MAKERERE  **UNIVERSITY**

COLLEGE OF BUSINESS AND MANAGEMENT SCIENCES

SCHOOL OF STATISTICS

FACTORS AFFECTING THE PRODUCTIVITY OF SMALL-SCALE CASSAVA PRODUCERS IN THE WEST NILE REGION OF UGANDA

BY

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QUANTITATIVE ECONOMICS

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DECLARATION

I declare that the dissertation report is a result of my own effort and to the best of my knowledge has never been presented in part or in full to any university or institution for any academic award.

Signature ..... Date 7/12/2023

APPROVAL

This dissertation report has been submitted for examination with my approval as the university supervisor

Signature ..... Date 5/12/2023

NAMUGENYI CHRISTABELLAH

DEDICATION

I dedicate this report to my parents for their support towards my education. Their encouragement, advice, financial support and devotion to my endeavor have kept me striving for greater heights. May the almighty bless them

ACKNOWLEDGEMENT

First of all I would like to thank the almighty God for giving me strength, courage and ability to accomplish my dissertation report in a scheduled time in spite of various complication

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LIST OF ACRONYMS AND ABREVIATION

UBOS Uganda Bureau of Statistics

FAO Food and Agriculture Organization

MAAIF Ministry Of Agriculture And Animal Industry And Fisheries

UN **U**nited Nations

NAADS National Agriculture Advisory Services

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ABSTRACT

This study analyzed the factors affecting the productivity of smallholder cassava farmers in West nile region of Uganda. The study utilized four specific objectives namely; to investigate the effect of demographic factors (age, gender, education level, and household size) on the productivity of smallholder cassava farmers, to determine the effect of farming experience on the productivity of smallholder cassava farmers, to determine the effect of land size owned by the smallholder cassava farmers on their productivity, and to assess the effect of agricultural extension support on the productivity of smallholder cassava farmers.

Simple random technique and convenient sampling were employed to select targeted 96 smallholder cassava farmers to participate in the study and a structured questionnaire was used to collect the required data and STATA 15.0 software was used in data analysis. The result of the analysis revealed that the registered a response rate of 100 percent. Slightly more than a half (56.2 percent) of the respondents were female.

The study established that, smallholder cassava farmers who did not benefit from extension services were significantly associated with a lower cassava yield of 49.3 kilograms compared to their counterparts who benefited from extension services. Also, smallholder cassava farmers who benefited from extension services in the periods of 2015 – 2018 and 2009 – 2014 were significantly associated with a lower cassava yield of 53.8 kilograms and 68.6 kilograms, respectively as compared to their colleagues who had just benefited from the extension services with the period of 2019 – 2021. The study also established that, a unit increase in the number of household members participating in cassava farming would lead to an increase in cassava yield by 17.8 kilograms per harvest. Furthermore, the result of the study also revealed that, an increase in the cassava farm size by 1 acre would lead to an increase in cassava yield by 221.4 kilograms per harvest.

Based on the findings of the study, the researcher recommends that extension services should be made accessible to the smallholder farmers through government programs such as; operation wealth creation, parish model, and so forth. Low cost credit facilities should be advanced to the smallholder farmers to avail them with the capital needed to access the extension services as well as purchasing other farm equipment. Therefore, further study should seek on analyzing the factors

affecting productivity of smallholder cassava farmers using other factors such as; the farming method adopted, type of cassava seed cultivated, membership in a cooperative society.

CHAPTER 1
INTRODUCTION

Introduction

This chapter presents the background, problem statement, objective of the study, hypothesis of the study

Background of the study

Uganda which has been ranked among the 15 poorest countries in the world is a low-income country located in east Africa. Uganda has a population of 48,971,937 (united Nation's data, November 2022).

Agriculture has remained a critical sector in Uganda with an estimated contribution of 23.8% GDP and it provides employment to over 70% of the population (UBOS, 2022). Uganda's agriculture sector is wide consisting of small, medium and large-scale farmers with varying level of efficiency. Cassava is one of the most important staple food crops in the country. It is mainly grown in eastern, northern and northwest part of the country. The crop is grown by 29% of the agricultural households. In 2018, about 4.4 million tons were produced from a land size of 941,0000 Ha and the annual yield of cassava was 8.7 MT/Ha.

The crop is grown by small holder farmers on 1-2 acres of land for food security and income generation. Most of it sold as cassava chips or ca3ssava flour milled from dry cassava but mostly sold as fresh cassava in urban areas.

According to Food and Agricultural Organization (FAO, 2019), the agricultural sector in Uganda is dominated by small holder farmers who mostly cultivate coffee, sweet potatoes, beans, cereals, cassava, and rare cattle, goats, pigs and poultry. According to FAO, small scale farmers are farmers who use land area of 2 Ha and below. The farming activities of a small-scale farmers are constraint by land size and family labor. How ever farming activities in Uganda are constraint by the fact that farmers produce many crops on a small piece of land (UBOS, 2010).

Several studies like FAO (2014) have noted that Uganda and other sub-Saharan Africa (SSA) are less productive compared to world standards. For instance, more than 96% of the small-scale cassava producers access low planting materials that lead to decrease in output. In some cases, there has been declining productivity per unit area.

Problem statement

Cassava production in Uganda faces various challenges that affect both the yield and quality of the crop. Some of these challenges include;

Pests and diseases: cassava is prone to various pests and diseases such as cassava brown streak disease and cassava mosaic disease which can lead to significant yield losses.

Lack of improved varieties: Farmers in Uganda often plant traditional cassava that have low yield potential.

Poor soil fertility: cassava requires good soil fertility to achieve high yields. However, most soils in Uganda are depleted due to continuous cultivation and lack of proper management practices.

Lack of mechanization: most cassava cultivation in Uganda is done manually which is labor intensive and time consuming. This limits the amount of land that can be cultivated and affects the overall productivity of the crop

Addressing these challenges require a concerted effort from all stake holders including farmers, policymakers, researchers and development partners.

Implementing strategies such as integrated pest management, promoting the use of improved varieties, use of fertilizers, and improving storage practices that can improve cassava production in the west Nile region of Uganda

Objective of the study

Main objective

The main objective of this study is to investigate the main factors affecting small scale cassava production in the west nile region of Uganda.

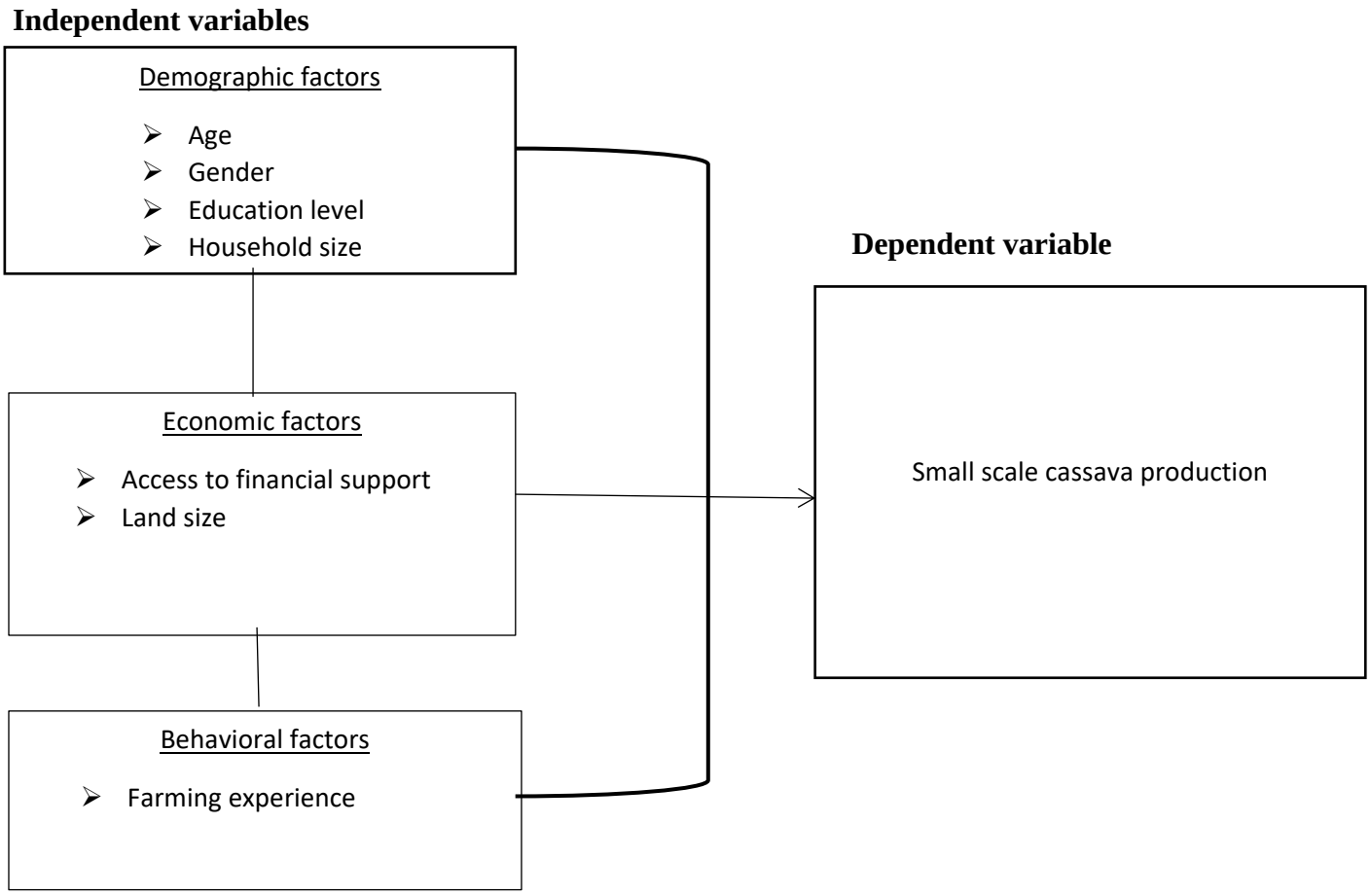
Specific objectives of the study

1. To investigate the effects of demographic factors (age, gender, education level, and house hold size) on small scale cassava production in the west Nile region of Uganda
2. To determine effects of economic factors on small scale cassava production in the West Nile region of Uganda(extension services).
3. To determine the effect of land size owned by the small scale cassava farmers on small scale cassava production in the west nile region of Uganda
4. To investigate the effect of behavioral factors(farming experience) on small scale cassava production in the west nile region of Uganda.

Hypothesis of the study

- **H01: E**ducation level has no effects on small scale production of cassava in the west nile region of uganda
- **H02:** gender has no effect on small scale cassava production in the west nile region of uganda
- **H03: Far**ming experience has no effect on small scale production of cassava in the west nile region of Uganda.
- **H04:** Agricultural extension support has no effect on small scale cassava production in the west nile region of Uganda.(economic factor)
- **H05:** Land size owned by farmers has no effect on small scale production of cassava in the west nile region of Uganda.

Conceptual frame work



CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter analyzes the past and present literature on the performance of small scale casava producers by other scholars. The researcher reviewed materials such as journals, articles,text books and newspapers.

2.2 Literature review

According to a research done by NAARI, cassava has been quickly adopted and its production expanded rapidly. Cassava cultivation increased greatly during the outbreak of the tropical migratory locust (Locusta migratoria migratoriodes S&F) from 1931 to 1933 (Jameson, 1964). Increases also occurred after the droughts of 1939 and 1941 when it became imperative to conserve local foods during the war (Jameson, 1964). The outbreak of African cassava mosaic virus and the shortage of food in some parts of Uganda notably Teso (now Kumi and Soroti districts) in 1943–44 encouraged an eradication campaign and introduction by the district councils of a by-law which made it mandatory for each farmer to grow at least 0.4 ha of cassava mosaic resistant varieties as a safeguard against famine.

The high yield ability of the crop and flexibility of the crop in the farming and food systems, abilities to do well in marginal and stressed environments, its abilities to give satisfactory yields where most other crops fail, to demand low labour requirements and to be left in situ for over two years without spoilage and its apparent resistance or tolerance to pests and diseases, particularly locusts (Jameson, 1970) encouraged its rapid spread and adoption and made it an excellent food security crop. Moreover, its value as a famine reserve crop that was available when others were not was appreciated (Jameson, 1970). Consequently, cassava plantings increased rapidly as the crop became a cheap source of food in quantity (Jameson, 1964).

The worldwide production of cassava amounted to 278 million metric tons in 2018, out of which Africa's share was about 61% (FAOSTAT, 2020). Globally, cassava production has increased by 240 million metric tons since 2010 (FAOSTAT, 2020). According to FAO projections, by 2025, about 62% of global cassava production will come from sub-Saharan Africa (FAOSTAT, 2020). In Ethiopia, root crops such as potatoes, sweet potatoes, taro, and cassava covered <2% of the country's total cropping area, and accounted for 23.4, 38.4, and 17.7% of the overall production of

root crops, respectively [CSA (Central Statistical Agency), 2018]. Cassava is among the most widely cultivated crops in some districts of Wolaita zone, southern Ethiopia (Kebede et al., 2012; Mulualem et al., 2013; Mulualem and Dagne, 2015; Laekemariam, 2016; Sarka, 2017; Tadesse et al., 2017; Legesse, 2018). It was the first root and tuber crop produced as a food and revenue-generating crop, followed by taro and sweet potato in this zone [Offa District Agricultural and Natural Resource Development Office (ODANRDO), 2018]. The minimum production of cassava in the study area is 20,350 kg/ha [Offa District Agricultural and Natural Resource Development Office (ODANRDO), 2018]. However, under optimal conditions, cassava yields can be about 80 tons per hectare (Howeler et al., 2013; Food and Agricultural Organization (FAO), 2018)

Empirical literature review

2.2.1 Age

A study conducted by Munishi et al. (2017) established that the performance of smallholder tea farmers in Tanzania was significantly lowered by age. This implies that as the age of a smallholder farmer increases, the productivity interms of tea yield decreases. Their finding concurred with the results of the earlier studies conducted by Dube & Guveya (2014) and Simbua & Loconto (2010) whose studies also reported a negative relationship between age and performance of smallholder farmers. However, the findings of Katundu et al. (2013) departs from the above findings. According to Katundu et al. (2013), age is a proxy measure of farming experience and is positively associated with performance of the smallholder farmers.

2.2.2 Gender

According to Mumba et al. (2012), Katundu et al. (2013), Masuku (2014), and Urassa (2015), gender is negatively associated with the performance of smallholder farmers. This finding was affirmed by the result of Munishi et al. (2017) whose study also reported that gender was associated with lower performance of smallholder tea farmers in Tanzania. This result can be attributed to gender bias in land resource ownership especially in Sub Saharan Africa andother rural areas, where only men are allowed to own land (World Bank 2012; Boniphace *et al.* 2014).

2.2.3 Education level

Education has been widely regarded as the most valuable asset for rural communities (World Bank, 2008) and can highly enhance their crops production. According to Minai et al (2014), there is a positive relationship between education and yields. They further explained that more educated

farmers have the ability to perceive, interpret, and respond to new information and adopt improved technologies such as fertilizers and pesticides much faster, which boost their productivity compared to their less educated counterparts. This agrees with the findings of Aneani et al. (2012) and Nyagaka et al. (2010) whose studies also established that farmers with more years of formal schooling were more efficient than their counterparts.

2.2.4 Household size

In most communities, households are the main source of labor for smallholder farmers (Perera, 2014; Katundu et al., 2013). Munishi et al. (2017) reported that performance of smallholder tea farmers was considerably improved when larger number of household members participated in tea farming activities. This finding agrees with the result of a study conducted by Mumba et al. (2012) whose study reported similar results on dairy farming in Zanibar.

2.2.5 Farming experience

Several studies have revealed the influence of farming experience on the performance of smallholder farmers. According to Samaraweera et al. (2013) and Tanui et al. (2012), farming experience depends on the age, number of years spent farming, and number of extension services attended by the farmer, which substantially impacts their crop productivity. In this line, Moobi and Oladele (2012) argued that despite the influence of age on farming experience, young and energetic people are still needed not only to accompany old farmers but also to learn from them. A study conducted by Munishi et al. (2017) found out that farming experience is positively associated with the performance of smallholder tea farmers in Tanzania. Smallholder farmers who spent more years in farming demonstrated more knowledge in dealing with farming challenges such as climate change, diseases, market pcassava fluctuation, soil fertility decline, among others (Munishi et al., 2017).

2.2.6 Size of land holding

Farm size influences performance of smallholder farmers as it determines the efficiency of land use. According to Minai et al. (2014), farmers with smaller farms reported more yields than their counterparts with larger farms. This result is in line with the findings of Adesoji and Farinde (2006) who also reported that increase in farm size decreases the yields of arable crops.

2.2.7 Agricultural extension support

A study conducted by Minai et al. (2014) revealed that consulting extension agents on what needed to be done was associated with 21 percent increase in yield. The extension support mentioned by smallholder farmers were field training and access to information. According to Nyagaka et al. (2010), frequent visits to the farmers by extension agents provided the farmer with necessary information about the availability of needed resources, market pcassavas as well as the profitability status. Nchare (2007), further argued that extension workers play a central role in informing, motivating and educating farmers about available technologies. In this same line, Seyoum et al. (1998) also established a 14 percent difference in productivity between farmers who had access to extension services and those who did not.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methods that will be employed by the researcher to generate the research findings. It presents the research design, study population, sample size determination, data collection methods, data analysis, and ethical consideration

3.2 Research design

This study employed a descriptive survey design to enable the researcher gather information, summarize and present, interpret and analyze data to answer the research questions. The

researcher used both cross-sectional and case study design to collect data from the population. The researcher used a case study design to collect descriptive data to infer to the whole population, such as gender, age, education level, household size, and farming experience

3.3 Study population

The target population in this study are small holder farmers in the west nile region of Uganda. The sample size used was 100 respondents and 96 respondents were valid

3.4 Sample size determination

The sample population for this study will be 100 respondents. According to Kothari(1985) , when field studies are under taken in practical life, the consideration of time and costs leads to selection of few respondents and items to be included in the sample. Taro Yamane a mathematical statiscian devised a formular for estimating or determining sample size in respect to the population under study, allowing inferences and conclusions drawn from the survey to be applied to the complete population from which the sample is drawn.

$n=N/(1+n(e)^2)$

where;

n – sample size

N – population under study

e– precision or sampling error which is usually 0.1, 0.05, 0.01

Using Yamane's formular,

N=860

e=0.1

n= $860/(1+860(0.1)^2$

= 100 respondents

3.5 Data Collection

A structured questionnaire consisting of closed-ended questions is used to collect data from the respondents. The researcher will develop the questionnaire in such a way that it will answer the specific objectives of the study. The researcher will use a questionnaire approach of data collection because it can reach out to large numbers of people within a short period, and it offers a sense of confidentiality to the respondents.

3.6 Validity and reliability of the data collection instrument

The questionnaire is pre-tested with a group of 5 (five) trusted smallholder cassava farmers to avoid repetition of questions and participant fatigue. Items that will be used in the survey will base on results and theoretical perspectives from the literature review to ensure validity and reliability of the instrument.

3.7 Data analysis

After administering the questionnaires, they will be collected and checked for completeness and consistency. Completed questionnaires will be entered in a Microsoft Excel for cleaning and coding. Cleaned data will then be exported to STATA software for further analyzes

3.8 Univariate analysis

Numerical data (Quantity, age, household members involved in cassava farming, farming experience, and farm size) will be summarized and presented as means and standard deviations.

Categorical data (gender, education level, and agricultural extension support) will be presented as frequencies and percentages.

3.9 Bivariate analysis

To assess the associations between age, household members involved in cassava farming, farming experience, farm size and cassava productivity, Pearson's correlation test will be performed at 5% level of significance. Therefore, a $P < .05$ was considered statistically significant.

To measure the relationship between two variables

The formula below will be used to compute the Pearson's correlation coefficient.

$$r = \frac{\sum(X_i - x)(Y_i - y)}{\sqrt{\sum(X_i - x)^2 \sum(Y_i - y)^2}}$$

Where;

r is the Pearson's correlation coefficient.

X_i is the value of the i^{th} X-variable in a sample.

x is the mean value of the values of the X-variables.

Y_i is the value of the i^{th} Y-variable in a sample.

y is the mean value of the values of the Y-variables.

i is an index number

And to assess the association between gender, education level, agricultural extension support and cassava productivity, one-way ANOVA test will be performed at 5% level of significance. Therefore, a $P < .05$ is considered statistically significant. Anova helps to understand how different groups respond with the null hypothesis for the test that the means of the different groups are equal

The formula below is used to compute F Statistics.

$$F = \frac{MST}{MSE}$$

$$MST = \frac{\sum_{i=1}^{k}\left(\frac{T_i^2}{n_i}\right) - \frac{G^2}{n}}{k-1}$$

$$\text{MSE} = \frac{\sum_{i=1}^{k}\sum_{j}^{n_i} Y_{ij}^2 - \sum_{i=1}^{k}\left(\frac{T_i^2}{n_i}\right)}{n-k}$$

Where; F is the variance ratio for the overall test. MST is the mean square between groups, MSE is the mean square of errors, Y_{ij} is the observed frequency, T_i is the i^{th} group total, G is the grand total, n_i is the number of observations in the i^{th} group, and n is the total number of observations.

3.10 Multivariate analysis

Multiple linear regression analysis will be performed to examine the effect of the factors affecting cassava production.

Multiple linear regression is used to check how strong the relationship is between two or more independent variables and one dependent variable

Cassava productivity will be regressed against the independent variables that had a statistical significant association with cassava productivity as obtained from the bivariate analysis.

Model

$$Y = \beta_0 + \beta_i X_i + \mu$$

Where; β_0 is the constant, β_i is the coefficient of X_i, for i = 1,2,3,…., X_i is the independent variables, for i = 1,2,3,…., and μ is the error term

Table of variables

Variable	Category	Measurement

Gender	Male Female	Categorical
Education	None Primary Secondary Tertiary	Categorical
Extension service	Yes No	Binary
Household size	1-2 3-5 Above 5	Categorical
Quantity produced		Numerical
Age		Categorical
Farming experience	1-2 years of experience 3-5 Above 5	Categorical
Land size	1-2 3-4 5 and Above	Categorical

CHAPTER FOUR

RESEARCH ANALYSIS

4.1 Introduction

This chapter presents the data analysis, interpretations, and findings of factors affecting productivity of smallholder cassava farmers in West Nile region of Uganda.

4.2 Response rate

The study targeted a total sample size of 100 smallholder cassava farmers in West Nile region of Uganda. Out of the 100 questionnaires that were administered, 96 were well filled, retrieved by the researcher, and considered in this analysis, which represented a response rate of 100 percent.

4.3 Univariate analysis

The categorical variables in the study were analyzed and presented as frequencies and percentages, while the continuous variables were analyzed and the descriptive summaries obtained were presented as mean, standard deviation, minimum, and maximum. The result of these analyses are presented in table 4.1 and table 4.2 below.

4.3.1 Univariate analysis of the categorical variables

Table 4.1: Summary of univariate analysis of categorical variables

Variables	Categories	Frequency	Percentage (%)
Gender	Male	42	43.8
	Female	54	56.2
Education	None	15	15.6
	Primary	34	35.4
	Secondary	24	25.0
	Tertiary	23	24.0
Extension Service status	Yes	24	25.0
	No	72	75.0
Last extension service	2019 – 2021	9	9.4
	2015 – 2018	8	8.3
	2009 – 2014	7	7.3
	Never	72	75.0
Household size	1 – 2 members	10	10.4
	3 – 5 members	36	37.5
	Above 5 members	50	52.1
Land size	1-2	45	46.9
	3-4	33	34.4
	5 and Above	18	18.7

Source: Author, 2023

The result of the study revealed that, more than a half of the respondents (56.2 percent) were female. In regards to the level of education attained, 35.4 percent of the respondents stated that they studied up to primary level of education, 25.0 percent of the respondents studied up to secondary level, 24.0 percent of the respondents studied beyond secondary level of education, and 15.6 percent of the responded reported that they did not attain any formal education. Majority of the respondents (75.0 percent) reported that they never benefited from any extension services, while only 25.0 percent of the respondents admitted that they benefited from extension services. When asked about the last time they benefited from extension services, majority of the respondents (75.0 percent) responded that they never benefited from any extension services, 9.4 percent of the respondents stated that they benefited from extension services in the period of 2019 – 2021, 8.3 percent of the respondents benefited in the period of 2015 – 2018, and 7.3 percent of the respondents last benefited from extension services in the period of 2009 – 2014. Slightly more than a half of the respondents (52.1 percent) stated that their households comprised of more than 5 members, 37.5 percent of the respondents reported a family size of 3 – 5 members, and 10.4 percent of the respondents a family size of 1 – 2 members. According to the results, the largest percentage of farmers had 1-2 acres of land (46.9%) followed by those with 3-4 acres of land (34.4%) and the least percentage had 5 and above acres of land.

4.3.2 Univariate analysis of the continuous variables

Table 4.2 Univariate analysis of the continuous variables

Variables	Obs	Mean	Std. Dev.	Min	Max
Age	96	39.04	14.61	15	74
Household size	96	3.98	2.38	1	10
Farming experience	96	7.5	5.15	1	21
Land size	96	2.02	1.22	0.2	5
Cassava quantity	96	430.63	341.1142	45	1800

Source: Author, 2023.

According to the result above, the mean age of the smallholder cassava farmers in West Nile region of Uganda was 39.04 years old. The average number of household members contributing to smallholder cassava farming in West Nile region of Uganda was 4, with a minimum of a single household member and a maximum of 10 members. Smallholder cassava farmers in West Nile

region of Uganda had an average of 7.5 years of experience in cassava farming, with the least experienced farmer having 1 year of experience in cassava farming and the most experienced farmer having 21 years of experience in cassava farming. The average size of a smallholders' cassava farm in West Nile region of Uganda was 2.02 acres, with the smallest farm being 0.2 acre and the largest cassava farm owned a smallholder cassava farmer was 5 acres. The average yield of a smallholder cassava farmer in West Nile region of Uganda was 430.63 kilograms per harvest, with the lowest harvest of 45 kilograms and the highest harvest of 1800 kilograms.

4.4 Bivariate analysis

The association between the categorical variables and cassava productivity was assessed using oneway ANOVA, while the association between the continuous variables and cassava productivity was assessed using Pearson's correlation statistics. The results of these analysis is presented in the table below.

Table 4.3: Association between the categorical variables and cassava productivity

Variable	**Category**	**Mean quantity of cassava**	**Prob>F**
Gender	Male	451.9	0.4904
	Female	403.2	
Education	None	466.0	0.9086
	Primary	417.5	
	Secondary	457.5	
	Tertiary	398.9	
Extension service status	Yes	452.7	0.0243
	No	423.3	
Last extension service	2019 – 2021	498.9	0.0317
	2015 – 2018	441.9	
	2009 – 2014	405.7	
	Never	423.3	

Source: Author, 2023

From the table 4.3 above, only extension service status and period of the last extension service had a statistically significant relationship with the smallholder cassava productivity, as revealed by the p-values less than 0.05, while gender and education level of the respondents were not significantly associated with the smallholder cassava productivity, as shown by the p-values greater than 0.05.

Table 4.4: Correlation between continuous variables and cassava productivity

		Age	Household size in cassava production	Cassava farming experience	Cassava farm size
Cassava quantity	Pearson's r	0.0844	0.3163	0.2677	0.8430
	Sig. (2-tailed)	0.4135	0.0017	0.0084	0.0000

Source: Author, 2023

As shown on the table 4.4 above, cassava farm size, cassava farming experience, and the number of household members participating in cassava farming had a statistically significant relationship with smallholder cassava productivity as the p-values is less than 0.05, while age of the smallholder cassava farmer had insignificant relationship with smallholder cassava productivity, as revealed by a p-value of 0.4135, which is greater than 0.05.

The result also revealed a very strong positive correlation (r = 0.8430) between cassava productivity and cassava farm size, while age, cassava farming experience, and the number of household members participating in cassava farming had a weak positive correlation with cassava productivity as revealed by the Pearson's correlation coefficient of less than 0.4.

This shows that cassava farm size has a positive relationship with cassava productivity ie, the larger the size of the farm, the higher the productivity and the smaller the size of the land the lesser the productivity. Likewise farming experience has a positive relationship with cassava productivity, the more years one has in cassava production, the more the productivity of cassava. The number members also has a positive relationship with cassava productivity that is to say the larger the household the larger the productivity of cassava and the smaller the household, the smaller the productivity of cassava.

While age of an individual did not have a significant relationship with cassava productivity .Age of a farmer does not affect productivity as a young farmer may produce more cassava than an old man.

4.5 Multivariate analysis

Linear regression analysis was used to determine the effect of extension service status, period of last extension service, number of household members participating in cassava production, cassava

farming experience, cassava farm size on cassava productivity of smallholder farmers in West Nile region of Uganda. The output of the linear regression model was as presented below in table 4.5.

Table 4.5: Linear regression output

Cassava productivity	**Coef.**	**p>|t|**	**[95% Conf. Interval]**	
Extension service				
No	-49.3236	0.041	-98.9497	0.30255
Last extension service				
2015 – 2018	-53.8315	0.047	-108.5662	0.90323
2009 – 2014	-68.634	0.048	-138.0046	0.73661
Never	0			
Household size in cassava production	17.7804	0.028	6.83094	28.72994
Cassava farming experience	-5.628601	0.291	-16.16239	4.905188
Cassava farm size	221.3634	0.000	180.6058	262.1211
_cons	136.5355	0.114	-33.36043	306.4314

Source: Author, 2023.

The model is a good fit because prob>0.05 at 5% level of significance. Thus the predictor variables; extension services, house hold size, cassava farming experience, farm size and dependent variable; cassava productivity.

According to the result of the linear regression analysis, extension service status, period of extension service, number of household members participating in cassava production, and cassava farm size were established to be statistically significant predictors of cassava productivity of smallholder cassava farmers in West Nile region of Uganda, as revealed by the p-values less than 0.05.

According to the results, extension service status, period of extension service, number of household members participating in cassava production, and cassava farm size were established to have a positive relationship with cassava productivity that is to say, when farmers get extension

services in terms of finance increases the productivity of small scale farmers as they are able to purchase fertilizers to use on their gardens while no extension services limit farmers from purchasing products such as fertilizers and modern machines thus low productivity of farms. The larger the number of household members, the higher the productivity of cassava farmers as there is enough labour to work on the farm while the smaller the household size, the smaller the productivity of cassava because there is limited labour to work on the farm. Likewise the larger the farm size, the larger the productivity of cassava because the farmers will have enough land to plant cassava while the smaller the farm size, the smaller the cassava productivity as the land available for farming is limited.

while cassava farming experience was found to be an insignificant predictor of cassava productivity of smallholder cassava farmer West Nile region of Uganda, as confirmed by the p-value = 0.291, which is greater than 0.05. This is because a new farmer may plant cassavba and attain high yield due to other factors such as the use of modern techniques for farming.

Smallholder cassava farmers who did not benefit from extension services were significantly associated with a lower cassava yield of 49.3 kilograms compared to their counterparts who benefited from extension services, holding others factors that affect cassava productivity constant.

Smallholder cassava farmers who benefited from extension services in the periods of 2015 – 2018 and 2009 – 2014 were significantly associated with a lower cassava yield of 53.8 kilograms and 68.6 kilograms, respectively as compared to their colleagues who had just benefited from the extension services with the period of 2019 – 2021, keeping other factors that affect cassava productivity constant. Farmers get finances for improving their farms

Keeping other factors that affect cassava productivity constant, a unit increase in the number of household members participating in cassava farming would lead to an increase in cassava yield by 17.8 kilograms per harvest.

Also, an increase in the cassava farm size by 1 acre would lead to an increase in cassava yield by 221.4 kilograms per harvest, holding other factors that affect cassava yield constant.

CHAPTER FIVE

DISCUSSION OF RESULTS, CONCLUSION, AND RECOMMENDATION

5.1 Introduction

This chapter presents the summary of findings, conclusion, and recommendation based on the findings of this study.

5.2Discussions of results

This study is aimed at analyzing the factors affecting the productivity of smallholder cassava farmers in West Nile region of Uganda. The four specific objectives utilized in this study were; to investigate the effect of demographic factors (age, gender, education level, and household size) on the productivity of smallholder cassava farmers, to determine the effect of farming experience on the productivity of smallholder cassava farmers, to determine the effect of land size owned by the smallholder cassava farmers on their productivity, and to assess the effect of agricultural extension support on the productivity of smallholder cassava farmers. The result of the analysis revealed that the study registered a response rate of 100 percent.

5.2.1 Demographic factors and cassava productivity

The result of the study revealed that the number of household members participating in cassava farming had a significant effect on cassava yield. According to the study, a unit increase in the number of household members participating in cassava farming would lead to an increase in cassava yield by 17.8 kilograms per harvest. This result concurred with the findings of Munishi et al. (2017) and Mumba et al. (2012), whose studies also established similar result. The study's result also affirmed the importance of family labor in productivity of smallholder farmers as stated by Perera (2014) and Katundu et al. (2013).

5.2.2 Cassava farming experience and cassava productivity

According to the study, cassava farming experience was established to have a weak but significant relationship with cassava productivity at the bivariate level of analysis. At the multivariate level of analysis, an additional year of cassava farming experience would lead to a decrease in cassava yield by 5.6 kilograms per harvest, however, this decrease was not statistically significant. This result departed from the finding of Munishi et al. (2017), whose study established that smallholder farmers who had spent more years in farming were associated with more productivity as they are

exposed to more skills of handing farming challenges compared their colleagues who are less experienced.

5.2.3 Cassava farm size and cassava productivity

This study established a very strong positive relationship between cassava farm size and cassava productivity at the bivariate level of analysis. The result of the study also revealed that, an increase in the cassava farm size by 1 acre would lead to an increase in cassava yield by 221.4 kilograms per harvest. This result was contrary to the findings of Minai et al. (2014) and Adesoji and Farinde (2006) whose studies reported that increase in farm size decreases the yields of arable crops.

5.2.4 Extension services and cassava productivity

According to this study, smallholder cassava farmers who did not benefit from extension services were significantly associated with a lower cassava yield of 49.3 kilograms compared to their counterparts who benefited from extension services. This is in agreement with the finding of Seyoum et al. (1998), whose study also established a 14 percent difference in productivity between farmers who had access to extension services and those who did not. Also, smallholder cassava farmers who benefited from extension services in the periods of 2015 – 2018 and 2009 – 2014 were significantly associated with a lower cassava yield of 53.8 kilograms and 68.6 kilograms, respectively as compared to their colleagues who had just benefited from the extension services with the period of 2019 – 2021. This result is in line with the finding of Minai et al. (2014), whose study revealed that frequent consultation of extension agents on what needed to be done was associated with 21 percent increase in yield.

5.3 Conclusion

Factors that significantly influenced cassava productivity were; access to extension services, period of access to extension services, number of household members participating in cassava production, and cassava farm size.

According to this study, smallholder cassava farmers who did not benefit from extension services were significantly associated with a lower cassava yield of 49.3 kilograms compared to their counterparts who benefited from extension services. Also, smallholder cassava farmers who benefited from extension services in the periods of 2015 – 2018 and 2009 – 2014 were significantly associated with a lower cassava yield of 53.8 kilograms and 68.6 kilograms, respectively as

compared to their colleagues who had just benefited from the extension services with the period of 2019 – 2021.

The study also established that, a unit increase in the number of household members participating in cassava farming would lead to an increase in cassava yield by 17.8 kilograms per harvest.

Furthermore, the result of the study also revealed that, an increase in the cassava farm size by 1 acre would lead to an increase in cassava yield by 221.4 kilograms per harvest.

5.4 Recommendation

Based on the findings of the study, the following recommendations were put forward by the researcher.

5.4.1 Policy recommendation

The result of this study revealed the influence of extension services on the productivity of smallholder cassava farmers. The study also revealed that majority (75.0 percent) of the smallholder cassava farmers in West Nile region of Uganda did not have access to extensions, and only few (9.4 percent) had access to extension services in the period of 2019 – 2021. Therefore, the researcher recommends that the extension services should be made accessible to the smallholder farmers through government programs such as; operation wealth creation, parish model, and so forth. Low cost credit facilities should be advanced to the smallholder farmers to avail them with the capital needed to access the extension services as well as purchasing other farm equipment. This interventions will lead to increased productivity of smallholder cassava farmers whose productivity will be boosted by the production knowledge acquired through the access to extension services in form of trainings, advisory services, among others.

5.4.2 Recommendation for further studies

The result of this study revealed that only 58.4 percent of the overall variations in the cassava productivity of smallholder farmers in West Nile region of Uganda was caused by extension service status, period of last extension service, number of household members participating in cassava farming, cassava farming experience, and cassava farm size. This implies that there are other variables not included in this this study that also influence cassava productivity of smallholder farmers that are captured in the current study as an error term. Therefore, further study should seek on analyzing the factors affecting productivity of smallholder cassava farmers using

other factors not hypothesized in this study such as; the farming method adopted, type of cassava seed cultivated, membership in a cooperative society, and so forth.

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APPENDIX

Appendix I: Questionnaire

Questionnaire:

Research Title: "Analysis of the factors affecting the performance of smallholder cassava farmers in West Nile region of Uganda".

Dear Respondent,

My name is Poni Sharon Scopas, pursuing a Degree of Bachelor of Science in Quantitative Economics at Makerere University. I am conducting a study on "Factors affecting the performance of smallholder cassava farmers in West Nile region of Uganda", in partial fulfilment of the requirements for the award of a Degree of Bachelor of Science in Quantitative Economics of Makerere University. Therefore, this questionnaire is intended to help the researcher get information on the factors affecting the performance of smallholder cassava farmers in West Nile region of Uganda. The purpose of the study is purely academic and information provided will be treated with utmost confidence. You have been selected as a key respondent for this study. Kindly, complete the questionnaire to enable the researcher complete the study. Please tick the answers which are most appropriate.

I appreciate your participation in this study.

Thank you!

(Tick the most appropriate answer).

SECTION A: Demographic factors.

1. What is the gender of the respondent?

a) Male b) Female

2. What is your age in complete years?

……. Years old.

3. What is your highest level of education?

a) None
c) Secondary
b) Primary
d) Tertiary

4. How many people live in this household?

a) 1 - 2
c) 6 and above
b) 3 - 5

5. How many members of this household participate in cassava farming?

…….. Members

SECTION B: Cassava farming experience

6. For how long have you been practicing cassava farming?

…… years.

7. For the years you have been practicing cassava farming, how can describe your performance based on the cassava yield?

a) Increasing
c) Constant
b) Decreasing

SECTION C: Land size allocated to cassava farming

8. How big is your current cassava farm?

…….. Acres.

9. Compared to your previous cassava farm, how can you describe the current cassava farm size?

a) Larger
c) Constant
b) Smaller

SECTION D: Agricultural extension support

8. How big is your current cassava farm?

…….. Acres.

9. Compared to your previous cassava farm, how can you describe the current cassava farm size?

a) Larger
b) Smaller
c) Constant

SECTION E: Cassava yield

10. Roughly, how many kilograms of cassava did you get from the last harvest?

…… Kgs.

11. Compared to your previous cassava harvest, how can you describe the last cassava harvest?

a) Higher
b) Lower
c) Constant

12. When (year) did you last receive extension service support …… (IF NEVER RECORD 00)

Thank you so much for your time. Please, have a blessed day.