DETERMINANTS OF MAIZE PRODUCTION IN UGANDA

(A CASE STUDY OF BAITAMBOGWE SUB-COUNTY IN MAYUGE DISTRICT)

A POST GRADUATE DISSERTATION PRESENTED TO FACULTY OF SCIENCE IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE MASTERS OF SCIENCE IN DEVELOPMENT ECONOMICS

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ABSTRACT

This research examined the determinants of maize production in Uganda. A multistage sampling technique was used to select 54 farmers in the study area of Baitambogwe sub-county in Mayuge District.

The data obtained from the field were subjected to analysis using inferential statistics, which was used to test the hypotheses. Results of the Cobb-Douglas model showed that family labour, quantity of seeds used and bags of maize sold are positive and statistically significant related with maize output with coefficients of 5.964, 5.945 and 11.012 respectively. This implies that a one percent increase in family labour, quantities of seeds used, and bags of maize sold leads to an increase in maize output by 5.964, 5.945 and 11.012 percent respectively. The probability of the F- statistics from the model used was 0.0060 which is less than 0.05, confirming the overall significance of the model used in the study, was good indicating a good fit and the correctness of the model.

The study therefore recommends that, the government should develop strategic policies to target attaining quality family labour, improved and quality seeds and availing markets for the maize produced by the farmers in the study.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Uganda is a country that is blessed with fertile soils and a fairy well- distributed rainfall, which makes agriculture a reasonably secure occupation. This is coupled with the fact that most of the developing countries' economies in Sub- Saharan Africa depend mainly on agricultural production. The Ugandan economy is dominated by the agricultural sector, which accounts for 34 percent of the (GDP) Gross Domestic Product (MFPED 2006).

The sector also accounts for 85 percent of the export earnings, 80 percent of employment, most of the raw materials to the agro-based industrial sector, and ensures food security. Being the leading sector of the Ugandan economy, agriculture is the engine and the major source of future growth (MAAIF/MFPED 2000).

In Uganda, the rural population (more than 85 percent of the total population) survives on agriculture as subsistence and petty commercial farmers. The majority of the subsistence farmers are poor people who do not have enough food, lack sufficient money to meet their health, education and other basic needs, own few productive assets, lack access to the essential services and so on (WOUGNET 2001). Therefore the need to improve the standards of living of these people through agricultural production was of paramount importance. It is against this background that the government of Uganda put in place the plan for Modernization of Agriculture in its poverty Eradication Action Plan (PEAP) with the aim of transforming subsistence agriculture to commercial agriculture and ensuring food security in the country.

Maize became an important subsistence none traditional food/cash crop as marketing systems for cotton and coffee collapsed completely in 1980's (Ojok 1994). Currently maize is a major staple, giving a variety to house hold diets in form of roasted or steamed green cobs, maize flour and porridge. Maize is thus a strategic crop in Ugandan food security, largely as a result of increasing urbanization and has the potential to become a nontraditional agricultural export crop (Ojok 1994). Based on the seed requirements, animal feeds industrial use and human consumption; a total demand for maize is estimated at 391.300 Metric Tonnes (MFEP 1995).

Although, Maize is a very important staple food crop in Uganda, grown in almost all agro-ecological zones in the country, its outputs are very low as compared to the other food crops produced in Uganda.

Table 1.1 Production of Major Food Crops in Uganda (tonnes)

Crop	**2005**	**2006**	**2007**
Bananas	9,380	9,052	9,233
Maize	1,237	1,258	1,262
Irish Potatoes	2,604	2,627	2,654
Cassava	5,576	4,924	4,973

Source: *(UBOS 2008)*

Maize is an important cereal crop that is virtually grown in all parts of Uganda. Presently it is the most important food crop widely grown and it is a major part of the diet of both rural and urban communities as well as institutions in Uganda. The crop occupies a strategic position in the country's food security alongside bananas, Irish Potatoes, cassava and sweet potatoes.

Maize also provides farm households, produce buyers, processors, exporters and transporters with income. It is therefore an important crop from both the food security and income-generation point of view. The maize sub-sector is estimated to provide a living for about 2-2.5 million households, close to 1,000 traders/agents and over 20 exporters.

Maize has of recent become a major export crop in the regional markets, rising from about US$6.0 million in 1990 to an estimated US$11.8 million in 2000 and US$10.4 million in 2001 (PSFU 2008). It is probably on these premises that Government of Uganda, the development partners and the private sector attach great importance to the promotion of maize.

As with other commodities in Uganda, maize production is carried out by two groups of farmers, the predominant small scale and the emerging medium/large scale commercial farmers. Typically small scale and medium scale farmers have holdings of between 0.2-0.8ha and 0.8-2.0ha under maize respectively. Maize grows well in an area with an annual minimal rainfall of 700 mm (MAAIF 2002).

Busoga region is considered to be with the largest acreage of maize fields, but also there is considerate production in Bunyolo and Bugisu regions. Some areas can support two crops a year while others can only support one because of insufficient rains or extended length of the growing season. The crop takes about 4 months from planting to harvest in the lowland areas and up to 8-9 months in the Sebei highlands. In general, maize can be grown in nearly all parts of Uganda, though the leading traditional maize producing districts include Sebei, Busoga, Bugisu, Masindi, Kabarole and Kasese (MAAIF 2002).

1.2 Statement of the Problem:

Maize production in Uganda is very low compared to other major food crops (refer to table 1.1), in spite of the fact that it is consumed directly by very many people domestically, in institutions such as hospitals, schools and industries. The government through its research organisations, such as National Agricultural Research Organisation(NARO)and others has deliberately developed high yielding varieties, provided extension services up to parish levels throughout the entire country, removed import tax on most of agricultural inputs such fertilisers and machineries like tractors. Despite those mentioned efforts done by the government, maize production has remained low to the extent of trailing all the major food crops.

1.3 Objective of the study:

The main objective of this research was to analyse the determinants of maize production in Uganda.

1.3.1 Specific Objectives of the study:

1- To examine the relationship between farm size and maize output.

2- To examine the relationship between quantities of seeds used and maize output.

3- To examine the relationship between family labour and maize output.

4- To examine the relationship between quantities of fertilisers used and maize output.

5- To examine the relationship between bags of maize sold and the maize output.

1.4 Hypotheses of the study

1- There is a negative relationship between farm size and maize output.

2- There is a negative relationship between quantities of seeds used and maize output.

3- There is a negative relationship between family labour and maize output.

4- There is a negative relationship between quantities of fertilisers used and maize output.

5- There is a negative relationship between bags of maize sold and maize output.

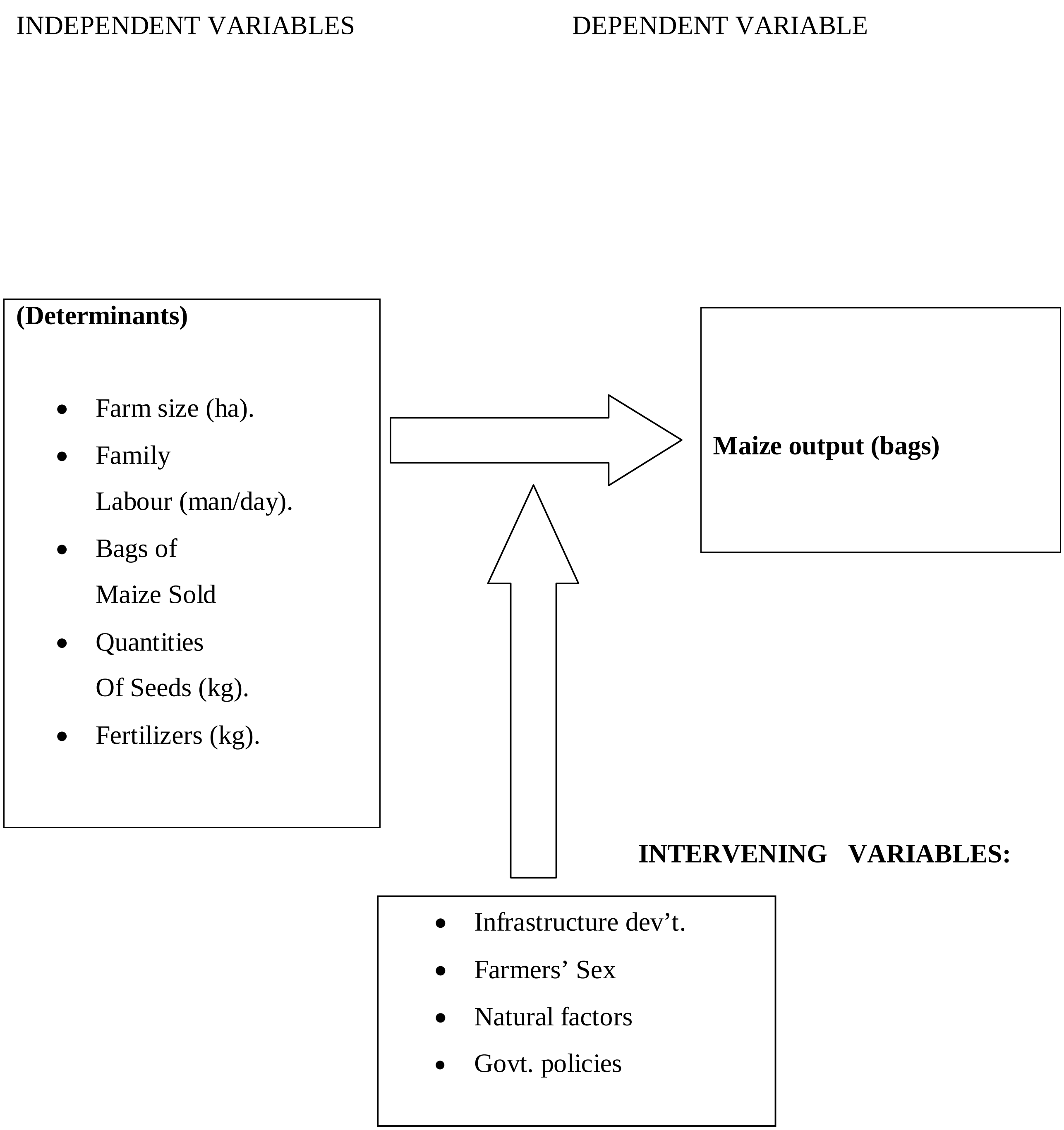
1.5 Scope of the Study

The study was carried out in Baitambogwe Sub- County in Mayuge district. The sub-county has 4 parishes namely; Butte, Lukone, Wabulungu and Katonte. Data was collected from 54 maize farmers in the four parishes that were studied.

1.6 The significance of the Study

This research was conducted to examine the determinants of maize production in Uganda and provide the empirical results which can be of great value for the academicians and policy makers in the formulating future policies on modernization of agriculture in general and maize sector in particular in order to address the current problem and the future crisis.

Figure: 1.1 The logical flow chart of the variables:



1.7 The Conceptual Model

The conceptualization of the relationship between the determinants and maize output is shown in figure 1.2. The major determinants of maize production in Uganda are anticipated to be; farm Size, family labour, bags of maize sold, quantities of seeds used and quantities of fertilizers used; and the other intervening factors such as government policies, infrastructure development, natural factors and farmers' sex.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology and methods that were used in the study. In particular, discussed in this chapter are: the research design, location of the study, model specification, target population, sample size, sample selection, data collection methods, as well as qualitative and quantitative data analysis techniques. In each case, justification is provided for the choices that were made.

3.2 Research Design

The study adopted a cross sectional survey design and the maize farmers were the respondents in this study. The design enabled the collection of qualitative and quantitative data using questionnaires. Data aimed at answering the research questions was collected once and for all. The design was also used to compare study variables and establish the relationships.

3.3 Location of the Study

The study was conducted in Mayuge District and Baitambogwe sub–county was selected because, NAADS Programmes, specifically the agricultural extension services where maize growing has been promoted in the entire District. Maize growing has been greatly taken on by the farmers in the four parishes which make up the sub-county. Hence the data collected from farmers was reliable and representative of the entire population in the District. For the purpose of the study the population included maize farmers from Katonte, Lukone, Butte and Wabulungu parishes.

Table: 3.1 Categories of target population

FARMER CATEGORY	POPULATION
Katonte maize farmers	25
Butte maize farmers	10
Lukone maize farmers	10
Wabulungu maize farmers	10
TOTAL	55

The table 3.1 shows a targeted population of 55 elements. The categories of the respondents were purposively determined because the respondents were expected to provide the necessary information concerning the study objectives.

3.4 Sample Size

The sample size of 54 farmers was determined from a target population of 55 farmers using a sample determination table developed by Krejcie and Morgan (1970). The sample size was determined by both purposive and random sampling methods. Structured questionnaires were later administered by the researcher to collect information regarding the study objectives.

Table: 3.2 Sample size selection

Farmer Category	**Population**	**Respondents**
Katonte maize farmers	25	24
Butte maize farmers	10	10
Lukone maize farmers	10	10
Wabulungu maize farmers	10	10
Total	55	54

3.5 Sampling Methods

Using a combination of purposive and random sampling techniques, primary data was collected from of a sample of 54 farmers from a target population of 55 farmers. Mayuge District and Baitambogwe Sub-county were purposively selected because agricultural extension service has been greatly adopted by farmers. Using information from the District Agricultural and Extension staff, a list of all parishes within Baitambogwe Sub-county was compiled from which four Parishes; Katonte, Butte, Lukone and Wabulungu parishes were purposively selected. The number of farmers in each parish was later determined using the sample size determination table developed by Krejcie and Morgan (1970).

3.6 Data Collection Procedures

The researcher obtained an introductory letter addressed to the Baitambogwe Sub–county chairperson from Uganda Martyrs University where he is pursuing his Master’s Degree.

After granting him permission to continue with the exercise, the researcher approached the Baitambogwe Sub- county NAADS Coordinator for assistance to meet the various known maize farmers. After briefing the farmers about the purposes of the study, the researcher together with his research assistant randomly selected individual farmers from each group from the selected parishes.

3.7 Data collection methods and Instruments

Data was collected from 54 maize farmers on socio – economic characteristics, participatory planning, farmer training and technology development factors impacting on maize determinants, using structured questionnaires. Structured questionnaires were used because they were easy to administer and analyse. A few open ended questionnaires which provided room for all new responses to be recorded in addition to those that were provided.

3.8 Data Analysis

The data obtained from the field were subjected to analysis using inferential statistics, which was used to test the hypotheses. The Stochastic frontier production model was used to determine the relationship between the dependent variable (maize output) and the independent variables. STATA Version 8 was used to generate parameter estimates of the Cobb-Douglas model and the categorical variables were compared to generate the Pearson chi-square statistics while continuous variables were compared to generate the P-values.

3.9 Model Specification

The ideas of production function can be illustrated with a farm using n inputs: X_1, X_2...X_n, to produce output Y, which shows the maximum output obtainable from various inputs used in production. Therefore for the sake of this study, the stochastic frontier production function in which Cobb-Douglas was proposed by Battese and Coelli (1995) and confirmed by Yao and Liu (1998) represents the best functional form of the production frontier and was used for data analysis in order to better examine the determinants of maize production in Uganda.

$Y=f(X_1, X2...X_n)$……………………………………………….................................1

Where,

Y = Output, total maize produced (kg), X_1 = Farm size (ha)

X_2 = Family labour (man day), X_3 = Bags of maize sold (Kg)

X_4 = Quantities of seeds used (kg), X_5 = Quantities of fertilizers used (Kg)

Linear function:

$Y= \beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5$…………………………………………………2

Cobb-Douglas production frontier function:

$LnY =\beta_0+\beta_1lnX_1+\beta_2lnX_2+\beta_3lnX_3+\beta_4lnX_4+\beta_5lnX_5$…………………………………….3

3.10 Estimation of the Model

The linear model specified for this study was estimated using the multivariate analysis method to establish the effect of the independent variables on the development variables on the dependent variable (Maize output). The application of least squares to a single equation assumes a classical linear function, among others, that the explanatory variables are truly exogenous that is; there is one-way causation between the dependent variable and the regressors.

3.11 Testing Normality

In econometrics, normality tests are used to determine whether a random variable is normally distributed, or not. One application of normality tests is to take the residuals from a log-linear stochastic frontier production function model. If they are not normally distributed, the residuals should not be used in Z-tests or in any other tests derived from the normal distribution, such as t-tests and chi-square tests. If the residuals are not normally distributed, then the dependent variable or at least one explanatory variable may have the wrong functional form, or important variables may be missing, etcetera.

In this study descriptive analysis was conducted to establish the normality of the variables using the Normal probability test which measures the goodness-of-fit of departure from normality, based on the sample kurtosis and skewness.

Normality of the variables allows the use parametric measures during estimation and hypothesis testing. If variables are not normally distributed, then variable transformation (or increase in sample size) is necessary to make the variables normally distributed.

3.12 Multicollinearity test

The term Multicollinearity is due to Ragnar Frisch, originally it meant the existence of a perfect or exact linear relationship among some or all explanatory variables of a Cobb- Douglas model. Multicollinearity in Cobb- Douglas models is an unacceptably high level of inter-correlation among the independent variables, such that the effects of the independents cannot be separated. Under Multicollinearity, estimates are unbiased but assessments of the relative strength of the explanatory variables and their joint effect are unreliable.

Unbiased consistent estimates will occur and their standard errors will correctly estimate. The only effect of Multicollinearity is to make it hard to get coefficient estimates with small variance. Since Multicollinearity is essentially a sample phenomenon, arising out of largely non-experimental data collected in most social sciences, there is no one unique method of detecting it or measuring it or measuring its strength.

In addressing the effect of Multicollinearity, this study considered the rule of thumb that if the pair-wise or zero-order correlation coefficient between two regressors is high, say, in excess of 0.8, then Multicollinearity is a serious problem. The problem with this criterion is that, although high zero-order correlations may suggest collinearity, it is not necessary that they be high to have collinearity in any specific case. The high zero-order correlations are a sufficient but not a necessary condition for the existence of Multicollinearity because it can exist even though the zero-order or simple correlations are comparatively low say, less than 0.05 (Gujarati 2003).

CHAPTER FOUR

PRESENTATIONS AND DISCUSSIONS OF THE EMPIRICAL FINDINGS

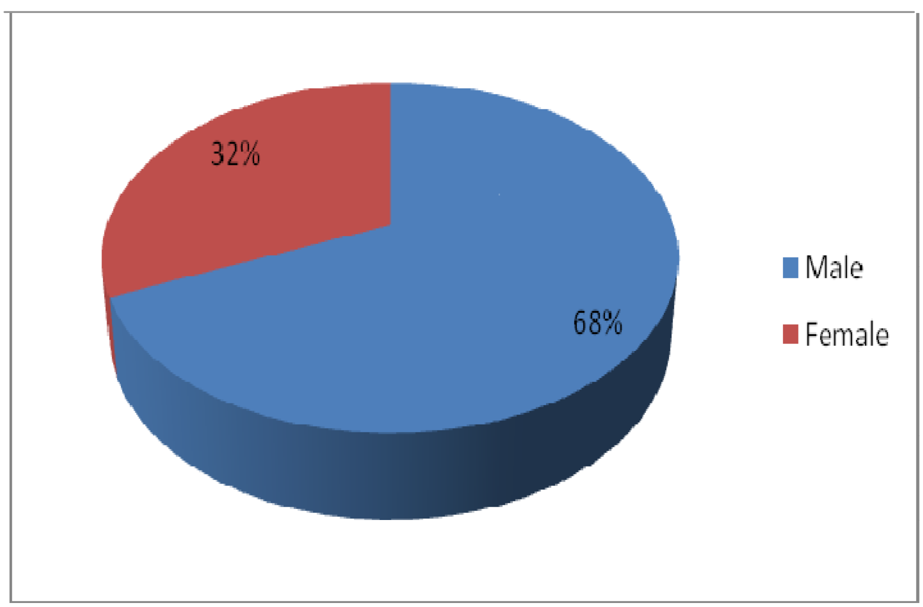
4.1 Introduction

In this chapter the findings of the study are presented and discussed in four main sections, namely: the univariate analysis, bivariate analysis and Multivariate analysis of the variables using charts, graphs and tables respectively.

4.2 The Univariate analysis

The univariate analysis was conducted thematically on the variables and their results are presented in the figures below.

Figure: 4.1 sex distribution of respondents

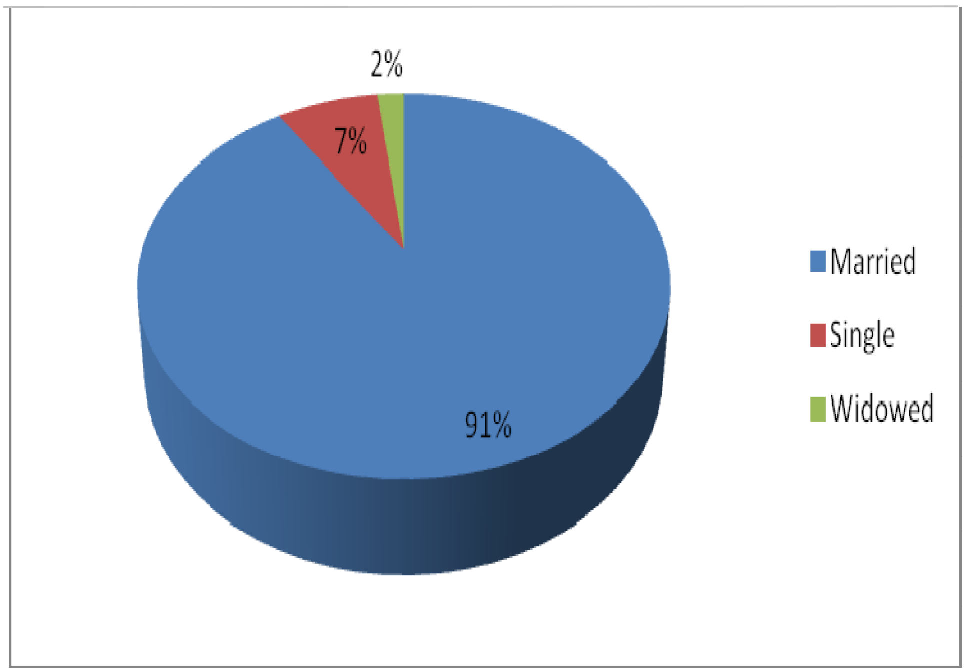


Source: *(Research Survey)*

Figure 4.1 shows that 68 percent of the respondents were male and the females were 32 percent in the study area.

Figure 4.2 shows that 91 percent of the respondents were married, 7 percent were singles and only 2 percent were the widowed.

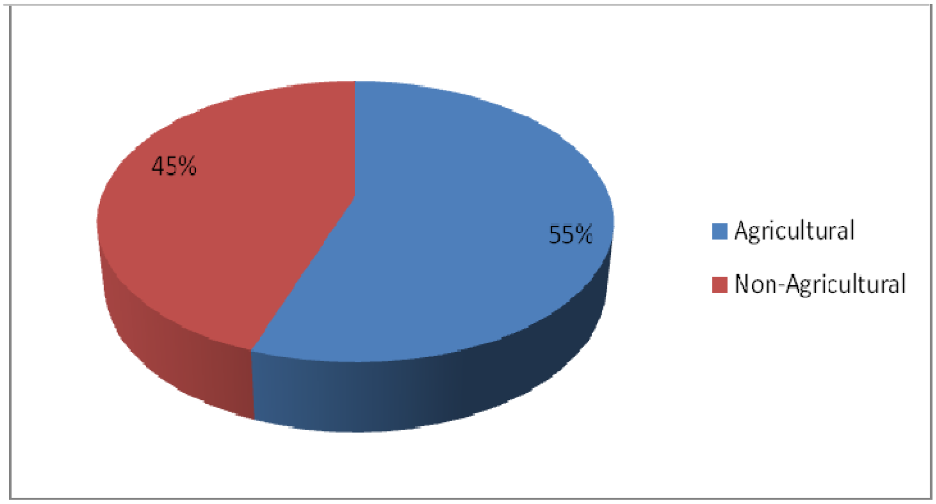
Figure: 4.2 Results of farmers' marital status



Source: *(Research Survey)*

The study also investigated the respondents' major sources of income and their results are presented below.

Figure :4.3 Farmers' major sources of income

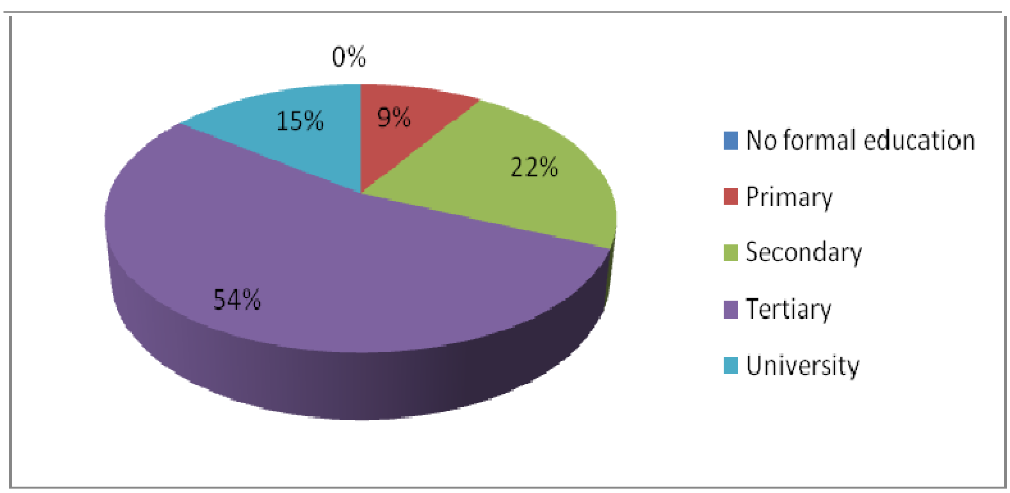


Source: *(Research Survey)*

Results show that 55 percent of the respondents depend on agriculture as their major source of income.

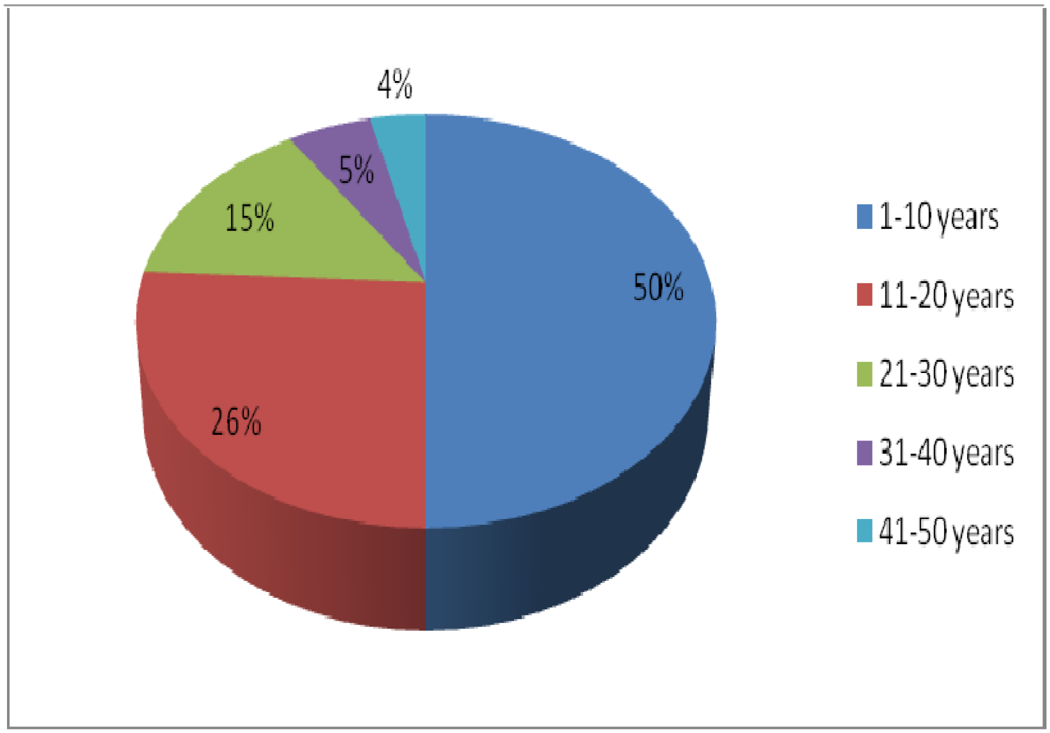
Figure 4.4 shows that, 9 percent, 22 percent, 54 percent and 15 percent had primary, secondary, tertiary and University education respectively.

Figure:4.4 Educational levels of respondents



Source: *(Research Survey)*

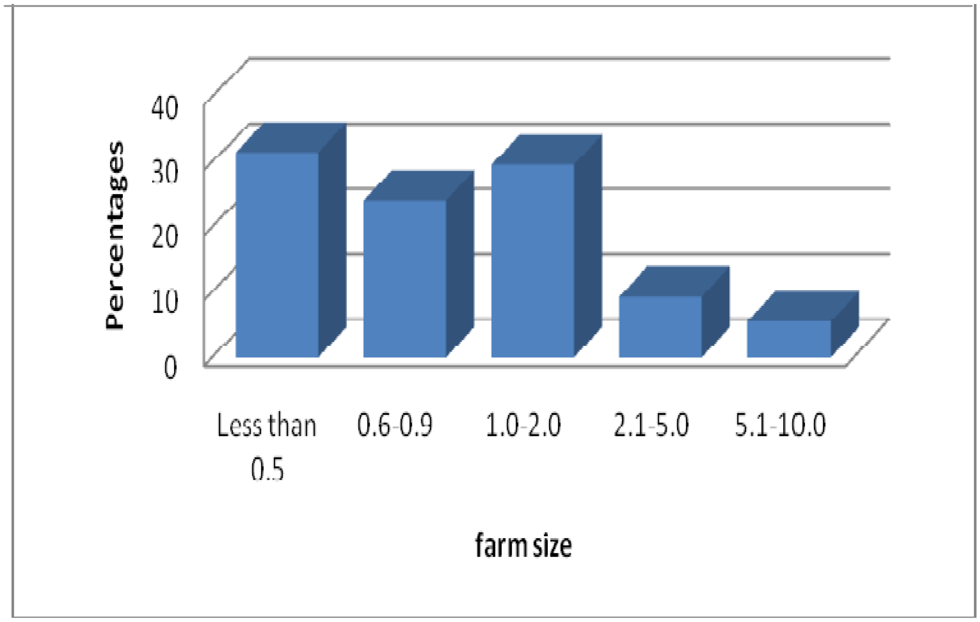
Figure 4.5 Farmers' years in maize farming



Source: *(research survey)*

Figure 4.5 shows the years of experience of the respondents in maiaze production. Results indicate that 50 percent of the respondents took on farming as major occupation for period between 1-10 years. And only 4 percent of the respondents had experience of 41-50 years in maize farming. This is supposed to have a negative impact on maize output, all things being equal.

Figure 4.6 Distribution of respondents by farm size (hectares)

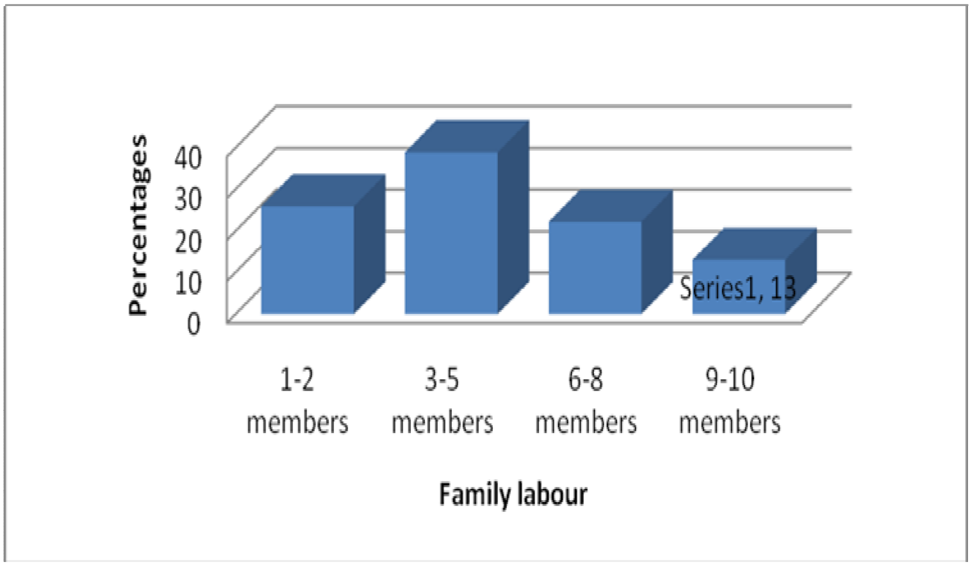


Source: *(research survey)*

From the figure 4.6 shows that, 31 percent, 24 percent, 30 percent, 9 percent, 6 percent, of the respondents had less than 0.5, 0.6-0.9, 1-2, 2.1-5 and 5.1-10 hectares they used in maize production respectively. Furthermore, 55 percent of the respondents used less than one hectare each in maize production. Implying that majority of the farmers involved in the study were small scale farmers and a negative contributing factor on the maize output in the study area.

The figure 4.7 show that 26 percent, 39 percent, 22 percent, and 13 percent used family labour of 1-2, 3-5, 6-8 and 9-10 family labour inputs in their individual maize production.

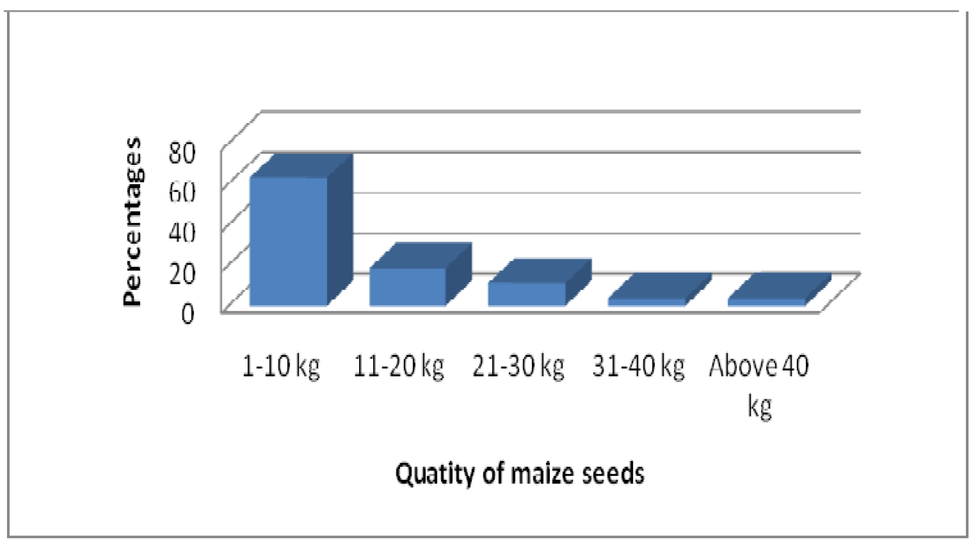
Figure 4.7 Results of family labour (man-per-day)



Source: *(research survey)*

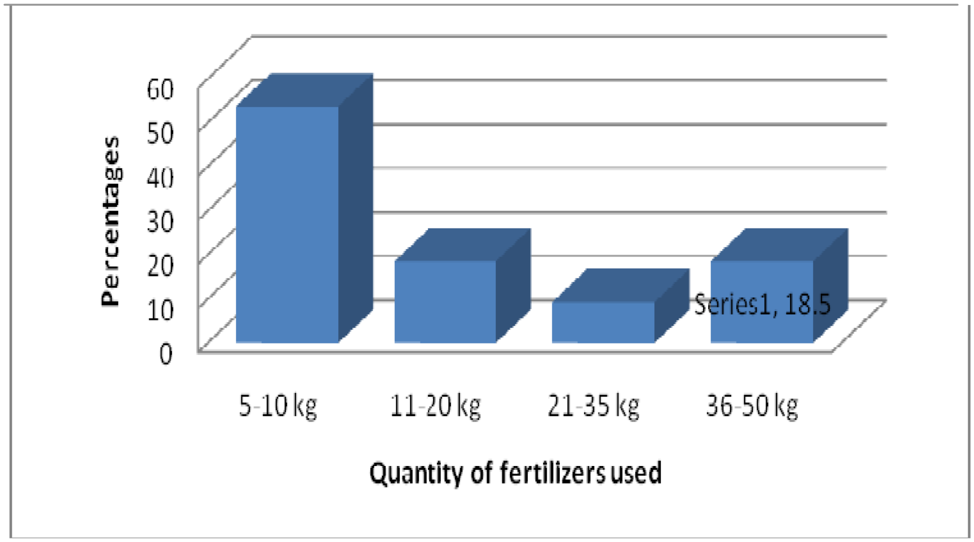
Figure 4.8 shows that, 63 percent, 18 percent, 11 percent, 4 percent and 4 percent of the respondents used 1-10, 11-20, 21-30, 31-40 and above 40 kg of seeds in maize production respectively.

Figure 4.8 Quantities of maize seeds used (kg)



Source: (research survey)

Figure 4.9 Quantities of fertilizers used (Kg)



Source: *(research survey)*

Figure 4.9 shows that, 54 percent, 18 percent, 9 percent, and 19 percent of the respondents used 5-10, 11-20, 21-35 and 36-50 kg of fertilisers in their individual maize production.

Figure 4.10: Number of bags of maize sold

Source: *(research survey)*

Figure 4.10,shows that 46 percent, 30 percent, 9 percent and 15 percent of the respondents involved in the study, sold less than 5 bags, 5-10, 11-16 and above 16 respectively.

From the table 4.1, 17 farmers use less than 0.5 hectares in maize production and their outputs are less than 10 bags of maize each. Also the results indicate that, 30 farmers out of the 54 involved in the study use farm sizes in the range of 0.1-0.9 hectares in maize production and their outputs are below 10 bags each. That gives an indication that, 55.6 percent of the farmers in the study area are small scale farmers who use less than one hectare in maize production.

4.4 The Bivariate analysis

The bivariate analysis was carried out to determine the relationships between the independent variables and the dependent variable(maize output) and the results are presented in the tabulation tables followed by their discussions.

Table 4.1: Farm size and maize output

Variable	Total number	Farmers producing >10 bags of maize	Percentage	
Farm size (ha)				
Less than 0.5	17	0	0.0	Pearson chi2(16) = 156.0271
0.6-0.9	13	0	0.0	Pr = 0.056
1.0-2.0	16	12	75.0	
2.1-5.0	5	5	100.0	
5.1-10.0	3	3	100.0	

Source: *(research survey)*

Furthermore, the results indicate that 24 farmers use 1-10 hectares in maize production and out of those only 4 farmers produce less than 10 bags of maize. Also only 3 farmers from the study area use 5-10 hectares in maize production and their outputs greater were than 10 bags of maize each. That gave an overall probability value of 0.056, meaning that there was no relationship between farm size and the maize output.

Table 4.2 Family labour and maize output

Variable	Total number	Farmers producing >10 sacks of maize	Percentage	
Family labour (man per day)				
1-2	15	0	0.0	Pearson chi2(16) = 162.8125
3-5	21	2	9.5	Pr = 0.000
6-8	12	12	100.0	
9-10	3	3	100.0	
Above 10	3	3	100.0	

Source: *(research survey)*

The results in table 4.2 show that 15 families use 1-2 family labour in maize production, 21 families use 3-5 family labour in maize production. From 36 families involved in the study, only 2 families had maize outputs above 10 bags. Only 18 farmers use family labour of 6 and above in maize production and their outputs are above 10 bags of maize each.

The overall probability value from the tabulations table 4.2 was 0.000, implying that there was a relationship between the family labour input and the maize output in study.

Table 4.3 Bags of maize sold and maize output

Variable	Total number	Farmers producing >10 sacks of maize	Percentage	
Bags of maize sold				
Less than 5	25	0	0.0	Pearson chi2(12) = 80.8253
5-10	16	7	43.8	Pr = 0.000
11-16	5	5	100.0	
Above 17	8	8	100.0	

Source: *(Research survey)*

The results from the table 4.3 indicate that, 25 farmers sold less than 5 bags of maize. 16 farmers sold between 5-10 bags of maize and 7 out of the 16 farmers, sold greater than 10 bags of maize. Furthermore the study results show that, 20 farmers out of 29 each sold greater than 10 bags of maize produced and the overall probability value of 0.000 was obtained, implying that there was a relationship between the number of bags of maize sold and the maize output in the study area.

Table 4.4 Quantities of seeds used and maize output

Variable	Total number	Farmers producing >10 sacks of maize	Percentage	
Quantity of seeds planted (kg)				
1-10	34	0	0.0	Pearson chi2(16) = 138.1500
11-20	10	10	100.0	Pr = 0.000
21-30	6	6	100.0	
31-40	2	2	100.0	
Above 40	2	2	100.0	

Source: *(research survey)*

From the table 4.4, the results indicate that 34 farmers used quantities of seeds in a range of 1-10 kg in maize production and their outputs were less than 10 bags of maize each. Only 20 farmers used 11 and above kilogrammes of seeds in maize production and their individual outputs were greater than 10 bags of maize. The overall tabulations show the probability value of 0.000 which means that there was a relationship between quantities of seeds used and the maize output in the study area.

Table 4.5 Quantities of fertilizers used and maize output

Variable	Total number	Farmers producing >10 sacks of maize	Percentage	
Quantities of fertilizers used (kg)				
5-10	29	0	0.0	Pearson chi2(12) = 85.0700 Pr = 0.831
11-20	10	5	50.0	
21-35	5	5	100.0	
36-50	10	10	100.0	

Source: *(research survey)*

The table 4.5 shows that, 29 farmers used 5-10 kilogrammes of fertilizers in maize production and their outputs were below 10 bags each. 25 farmers used 11 and above kilogrammes of fertilizers each in maize production and out of the 25 farmers, only 5 farmers produced less than 10 bags of maize. And the tabulation results show a probability value of 0.831 implying that there was no relationship between the quantities of fertilizers used and the maize output in the study conducted.

In conclusion, the family labour, number of bags sold, and quantities of seeds used had relationship with the maize output in the study conducted.

4.5 The Multivariate Analysis

The multivariate analysis was carried out to establish the effect of each independent variable on the total maize output. A log-log linear model which is a Cobb-Douglas production frontier function was fitted due to the type of data used.

Table 4.6 Results of the Cobb-Douglas model

F value=4.76, Prob(F)=0.0060, R-Squared=0.5694, Adj.R, Squared=0.4499, Root MSE=7.7792					
Output	**Coef.**	**Std. Err**	**T**	**P-value**	**95% C. I**
Lnfmsize	-1.6808	1.9702	-0.85	0.405	5.81997 2.45838
Lnflabor	5.9643	2.9387	2.03	0.050	0.20971 12.13837
Lnqseeds	5.9447	2.7927	2.13	0.047	11.81232 0.07710
Lnqfertilizers	6.05123	3.2486	1.86	0.079	0.7739 12.87636
Lnbsold	11.0117	3.5898	3.07	0.007	3.46995 18.55353
Cost.	-3.7824	8.1388	-0.46	0.648	20.8809 13.31603

Source: *(research survey)*

Table 4.6 shows that, farm size had a coefficient of negative 1.6808 which is in agreement with the hypothesis stated in chapter one, that there is a negative relationship between farm size and maize output. Also the variable had a probability value of 0.405 which is greater than 0.05, implying that the variable is statistically insignificant. We therefore conclude that there is no relationship between farm size and maize output in the study conducted.

Results of the family labour indicate that, it had a positive coefficient of 5.9643 which is not in agreement with the hypothesis stated in chapter one, that there is a negative relationship between family labour and maize output. Also the variable had a probability value of 0.050 which is not greater than 0.05, implying that it is statistically significant. So we reject the null hypothesis stated in chapter one and conclude that there is a positive relationship between family labour and maize output. Because a one percent increase in family labour, leads to an increase in maize output by 5.9643 percent. The results are not surprising in that they are in the agreement with the economic theory, which states that, as more and more units of labour are employed, other factors held constant; the total output increases provided the law of diminishing returns does not set in.

The results of the quantity of maize seeds used indicate that, it had a positive coefficient of 2.7927 which is not in agreement with the hypothesis stated in chapter one, that there is a negative relationship between quantity of maize seeds used and maize output. Also the variable had a probability value of 0.047, which is not greater than 0.05, implying that it is statistically significant. So we reject the null hypothesis stated in chapter one and conclude that there is a positive relationship between quantity of seeds used and maize output. Because a one percent increase in the quantity of seeds used leads to an increase in maize output by 2.7927 percent. The results are not surprising in that, they are in agreement with the economic theory, which states that as more and more units of labour are employed, other factors held constant the total output increases provided the law of diminishing returns have not set in.

Results of the quantity of fertilizers used indicate that, it had a positive coefficient of 6.05123 which is not in agreement with the hypothesis stated in chapter one, that there is a negative relationship between quantity of fertilizers used and maize output. Also the variable had a probability value of 0.079 which is greater than 0.05, implying that it is statistically insignificant. So we reject the null hypothesis stated in chapter one and conclude that there is a positive and statistically insignificant relationship between quantity of fertilizers used and maize output in the study conducted.

The results of the bags of maize sold indicate that, it had a positive coefficient of 11.0117 which is not in agreement with the hypothesis stated in chapter one, that there is a negative relationship between, bags of maize sold and maize output. Also the variable had a probability value of 0.007 which is not greater than 0.05, implying that it is statistically significant. So we reject the null hypothesis stated in chapter one and conclude that there is a positive relationship between bags of maize sold and the maize output. Because a one percent increase in bags of maize sold leads to an increase in maize output by 11.0117 percent. The results are not surprising in that, they are in agreement with the economic theory which states that the availability of the market of market produce results into stimulation of production which leads to an increase in the maize output.

The diagnostic statistical tests show that the probability of the statistics is 0.0060 which is less than 0.05. Which confirmed that the overall significance of the model used in the study, was good and indicating a good fit and the correctness of the specified distributional assumptions. The R^2 of 0.5694 shown in the results, means that the variables included in the study accounted for about 56.9 percent of the variations in maize production in the study area. Adjusted R^2 of 0.4499 shown in the model results, taking into account the degrees of freedom (number of observations minus number of variables), the independent variables account for about 45 percent of the variations in the total output of the maize production as measured in terms of bags.

4.4.1 The normality tests

Normality tests were conducted to examine whether the random variables used in the study were normally distributed. The mean, P-value, Kurtosis and Skewness of the variables were determined and from the table 4.7 shows that all the independent variables stated in the production function were, normally distributed in the model. And it was confirmed further from the normality test graph as shown in figure 4.11.

Table 4.7 The Normality tests

Variables	Y	X_1	X_2	X_3	X_4	X_5
mean	2.3518	2.3333	2.2222	1.9259	1.6666	1.9259
sd	1.1999	1.181	1.0931	1.078	1.064	1.1793
skewness	0.6183	0.5079	0.8629	0.8753	1.6444	0.8408
kurtosis	2.3971	2.4390	3.3184	2.4547	4.98	2.1176
p50	2	2	0.0021	0.0007	0.0032	1.06
min	1	1	1	1	1	1
max	5	5	5	4	5	4
se(mean)	0.1633	0.1608	0.1488	0.1468	0.1448	0.1605

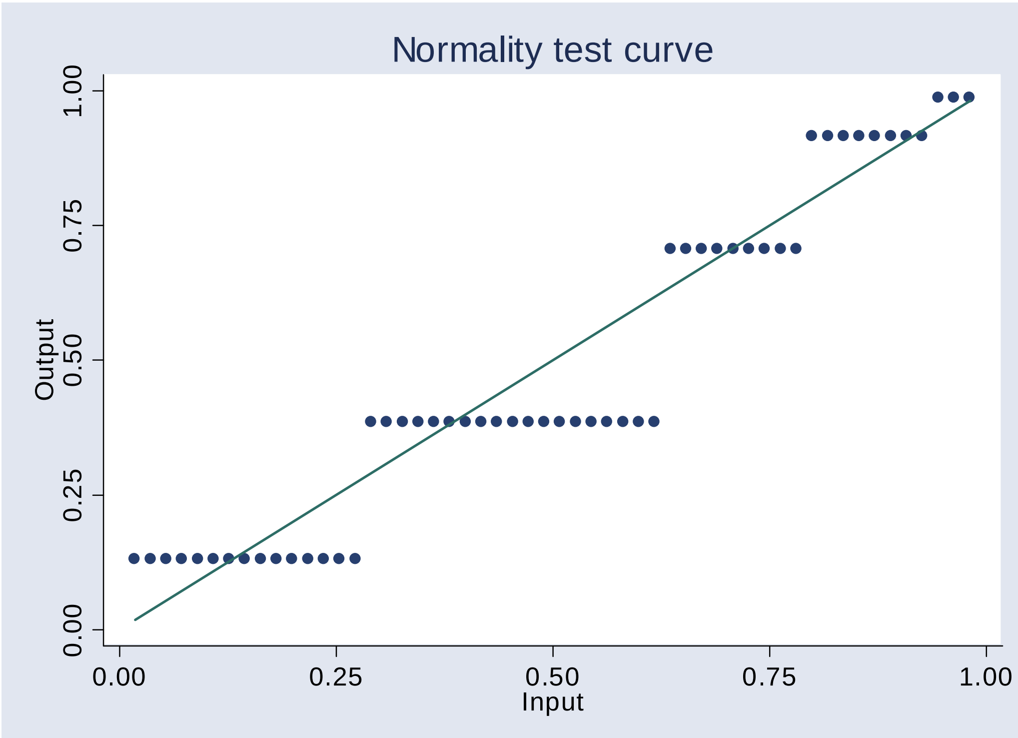
Source: *(research survey)*

Where:

Y= Maize output, X_1=Farm size, X_2=Family labour, X_3=Bags of maize sold, X_4=Quantity of seeds used, X_5=Quantity of fertilizers used.

Figure 4.11 shows a normal curve passing through scattered distribution of the independent variables. The dotted horizontal short lines represent the normal distribution of the independent variables. Therefore it can be noted that normal curve crosses all the variables meaning that these independent variables are normally distributed.

Figure 4 11: Normality test graph



Source: *(research survey)*

4.4.2 The Multicollinearity test

The Multicollinearity test was carried out to determine existence of any relationship among some or all the explanatory variables adopted in the Cobb-Douglas model used in this study. The results attached in appendix one, indicate that maize output had a statistical correlation ship with family labour, quantity of fertilisers used and number of bags of maize sold in a year. This positive relationship implies that if family labour, or quantities of seeds used in planting is increased, the total output of maize produced in the year also increases. Farm size was shown to have a correlation with family labour and quantities of seeds used. However, there was no perfect Multicollinearity between the variables that were adopted in the model.

CHAPTER FIVE

CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter deals with the conclusions, and recommendations drawn from the study to different stake holders.

5.2 Conclusion

The study examined the determinants of maize production in Uganda. A multistage sampling technique was used to select 54 maize farmers in the study area. Data were collected and subjected to inferential statistics (the linear function) which were used to determine the relationship between the dependent variable (maize output), the independent variables.

Results of the Cobb-Douglas model showed that family labour, quantity of seeds used and bags of maize sold were positive and statistically significant in the study related with coefficients of 5.9643, 5.9447 and 11.0117 respectively. The probability of the statistics from the model used was 0.0060 which is less than 0.05. And that confirmed the overall significance of the model used in the study, was good and indicating a good fit and the correctness of the specified distributional assumptions in this study.

5.3 Recommendations:

Based on the findings in the study area, the following are recommended:

The government should develop strategic policies to promote quality seed production in the country so that small scale farmers can acquire the required quantities and quality seeds and also be able to plant maize in time.

Also the government should develop a policy which will help farmers to attain quality family labour which they use in maize production.

Lastly, the government should develop a strategy of helping maize farmers to get reliable markets for their maize output such as exporting maize produce to international markets.

5.4 Suggestions for further Research

The study examined the farm size, family labour, quantities of seeds used, and quantities of fertilisers and bags of maize sold as the only determinants of maize production in Uganda. And this can lead to model misspecification because other factors such as family size and education of farmers were left out. Further research could include them in the study.

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