS attention should be given to various challenges facing them. Some of the challenges that need to be addressed include; change in climate as a result of global warming, use of inorganic inputs which degrades the environment leading to reduced yields (Alemayehu *et al.,* 2015). Rapid increase in population combined with environmental degradation has overtaken the production of food which has led to increased hunger, malnutrition health issues relate to nutrition. This is more unique to underdeveloped countries like Uganda in Africa, (Jiménez-Aguilar and Grusak, 2017). Additionally, surge in population limits the available land for farming, thus shifting to IVS could address this as they require small space.

Furthermore, limited infrastructure for the transporting and handling of indigenous IVS has emerged as a greater barrier than market demand. Poor logistics also lead to higher post-harvest losses and limited knowledge retention within the sector contributes to a loss of expertise and skills (Omulo, 2016). Study on the adoption of agricultural modest practices among farmers indicated shown that nearly all farmers in formerly European-settled areas are exposed to advanced farming techniques. This familiarity could be due to early and enhanced exposure to agricultural extension services. Most studies demonstrated that a strong positive relationship between access to agricultural information and the uptake of improved farming practices. Farmers with continuous access to extension support are more likely to practice a wide range of agricultural improvements, unlike their counterparts with limited access to these resources (Kyamba *et al.,* 2014). These challenges point the need for necessary interventions to support

indigenous vegetable farming through improved infrastructure, sustainable approaches to farming and enhanced access to agricultural information.

In Africa, IVS re faced by a number of challenges which acts as a set back to their production and economic potential. Limited access to quality seeds is a major challenge in Kenya and Zambia (Byrnes 2017). Lack of market and profitability is another challenge, for instance many farmers could not grow spider vegetables due to lack of market and profitability. Additionally, pests are also potential barriers for instance most farmers shied from growing vegetables as they are more prone to pests. Cost of inputs such as fertilizer, and limited access to improved germplasm were also major barriers. The farmers ability to grow IVS was also thwarted by finance resources which are limited. Poor state of soil quality and limited knowledge could also be critical barrier, as more households could not be aware of benefits and unconventional cultivation practices of IVS. Therefore, there is urgent need to address these gaps as a way of enhancing utilization and access of IVS.

The Five-Year Strategic Plan (2009-2013) of The Horticultural Crops Development Authority (HCDA) also noted that the primary barrier to cultivation of IVS was lack of credit. High rates of interest also made it difficult for producers to secure financing for input acquisition and capital investment, which definitely hinders productivity. Schreinemachers *et al.,* (2018) argue that in order to realize full economic potential of IVS, governments should intensify their investment in agricultural productivity through initiatives such as provision of improved crop varieties, offering biological approaches to

controlling of pests, advocating for protected cultivation, and as well as improving post-harvest management and food safety standards.

Further studies by Aleni (2017) and Bua and Onang (2017) showed that the key challenges for indigenous vegetable farmers include; limited infrastructure, inadequate inputs and financial deficits, insufficient knowledge on marketing, lack of government support, lack of policies promoting IVS development, and negative attitude towards them. Huib H. *et al.,* (2019) also examined farming practices in the Arua district, and reported that indigenous vegetable farming remains highly labor-intensive, with most agricultural and post-harvest practices done manually. Farmers also rely on organic fertilization from residues of crops, household wastes, and inadequate manure due to cattle scarcity, as it is perceived that mineral fertilizers are costly and uncertain to economic benefit. Therefore there is need to address some of these contextual barriers as a way of unlocking IVS potential

## 2.4 Conceptual Framework

Conceptual framework is representation of the relationship between independent and dependent variables. For this study the conceptual framework will be derived from the study objectives. The study has three objectives namely; to determine the influence of socio-economic factors on IVS utilization, to evaluate how nutritional awareness influences IVS utilization, and to identify constraints that limit the cultivation and utilization of IVS. When combined, the three provides an understanding basis how these factors influence the utilization of IVS, pointing out how the opportunities and utilization can be increased and which interventions should be undertaken to address challenges existing..

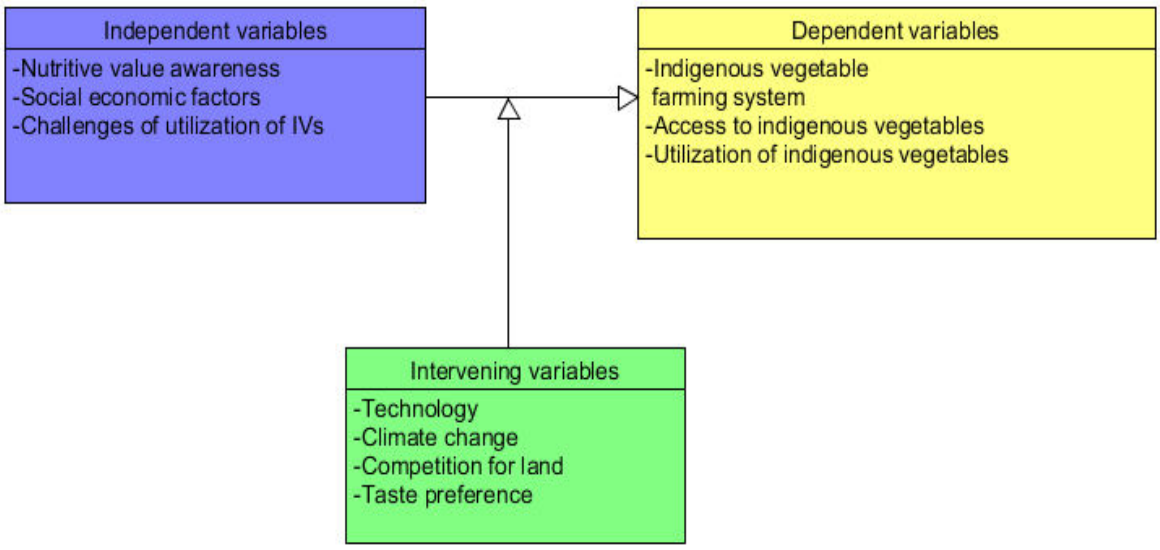


Figure 2.1 conceptual framework

Source: researcher 2025

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.0 Introduction

This section is made up of the following sub-sections; the location where the study was conducted, the design of the research that will guide this study, the population under study, sampling strategies, the size of the sample, methods used for during data collection, data collection procedures, methods of analysing data, and interpretation of the research findings.

## 3.1 Location of the Study

The location of this study was Arua District, which is located to the West Nile agro-ecological zone of Uganda, the district serves as vegetable production basket, which is the main economic activity that supports majority of the population. The district is located on the longitudes 30°30'E to 31°30'E and latitudes 20°30'N to 30°50'N, the environment within the district is conducive for agriculture. It borders Republic of Sudan and the Democratic Republic of Congo, making it ideal for cross border opportunities such as cross-border agricultural trade.

The size of the district is approximately 5419.64 km², where arable land accounts for 87%, this makes it more appropriate for agricultural productivity. The rainfall pattern in the district is bi-modal with an annual average of 1250 mm; this makes it more consistent in growing crops. High rainfall is experienced between August and September, which coincides to periods of growing vegetables. The also district enconters some climatic challenges such as high rates of evaporation rates (130-180 mm per month) and draught

which are prolonged between December to March, which comes high temperatures. These conditions make it ideal to grow IVS. This study therefore is aligned to the need of tapping the existing potential in of Arua District while addressing the effects of climatic variability. These findings are expected to inform the stakeholders, such as farmers, policymakers, and development partners, on how best they can enhance production of IVS as a way of unlocking their potential in addressing food security in the agricultural landscape in the Region.

### 3.2 Research Design

Research refers to the systematic and organized process aimed at investigating specific issues to find solutions (Sekaran, 2000; Burn, 1994). As a result, research outcomes often expected to develop of new insights, concept formation, and the collection of information to support comprehensive inferences (Sekaran, 2000). In addition, Bulmer (1997) emphasized that sociological research is critical in generating systematic, reliable, and valid insights into social phenomena. Kerlinger (1986) also describes scientific inquiry as a structured, controlled, empirical, and analytical investigation of hypotheses about the relationships between phenomena. According to Mugenda and Mugenda (2003) a survey research methodology used to collect data from selected individuals within a targeted group. Survey design is used when one wants to describe in quantitative terms the degree to which two or more variables are related, (Mugenda and Mugenda, 2003). This study therefore used correlational survey design. correlational studies involve the collection of data in two or more variables on the same group of respondents and computing a correlational coefficient. If the variables are found not to be significantly correlated, these

variables are removed from further observation. If they are highly correlated, this is used as a basis on which one can carry out a causal-comparative study to determine if the relationship is causal. It allows one to analyse inter-relationships among a large number of variables in a single study; also permits one to analyse how several variables either singly or in combination that might affect a particular phenomenon being studied.

### 3.3 Study Population

According to Cooper and Schindler (2001), a population encompasses all elements about which research conclusions are made. This study focused on 340 IVS farmers both drawn from Arua District, Uganda.

### 3.4 Sample Size

A sample is a portion of the total population selected to draw generalizations. It represents a specific ratio of the population chosen for the study. For this investigation, 340 households were sampled using Krejcie and Morgan (1970), as this sample size effectively represents the entire target population using the formula;

$$\textbf{Sample Size} = X^2 NP\,(1-P) \div d^2(N-1) + X^2 P\,(1-P) \ldots\ldots\ldots\ldots\ldots\ldots 1$$

*Source*: Krejcie and Morgan (1970*)*

### 3.5 Sampling Techniques

is the process of selecting a subset of individuals from a population for research purposes (Kombo & Orodho, 2003; Mugenda & Mugenda, 1999). The target population comprised small-scale farmers engaged in indigenous vegetable farming in Arua District, as well as key stakeholders such as agricultural extension officers.

A multi-stage sampling technique was used: Purposive sampling was used to select Arua District due to its high potential for indigenous vegetable production. Stratified sampling

was used to divide the district. Simple random sampling was used to select farmers. Purposive sampling was used to include agricultural extension officers.

### 3.6 Research Instruments

Gathering and measuring information on relevant variables in a systematic way to answer research questions is the job of data collection instruments. A combination of a questionnaire, interviews, and focus groups were used to compile the data for this study. The questionnaire was divided into sections and had both open-ended and close-ended questions. Factors influencing the aims of the study were addressed in each part. Focus groups were held with vegetable vendors in five sub counties of the Arua area, and five extension officials in the district were interviewed on a scheduled basis.

#### 3.6.1 Reliability of the Instruments

Grinnell (1993) defines the precision of a measuring device as an indicator of its reliability. Researchers expect that, under identical conditions, research instruments will yield consistent results (Donald, 2006; Mugenda & Mugenda, 2003; Tromp, 2009). However, errors can occur due to random influences causing variations in measurements, except when such variations are substantial enough to enhance systematic variance. After developing internal reliability and consistency was achieved by pretesting instruments with 20 participants in Arua district to assess their reliability and identify any limitations.

### 3.6.2 Validity of the Instruments

According Best and Kahn (2003) an instrument is considered valid when it accurately measures what it is intended to measure. Kothari (2004) further explains validity as the instrument's utility. Validity therefore refers to the degree to which variations detected by a measurement tool accurately reflect actual differences over time among the subjects being studied. Equally, Anastasia (1982) indicated that validity is a measure of quality in research tools, in terms of accuracy, correctness, truthfulness, relevance, and appropriateness. In this study, the instruments were reviewed by research professionals (supervisors) from the Department of Agribusiness and Extension at Masinde Muliro University of Science and Technology, whose feedback helped refine the focus and enhance the instruments' effectiveness.

## 3.7 Data Collection Procedure

According to Madhu (2005), a data collection procedure is a blueprint for all the steps that go into doing a certain study. Permission to conduct the study was obtained from the Uganda National Council for Science and Technology (UNCST) and the Arua District Agricultural Office. Informed consent was obtained from all participants, and confidentiality of the information was strictly.

## 3.8 Data Analysis Techniques

Following data collection, the data were cleaned, coded, and analysed using univariate statistics (frequencies and percentages) along with, bivariate statistics (correlation) to determine whether there is association between social-economic factors and IVS farming

and multivariate statistics (multiple regression analysis) to assess the overall impact of the identified constraints on indigenous vegetable farming in the study area.

**Objective 1: To establish the influence of socio-economic factors on indigenous vegetable farming among small-scale farmers in Arua District, Uganda.**

Data on socio-economic variables such as age, gender, education level, income, extension services and farming experience were analyzed using univariate statistics to present their distribution among respondents. To determine their influence on indigenous vegetable farming, multiple regression analysis was conducted, with indigenous vegetable farming (measured by acreage under cultivation, frequency of production, or income contribution) as the dependent variable. The strength and direction of the relationship between socio-economic factors and indigenous vegetable farming were assessed using Pearson's correlation coefficients at a 0.05 significance level.

**Objective 2: determine of level of awareness of small-scale farmers on the nutritive value of indigenous vegetables in Arua District, Uganda**.

The farmers knowledge and perceptions regarding nutritional benefits associated with IVS were measured using a likert scale on a five-point scale questionnaire (where1 = strongly disagree to 5 = strongly agree). Univariate statistics was used to analyse data and expressed as (frequencies, percentages, and mean scores). Averaging of responses was then computed to determine nutritional awareness index.

**Objective 3: Constraints faced by farmers to the utilization of IVS in Arua District, Uganda.**

Farmers were asked to give data on production levels, market availability, and challenges of consumption. The responses were analyzed by univariate statistics as expressed as

(frequencies and percentages). To determine most pressing barrier, ranking was done. Thematic analysis was then done on data from interviews and focus group discussions to supplement quantitative data.

### 3.9 Ethical Considerations

Attention and care were accorded to participants; ethical challenges were addressed individually. Ethical challenges of access, acceptance informed consent, privacy (anonymity and confidentiality), and issues misrepresentation of data (Cohen *et al.,* 2000). Informed consent was obtained from the respondents by clearly explaining the rationale of the study, safety of respondents was enhanced to reduce potential inconveniences. Respondents were advised not to write their names on the questionnaires for privacy and anonymity. Respondents' information was treated with confidentiality and purely used for academic purposes. The data was not manipulated.

# CHAPTER FOUR

# FINDINGS, DATA ANALYSIS AND DISCUSSIONS

## 4.0 Introduction

This chapter presents the analysis, interpretation, and discussion of results. Qualitative data was analysed using descriptive statistics, such as percentages and frequency counts. The analysis is summarized and displayed through tables and figures for clarity. Results are organized under subheadings that correspond to each research objective as follows;

1) To establish the influence of socio-economic factors on the indigenous vegetable farming among small-scale farmers in Arua District, Uganda.
2) To determine the level of awareness of the nutritive value of indigenous vegetables among among small-scale farmers in Arua District, Uganda.
3) To identify constraints hindering the utilization of indigenous vegetable farming among small-scale farmers in Arua District, Uganda.

## 4.1 Social-economic factors

The respondents' social economic characteristics such as; gender, were outlined and analyzed based on gender, age, education level and access to extension services as indicated below;

### 4.1.1 Gender of the respondents

Farmers were asked to indicate their age. From the findings there was age variation in the participation of indigenous vegetable farming. The results indicated that 183 respondents

(53.8%) were male, while 157 respondents (46.2%) were female. The predominance of males in the studied group may be attributed to their roles as family leaders engaged in the economic activities essential for household sustenance. This study contravenes study by finid *et al.,* on Ricebean (Vigna umbellata) which pointed out that females were more involved in production activities. This could be as a result of land tenure rights, where males are endowed with right to own and dictate what to grown and how it should be grown.

**Table 4.1. Distribution by gender of Indigenous Vegetable Farmers in Arua District, Uganda**

| Gender | Frequency | Percentage (%) |
|---|---|---|
| Male | 183 | 53.8 |
| Female | 157 | 46.2 |
| **Total** | **340** | **100** |

### 4.1.2 Education level status of respondents

Indigenous farmers were also asked to indicate their highest level of education and the results were presented as shown in the (Table 4.2). The findings indicated that the most respondents had secondary education (45.6%) followed by primary (41.2%), while postgraduate accounted for the least (0.3%).

Education influences positively the farmers' decision making on what practice, how to practice and when to practice. In this study most farmers had secondary school education meaning they were able to read and write hence could be able to use technical information to enhance IVS. However, some farmers (women) completely lacked formal education. This could imply that participation of women who completely lacked formal

education in IVS farming could be as a result of existence of indigenous farming before and most knowledge could be passed down to generation. Earlier findings by Monica *et al.,* (2020) which found out that most small-scale legume farmers in Tanzania relied on their own experience and knowledge as majority lacked formal education. Similar to Siri *et al.,* (2016) who found that education had no influence in the adoption of improved common bean. These findings contravene the two findings as most of the farmers had secondary school education meaning they could read and adopt new technologies of IVS production.

**Table 4.2: Distribution by education level of Indigenous Vegetable Farmers in Arua District, Uganda**

| Education level | Frequency(f) | Percentage (%) |
|---|---|---|
| Primary | 140 | 41.2 |
| Secondary | 155 | 45.6 |
| Institutional | 42 | 12.4 |
| University | 2 | 0.5 |
| Post graduate | 1 | 0.3 |
| **Total** | **340** | **100** |

### 4.1.3 Age of respondents

Respondents were also asked to indicate their age. Majority of the farmers were of age class 31-40 years (41%), age group 60 years and above (0.9%) was least presented followed by age class of 41-50 years (3%) as shown in table 4.3. Middle age class normally 35-50 is the highly productive age group in human growth and development cycle. According to Babangida (2016) middle age farmers play crucial roles in

agricultural farming on small scale in Sub-Saharan countries. The participation could be as a result of experience amassed in IVS farming and the urge to keep their family's food secure. Age class 19-34 years indicated youths in their formative active stage who probably engaged in non-farming activities for fast income alternatively could be going to school for education and thus only school dropouts could be involved in the production of IVS. 60 years and above represented advanced age group which was least involved due to reduced labour output as a result of reduced energy and availability of other younger family members. This also collaborates with the study by CIAT (2001) in which common beans were mainly produced by small scale farmers who were middle age. This study therefore concurs with the above studies which in affirming that most farmers who are actively involved in Agricultural farming activities are more likely to be of middle age.

**Table4.3: Distribution by age of Indigenous Vegetable Farmers in Arua District, Uganda**

| Age | Frequency | Percentage (%) |
|---|---|---|
| 18-20 | 13 | 3.8 |
| 21-30 | 64 | 19 |
| 31-40 | 138 | 41 |
| 41-50 | 97 | 3 |
| 51-60 | 27 | 8 |
| 60 and above | 1 | 0.9 |

### 4.1.4 Influence of Extension Services and Income on IVS Farming

The second objective sought to establish how socioeconomic factors: extension services and income affect IVs farming system. The responses for this section are captured in table 4.4

**Table 4.4: The Respondents Results on extension services and income on IVS Farming.**

| ASPECT | TRUE | | FALSE | |
|---|---|---|---|---|
| | F | % | F | % |
| There is a government policy on Extension services | 95 | 27.94 | 245 | 72.06 |
| You have been visited by extension Officer to learn about vegetable farming | 100 | 29.41 | 240 | 70.59 |
| You have visited extension officer for Information on vegetable farming | 83 | 24.41 | 257 | 75.59 |
| Information on vegetable farming You have been informed where to find Seeds | 78 | 22.94 | 241 | 77.05 |
| They make follow-up to ensure you plant IVs | 61 | 17.94 | 279 | 82.06 |
| You have planted more exotic than IVs in Your garden | 141 | 41.47 | 199 | 58.53 |
| There is a wholesale market for vegetables In your area | 106 | 31.18 | 234 | 68.82 |
| You have enough money to support your Family | 141 | 41.47 | 199 | 58.53 |
| IVs can be a source of livelihood | 174 | 51.18 | 166 | 48.82 |

The impact of socioeconomic elements on IVs agricultural system, including income and extension services, is shown in Table 4.4, which displays the results from the respondents. As a first step, we asked participants to rate how often they saw government policies regarding extension services. Of those who took the survey, 95 (or 27.94%) confirmed the existence of a government policy for extension service, while 245 (or 72.06% of the total) declined. The report from the interview schedule corroborated this finding, showing that there was a ratio of one extension officer for one thousand Sub-Counties. Since Chemonics International (2018) found that government policy on

extension in Uganda is lacking and that funding for extension services is inadequate, this accurately reflects the reality on the ground. Farmers in this situation are clueless about official policies. Therefore, the government must devise a comprehensive program that targets the masses (EABW, 2019). The second part was finding out whether an extension agent had come to teach them how to grow vegetables. Out of the total, 100 (or 29.41%) confirmed, while the majority (240 or 70.9%) declined. Extension agents had not visited most of the farmers. The idea that farmers need technical guidance on measures that are suitable for their farms and that crop production extension services are necessary for the adoption of these technologies is contradicted by this (Kyamba *et al.,* 2014). The interview schedule showed that extension officers in this area held meetings twice a month. This is why more farmers were able to adopt IVs production technologies. With enough extension information, production levels are high, and farmers should reap the full benefits of IVs farming.

Discussions in the focus groups revealed that extension agents have made periodic site visits to educate farmers on proper ground preparation, bed setup, and agronomic methods for planting IVs. The other aspect was to find out whether the respondents sought advice on vegetable gardening from extension agents. The majority of the farmers 257 (75.59%) had not visited extension officers, while 83 (24.41%) had, this implies few farmers seek out information from extension officials on IVs, despite the fact that new technologies are not widely used in IV production. This might be because extension officers are located in sub-county offices, which are far away from the farmers (EABW, 2019). Therefore, it is recommended that extension officers be assigned at the parish level. There has to be a mechanism in place to encourage farmers to meet with extension

agents, and vice versa. As a fourth requirement, participants were asked to document any knowledge they may have had on the availability of IV seed sources. Out of the total number of responders, 78 (or 22.95%) were in favor, while 262 (or 77.05%) were against. According to the findings, many farmers are unaware of where to obtain seeds. This backs up the conclusions made by Byrnes (2017), who examined IVs consumption in Kenya and Zambia and found that farmers cited a lack of seed availability as the main problem with growing indigenous vegetables. Furthermore, it is necessary to create an efficient system for enhanced seed production and distribution, as proposed by Bua and Onang (2017), in order to substitute the current strategies of IVs germplasm conservation and farmer-to-farmer seed exchange in Uganda. As a result, farmers and extension agents do not share any data. In this case, IV farmers do not have complete access to information on the best, most cost-effective seeds.

As for the fifth question, it asked respondents to verify if extension officers checked in with farmers to make sure they had planted IVs. The results show that 279(82.06%) reported negatively, whereas 61 (17.94%) indicated that a follow-up had taken place. When asked whether extension officers would follow up to make sure they planted IVs, most respondents said no. What this means is that IV farmers are essentially on their own to continue growing IVs. This circumstance proves that the advice made by Kyamba *et al.,* (2014), which states that in order for indigenous vegetable production to be sustainable in any location, the provision of advisory services and support services to farmers should be enhanced through extension services, has not been implemented. As for the sixth point, it was important to find out if the gardeners who participated grew more unusual veggies or IVs. Only 141 farmers (41.47% of the total) gave their approval,

while 199 (58.53%) cast their doubts on the matter. A greater number of IVs have been planted than exotic veggies, according to the results. It is worth noting that IVs have long played an important role in traditional African diets and are thought to enhance staple-based diets (Kansiime *et al.,* 2017). This is why intravenous injections are more commonly grown by farmers than exotic plants. Seventhly, we wanted to know if anybody knew about a wholesale market for veggies. The majority of them (234 out of 106, or 31.18%), were unaware of the existence of such a market, according to the results. The vast majority of people who took the survey had no idea where to buy IVs in bulk. This is in line with what Byrnes (2017) found; yet, he goes on to say that this shouldn't be the case because IVs could have a commercial demand. This is a great opportunity for farmers in the Arua district, and they should seize it.

Furthermore, it was necessary to ascertain whether the respondents possessed enough financial resources to adequately support their families. From the findings, 141 individuals (41.47%) agreed that they had enough financial resources, while the 199 (58.53%) did not. This means that most farmers lacked sufficient financial resources to take care of their families. Equally this could connotate that IVS cultivation IVS might have not been leveraged due to financial limitations; rather, grown for domestic consumption as traditional vegetable, this situation contradicts the findings reported by Gido, Bett, and Bokelmann (2016), which indicate that IVS possess considerable economic potential. The trend of commercialization is on the rise, due to adequate finance availability. Furthermore, Schreinemachers *et al.,* (2018) argue that reducing rural poverty and unemployment can be addressed by vegetable production in third world nations, which could serve as crucial diversification elements in farms. Farmers were also

asked to indicate whether IVS were viable in income generation. 174 (51.18%) farmers 51.18%, agreed, while 166(48.82%) farmers, disagreed. Nevertheless, IVS could boost economically vulnerable individuals lacking enough financial resources to support their families comfortably. These findings align by findings from Schleiermacher's *et al.,* (2018), who indicated that to IVS have a greater economic potential if fully tapped and governments and donors give it priority that it deserves.




**Figure 4.1: Extension Officers (EO) Visits**

### 4.1.5 Correlation for Social Economic Factors and utilization of indigenous vegetables

To assess the impact of socio-economic factors on the cultivation of indigenous vegetables, the Pearson Moment Correlation Coefficient was employed to compute the scores for socio-economic factors as the independent variable and the consumption of

indigenous vegetables as the dependent variable. The outcomes are presented in the table below.

**Table 4.5: Correlation between Social Economic Factors and uptake of IVs**

| | | Social Economic Factors |
|---|---|---|
| **Uptake of IVs** | Pearson Correlation | .920** |
| | Sig. (2-tailed) | .000 |
| | N | 340 |

The results showed that there was a strong positive association (r=.920 n=340 p<.01) between influence of social economic factors and uptake of indigenous vegetables as shown in Table 4.6 above.

### 4.1.6 Regression Analysis for Social Economic Factors and utilization of IVs

To establish the level of influence of social economic factors on uptake of indigenous vegetables the study used a coefficient of determination ($R^2$) using regression analysis as shown in Table 4.6

**Table 4.6: Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .920[a] | .893 | .890 | .27964 |

a. Predictors: (Constant), Social Economic Factors

According to Table 4.7, the R value stands at .920, indicating a significant correlation between socio-economic factors and the adoption of indigenous vegetables in the Arua district. R2 indicates a value of .893 regarding the variation in the uptake of indigenous vegetables influenced by socio-economic factors. An analysis of variance (ANOVA) was conducted to determine if socio-economic factors significantly predicted the uptake of indigenous vegetables in the Arua district. The findings are captured in Table 4.7.

**Table 4.7: ANOVA on the effect of Social Economic Factors on utilization of IVS**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 236.207 | 1 | 236.207 | 314.942 | .000[b] |
| | Residual | 25.415 | 340 | .075 | | |
| | **Total** | **261.622** | **339** | | | |

a. Dependent Variable: Indigenous vegetables Utilization

b. Predictors: (Constant), Social Economic Factors

From Table 4.7 where [F (1, 339) = 314.942, P<.05] shows that social economic factors influence the utilization of IVS hence it is a critical predictor.

### 4.1.7 The Regression Model

Regression model was used to ascertain whether the independent variable was significant in relation to the dependent variable, specifically in the utilization of IVS. This assisted to confirm the statistical significance of the predictor variable employed in this investigation. The following regression model was used;

$Y= \beta_0 +\beta_1 X_1+\varepsilon$…….(i)

**Where:**

Y = Uptake of indigenous vegetables

$\beta_0$ =Y intercept

$\beta_1$ = the slope of the regression line for the independent variable

$X_1$ = Social economic factors

$\varepsilon$ = Error term.

Table 4.8 shows the regression model coefficients that was used to fit the equation

**Table 4.8: Coefficients of Regression Equations**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | **B** | **Std. Error** | **Beta** | **t** | **Sig.** |
| 1 | (Constant) | 1.380 | .144 | | 9.575 | .000 |
| | Social Economic Factors | .657 | .046 | .536 | 14.153 | .000 |

a. Dependent Variable: Uptake of indigenous vegetable

The results gave the study a simple linear regression equation of:

*Uptake of indigenous vegetable= 1.380 + 0.536 Social economic factors + ε*

The equation suggests that each individual unit increase in socio-economic factors corresponds to a 53.6% rise in the uptake of indigenous vegetables. The linear regression equation reveals that the coefficients reflect the extent to which the independent variable fluctuates in relation to the consumption of indigenous vegetables, assuming all other variables remain unchanged. β0=1.380 indicates that, in the hypothetical scenario where all socio-economic factors are assigned a value of zero, the consumption of indigenous vegetables would still stand at 1.380. as indicated above independent variable significantly influenced IVS utilization, as indicated by a statistically significant constant in the model equation. where coefficient β1 = 0.536 means that an increase in one-unit results in increase in socio-economic factors that corresponds to a 0.536 increase in the utilization of IVS. This predictor demonstrates statistical significance. Therefore socio-economic factors are critical in the adoption of indigenous vegetables.

### 4.2 The Level of Awareness of Nutritive Value of Indigenous Vegetables

The second objective was to determine how awareness in nutritive value of vegetables influenced their utilization as indicated in table 4.9.

**Table 4.9: Level of awareness of Nutritive Value of IVs**

| ASPECT | YES | | NO | |
|---|---|---|---|---|
| | F | % | F | % |
| Do you know Indigenous Vegetables | 296 | 87.06 | 44 | 12.94 |
| Do you grow some | 286 | 84.12 | 54 | 15.88 |
| Does your family consume some | 286 | 84.12 | 54 | 15.88 |
| you consume them for nutritional and medicinal value | 246 | 72.35 | 94 | 27.65 |
| you enjoy them more than meat | 231 | 67.94 | 109 | 32.06 |
| Ivs grow by themselves | 112 | 32.94 | 288 | 67.06 |

Farmers were asked to indicate the level of their familiarity with IVs. 296 (87.06%) were familiar with IVs, whilst 44 (12.9%) were unfamiliar. The responses from the extensional officers also indicated that most were familiar with IVS. The findings align with Kansiime *et al.,* (2017), who indicated that IVS were common as they have historically linked to African dietary heritage. The second construct was to find out whether the farmers grew IVS, 286 (84.12%) of the respondents cultivated IVS, whereas 54 (15.88%) did not. This means that most farmers had experience in cultivating IVS. Equally, the extension officers, through their interview schedule, indicated that they had ability to grow IVS as they were even able to conduct demos on farms on IVS. In the focus group discussion, the researcher it was noted that most were able to grow IVS, this corroborates with Mbhenyane's (2017) argument that most farmers could grow invasive species of IVS that expand spontaneously. The construct was to ascertain whether respondents' families consumed IVS, results indicated that 286 (84.12%) consumed IVS, whilst 54 (15.88%)

do not. This is in tandem with group discussion findings, this aligns with the research conducted by Taruvinga and Nengovhela (2015), who investigated perceptions in consumption of indigenous vegetables in the Eastern Cape including 100 participants. Their findings showed high levels of awareness, consumption, and favourable attitudes, suggesting a possible rise increase in consumption. Similarly, Mbhenyane (2017) noted that IVS were consumed by many households particularly in regions where they are cultivated. This indicates that, age and particularly individuals of middle age are the primary users of IVs, as the information of their nutritional awareness and medicinal benefits is part and parcel of them.

Respondents were asked to indicate whether they utilize IVs for medical purposes. 246 (76.35%) agreed, while 94 (27.65%) disagreed. This collaborates with the findings from Kansiime *et al.,* (2016) and Mbhenyane (2016) where IVS had great therapeutic properties. The farmers who disagreed could be as a result of unawareness of medical benefits associated with IVS. Thus, it's imperative for extension officers to educate farmers on therapeutic benefits of indigenous vegetables. The study also aimed to determine if respondents preferred IVs over animal meat. Results indicate that 231 (67.94%) preferred IVs over animal meat, while 109 (32.06%) favoured animal flesh over IVs. The results indicate that the majority of respondents appreciate IVs, perhaps due to their comprehension of the associated nutritional and medical benefits. The interview schedule indicated that the nutritional value of intravenous (IV) solutions is recognized for their provision of minerals, vitamins, and fiber, leading to increased consumer demand due to their accessibility. The last item was to determine if IVs

propagate autonomously or are cultivated by farmers. Results indicate that 228 (67.06%) of farmers confirmed cultivation, whereas 112 (32.94%) denied it.

### 4.3 The Challenges that Hinder Utilization of IVs Farming Systems

The third objective set to establish some of the challenges that hinder utilization of indigenous vegetable farming system. This result is captured in Table 4.10

**Table 4.10: Challenges that hinder utilization of Indigenous Vegetable Farming System**

| ASPECT | AGREE | | DISAGREE | |
|---|---|---|---|---|
| | f | % | f | % |
| My piece of land is too small to grow IV | 251 | 73.8 | 89 | 26.2 |
| I lack knowledge on the importance of IV | 43 | 12.7 | 297 | 87.4 |
| Consumption of IV is less than exotic ones | 245 | 72.1 | 95 | 27.9 |
| Seeds of IV are not easily accessed | 216 | 63.5 | 124 | 36.5 |
| There is more training of exotic vegetable than IV | 245 | 72.1 | 95 | 27.9 |
| Infrastructure makes market accessibility hard | 275 | 80.9 | 65 | 19.1 |
| There is a micro finance for credit facilities to vegetables farming | 115 | 33.8 | 225 | 66.2 |
| Have you gone for credit facilities | 43 | 12.7 | 297 | 87.4 |
| The equilateral was vegetable farm | 257 | 75.6 | 83 | 24.4 |

The initial construct was to determine whether the limited size of the parcel of land posed an obstacle to the cultivation of IVs. The findings indicate that a significant majority, 251 individuals (73.82%), expressed affirmation, whereas 89 individuals (26.18%) did not concur. The majority of respondents concurred that their parcels of land were insufficient in size for the cultivation of IVs. This may stem from the assertion made by Jiménez-Aguilar and Grusak (2017) regarding the rising population in Sub-Saharan nations, which contributes hunger and malnutrition.

Farmers understanding on understanding of IVS formed part of this investigation. Majority, 251 (73.82%) had knowledge, while 89 (26.18%) lacked any understanding of IVS. This collaborates with the findings from Kansiime *et al.,* (2017), who indicated that most had knowledge about IVS as they historically played a significant role in African dietary traditions and are recognized as they supplement staple-based diets, thus gaining widespread acknowledgment among consumers.

Participants were asked to indicate whether their consumption of IVS was lower than that of exotic vegetables. 245 (72.06%) individuals agreed, while 95(27.94%) individuals, did not agree. This implies that the IVS consumption is lower than that of exotic options. This validates study by Aleni's (2017) in Uganda, where despite the abundant nutrient content of indigenous vegetables, there was decline in their consumption and instead people consumed exotic varieties like cabbages. This could be as a result of awareness as indicated by Afari-Sefa *et al.,* (2015) who indicated that consumption of IVS was constrained by adverse perceptions and a deficiency in awareness regarding their nutritional benefits.

Availability of IVS seeds was also investigated, majority, 216 (63.53%), individuals agreed with the notion that the seeds were inaccessible, whereas 124(36.47%) individuals believed that the seeds were available. This indicates that the IVS seeds availability was limited, this echoes the findings of Byrnes (2017) who in his study on the consumption of indigenous vegetables in Kenya and Zambia, Indicated that availability of seeds was primary challenge to producing IVS. This is further reinforced by Bua and Onang (2017), who indicated that in Uganda, there is a necessity to develop an effective approach for enhanced seed production and distribution to supplant the farmer-to-farmer seed exchange and the conservation of indigenous varieties' germplasm as strategies for improving the production of indigenous varieties.

The other construct item aimed to determine if there was a greater emphasis on training related to exotic vegetables compared to intravenous therapies. The findings indicate that 245 (72.06%,) agreed, while 95 (27.94%,) disagreed. The majority of respondents indicated that focus was on training regarding exotic vegetables compared to indigenous

varieties. This observation is supported by the existing literature that points a significant indigenous crops neglect in a commercial perspective. The net effect of this is that these IVS have less become competitive compared to well-established major crops, leading to a gradual erosion of their diversity and the traditional knowledge associated with them. Global food security policies have largely overlooked the significant nutritive potential of indigenous foods, particularly those sourced from economically disadvantaged communities (Mbhenyane, 2017).

The other construct aimed to determine if infrastructure complicated market accessibility. The findings indicate that 275 respondents, representing 80.88%, agreed that infrastructure was a barrier, whereas 65 (19.12%) respondents disagreed. The predominant view among respondents identified infrastructure as a significant obstacle to the farming of IVs. This aligns with the conclusions drawn by Omula (2016), indicating that inadequate infrastructure for the transportation and handling of indigenous vegetables has emerged as a more significant limitation than market demand or pricing in urban settings. This underscores the need for enhanced infrastructure so as to enable small-scale farmers to move free with their IVS.

Existing microfinance options for credit facilities pertaining to vegetable farming. Were also investigated. minority, 115 (33.82%) individuals agreed whereas the majority, adding to 225(66.18%) individuals disagreed. The absence of credit facilities was loud from the findings. This affirms the findings presented in the Five-Year Strategic Plan (2009-2013) by the Horticultural Crops Development Authority (HCDA), which identified insufficient credit for the acquisition of inputs and capital investment as the primary factor contributing to low productivity in horticulture. The elevated interest rates

render it exceedingly challenging for horticultural farmers to secure credit. This suggests that farmers are unable to engage in extensive IVs farming for commercial purposes; however, it presents a viable opportunity for income among rural populations. Consequently, a significant number of individuals indicated that their primary motivation for cultivating IVs is for personal consumption. It is essential to establish and enhance microfinance organizations that specifically cater to the commercial farming of IVs.

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# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## 5.0 Introduction

This chapter presents the following sections; summary, conclusions and recommendations from this study. These were based on the objectives of the research study.

## 5.1 Summary of Findings

The study examined investigate opportunities and challenges in accessing and utilizing indigenous vegetables in Arua District, West Nile Agro-ecological Zone, Uganda. Specifically, it sought to: determine the influence of socio-economic factors on utilization of indigenous vegetable, determine the level of awareness of the nutritive value of indigenous vegetables, and identify constraints to the utilization of indigenous vegetables.

**Objective 1: Influence of Socio-Economic Factors on indigenous vegetable utilization in Arua District, Uganda.**

From the findings socio-economic factors significantly influenced utilization of indigenous vegetables. Most respondents were male (53.8%), in the productive middle-age group of 31–40 years (41%), and had attained at least secondary education (45.6%). Education positively influenced the ability to adopt new farming technologies. Extension

services were reported to be inadequate 72% of respondents indicated the absence of government policies on extension, and over 70% had not been visited by an extension officer. A majority (77%) were unaware of seed sources for IVS, while 82% reported no follow-up from extension officers. However, 51.18% acknowledged that IVS could serve as a source of livelihood. Statistical analysis revealed a strong positive correlation ($r = 0.920$, $p \leq 0.01$) between socio-economic factors and the adoption of indigenous vegetables. Results from regression indicated that socio-economic factors accounted for 89.3% of the variation in IV adoption ($R^2 = 0.893$), indicating that these factors were significant predictors of IVS uptake.

**Objective 2: Awareness of Nutritive Value of Indigenous Vegetables**

Results indicated a high level of awareness of the nutritive and medicinal value of IVS. About 87% of respondents knew about IVS, and 84% cultivated and consumed them. Moreover, 72% acknowledged consuming IVS for their nutritional and medicinal value, while 68% preferred IVS to meat. These findings suggest that most farmers recognize the nutritional benefits of IVS, though a small percentage remain unaware. The study further found that IVs are primarily cultivated for home consumption, with limited commercialization.

**Objective 3: Constraints Hindering Utilization of Indigenous Vegetable Farming**

A number of constraints were listed as barriers to the effective utilization and commercialization of IVS, these included limited size of land (73.8%), low availability of seed (63.5%), domineering of exotic vegetables (72.1%), poor state of infrastructure (80.9%), training which is limited (72.1%), and access to credit which is limited (66.2%),

with 87.4% having never sought credit for IVS farming. These barriers might have collectively contributed to low production levels and underutilization of indigenous vegetables in Arua District,Uganda.

## 5.2 Conclusion

From the findings, it can be concluded that; factors like socio-economic particularly level of education, income, and access to extension services significantly influenced the utilization of indigenous vegetables among small-scale farmers in Arua District. The findings from regression analysis showed that socio-economic factors attributed to the 89% of the in IVS utilization, this show their important role making decisions that influence production of IVS, thus the null hypothesis is rejected. Most farmers were aware about nutritional and medicinal benefits associated with IVS, the awareness was not critical in utilization of IVS among small-scale farmers in Arua District, Uganda, thus we fail to reject null hypothesis. Furthermore, barriers like; inadequate extension services, limited seed availability, poor infrastructure, and lack of credit facilities continue to hindered access and utilization pf IVS. Overall, the findings ought to emphasize on the need for institutional support, improved awareness campaigns, and the establishment of supportive market and policy frameworks to enhance indigenous vegetable farming in Uganda.

### 5.3 Recommendations

From these findings, the followings recommendations can be mad;

1. ministry of Agriculture in conjunction with other relevant partners should strengthen outreach programs at parish and village levels to provide regular training and follow-up for IV farmers.

2. research bodies and government institutions should consider breeding IVS seeds and distribute them through certified channels to ensure consistent supply.

3. Market Infrastructure should be enhanced Investment in rural infrastructure such as roads, storage facilities, and market centres is necessary to improve farmers' access to local and regional markets for IVs.

## 5.4 Suggestions for Further Research

1. Future studies should focus on indigenous vegetable farming practices in other districts or regions of Uganda for comparative analysis.

2. Since this study was cross-sectional, further studies should consider adopting a longitudinal design to track changes in adoption rates, productivity, and farmers' perceptions of indigenous vegetables over time.

3. Given that this study assumed that all farmers have similar awareness and access to inputs, future studies should consider to investigate variations in knowledge, training, and resource availability among different categories of farmers.

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# APPENDICES

## Appendix 1: Questionnaire

Challenges and Opportunities for Utilisation of indigenous vegetable farming systems in Arua district of west Nile Agro Ecological zone of Uganda

**Dear respondent, my name is Tom Onzima. I am a post graduate student at the department of Agribusiness and Extension Management, Masinde Muliro University of Science and Technology.** We are conducting a study on Challenges and Opportunities for Utilisation of indigenous vegetable farming systems in Arua district of West Nile Agro Ecological zone of Uganda

You have been randomly selected to participate in the study. This study aims at improving the level of utilization of indigenous vegetable farming in Arua District. Your views will be kept strictly confidential and will not be divulged to anybody and will only be used for the stated purpose. All interviews shall be done in private setting and no reference will be made in any oral or written reports. No risks are anticipated as a result of participating in this exercise. Should you have any question about the procedures used, you are encouraged to ask and if you feel uncomfortable, you are free to withdraw at any Point. Your participation will be voluntary and you allowed refusing to answer any question. We shall very much appreciate your time and cooperation. If you agree to participate in this exercise, please sign and return the consent form to the interviewer before the exercise begins.

### CONSENT

I have read and understood the above information and all questions pertaining to the project shall be answered to the best of my knowledge. I also understood that by signing and returning this consent form, I have agreed to participate in this exercise voluntarily.

Signature……..

Date……...……..

**Instructions for Research Assistants** (***Tick the appropriate box for the response***)

**PART A: PERSONAL DETAILS**

Date……..Questionnaire No.……...

**SECTION B: LEVEL OF THE AWARENESS OF THE VALUES / IMPORTANCE OF THE INDIGENOUS VEGETABLES**

1. Have you ever heard of indigenous vegetables……....
   a. Yes ☐ b. No ☐
2. Do you grow any or some of them……..
   a. Yes ☐ b. No ☐
3. What are most common Indigenous Vegetables in your area…….…….
   a. Amaranths (*Dodo*) b. Spider plant (*Giribi*) c. Okra (*Bamia*) d. All the above
   e. Others (please specify)……...……..
4. Do you plant them or they grow by themselves……...
   a. Grow by themselves b. We plant them
5. Does your household consume some or all these indigenous vegetables……
   a.Yes ☐ b. No ☐

4. If yes, how often do you consume…….…….
   a. In every meal ☐ b. Once in a while ☐
5. Do you know of their help to your health…….
   a. Yes ☐ b. No☐ c. Not sure ☐
6. I consume these vegetable just because learnt that they give vitamins and are medicinal to my health…….
   a. True☐ b. false ☐
7. As such, I enjoy indigenous vegetables more than animal meat……..
   a. True ☐ b. False ☐

**SECTION C: INFLUENCE OF THE SOCIOECONOMIC FACTORS ON THE ACCESS AND UTILIZE THE INDIGENOUS VEGETABLE FARMING**

1. Are you aware of any government policies in proving agricultural extension services to the farmers……..
   a. Yes ☐ b. No ☐

2. If yes which one do you know……
    a. Visit the district agricultural offices ☐
    b. Be visited by the district agricultural extension officer's ☐ c. Both ☐
3. So have you been visited by the district Agricultural extension officers to teach about vegetable crop farming technologies……
    a. Yes ☐ b. No ☐
4. Have you ever visited the district Agricultural extension offices to seek information about vegetable crop farming technologies……..
    a. Yes ☐ b. No ☐
5. If yes, how many times in the last 2 years……
6. Do you sell vegetables in your farm…….....
    a. Yes ☐ b. No ☐
7. How do you sell the vegetables……
    a. Consumers buy from the farm gate ☐
    b. Take to the nearest village markets ☐
    c. Both ☐
8. Often how is your price determined…….
    a. Market Driven ☐ b. Dictated by buyer ☐ c. Negotiated ☐
9. Have you ever applied for any credit facility…….....which year……
    a. Yes ☐ b. No ☐
10. If yes, from which…….....How much……
11. Did you pay it back…….....
    a. Yes ☐ b. I am still in the process of paying it ☐
12. Indigenous vegetable farming can be source of livelihood……..
    a. Yes ☐ b. No ☐

**SECTION D**: **SOME OF THE CHALLENGES THAT HINDER THE ACCESS AND UTILIZE THE INDIGENOUS VEGETABLE FARMING**

1. My piece of land is too small to grow indigenous vegetables…

   a. True ☐ b. False ☐

2. I luck sufficient knowledge on the importance of indigenous vegetables……

   a. True ☐ b. False ☐

3. In my village, consumption of indigenous vegetables is lower than exotic ones….

   a. Yes ☐ b. No ☐

4. Indigenous vegetable seeds cannot be easily accessed…….

   a. True ☐ b. False ☐

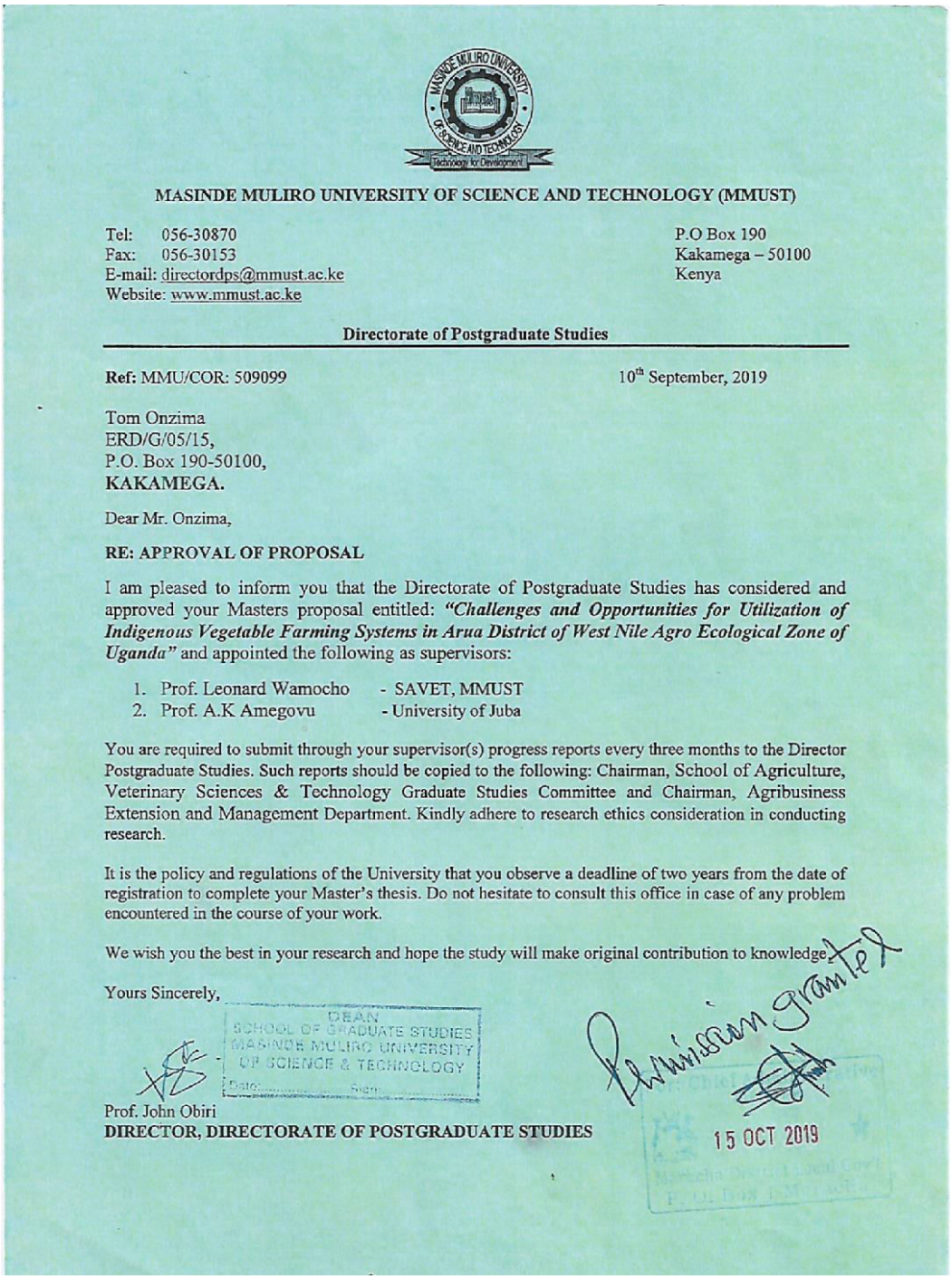
5. The climate does not favor vegetable cultivation…….

   a. Yes ☐ b. No ☐

6. No micro financial organization that funds vegetable farming……....

   a. Yes ☐ b. No ☐

## Appendix 2: Letter from Masinde Muliro University for Approval of Research



MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

Tel: 056-30870
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E-mail: directordps@mmust.ac.ke
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P.O Box 190
Kakamega – 50100
Kenya

**Directorate of Postgraduate Studies**

**Ref:** MMU/COR: 509099

10th September, 2019

Tom Onzima
ERD/G/05/15,
P.O. Box 190-50100,
**KAKAMEGA.**

Dear Mr. Onzima,

**RE: APPROVAL OF PROPOSAL**

I am pleased to inform you that the Directorate of Postgraduate Studies has considered and approved your Masters proposal entitled: ***"Challenges and Opportunities for Utilization of Indigenous Vegetable Farming Systems in Arua District of West Nile Agro Ecological Zone of Uganda"*** and appointed the following as supervisors:

1. Prof. Leonard Wamocho - SAVET, MMUST
2. Prof. A.K Amegovu - University of Juba

You are required to submit through your supervisor(s) progress reports every three months to the Director Postgraduate Studies. Such reports should be copied to the following: Chairman, School of Agriculture, Veterinary Sciences & Technology Graduate Studies Committee and Chairman, Agribusiness Extension and Management Department. Kindly adhere to research ethics consideration in conducting research.

It is the policy and regulations of the University that you observe a deadline of two years from the date of registration to complete your Master's thesis. Do not hesitate to consult this office in case of any problem encountered in the course of your work.

We wish you the best in your research and hope the study will make original contribution to knowledge.

Yours Sincerely,

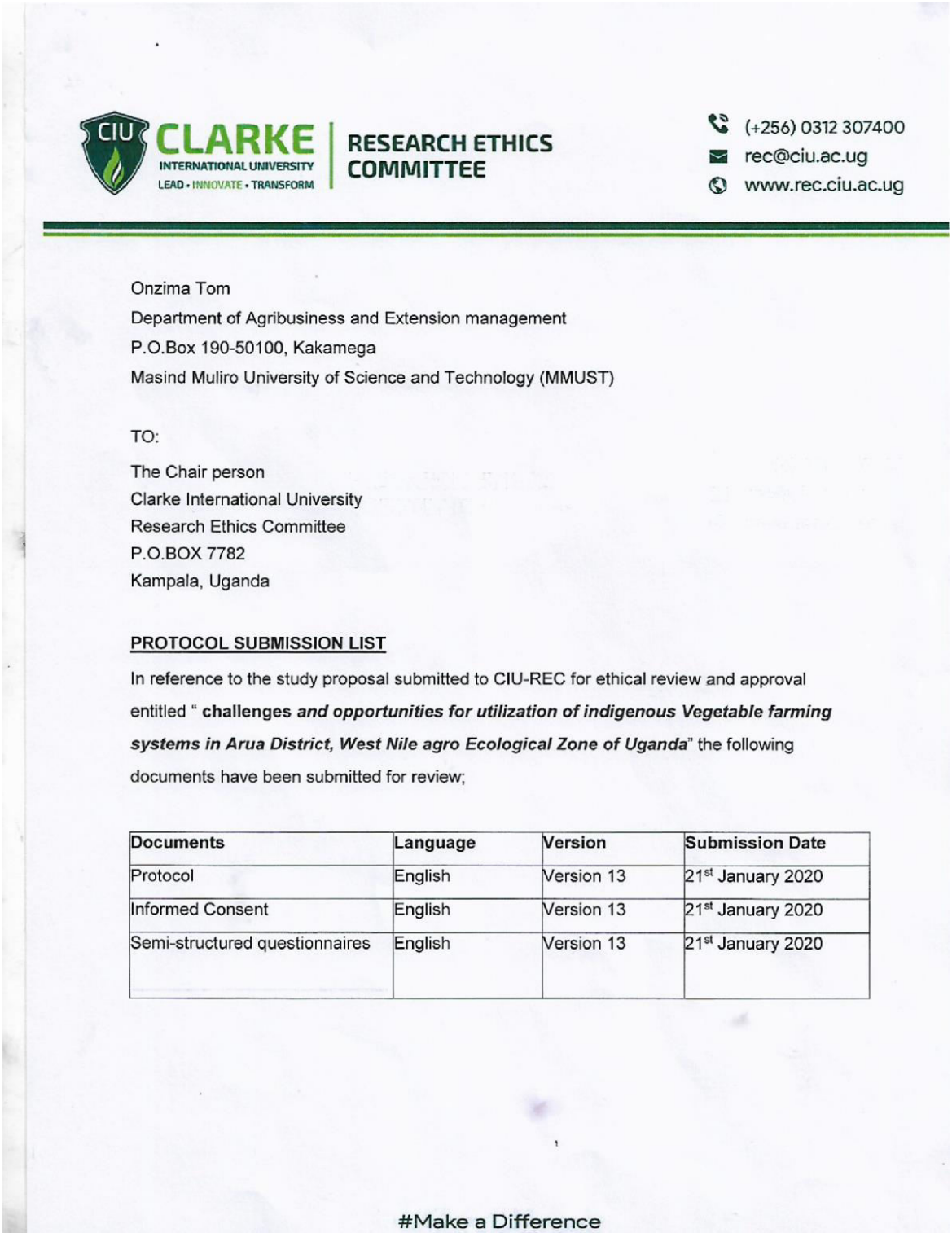
DEAN
SCHOOL OF GRADUATE STUDIES
MASINDE MULIRO UNIVERSITY
OF SCIENCE & TECHNOLOGY
Date: Sign:

Prof. John Obiri
**DIRECTOR, DIRECTORATE OF POSTGRADUATE STUDIES**

Permission granted

15 OCT 2019

## Appendix 3: Letter from Research Ethics Committee for Protocol Submission List



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TO:

The Chair person
Clarke International University
Research Ethics Committee
P.O.BOX 7782
Kampala, Uganda

**PROTOCOL SUBMISSION LIST**

In reference to the study proposal submitted to CIU-REC for ethical review and approval entitled " **challenges *and opportunities for utilization of indigenous Vegetable farming systems in Arua District, West Nile agro Ecological Zone of Uganda*** " the following documents have been submitted for review;

| Documents | Language | Version | Submission Date |
|---|---|---|---|
| Protocol | English | Version 13 | 21st January 2020 |
| Informed Consent | English | Version 13 | 21st January 2020 |
| Semi-structured questionnaires | English | Version 13 | 21st January 2020 |

#Make a Difference

## Appendix 4: Application form for researcher wishing to carry out research in Uganda and to Use Government Archives





**PRESIDENT'S OFFICE**
RESEARCH SECRETARIAT
P.O BOX 7168
KAMPALA, UGANDA

**APPLICATION FORM FOR RESEARCHERS WISHING TO CARRY OUT RESEARCH IN UGANDA AND TO USE GOVERNMENT ARCHIVES**

**SECTION A**

| | | | |
|---|---|---|---|
| 1. | Surname | ONZIMA | |
| 2. | Other Names | TOM | |
| 3. | Date and Place of Birth | 17th, November 1984, ARUA | |
| 4. | Nationality | Uganda | |
| 5. | Country of residence | Uganda | |
| 6. | Passport Number, Date and Place of Issue | Passport Number: | A00078101 |
| | | Date: | 2019-05-17 |
| | | Place of Issue: | KAMPALA |
| 7. | Permanent address | P.O. Box Number: | 830 |
| | | Telephone: | 0782180528 |
| | | Street/Plot Number: | KIRINYABIGO |
| | | City/Town: | KAWANDA |

**The Map of the Study area**

