

**FINANCIAL FACTORS INFLUENCING THE ADOPTION OF MAIZE  
TECHNOLOGIES IN IGANGA DISTRICT, UGANDA**

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**AUGUST 2006**

## Declaration

This dissertation is my own original work and has never been presented to any institution for a degree award. The sources used to compile it are presented and where another person's work has been used it is acknowledged.

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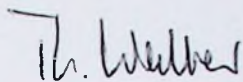
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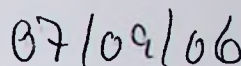
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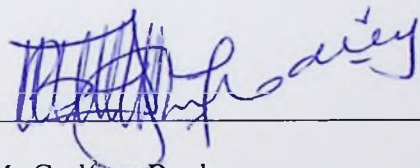
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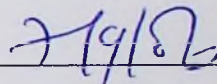
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## Dedication

To my beloved husband and children who have supported me in all ways.

## **Acknowledgement**

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**Acronyms and Abbreviations**

|       |                                                        |
|-------|--------------------------------------------------------|
| AEP   | Agricultural Extension Program                         |
| DAE   | Directorate of Agricultural Extension                  |
| FAO   | Food Agriculture Organization                          |
| GOU   | Government of Uganda                                   |
| MAAIF | Ministry of Agriculture, animal Industry and Fisheries |
| NAADS | National Agricultural Advisory Services                |
| NAARI | Namulonge Agricultural Animal Industry and fisheries   |
| NARS  | National Agricultural Research System                  |
| NARO  | National Agricultural Research Organisation            |
| NGO   | Non Governmental Organization                          |
| PMA   | Plan for Modernisation of Agriculture                  |
| SPSS  | Statistical Package for Social Scientist               |
| UNFA  | Uganda National Farmers Association                    |

## **Abstract**

The purpose of this study was to establish the relationship between the financial factors and the adoption of improved maize in Iganga district, Uganda. A conceptual framework was developed using the Independent and Dependent variables.

The objectives of the study were to identify the maize technologies, establish the level of perceived financial factors that influence the farmer's decision to adopt these technologies and to establish the relationship between financial factors and farmer's adoption of maize technologies that have been developed and disseminated by the National Agricultural Research Organisation (NARO) in Iganga district, Uganda.

The researcher used a cross sectional survey design. 88 respondents were selected using purposive sampling composed of adopters and non-adopters of the maize technologies in the area under study.

The study revealed that when the actual costs of inputs are low, farmers are likely to adopt the improved maize than when the cost is high. It was also revealed that when farmers perceive that there is a net profit in the sale of improved maize produce, they are likely to adopt than when they don't expect profit. The study further revealed that when farmers have access to credit facilities to support their financial requirements, they are likely to adopt the maize technologies than when they have no access to credit facilities. It was also revealed that when a farmer perceives that there is access to market for the maize outputs s(he) is likely to adopt the maize technologies because s(he) will be sure of a return on sale and the reverse is true.

Maize crop is an important cash and subsistence crop in Uganda and therefore the study recommends that the government needs to coordinate the implementation of the National Agricultural research Policy (2003) objectives that are geared towards addressing the needs and opportunities of the poor in the market driven environment.

## **CHAPTER ONE INTRODUCTION**

### **1.1 Background to the study**

Almost all kinds of business activities directly or indirectly involve the acquisition and use of funds, (Pandey, 1997). Pandey further advances that business enterprises secure capital they need and sell their goods and services to earn a profit. The three most important activities in a business venture are finance, production and marketing.

Accordingly, the cost of inputs, profit, market and financial capital are factors that influence the adoption of agricultural technologies world wide. Thus in case of low level of adoption of the maize technologies in Uganda, questioning the underlying financial factors becomes too difficult to ignore.

A study by Groote et al. (2002) on maize production trends in Ethiopia, Kenya and Tanzania shows that maize yields increased substantially (from 1 tons/ha in the early 1960' to 1.5 tons/ha) in the mid 1980's. This yield increase was attributed partly to the increase in the affordability of the improved maize seed varieties and fertilizers, which many farmers adopted over the years. However, despite the liberalization of the seed and fertilizer sectors, the adoption process has stalled in Kenya and Tanzania. In Ethiopia, where there was a strong credit program, adoption of maize improved in the late 1990's. However, when the maize price collapsed in Ethiopia in 1997 and 2001, there was a dramatic decrease in adoption in 2002.

It has been observed that for most crops in Uganda, yields are less than a third of their potential. Despite the strong promotion campaigns for new varieties by many national and international companies, farmers are still producing and exchanging seed informally. Among them are farmers who cannot afford the cost of seed coming out of the system and those who cannot

access the market to sell the produce (Kiwanuka, 2004). Such is the case of the farmer adoption of the maize technologies in Uganda.

Because of the importance of maize to food security, Ugandan Government has supported maize research, dissemination and application of research results from the 1920's (NARO Activity report, 1996). In spite of the fact that the Ugandan National Agricultural Research System has developed and released several production-enhancing technologies over the century, yields of most major crops at the farm level have been low (Serunkuma, 2005).

Although the area under maize has increased tremendously there has not been a corresponding increase in the farmer's yields. Multi-location research and demonstration trials by the Maize Research Program of the National Agricultural Research Organisation (NARO), along with the Agricultural Extension Program (AEP), Directorate of Agricultural Extension (DAE), Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), have made farmers aware of the increased yield and income benefits of the improved maize varieties of Kawanda Composite A, Longe 1, Longe 5 (Nalongo), Longe 2H, Uganda hybrid, Panar and Zimbabwe. Despite these efforts, farmer's average yields range from 0.8 to 1.5 ton/ha (Nanyeenya et al., 1997). Facts finding missions by MAAIF, FAO and NGO's have found that the inhabitants of these areas also experience food shortages resulting into famine like other regions without such potentials (FAO, 1997).

In Uganda, maize produce is affected by price fluctuations and at times goes as below as 200 UGX/kg during harvest and 700UGX/kg during period of scarcity. The cost of improved seeds is rather high 1300UGX/kg in the local markets, for an ordinary local farmer, compared to the local varieties which can be obtained through the barter system in the villages. Farmers are not

prepared for stocks because of cost of establishing the cribs is high. The cost of input materials such as fertilizers (2000UGX/kg/sq meter) and herbicides (4000UGX/kg/50kg) are high for an ordinary farmer hence limiting farmers to the local varieties (Eden, 2003).

While many technologies that yield many times the average farm yields already exist on research stations, their adoption rates by the farmers have been miserably low (PMA consultative group, 1998). It is therefore cause worthy to find out the extent to which the financial factors influence the adoption of maize technologies in Iganga district. This will help design the strategies to enhance their acceptability by farmers in Uganda.

**1.2 Statement of the problem**

Despite the governments support in maize research, dissemination and application of the research results from the 1920's, the adoption rates in Iganga district of different maize technologies are still lower than the application of the local maize.

Adoption rates in Iganga of different maize varieties grown from 1998 to 2002 show Longe 1: 35%, Uganda hybrid: 12%, Local: 45%, Longe 2H: 3%, Zimbabwe hybrid: 3%, Panar hybrid: 1%, Longe 5: 1%, NARO Annual report, (2003). Comparing the local variety with each of the maize technology, the adoption of the maize technologies is lower than the application of the local varieties in Iganga district.

Farmers in Iganga district are still using traditional indigenous practices. This has then rendered the maize technologies irrelevant and ineffective in Uganda (Akwang et al., 1999). Accordingly, there is concern as to whether the low adoption levels above have any relationship with the cost of inputs, expected net profit, access to market and access to credit facilities by both adopters and

non adopters. Therefore, the need to establish the relationship between the financial factors and the adoption of maize technologies in Iganga district, Uganda.

### **1.3 Purpose of the study**

The purpose of the study is to establish the relationship between financial factors and farmer adoption of maize technologies in Iganga district, Uganda.

### **1.4 Objectives of the study**

1. To identify the maize technologies developed and disseminated by NARO in Iganga district, Uganda.
2. To establish the level of financial factors perceived to influence the farmer's adoption of the maize technologies developed and disseminated by NARO in Iganga district, Uganda.
3. To establish the relationship between financial factors and farmer's adoption of maize technologies that have been developed and disseminated in Iganga district, Uganda.

### **1.5 Research questions**

1. What maize technologies been developed and disseminated by NARO in Iganga district, Uganda?
2. What is the level of financial factors perceived to influence farmer's adoption of the maize technologies developed and disseminated by NARO in Iganga district, Uganda?
3. What is the relationship between the financial factors and farmer's adoption of the maize technologies that have been developed and disseminated by NARO in Iganga district, Uganda?

## 1.6 Study Area

Iganga district is located at longitude 33° 22'E to 33° 97'E and latitudes 0° 17'S to 0° 75'N. It borders Tororo Districts in the East, Jinja District in the West, Kamuli District in the North and Lake Victoria in the south (Appendix 1). The national census carried out in the year 2002 revealed that the district has a total area of 3,100km, with a population density of 196 person/km.

Iganga is a district in the eastern region with annual rainfall ranging from 1,250 to 2200mm. Temperatures are always almost uniformly high over 21° C. It is one of the leading maize producing districts in Uganda (Bigirwa, 1992). The district is divided into four counties and 25 sub counties.

Iganga district was selected for this study for several reasons. First, Iganga is the major maize growing district in Uganda and the crop has gained importance as a major subsistence and commercial crop in the district (Mwesigwa, Kayobyio and Kyetere, 1999; Kisauzi and Sengooba, 1999 and Bigirwa, 1992). The district accounts for about 10% of the maize produced in Uganda. Second, since late 1980's, the maize technology verification and demonstration trials have been widely conducted by the maize technology program, both at Ikulwe District Farm Institute in Iganga and on farmer's fields throughout the district. Third, farmers in the district have received extension support from the AEP. It was considered that farmer's wide exposure to improved maize technology packages, along with the importance of maize as a source of food and income, should have favored the adoption of recommended maize technologies in the study area and would provide ample data for an analysis of the financial factors influencing the technology adoption.

### **1.7 Scope of the study**

The geographical scope of this study covered the maize technologies developed and disseminated in the sub counties: Bukanga, Bulamagi, Buyanga and Kibaale, Iganga district. Iganga is the major maize growing district where the crop has gained importance as a major subsistence and commercial crop in the district (Bigirwa, 1992). Therefore, Iganga district was purposively selected for the study because of its representative of maize growing areas in Uganda. Such an area gives an ideal setting for observation of the relationship between financial factors and farmer adoption of maize technologies.

The study time covered the maize technologies grown in the first cropping season of 2004.

The study was confined to establish the relationship between the cost of inputs, expected net profit, access to market and access to credit facilities by both adopters and non adopters; and the actual acceptance and continued use of the maize technologies in Iganga district.

### **1.8 Significance of the study**

The information will assist maize researchers and extension workers to continue developing technologies that are responsive to: low cost of production, attract high net profit, requires low financial capital and are attractive to the market. This will help the researchers achieve the objective for which the technologies are developed and disseminated in Uganda.

The analysis will also enable policy makers to ensure that measures and policies are put in place to abate the negative effect of the cost of maize production, financial capital that may be

hindering the acceptance of maize technologies in Uganda. This may favor the adoption of improved maize hence increasing food security in Uganda.

The study will help improve the researchers' knowledge, skills and understanding of the technologies developed and the dissemination process in Uganda.

The study will contribute to the existing literature about the finance concept and the adoption of the agricultural technologies in Uganda. This can be useful to the academicians and researchers for future study.

## **1.9 Conceptual Framework**

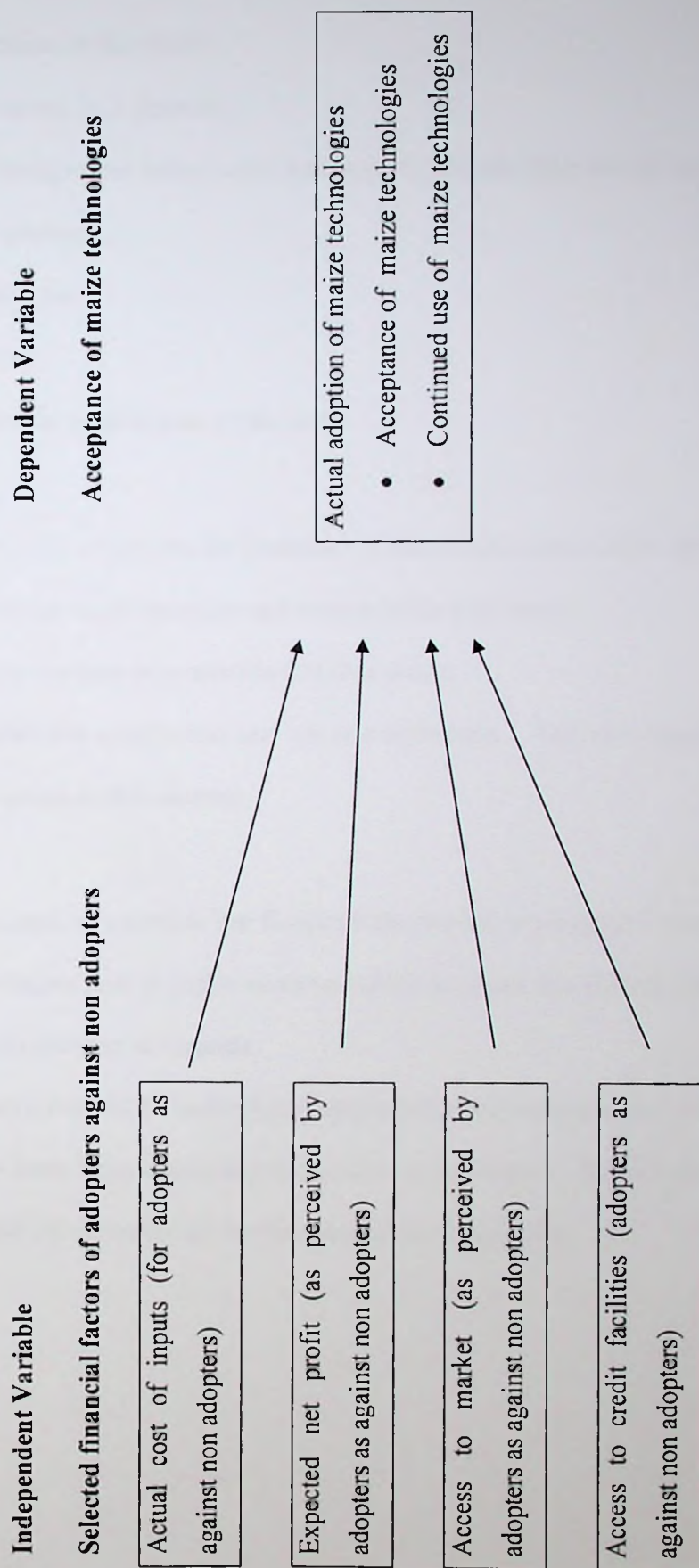
The framework involves two variables namely; independent and dependent variables.

**Independent variables:** The researcher has selected four financial variables from the broad concept of financial factors. The variables are cost of inputs, expected net profit, access to market, and access to credit facilities.

**Dependent variable:** actual adoption of maize technologies. This variable will be measured by acceptance and continuous use of the maize technologies.

Figure 1.9 below illustrates the relationship to be studied.

Figure 1.9 Conceptual Framework



Derived from the Financial Management Concept by I M Pandey, (1997) that the most important activities of a business venture are raising funds, allocating funds effectively and efficiently and maximising profit.

**1.10 Organisation of the study**

The study is organized in 5 chapters

Chapter 1 gives background information and in particular provides the following;

Statement of the problem,

Purpose and objectives,

Research questions,

Study area, scope and significance of the study

Chapter 2 provides the review on the literature on the related topic under study.

Chapter 3 outlines the methodologies and tools used in this study.

Chapter 4 provides the data presentation and discussion.

Chapter 5 provides the conclusion and recommendations. The recommended areas for future research are also given in this chapter.

A study was designed to establish the financial factors influencing the farmer’s decision to adopt the maize technologies and to make recommendations about the findings that will smoothen the technology transfer process in Uganda.

The study covered a total of 88 individual farmers from both adopters and non-adopters from the 4 sub counties that have been exposed to the maize technologies. A semi-structured questionnaire was developed and administered to the sampled farmer categories.

## **CHAPTER TWO    LITERATURE REVIEW**

### **2.0     Introduction**

This chapter attempts to analyze the literature on the adoption of maize technologies, its development and challenges in Uganda and elsewhere. This chapter presents literature on the maize technology adoption, financial factors and adoption of maize technologies.

### **2.1     Maize technology adoption**

From the early 1920's until mid 1940's, maize technologies were introduced mainly to Uganda from South Africa, Tanzania and Kenya. Further efforts in maize improvement were made in 1957 with emphasis on breeding for resistance to rust under the East African Agriculture and Forestry Research Organisation (EAAFRO). The present research effort in Uganda began in 1987; whereby, the present open pollinated variety starting with Longe 1 was developed and released in 1991.

Similarly, maize improvement efforts by isolated researchers and farmers in Kenya date back to the 1920s (Gerhart, 1975). The Government of Kenya, responding to demands from large scale maize farmers; initiated a systematic maize germ plasm improvement program in 1955 when it hired a plant breeder. M. N. Harrison, to develop late-maturity maize hybrids for high-altitude regions. The Kenya Government later expanded the program to develop early-maturing maize for marginal regions in 1957 and medium-maturing varieties in 1965. One of the greatest achievements of the maize research program over the years has been its provision of a range of improved maize varieties suitable for different agro-climatic conditions in Kenya (Karanja, 1996). Farmer adoption of high yielding and diverse varieties led to increased maize production through improved farm yields and expansion of maize area in Kenya. Karanja (1996) further states that the maize area and yield more than doubled, and production increased nearly five fold between

1955–59 and 1985–88. The area planted for improved seed increased from about 2% to 64% in 1985–88. The adoption and spread of hybrid maize contributed to increased household and national food security and improved incomes for maize farmers in Kenya.

Until the late 1980s, aggregate increases in maize production in Zambia were limited, despite a substantial expansion of hybrid maize adoption and fertilizer use. Since then, a wide range of improved maize varieties suitable for small farms has been released by agricultural research stations in Zambia. The potential thus exists for rapid improvements in productivity, income and welfare (Kumar, 2004).

Adoption is defined as the application of a technology as it is recommended (Ashyby, 1991). In its simplest term, Rogers (1982) describes adoption as a process of willingly accepting innovation by the members of a social system.

Adoption is referred to as the extent to which major components of recommended options were used (Bhuktan, 1997). The acceptability to the users of any research material used for application in the fields is vital for its success.

Adoption in this study is defined as the percentage of the agricultural technologies under use to the total agricultural technologies developed by research scientists in NARO.

By definition the rate of adoption is the relative speed with which members of a social system adopt a technology. Adoption is generally measured as the number individuals who adopt new idea in a specified time. Among members of a social system, some innovations diffuse from first introduction to widespread use in only a few years (Rogers, 1982).

Feder et al. (1985) defined adoption as the degree of a new innovation in the long-run equilibrium when a farmer has full information about the new technology and its potential. If the innovation is modified periodically, however, the equilibrium level of adoption will be achieved. Feder et al., go on to say that as the new technology is introduced, some farmers who have adopted will experiment with it before adopting.

Scholars of adoption rate say that technological improvement that involves a reduced cost to consumers attracts a rapid rate of adoption. Rogers (1982) explains that 30% of the variation in the rate of adoption is based on profitability.

Adoption and non-adoption of agricultural technologies can be characterized by efforts to combine indigenous and modern technologies. Farmers recognize the ecological, economic and social considerations and attempt to balance the productive and protective functions of farming technologies. These factors influence the way farmers use and reject particular farming technologies. Farmers do not simply adopt or reject technology options, they conduct various "trials" to better adopt these technologies in locally relevant ways. When a new technology is introduced into a given area, there will always be technology users, non-users and those who, after initial use, will opt to stop using it. Reasons for use, non-use and discontinued use of technologies by farmers among others include: economic, ecological, social, technical reasons (Bhuktan, 1997).

Eijnatten (1965), in his findings on maize research in Nigeria, points out that the indigenous West African maize materials has a far lower yielding performance than many of the introduced maize materials. Eijnatten goes on to say that worldwide several newly introduced varieties of maize proved to out yield the local maize varieties to a great extent. These materials are therefore considered to be of high importance for the breeding programmes.

## **2.2 Financial factors and adoption of agricultural technologies**

Agriculture is the dominant sector in Uganda's economy. In 1998/99 financial year, agriculture contributed the largest share of the domestic product which was 43% (MFPED, 1999). Agriculture also provides more than 95% of the country's export earnings and a livelihood to about 90% of the population. However, Uganda's agriculture registers one of the lowest yields in the world, in spite of favorable climatic conditions. Causes of food productivity include low levels of technology, low skills, inadequate extension services and poor farm gate prices which are on average, 17% of the retail value (MFPED, 1999). The small holder farmers cannot afford to purchase expensive technological inputs that can sustainably improve agricultural production (Katuromunda, 2001)

The farmer demand and continued use of the agricultural technologies considers the assumption that factors such as the cost of production, access to primary market, access to financial capital and earning a profit are favorable to the farmer.

Mwesigwa, Kayobyo and Kyetere, (1999) state that although improved varieties for maize exist in Uganda, they are not being used by the majority of farmers mainly due to high price of inputs, low output earnings, and lack of credit facilities. The cost of maize seed, input materials and services are important for increased crop yield and agricultural production; and in most cases guarantee household food security.

### **2.2.1 Actual cost of inputs and adoption of maize technologies**

Despite the crucial role of improved maize varieties in bettering the livelihood of small-scale farmers, farmer adoption of these technologies is often constrained by the cost of maize seed (Mwesigwa, Kayobyo and Kyetere, 1999). The factors constraining adoption of agricultural

technology from the NARS perspectives were an ineffective technology dissemination system, unavailability of inputs, and the high costs of technology inputs (Ojacor and Padde, 1998).

Rogers (1982) in his study states that, some technologies with high cost though highly profitable, may have economic aspects of relative advantage, which makes it the most important predictor of the rate of adoption.

The extent of yield increases or input cost reduction versus the costs of adoption relative to the current management practices is key in explaining the extent and rate of technology adoption. The financial attributes of the farm may also influence profitability and the adoption decision. Innovations profitability has been regarded as the primary motivation behind adoption (Cornejo and McBride, 2002)

A study by Sekoba et al, (1993) on the level of maize technology adoption in the Bako area, Ethiopia, revealed that unavailability of inputs, cash shortage and varietal improvement are important factors in the adoption process of maize technologies and require due considerations.

A study in Tanzania by Groote et al. (2002), states that the sales of maize hybrid was quite good in 1997 – 1999. It however dropped slightly one year later, because of farmers' low purchasing power which deterred the farmers from buying the seeds. Study findings by Nkonya et al. (1998), on the adoption of maize production technologies in northern Tanzania, revealed that the major factors affecting the adoption of improved maize varieties are input prices and the marketing system. Nkonya et al. go on to say that the biggest draw back of the new varieties in Tanzania is the high price of the improved seed that have forced many farmers to recycle hybrids. Farmers who recycled improved maize said that the rising certified seed and fertilizer prices coupled with

falling output price was the major reason for recycling improved maize seed. The purchasing power of maize produce, in Tanzania, fell from its highest level in 1984 to its lowest level in 1995. Fertiliser price increased rapidly during 1990 – 1994 when the government continued to withdraw its subsidy from the peak level of more than 50% in the early 1980's to 0% in 1993 (Nkonya et al., 1998).

### **2.2.2 Expected net profit and adoption of maize technologies**

Market value has a significant and positive influence on adoption of improved maize varieties. Since maize is not only a subsistence crop the market value of the produce influences the adoption of the new varieties.

The Bank of Uganda monthly economic and financial report (July 2004) indicated that the price of maize export on the world market declined from 2.9 million US\$ in March 2004 to 1.13 million US\$ in April 2004 and subsequently to 1.09 million US\$ in May 2004. This consequently affected the price of maize produce in Iganga district of which maize is a major export crop in the area.

In Africa, even though the supply of agricultural technology has increased in recent decades, the evidence of low adoption rates suggests low profitability of these technologies. In order to increase agricultural productivity and rural incomes, and to enhance economic growth it is essential that the technologies developed are profitable and used by the targeted users (Jayne et al., 2002). Under the classical model of adoption, the more an innovation will provide concrete economic benefits, the greater the adoption.

Farmer's technology choices are based on their subjective awareness of financial risk and uncertainty and risk takers are expected to be more likely to try the improved maize varieties (Feder et al., 1985). Farmers in the developing countries are sensitive to risks. If a farmer perceives that the improved variety is financially risky, there are lesser chances of its adoption (Jayne et al., 2003).

Adoption of maize in Kahramanmaraş, Turkey, is influenced by the educational level of farmers, income, farm size, travels to the nearest town, opinion leadership, use of extension personnel, credit use and agricultural investments. Adopters of maize pose these characteristics more than late adopters and non adopters (Ismet and Cuma, 2005).

Economic factors such as market conditions and riskiness (price or yield) of technologies are important determinants of profitability that explains their adoption and demand by end users (Ohajianya, 2005). In most of the developing countries, of the Sub Saharan Africa, the low effective demand for technology as reflected in the adoption rates by smallholders can imply the technology is not affordable to them or is not profitable to them (Vancley, 1992).

### **2.2.3 Access to market and adoption of maize technologies**

Market access is a powerful factor that drives decision making of a farmer and brings in resources to the agricultural industry since the Ugandan farmer does not only produce for food.

Fagan and Andrews (1977) stated that frustration in marketing of agricultural products in the developing countries has occurred again and again as it has become difficult to find a place on a world market for their exports. The International programmes have helped the farmers to increase production to the point where they produced more of some products than they could export

cause the markets were tied up by special agreements. This, in turn, frustrated the would be producers of agricultural exports on the world market.

Alletti, Baldwin and Dina (1956) carried out a study on maize in Nigeria and stated that initially maize research in Nigeria gained large scale importance since the 1950' because it found a ready market in the area and fetched a high price initially at harvest. With the increase of the crop on the market after harvest, prices however dropped and this caused a decrease in the acceptability of the improved maize crop in Nigeria.

The distribution and marketing system for both food and cash crops is generally poor in Uganda. Farmers are forced to store their produce for long periods resulting in spoilage. In some cases middlemen profit from the delay by offering lower prices to farmers (Bigirwa, 1992).

#### **2.4 Access to credit facilities and adoption of maize technologies**

As the Ugandan agricultural industry modernizes, access to financial capital through donors and financial institutions is important for farmers and farmer groups. Financial capital can assist in areas such as buying quality seeds, acquiring farm inputs, establish storage facilities other production inputs. Proper financing may give farmers an opportunity to begin producing in bulk for the Ugandan agricultural industry which would improve their overall incomes.

It is necessary for farmers and farmer groups to have access to financial capital at low interest rates. Many of the current interest rates are so high that there is small incentive for small scale farmers to apply for loans for fear of a long pay back period (Archambault, 2004).

If farmers are to be given a loan, such loans should be small to enable them manage the funds to repay the loan. Small loans however, involve high administrative costs that render them impractical. Commercial banks also require collateral that small farmers do not have (Nkonya et al., 1998). Miller (1975) observed that loans given to small maize farmers in Nigeria were mainly used for paying school fees and casual labor, rarely were they used to buy farm inputs. Anderson and Dillon (1992) note that the informal credit institutions play a vital role in low income countries when they are well documented and guided.

In Uganda, the credit programs are deemed to have been effective in improving agricultural performance and development.

The micro and small-scale enterprises in Uganda make a significant contribution to both household and national economies; more than 60% of the enterprises depend on their business for at least half of the income (CEEWA, 1999). In Uganda where 85% of the population live in rural areas, has experienced a rapid rise in rural and micro finance and the number of Micro Finance Institutions is 91 (Seibel et al., 2002). In Iganga district there is the Rural Micro Finance Enterprise Credit Scheme established in 1995 and other village banks. It has been agreed that the promotion of small-scale enterprise in Uganda is a means of bringing about sustainable development and alleviation of poverty (Tuan, 1996).

It has also been argued by Murray, (2000) that the interest rates charged by Micro Finance Institutions are too high and end up suffocating the performance and growth of micro finance clients.

Adoption of certified seed utilization in Philippines was estimated at 22.38% of the total area in 1994. Among the major reasons for the low adoption of new and improved maize varieties in Philippines compared to other Asian countries are: 1) inadequate seed production and distribution system; 2) very low purchasing power of the maize farmer; 3) lack of credit; 4) inaccessibility due to poor or lack of road system; and lack of knowledge on the distinct advantages of using certified seeds (Logrono, Lopez and Alejandro, 1996).

In addition to the perceived profitability, it is necessary to consider the capital required in adopting the innovation (Pannell, 2001). Many improved varieties require considerable capital on inputs such as seeds and agro-chemicals in order to achieve their yield potential. For this reason their adoption depends on market relations (Ellis, 1993). Farmers thus adopt innovations that are divisible in order to maximize utility of income through choice of variables that they control (Feder et al., 1985).

One of the important factors that make technology adoption not attractive is the credit constraint on the part of end users. Some of the technologies require a large investment in purchasing inputs, which the farmers “cannot afford” in the short run due to the cash flow constraints even though the inputs would pay for themselves if the farmers could obtain them. Thus, while the financial profitability analysis indicates that a technology is profitable even after taking into account the high costs of certain inputs, its adoption may be constrained by the limited cash in hand or lack of credit available on conducive terms to end users (Jayne et al., 2002). Thus access to credit can influence the adoption of the new varieties (Eden, 2003).

Loan sizes given out by Micro Finance Institutes, in Uganda, are too small and the loan period too short to foster performance in the agricultural business. The interest rates charged are very high thus reducing the return on the money borrowed (CEEWA, 1999).

Feder et al., (1985) further adds that when a significant cash investment is needed for the use of a new technology, then credit plays an important role in its adoption, particularly for small farmers without readily available cash. Thus the availability of credit has a direct bearing on the decision to adopt the maize technologies (Eden, 2003).

## **CHAPTER THREE                      METHODOLOGY**

### **3.0      Introduction**

The Chapter presents the methodology that was used in the study. It spells out the research design, study population, sampling design, research data, research instruments, data processing and analysis. This chapter also provides the problems encountered during the study.

### **3.1      Research design**

The study engaged a cross sectional survey to establish the relationship between the financial factors and the adoption of maize technologies in the area under study.

### **3.2      Study population**

The study population included farmers who have been exposed to maize technologies in the area under study. Secondary data available at NAARI revealed that the number of farmers with at least 0.5 acres of land under maize cultivation in the first cropping season of 2004 were about 35 households in each sub county in Iganga district.

### **3.3      Sampling design**

According to Kothari (1985), a researcher can purposively choose the particular units of the universe for constituting a sample on the basis that the small mass that he so selects out of a huge one will be typical or representative of the whole.

In light of the above, the sampling design used was purposive. A total of 88 farmers, 22 from each sub-county were purposively selected accounting for both adopters and non-adopters of maize technologies in the area under study. The 4 sub counties selected include; Bukanga,

Bulamagi, Buyanga and Kibaale as these are the ones where farmers have been exposed to maize research trials by the agricultural research scientists from NARO.

These were purposively selected on the principle that they are representative of the entire district and to gain insight into the problem by selecting only informed persons who can provide the maximum degree into the problem with comprehensive information.

This design was adopted because of the nature of the study, advantage of time and other resources inherent in the method of sampling.

### **3.4 Research data**

The study used both primary data and secondary data.

Primary data was collected from farmers and key research scientists in NARO while secondary data was collected from the documentation that is available on the maize technologies in Uganda and else where.

### **3.5 Research Instruments**

The researcher prepared the semi-structured questionnaires that were used to gather quantitative and qualitative data from the respondents. Interview guide was used to collect data from key research scientists in NARO about the maize technologies developed and disseminated by NARO in Uganda. A total of 88 questionnaires were prepared and delivered to 88 farmers in the four sub counties, which were duly completed and returned to the researcher.

The questionnaires from which data on these variables were derived are presented in Appendix 1.

### **3.6 Data Processing and Analysis**

Data obtained was coded, edited and aggregated at sub county level and analysed using the Statistical Package for Social Scientist, the SPSS computer package. Descriptive statistics were

used in order to determine the frequency of distribution, mean values and standard deviations of the variables identified by the farmers. Correlation coefficient and regression analysis were used to measure the strength and direction of the relationship as well as explain the movement between the adoption of maize technologies and the selected financial factors.

The dependent variable is the adoption and the independent variables are the actual cost of inputs, expected net profit, access to market and access to credit facilities. Below are the two techniques used to measure the relationship existing between the independent and dependent variables.

a) Correlation analysis

The correlation coefficient analysis was used to find whether there is any relationship between the selected financial factors and adoption of maize technologies in the area under study. This analysis was used to find quantitative measure of the degree of the relationship between the study variables. The analysis also defines the direction of the relationship between the study variables.

b) Regression analysis

The regression analysis was used to explain movements in the adoption of maize technologies as a function of movements in a set of the selected financial factors. This analysis attempts to explain the movement in adoption as a function of movements in either the actual cost of inputs, expected net profit, access to market and access to credit facilities.

### **3.7 Problems encountered**

There was difficulty in farmers' expressing themselves as far as constraints and challenges faced were concerned. This is explained by the fact finding that 60% of the respondents have not attained above primary level of education. The researcher, however, with the help of Extension agents explained patiently and this required more time and cost of stay in the field.

## CHAPTER FOUR

## DATA PRESENTATION AND DISCUSSION

### 4.0 Introduction

This chapter deals with presentation and discussion of findings. It comprises of both descriptive and analytical statistics. The findings are based on the questionnaire given to the respondents during the study.

This chapter consists of four sections: presenting the social economic information of the respondents; the findings on the research question one; the findings on research question two; the findings on research question three and the summary of the findings that are relevant to the study. The findings are presented in form of descriptive and inferential statistics. Where data could not be quantified, it is explained.

### 4.1 Demographic characteristics of the respondents in the area under study

#### 4.1.1 Farmers response to the questionnaire

A total of 88 questionnaires were delivered to the 88 respondents in the 4 sub counties, in four equal distributions, in Iganga district. After the exercise, 88 questionnaires were collected posing a response rate of 100%.

**Table 4.1.1** Farmers response to the questionnaire

| County       | Sub county | Frequency | Percent    |
|--------------|------------|-----------|------------|
| Luuka        | Bukanga    | 22        | 25         |
| Kigulu       | Bulamagi   | 22        | 25         |
| Bugweri      | Buyanga    | 22        | 25         |
| Busiki       | Kibale     | 22        | 25         |
| <b>Total</b> |            | <b>88</b> | <b>100</b> |

*Source: Primary data*

#### 4.1.2 Sex of Respondents

Information on the sex of the respondents was sought using the questionnaire and the results indicated that a big proportion of respondents is males 73 (83%) as compared to females 15 (17%). This is an indicator that men have more access to resources such as credit, farm inputs, and can easily access market for the maize produce as was noted by Kumar (2004).

#### 4.1.3 Education Level of Respondents

Information was sought on the education level of the respondents and below are the findings.

Table 4.1.3 Education level of the Respondents

| Education level     | Number of Respondents |             | Total     | %          |
|---------------------|-----------------------|-------------|-----------|------------|
|                     | Adopter               | Non adopter |           |            |
| No formal education | 3                     | 4           | 7         | 8          |
| Primary education   | 29                    | 17          | 46        | 52         |
| Secondary education | 23                    | 10          | 33        | 38         |
| Tertiary            | 2                     | 0           | 2         | 2          |
| <b>Total</b>        | <b>57</b>             | <b>31</b>   | <b>88</b> | <b>100</b> |

*Source: Primary Data*

From the research findings above, adoption and non-adoption is concentrated on the primary level of education. The results further show that the percentage of adoption of maize technologies varies greater with the educated farmers. This is an indicator that education gives greater ability to access credit and find means of raising financial capital to secure farm inputs, labor and other production costs.

#### 4.1.4 Age of Respondents

The information on age of respondents was sought using the questionnaires and below are the results.

Table 4.1.4 Age of the respondents

| Age          | Number of respondents |             |           | %          |
|--------------|-----------------------|-------------|-----------|------------|
|              | Adopter               | Non adopter | Total     |            |
| < 21         | 3                     | 3           | 6         | 7          |
| 21 - 30      | 15                    | 9           | 24        | 27         |
| 31 - 40      | 15                    | 9           | 24        | 27         |
| 41 - 50      | 12                    | 4           | 16        | 18         |
| 51 - 60      | 8                     | 5           | 13        | 15         |
| > 61         | 4                     | 1           | 5         | 6          |
| <b>Total</b> | <b>57</b>             | <b>31</b>   | <b>88</b> | <b>100</b> |

Source: Primary data

The above findings reveal that the majority of household farmers in the area under study were between 21 and 41 years for both adopters and non-adopters of maize technologies. The average age of the respondents was 38 and half years with the standard deviation of 13 years. The minimum age was 16 while the maximum age was 74 years. The maturity of the farmers influence their ability to make decisions in undertaking financial risks while adopting the maize technologies. They have the capacity to acquire financial capital to cover the production resources required and penetrate the market even when the price of maize has declined on the world market.

#### 4.1.5 Respondent's occupation

Data findings revealed that 91% of the farmers are engaged in farming as their major occupation and maize growing as part of their farming activities. Table 4.1.5 below shows the respondents occupation in the area under study.

Table 4.1.5 Respondents occupation

| Occupation       | No. of Respondents |              |           | %          |
|------------------|--------------------|--------------|-----------|------------|
|                  | Adopters           | Non adopters | Total     |            |
| Farming          | 52                 | 28           | 80        | 91         |
| Other activities | 0                  | 2            | 2         | 2          |
| Non response     | 5                  | 1            | 6         | 7          |
| <b>Total</b>     | <b>57</b>          | <b>31</b>    | <b>88</b> | <b>100</b> |

Source: Primary data

The above information reveals that the respondents who were engaged in farming as their main occupation adopt more maize than those engaged in other activities. This can be concluded that the more time one spends on his/her occupation the more decisions in raising and managing agricultural investments. This was also concluded by Ismet and Cuma (2005). Farmers have gained experience in the management of new technologies and have the capacity to acquire seeds and agro-chemicals, access to the market and work towards maximising profits from the sale of maize. The occupation of the farmer is therefore believed to have influenced the farmer's decision to adopt the maize technologies in the area under study.

This section aimed at establishing the social economic characteristics about the population under study. The results of this section show that more males (83%) than females are engaged in agricultural activities and 91% of the respondents are engaged in agriculture as their main

occupation. Study findings show that most farmers attained primary level and the average age of farmers in the area under study is 38 years. After establishing the social economic characteristics the study proceeds to answer the research questions of the study in the following sections.

## 4.2 Results of research question 1: What maize technologies have been developed and disseminated by NARO in Iganga district, Uganda?

Primary and secondary data was used in answering research question one. Farmers and Research Scientists provided primary data while secondary data was collected from documentation that included annual reports, quarterly technical reports, research bulletins and other research dissemination information materials in NARO Institutes and elsewhere.

### 4.2.1 Maize technologies accepted and used by farmers in the area under study

The respondents were asked to indicate the maize technologies that have been grown in the area under study in the first cropping season of 2004. The grown maize varieties were both local and improved and below were the findings:

Table 4.2.1 Maize varieties grown in the study area during the first cropping season of 2004.

| Maize variety | Number of respondents | %   | Cumulative % |
|---------------|-----------------------|-----|--------------|
| Local         | 31                    | 35  | 35           |
| Longe 1       | 26                    | 30  | 65           |
| Longe 2h      | 6                     | 7   | 72           |
| Longe 4       | 11                    | 12  | 84           |
| Longe 5       | 13                    | 15  | 99           |
| Pana          | 1                     | 1   | 100          |
| Total         | 88                    | 100 |              |

Source: Primary Source

From the results in table 4.2.1 above, it is apparent that the acceptance and use of improved maize in the area under study is higher than the local varieties. 65% of the maize grown was pure improved varieties while 35% was local variety. The respondents also revealed that Pana was introduced by other research organizations other than NARO.

The study revealed a bigger number of respondents (65%) adopted the improved varieties as also confirmed by Eden (2003) that about 50% of the farmers in the Eastern region plant improved maize seed.

Secondary data available at NAARI revealed that more maize technologies (Longe 6H, Longe 7H, Longe 8H and Uganda hybrid) were developed and disseminated by NARO between 1999 and 2002. This study concludes that the above maize technologies were not adopted during the first cropping season of 2004.

#### 4.2.2 Farmers using the maize technologies across sub counties in Iganga district

Adoption and spread of maize technologies varies across sub counties as shown in the table below.

Table 4.2.2 Maize varieties across sub counties in the area under study

| Sub county   | Number or respondents |          |           |           |           |          |           | %          |
|--------------|-----------------------|----------|-----------|-----------|-----------|----------|-----------|------------|
|              | Longe1                | Longe 2h | Longe 4   | Longe 5   | Local     | Pana     | Total     |            |
| Bukanga      | 9                     | 0        | 3         | 2         | 8         | 0        | 22        | 25         |
| Bulamagi     | 6                     | 0        | 5         | 2         | 9         | 0        | 22        | 25         |
| Buyanga      | 8                     | 0        | 0         | 6         | 8         | 0        | 22        | 25         |
| Kibaale      | 3                     | 6        | 3         | 3         | 6         | 1        | 22        | 25         |
| <b>Total</b> | <b>26</b>             | <b>6</b> | <b>11</b> | <b>13</b> | <b>31</b> | <b>1</b> | <b>88</b> | <b>100</b> |

*Source: Primary Source*

From the study findings above, Longe 1 and Longe 5 were recorded in all sub counties; Longe 4 was not recorded in Buyanga while Longe 2h and Pana were not recorded in Bukanga, Bulamagi and Buyanga sub counties.

The review on the existing literature and the results of the interview with the research scientists recorded that Longe 1, Longe 2h, Longe 4, Longe 5, Longe 6H, Longe 7H, Longe 8H and Uganda

hybrid were introduced and released to the above maize growing sub counties by the year 2002. The above results imply that Longe 2h and Longe 4 were introduced by NARO in the area under study but were adopted by farmers in some sub counties and not in others during the first cropping season of 2004. Longe 6H, Longe 7H, Longe 8H and Uganda hybrid were introduced and released to the above sub counties but were not used at all by farmers during the first cropping season of 2004.

22 (38%) of the adopters attributed the adoption of maize technologies to low costs of improved seed, 19 (33%) were attracted by the high yield price of the improved maize, 14 (25%) were attracted by other factors and 2 (4%) did not respond. This is an indicator that 71% of the adopters were attracted by the cost of seed and the yield price of improved maize. This study commends the government's effort to provide the improved seed at a low price.

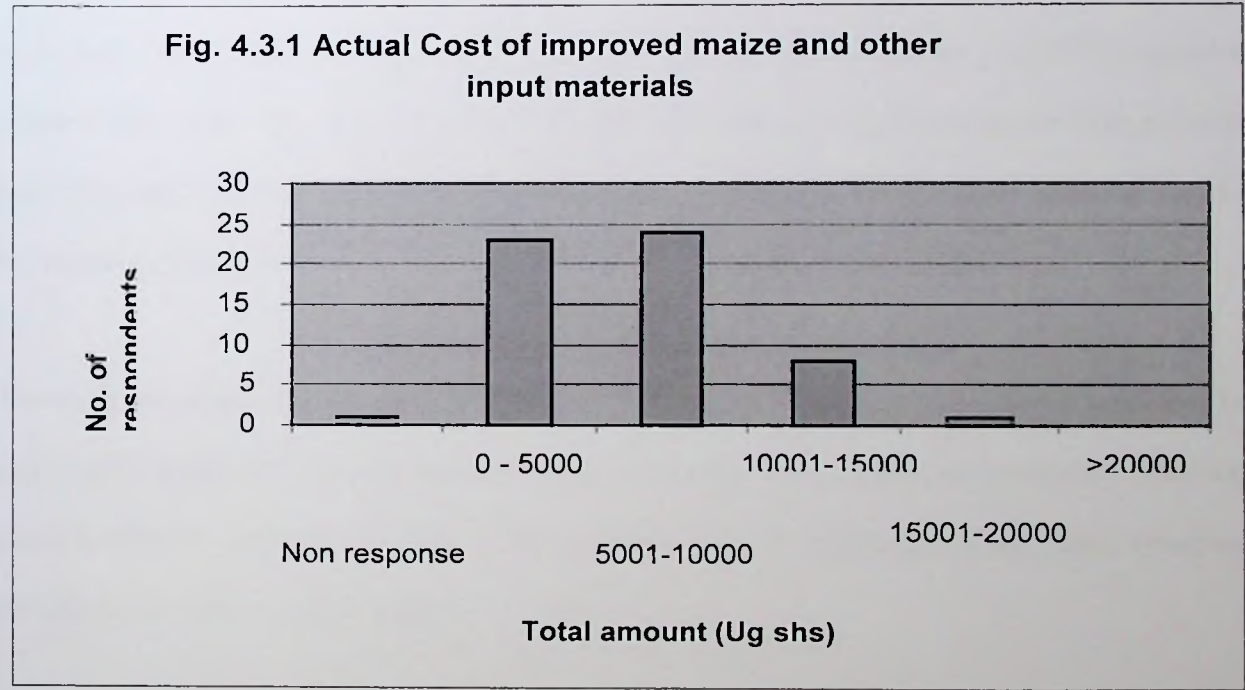
The findings of the study have established that the number of adopters (65%) of maize technologies is higher than number of non-adopters (35%). Having established the ratio of adopters to non adopter and the maize technologies developed and disseminated by NARO in the area under study, the next section deals with the level of perceived financial factors that influence the adoption of maize technologies in the area under study.

**4.3 Results of research question two: To establish the level of financial factors perceived to influence the farmer’s adoption of the maize technologies developed and disseminated by NARO in Iganga district, Uganda.**

Primary data was used to establish the level of financial factors perceived to influence the farmer’s decision to adopt the maize technologies in the area under study.

**4.3.1 Actual cost of improved maize seed and other inputs/materials for adopters as against non adopters**

The respondents were asked to indicate the cost of maize seed and other farm inputs during the first cropping season of 2004 and below are the findings.



Derived from the primary data

The results of the study indicated a high concentration of adoption of maize technologies when the costs of improved maize and farm inputs were less than Ug shs 10,000 and beyond that, the adoption went on reducing. This implies that at high costs of improved maize and farm inputs, the adoption of maize technologies is low.

Farmers from the area under study revealed that the cost of fertilizers and herbicide prices was high and a few farmers applied them. The study further revealed that the cost of improved maize seed was higher than the cost of the local seed. The local seed could be obtained through barter system while the improved seed could not. Farmers acknowledged that taking on an improved technology calls for the use of fertilizers, hire labor to do weeding, harvesting, threshing which attract costs.

In a similar study carried out in Kenya, Tanzania and Ethiopia, Groote et al (2002) revealed that farmers often report that input prices are too high, which means that prices are too high given their knowledge and expected returns. Inputs may not be available if transportation costs for inputs are too high and therefore farmers do not adopt the technologies to some extent.

The study therefore concluded that the farmer's affordability of maize technologies and other farm tools and implements was associated with the decision to adopt maize technologies. This study concurs with the findings of Ashby (1991) that high costs of technology inputs have constrained the adoption of maize technologies.

#### 4.3.2 Expected net profit from maize produce as perceived by adopters against non adopters

The respondents were asked to indicate whether they expect net profit from the sale of maize produce and below are the responses.

Table 4.3.2 Farmer's response on expected net profit from the sale of maize produce

| Response               | Number of Respondents |          | Total | %   |
|------------------------|-----------------------|----------|-------|-----|
|                        | Non adopters          | Adopters |       |     |
| No net profit expected | 25                    | 15       | 40    | 45  |
| Net profit expected    | 6                     | 42       | 48    | 55  |
| Total                  | 31                    | 57       | 88    | 100 |

Source: Primary data

It can be observed from the results above that the 25 farmers (28%) who do not expect to gain a profit from the sale of maize have not adopted maize technologies, while 42 farmers (48%) who expect to gain a profit from the sale of maize produce have adopted the maize technologies in the area under study. The study concludes that when farmers expect net profit from the sale of maize produce, they are likely to adopt the maize technologies in the area under study.

The evidence from this study revealed that farmers adopt the maize technologies because they expect an increase in farm (cash) income from sales of products in local markets as against the low costs of production and gives a quick return on investment.

The above findings are in line with the findings of Cornejo and McBride (2002) that an innovation's profitability has been regarded as the primary motivation behind adoption of maize technologies. Vanclay (1992) also confirmed that the higher the farmer perceives a high financial benefit the higher the adoption of maize technologies.

It can therefore be concluded that the higher the farmer expects a net profit from the sale of maize technologies the more likely s(he) is going to adopt.

### 4.3.3 Access to the market as perceived by adopters as against non adopters

The respondents were asked to indicate whether they had access to market for maize produce and below are the findings.

Table 4.3.3 Farmer’s access to the market for maize produce

| Response            | Number of respondents |          |       | %   |
|---------------------|-----------------------|----------|-------|-----|
|                     | Non-adopters          | Adopters | Total |     |
| No access to market | 26                    | 10       | 36    | 41  |
| Access to market    | 5                     | 47       | 52    | 59  |
| Total               | 31                    | 57       | 88    | 100 |

Source: Primary source

Study findings show that adoption is concentrated among farmers with high expectation in access to market for the maize produce. 47 (53%) farmers who perceive that there is market for the maize produce have adopted the maize technologies while 26 (29%) farmers who perceive there is no access to market for their produce have maintained their traditional indigenous practice in the area under study. Study findings revealed that maize produce was sold in homes and also in the local market. The respondents who sold from home reported that access to the local market was constrained by the cost of transport in the distance involved hence forced to sell from home. This exposed them to the exploitation of the middlemen who buy at low price. Non adopters reported that they abandoned the improved maize due to high cost of accessing the market and when they sell from home, the economic returns are very low.

Taking into consideration that maize is not only a subsistence crop, the market for the produce affects the adoption of the maize technologies, otherwise farmers stick to the traditional indigenous seeds. This study concludes that the farmers with access to the market for the sale of the maize produce are likely to adopt the maize technologies since the technologies are believed to have high yield attribute.

#### 4.3.4 Access to credit facilities by adopters as against non adopters

Adoption of maize technologies requires a considerable capital to acquire inputs such as seeds, fertilizers and farm tools in order to achieve their yield potential as was also stated by Pannell (2001).

The respondents were asked to indicate if they have access to credit facilities and below are the findings.

Table 4.3.4 Farmer's access to the credit facilities

| Response         | Number of respondents |           |           | %          |
|------------------|-----------------------|-----------|-----------|------------|
|                  | Non adopter           | Adopter   | Total     |            |
| No access        | 29                    | 13        | 42        | 48         |
| Access to credit | 2                     | 44        | 46        | 52         |
| <b>Total</b>     | <b>31</b>             | <b>57</b> | <b>88</b> | <b>100</b> |

Source: Primary data

Study findings above show that adoption of maize technologies is concentrated (50%) among farmers with access to the credit facilities in the area under study. Access to financial services was mentioned by farmers as a way to solve the problem of maize adoption. 68% of the non-adopters reported that they could have used the maize technologies if they had access to credit for buying improved seeds, fertilizers, pesticides, hired labor, irrigation facilities, storage facilities and other farm inputs.

Farmers revealed that financial services were concentrated in urban centers with unfavorable term's particularly high interest rates, short pay back period and ill-times repayment schedules.

Farmers also mentioned that credit secured from Micro Finance Institutes such as Pride Africa and Uganda Women Trust Fund, had not assisted them to support large scale farming, and that loans were too small to improve agricultural performance. The findings concur with the findings of Nkonya et al. (1998) that lack of collateral and cumbersome loan procedures were the major problems facing farmers trying to get loans from formal credit institutions in Tanzania. Nkonya et al. go on to say that commercial banks and other credit institution have no plans for providing loans to small farmers, especially small crop farmers. This study concludes that the farmer's limited access and affordability to/of credit is likely to influence the farmer's adoption of the maize technologies in the area under study.

This section that aimed at establishing the level of financial factors perceived to influence the adoption of maize technologies in Iganga district, concludes that the adoption of maize technologies is attributed to the cost of inputs, farmers perception of financial benefits arising from the sale of the improved maize, farmer's access to market and credit facilities. Having established the above, the study proceeds to establish the relationship between these financial factors and the adoption of maize technologies in the area under study.

#### 4.4 Results for research question three: To establish the relationship between financial factors and farmers adoption of maize technologies that have been developed and disseminated in Iganga District.

To establish the relationship between the financial factors and adoption of maize technologies, the correlation coefficient statistical method was used to describe both the magnitude and direction of the relationship.

The selected financial variables factors were correlated with the adoption indicators using the Pearson Correlation model to establish the magnitude and direction of the relationship, and below were the findings.

Table 4.4 (a) Pearson's Correlation Model

| Selected Financial variables |                     | Actual adoption of new maize technologies |
|------------------------------|---------------------|-------------------------------------------|
| Actual cost of inputs        | Pearson correlation | -0.77**                                   |
|                              | Sig. (2-tailed)     | .00                                       |
|                              | N                   | 88                                        |
| Expected net profit          | Pearson correlation | 0.28**                                    |
|                              | Sig. (2-tailed)     | .01                                       |
|                              | N                   | 88                                        |
| Access to market             | Pearson correlation | 0.53**                                    |
|                              | Sig. (2-tailed)     | .00                                       |
|                              | N                   | 88                                        |
| Access to credit facilities  | Pearson correlation | 0.68**                                    |
|                              | Sig. (2-tailed)     | .00                                       |
|                              | N                   | 88                                        |

\*\* Correlation is significant at the 0.01 level (2-tailed).

There is a significant inverse relationship ( $r = -0.77$ ,  $p = 0.01$ ) between the actual cost of input and adoption of maize technologies. The  $-0.77$  denotes a strong inverse relationship between adoption of maize technologies and the cost of inputs. This means that the adoption of maize technologies is dependent to a greater extent on the cost of inputs but in a negative direction. The higher the costs of inputs the less the adoption of maize technologies.

There is a positive relationship ( $r = 0.28$ ,  $p = 0.01$ ) between expected net profit from the sale of maize produce and the adoption of maize technologies. The  $+0.28$  denotes a weak positive relationship between adoption of maize technologies and the expected net profit. This means that farmers who expect net profit from the sale of improved maize produced are likely to adopt the maize technologies.

There is a moderate positive relationship ( $r = 0.53$ ,  $p = 0.01$ ) between access to market for improved maize produce and adoption of the maize technologies. The  $+0.53$  denotes a moderate positive relationship between adoption of maize technologies and the access to market for improved maize produce. This means that when farmers perceive that there is access to markets for improved maize produce, they are more likely to adopt the maize technologies.

There is a significant positive relationship ( $r = 0.68$ ,  $p = 0.01$ ) between access to credit facilities and adoption of maize technologies. The  $+0.68$  denotes a strong positive relationship between adoption of maize technologies and farmer's access to the credit facilities. The more the farmers have access to credit facilities, the more they are likely to adopt the maize technologies. This is attributed to the fact that farmers can relax their financial constraints and be able to afford the farm input materials.

From the above analysis, it is evident that generally the adoption of the maize technologies is influenced by the selected financial variables. This is in line with the findings of Bua, (1998); Nanyeenya et al., (1997); and Eden, (2003).

Given the above relationship between the selected financial factors and adoption of maize technologies, the prediction of the value of adoption given its covariance with the financial variables was established using the multiple regression analysis.

Multiple regression analysis was carried out for both the dependent and independent variables. Enter method was used since it is a simple method for estimating the regression equation. The purpose of the multiple regression analysis was to further discover the extent to which the dependent variable (adoption) is explained by the independent variable (selected financial factors: actual cost of inputs, expected net profit, farmer's access to market and access to credit facilities). The multiple linear regression prints statistics that describes the goodness of fit and relationships. The most important ones are Multiple R, R square, F – value and significant F-value.

Multiple R is the correlation coefficient between the dependent variable and the independent variable. If the value is closer to 1, the regressions model fits the data well.

R square, the square of multiple R explains the portion of the total variability in the dependent variable that can be explained by the independent variable.

F-value is the ratio of the mean square for regression to mean square for the residual.

Larger F values suggest that there is a linear relationship between the dependent variable and the independent variable. If the observed significance level associated with F-value is less than 0.05

at 5% level of significance, then there is a linear relationship between the dependent and independent variables. The table that follows shows the results of multiple regression analysis.

**Table 4.4 (b) Multiple regression model summary**

| Model | R    | R Square | Adjusted R Square | Std. Error of the Estimate | F - value | Sig. F |
|-------|------|----------|-------------------|----------------------------|-----------|--------|
| 1     | 0.86 | 0.75     | 0.74              | 0.25                       | 61.59     | 0.000  |

*Derived from the primary data using SPSS Computer package*

The regression test showed that the selected financial variables: cost of inputs, expected net profit, farmer's access to market and access to credit facilities are statistically significant predictor of adoption of maize technologies ( $F = 61.59$ , sig. 0.00). Therefore the relationship between adoption and the financial factors is very significant since at 5% level of significance any  $P$  – value less or equal to 0.05 implies a significant degree of relationship.

This therefore means that 75% of the variance in adoption can be accounted for by the selected financial factors that are: cost of inputs, expected net profit, access to market and access to credit. The remaining 25% is explained by other factors like the farmer and farmer characteristics, institutions and varietal characteristics that are likely to influence adoption of maize technologies.

The above findings are in line with the findings of Rogers (1992); Pannell (2001) and Ellis (1993) who discovered that technology adoption is dependant on the farmer's perception of the level of the economic benefits from the maize technologies. Farmer's capacity to acquire seeds and agro-chemicals, farmer's access to the market and farmer's perception to maximize profits from the sale of maize will influence the farmer's acceptance and use of the technologies. When a technology is

perceived to increase agricultural productivity and rural incomes and to enhance economic growth, it is likely to increase adoption of maize technologies, (Jayne et al., 2002).

To further explain the regression, table 4.4 (c) below shows the regression on the selected financial factors

**Table 4.4 (c) Multiple regression model**

| Variable            | Un standardized coefficient | Std. Error | Standardized Coefficients | t     | Sig. |
|---------------------|-----------------------------|------------|---------------------------|-------|------|
| (Constant)          | .78                         | .099       | 7.90                      | 7.90  | .00  |
| Cost of inputs      | -.18                        | .024       | -7.37                     | -7.37 | .00  |
| Access to credit    | .33                         | .063       | 5.30                      | 5.30  | .00  |
| Expected net profit | .12                         | .060       | 2.01                      | 2.01  | .05  |
| Access to market    | .16                         | .066       | 2.49                      | 2.49  | .02  |

Dependent Variable: adoption  
 Derived from primary data using SPSS

The independent variable that inflicts the greatest influence on adoption of maize technologies in the area under study according to table 4.4 (c) above follow the order of input costs, farmer’s access to credit facilities, access to market and the expected net profit from the sale of maize.

Using the data above in table 4.4 (c) a multiple regression equation for the relationship between adoption of maize technologies (dependent variable) and selected financial factors (independent variable), may be expressed as follows:

$$y = 0.78 - 0.18x_1 + 0.33x_2 + 0.12x_3 + 0.16x_4$$

Where  $x_1$  ,  $x_2$  ,  $x_3$  and  $x_4$  represent the financial variables.

In the equation,

$x_1$  - Cost of inputs

|       |   |                   |
|-------|---|-------------------|
| $x_2$ | - | Access credit     |
| $x_3$ | - | Net profit earned |
| $x_4$ | - | Access to market  |

### Interpretation

Adoption of maize technology is explained/accounted for by the identified indicators of the financial factors up to 0.22 or 22% and the remaining 0.78 or 78% is constant. This is supported by the findings of Bhuktan (1997) that farmers adopt the technology because they increase farm (cash) income from sales of products in local markets, increased economic value of farm products, quick returns on investment among other reasons.

$\beta$  gives the rate at which adoption of maize technologies changes in respect to a unit change in a given selected financial variables.  $\beta$  may be + or – depending on the direction of the relationship.

The above results imply that:

A unit increase in the cost of inputs of maize production leads to a reduction in the adoption of maize technology by 0.18. Farmers who find cost of herbicides, farm implements, improved maize seed, labor, storage facilities high are more likely not adopt the maize technologies. This is in line with the findings of Vanclay (1992) who stated that for a technology to be adopted, it has to be affordable to the users.

A unit increase in farmer's access to credit facilities will lead to an increase in adoption of maize technologies by 0.33. Access to credit is significant and the farmers in favor of adopting the maize technologies are raised by a factor of 0.33 compared to farmers who do not have access to credit in the area under study. Similar studies by Feder et al. (1985) and Eden (2003), showed similar influence for credit on adoption of maize technologies.

A unit increase in the level of farmer's net expected profit will lead to an increase in adoption of maize technologies by 0.12. Expected net profit from the sale of maize produce has a statistically significant impact on a farmer's choice to adopt the maize technologies. Farmers who expect to realize a profit from the sale of the maize produce are more likely (by a factor of 0.12) to adopt the maize technologies than farmers who do not. This is in line with the findings of Cornejo and McBride (2002) that an innovation's profitability is regarded as the primary motivation behind adoption. Rogers (1982) revealed that at least 30% of the variation in the rate of adoption of maize technologies is based on profitability.

Also, a direct relationship exists between the adoption of maize and farmer's access to market by 0.16. A unit increase in the farmer's perception of access to market will lead to an increase in adoption of maize technologies by 0.16. Sale of maize produce is one of the purposes of maize production in the area under study. Farmers who perceive that there is market for their produce are more likely (by a factor of 0.16) to adopt the maize technologies than farmers who do not.

#### **4.4 (d) Summary of the findings**

The model above has identified and prioritized the actual cost of inputs, farmer's access to credit facilities and farmer's access to market as the financial variables with a more significant influence on the adoption of maize technologies followed by expected net profit.

There is a positive relationship between adoption of the maize technologies and farmer's access credit facilities, farmer's access market for maize produce and expected net profit, thus a direct relationship between the adoption of maize technologies and the above financial factors. There is a negative strong relationship between the adoption of maize technologies and cost of inputs. This is true because the higher the cost of inputs, the lower the adoption of maize technologies, thus an inverse relationship between the variables.

The above findings are in line with the findings of Mwesigwa, Kayobyio and Kyetere, (1999); Nanyeenya et al. (1997) that the cost of inputs, credit facilities, market and expected profit facilitate the adoption of maize technologies.

## **4.5 Other Findings**

### **4.5.1 Farmer source of information about the maize technologies**

Study findings revealed that 33 (38%) of the respondents obtained information from the NARO Scientists, of this 28 (85%) were adopters. 44 (50%) of the farmers obtained the information from fellow farmers, of this 25 (57%) were adopters. 20 (23%) of the adopters revealed that they had been visited by the Research Scientists who taught them new methods of maize production. Comparatively, more farmers had got information from fellow farmers than NARO Scientists. This implies that farmers did not get sufficient information about the economic benefits of applying the maize technologies in the area under study. It is believed that improved maize increases yield and farmers would benefit from the increased earnings. This is likely to have affected the adoption of the maize technologies in the area under study.

### **4.5.2 Farmer's involvement in the research activities**

65 (35 adopters and 30 non-adopters) respondents reported that they had not taken part in on-farm trials, demonstration, and farmer training. 23 (22 adopters and 1 non-adopter) respondents had taken part in the on farm trials, demonstration, and farmer training. This then means the majority adopters had not taken part in the NARO programs, hence learning from fellow farmers. The study concludes that there were few maize farmers that took part in the on-farm trials and demonstrations. This implies that farmers have not been sensitised about labor saving technologies such as fertilizers and herbicides that would reduce on the cost of production. This has affected the adoption of the maize technologies in the area under study.

#### **4.5.3 Extension information to the farmers**

23 (40%) adopters continued to receive agricultural extension information from the extension agent in the district. The study revealed that the extension information was low. Extension information helps farmers to form groups. Farmer groups have the capacity to establish farm input supply stores at local level for seeds and other input tools at a low cost, a strong bargaining power for better maize prices on the market, can acquire loans, market in bulk to reduce on transport costs and have the capacity to save and lend to individual farmers at a low interest rate. The study concludes that lack of extension information may have contributed to low maize adoption rates in the area under study.

#### **4.5.4 Problems facing maize growing in the area under study**

Farmers were asked to state the problems encountered in Seed acquisition maize production, harvesting, and marketing. Farmers revealed that there were many improved maize dealers and some have fake seed. This could be one of the reasons affecting adoption in the area under study. One kilogram of improved maize was Ug shs 3000/, some farmers indicated that this cost was high for an ordinary farmer.

Some farmers indicated that the cost of transport to town to buy the seed was higher than the cost of maize seed. This increased the production cost. The study concludes that this has affected adoption of improved maize.

Farmers also indicated that storage outside their houses is feared because of thieves and termites. Acquisition of very strong structures for storage and herbicides to get rid of thieves and termites would increase the production costs for an ordinary farmer. The study concludes that this has contributed to non-adoption.

Farmers reported that they had been exploited by middlemen who buy maize produce from home. This has limited the farmer's exposure to the market where they can bargain for higher prices.

Having reported the problems encountered in maize production, the farmers were asked to give their recommendations, when responded to, would increase maize production and these are presented in the next chapter.

## **CHAPTER FIVE CONCLUSION AND RECOMMENDATION**

This chapter provides the conclusions and recommendations of the study and is based on the findings in chapter four.

### **5.1 Conclusion**

The study looked at the financial factors influencing the adoption of maize technologies in Iganga district, Uganda. The study was undertaken in Iganga district, one of the major maize growing districts where maize trials have been exposed to farmers by the agricultural research scientists.

The independent variables; actual cost of inputs, expected net profit, access to market, access to credit facilities by adopters as against non adopters and the dependent variable; Actual adoption of maize technologies were studied.

Adoption, which refers to the process of willingly accepting an innovation by members of a social system, was studied basing on the acceptance and use by farmers in the area under study.

The first objective of the study was to identify the maize technologies developed and disseminated by NARO in Iganga district.

The study findings revealed that Longe 1, Longe 2H, Longe 4, Longe 5, Longe 6H, Longe 7H, Longe 8H and Uganda Hybrid were released by NARO in the area under study. Study findings however show that only Longe 1, Longe 2H, Longe 4 and Longe 5 have been adopted by the farmers in the area under study.

The second objective of the study was to establish the level of perceived financial factors that influence the farmer's adoption of the maize technologies developed and disseminated in the area under study.

The study findings revealed that there is high concentration of adoption when the costs of inputs (less than Ug shs 10,000) are low. Adoption goes on reducing with an increase in the cost of inputs. Adoption is high (47%) when farmers expect a net profit from the sale of maize produce as compared to farmers who do not expect a net profit from the sale of maize produce. Adoption is also concentrated (53%) among farmers with high expectation in access to market for the maize produce. Adoption is concentrated (50%) among farmers with access to credit facilities as compared to those who do not have access to such facilities in the area under study.

The third objective was to establish the relationship between the financial factors and farmer's adoption of the maize technologies that have been developed and disseminated in Iganga district.

The study revealed the existence of a negative strong relationship between the actual cost of inputs and the adoption of maize technologies; when the costs of inputs are high the adoption is likely to be low. The study further revealed the existence of a positive relationship between the expected net profit by farmers and the adoption of maize technologies; when farmers expect net profit from the sale of maize produce, the adoption is likely to be high. There is a positive relationship between farmer's access to market and the adoption of maize technologies; farmers with access to market are likely to adopt as compared to farmers with no access to market to sell the maize produce in the area under study. The study finally revealed a positive relationship between farmer's access to credit and the adoption of maize technologies; farmers with access to credit are likely to adopt more than farmers with less access to credit facilities in the area under study.

F-value of 61.59 shows that the indicators of financial variable are statistically significant predictor of adoption of maize technologies, suggesting a strong probability of relationship in the population. Study findings revealed that actual cost of inputs, expected net profit, access to market, access to credit facilities all had statistically significant effects on the adoption of maize technologies.

The total variability in adoption of 75% can be accounted for by the financial variable indicators, while 25% is explained by other factors that may influence adoption of maize technologies.

The study findings were in line with the findings of many scholars of agricultural research adoption and the findings can be used to target specific problems in maize breeding program.

## **5.2 Recommendation**

From the experience and lessons learnt in the course of this study, several recommendations have been made.

The adoption of the maize technologies in Iganga could be improved by taking into account the following:

The agricultural research scientists should develop and provide labor saving technologies such as fertilizers; herbicides and draught power for tillage for the rural areas and ensure their application. This will reduce on the cost of production of adopting maize technologies in the area under study.

Uganda being an agricultural country where 85% of the population is employed, the government should put the focus on waive off tax from the agricultural harvest and importation of agricultural

tools to enable farmers acquire farm implements at low cost. This is likely to increase the adoption of maize technologies in the area under study.

The government through the implementing agencies should establish farm-input supplies at village level to provide farm materials at subsidized prices. Strengthening the network for input suppliers and dealers so as to ensure none of the groups is exploited can also be done at this level. This will minimize farmer exploitation through high costs of seeds and other inputs to encourage adoption of maize technologies in the area under study.

The government should support infrastructure rehabilitation and development such as roads and storage facilities. This will ease the flow of seeds and input materials, thus reducing the cost of transport and storage and ease the access to the market by farmers in the area under study.

The government should support Farmer Group Associations in order to build capacity in the rural areas. These Groups, once organized, are capable of managing areas of record keeping, production planning, credit mobilization, produce handling and storage, quality control and marketing which individual farmers may not handle. This will reduce on the costs of production and increase the farmers bargaining power for accessing credit facilities and market. It will also increase the farmers' net profits.

Farmer groups can be organized to produce and market in bulk; creating a conducive environment for rural marketing networks; develop strategies to eliminate exploitation by middle men; access to marketing information. This will reduce the non-adopters perception that there is no access to credit and market hence increasing their adoption of maize technologies in the area under study.

In addition, the farmer groups can be mandated to save and extend credit to farmers at a low interest. This will increase the farmer access to financial capital to enable them adopt the maize technologies.

Beyond the local farmer groups, the government can also build capacity in Micro Finance Institutions to manage savings and credit in rural areas. This can also take the form of provision of equipment, training in savings, and credit management. Farmers can be trained in the culture of saving whatever they earn so as not to depend on the external support. This will help farmer's access to credits as well as reducing the costs of production.

In addition, the government can also introduce and license local moneylenders, in the area under study, at low interest rates to provide small loans to the farmers to increase their investment capital.

Through cooperatives and Micro Finance Institutions, the government should revive its support to farmers by providing incentives such as credit in kind and friendly lending terms to farmers for purposes of promoting and encouraging technology transfer to even non adopters to increase their capital to enable them purchase the required farm implements. Cooperatives have the capacity to mobilize resources, market the produce, organize saving schemes and educate farmers on project planning, modern planting, farming methods, communal collection facilities and storage of maize outputs. This will encourage the farmers to adopt the maize technologies since they are provided at subsidized costs.

The government should support micro processing of maize produce at village level to add value instead of selling and exporting as raw materials. The government can also buy from farmers at high prices and export to regulate the fluctuating maize prices on the world market. This will

reduce the costs of production as well as improving on the access to the primary markets and international market by individual farmers and enabling them earn a reasonable net profit to encourage them adopt the maize technologies. This will also increase their perception of the availability of market hence increasing their adoption of the maize technologies.

### **5.3 Areas of further research**

NARO should carry out a study to find out why maize technologies released to farmers between 1999 and 2002 (Longe 6H, Longe 7H, Longe 8H and Uganda Hybrid) were not yet adopted in the first cropping season of 2004.

This study considered the case of Iganga district and in particular farmers who are exposed to the maize technologies. Hence there is need to conduct similar studies with other regions in Uganda by interested future researchers.

This study recommends that NARO should carry out a study to find out why few farmers have taken part in the on farm trials, demonstration, and farmer training that are intended for farmers in the area under study.

## References

- Akwang, A., Obuo, J., Okwadi, J., Oryokot, J., (1999), *Needs Assessment for Agricultural Research in the Lango Sub-Farming System: Annual Needs Assessment Report*, NARO. 59 – 60.
- Anderson. J. R. and Dillon, J. L. (1992). *Risk Analysis in Dryland Farming Systems*. United Nations Food and Agriculture Organisation (FAO) Rome, 9 – 38.
- Archambault, S., (2004). Factors influencing agriculture in Uganda. *Uganda Journal of Agriculture Sciences*. Vol. 1, No. 1, 9: 5.
- Ashyby, J. A. (1991). *Adopter and adapters: The participation of farmers in on-farm research*. In: *Planned change in farming systems: progress in on-farm research*. R., Tripp (ed), Chichester: John Wiley and Sons.
- Bank of Uganda, *Quarterly Economic Report*, June 2004, Volume 02/2005  
Credit to the private sector; 11:22 -25
- Baguma, D., Lubega, J., Tizikara, C. *NARO Annual Report 1998 – 1999*. National Agricultural Research Organization (NARO). 2000.
- Bhuktan, J. P. (1997). *Farmers changing the face of technology. Choices and Adaptation of Technology Options*,  
Farmer's Adaptation of Upland Agricultural Technology Options: 1, 4, 7  
Technology adoption or adaptation; 15 - 17  
Characteristics of technology users, non-users and drop out users; 21 - 22
- Bigirwa, G. (1992). *Characterisation of Ugandan Isolates of Exserohilum Turcicum from maize*. Msc, Thesis, University of Reading, U.K  
The maize crop; 1- 3  
Maize production in Uganda; 5 – 10

Bua, A. (1998). *Evaluation of participatory research approaches in the development, transfer and adoption of cassava technologies in Uganda:*

Limitations of Transfer of Technology; 38.

Adoption Theory; 72.

Byerlee, D. (1994). *Technology transfer system for improved Crop Management: Lessons of the future.* In *Agricultural Technology: Policy issues for the International Community* Ed. J. Underson. Wallingford, UK: CAB International

CEEWA, (1999). *The Role of Micro Finance Institutions in rural development in Uganda,*  
Participation of MFIs in the rural development in Uganda; 28 – 31.

Chema, S., Elon, G., Roseboom, J. (2003), *A review of key issues and recent experiences in reforming agricultural research in Africa.*

The NARS reform Agenda in Africa 3 – 26

Cornejo, J. F., and. McBride, W. D. (2002). *Adoption of bioengineered crops.* Agricultural Economic Report, No. 810.

Eden, F. M. (2003). *Factors affecting the adoption of maize crop in Masindi district, Uganda.* Research report, NAARI.

Eijnatten, C. L. M. Van. (1965). *Towards the improvement of maize in Nigeria.* The Initiation of research on maize in Nigeria, 1:1 – 2.

Ellis, F. (1993). *Peasant Economics: Farm households and agrarian development.* Cambridge University Press.

Fagan, M. Andrews, M. (1977). *Challenges for change.* Geographical approaches to selected world issues. Urgently needed: A global perspective, 9:174.

FAO Research and Technology Paper 2, (1997), *Agricultural Research policy and development.*

The Policy Environment for Agricultural Development, 2  
Technology Development and Transfer, 144  
Information Management and Dissemination, 152 – 153  
Factors Determining Adoption, 156 – 157

Feder, G., Just, E. R. and Zilberman, D. (1985). Adoption of agricultural innovations in developing countries: A survey. *Economic Development and Cultural change* 33: 255 – 298.

Galletti, R., Baldwin, K. D. S., Dina, I. O. (1956). *Nigeria Cocoa Farmers*. London Oxford University Press.

Gerhart, J. (1975). *The diffusion of Hybrid Maize in Western Kenya*. CIMMYT. Abridged Version. Mexico, D.F.: CIMMYT.

Groote, H. D., Doss, C., Lyimo, D. S., Mwangi, W. and Alemu, D. (2002). *Adoption of Maize Technologies in East Africa – What happened to Africa's emerging Maize Revolution?*  
Seed production and sales, 3.2, 11.

Gurajat, D. N. (1998). *Basic Econometrics*. 2<sup>nd</sup> Edition. New York, NY: McGraw-Hill

Ismet, B. and Cuma, A. (2005). Factors influencing the adoption of maize in Kahramanmaras province of Turkey. *Journal of Agricultural Economics*, Vol. 33: Issue s3. 431 - 440.

Jayne, T. S., Isaac, J., Minde, Gem Argwings-Kodhek, (2002). *Perspectives on Agricultural Transformation. Technology. A view from Africa*.  
Profitability and Agricultural Transformation, 86 – 87.  
Efficiency and Equity in Public investment in Agriculture, 155, 156

Karanja, D. D. (1996). *An economic and Institutional Analysis of maize Research in Kenya*. MSU Internation Development Working Paper, No. 57.

Katuromunda, S., (2001). *Compatibility and Productivity of forage legumes with maize and elephant grass in Peri Urban small holder crop-livestock production system*. Master's Dissertation, Makerere University, - Crop Science Department.

Kisauzi, D., Sengooba, T. (Eds.), (1999) *Organizational performance Assessment (OPA)*  
Task Force Report. National Agricultural Research Organization (NARO)

Kiwanuka, (2004). Seed security in Uganda; Current status, issues and challenges. *Journal of agricultural sciences*, 2004, 9: 23 – 30

Kothari, C. R. (1985). *Research Methodology*. Methods and Techniques 2<sup>nd</sup> Ed,  
Sampling Design, 68 – 84.

Kumar, S. K. (2004). *Adoption of hybrid maize in Zambia*: effects on gender roles, food consumption, and nutrition. IFPRI report.

Logrono, M.L. Lopez, E. L., Alejandro, F. (1996). Maize seed situation in the Philippines: A country report. *Philippine Journal of crop science*, 3: 61 – 70.

MAAIF (Ministry of Agriculture, Animal, Industry and Fisheries), Uganda, (2002): *Crop Production Handbook*. Entebbe, Uganda.

MFPED (Ministry of Finance, Planning and Economic Development), Uganda, (1999). Uganda Vision 2025. *Prosperous People, Harmonious Nation, Beautiful Country*. A Strategic Framework for National Development. Vol. 1.

National Long Term Perspective Studies Project. 9-51.

Miller, L.F. (1975). *Present and Potential Use of Credit by Small Maize and Rice Farmers in Western and Kwara States. Nigeria*. Technical Report AEE/74.3, Department of Agricultural Economics and Extension, University of Ibadan: pp. 43 – 54.

Mukiibi, J. K (2001). *Agriculture in Uganda*, Vol II,  
Crops, 55 – 69

Mugisa, O. R. (1992). *Districts Information Handbook*. Kampala, Uganda: Fountain Publishers.

Murray, M. V. (2000). *Role of Micro Finance Institutions in rural development in Uganda*,  
Comparison between MFI and Commercial Banks Interest rates; 12

Mwesige, K. R. (2001). *An economic surplus approach to priority setting for agricultural research in Uganda*. Master's Dissertation, Makerere University, - Crop Science Department.

Importance of Agriculture in Uganda; 12 – 15.

Organisation and Management of Agricultural Research; 17 – 18.

Mwesigwa, T. V. K., Kayoby, G., Kyetere, D. (1999). *Assessment of farmer's maize seed sources and management in Uganda*. Findings of an assessment study, NARO.

Issues adopted by farmers in Uganda. 28 – 30.

Nanyeenya, W. N., Mugisha-Mutetikka, Mwangi, W. and Verkuijl, H. (1997). *An assessment of factors affecting adoption of maize technologies in Uganda*. Findings of an assessment study, NARO

Nkoya, E., Xavery, P., Akonaay, H., Mwangi, W., Anandajayasekeram. P., Verkuijl. H., Martella. D., Moshi. A., (1998). *Adoption of Maize Production Technologies in Northern Tanzania*. Mexico D.F: International Maize and Wheat Improvement Center (CIMMYT), The United Republic of Tanzania, and the Southern African Centre for Cooperation in Agricultural Research (SACCAR).

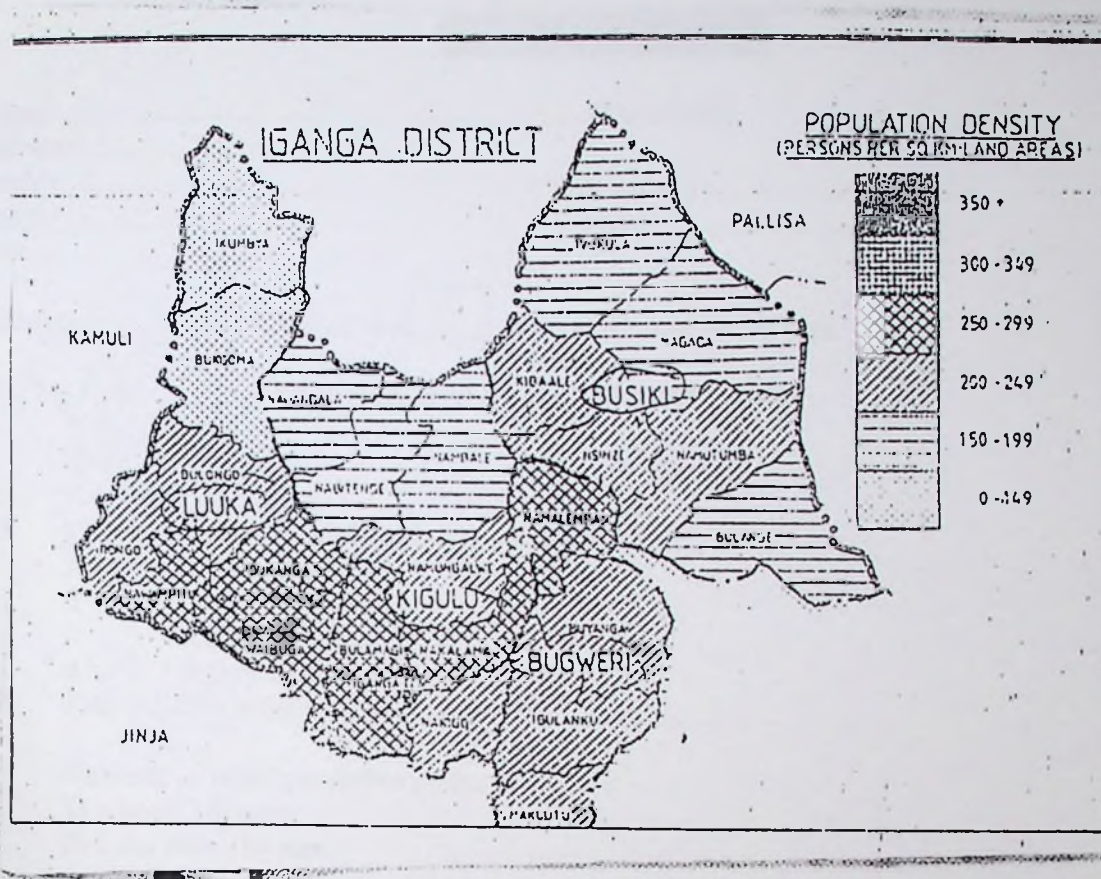
Ohajanya, D. O., (2005). Adoption of Improved Maize Varieties in Imo State as a two-stage decision process. Global approaches to Extension practice: *A Journal of Agricultural Extension*, Vol. 1, No.1. 91 – 96.

Ojacor, F. A., Padde, P. (1998) *Technology Development and Transfer*,  
Nation-Wide Survey, 6 – 7

- Ojok, L. R. (1994). *The rate of return to agricultural research in Uganda: The case of maize*. MSU International Development Working Paper No. 42. East Lansing, MI: Michigan State University.
- Okello, A.B., (1998). *A socio-economic analysis of irrigation technology adoption in Drought prone areas of Uganda*.  
 Technology choice and transfer, 10 – 11  
 Importance of technology transfer, 11 – 13.
- Ouma O. J., Murithi, M. F., Mwangi W., Hugo De G. (2002). *Adoption of maize seed & Fertilizer Technology in Embu District, Kenya*.  
 Farmers adoption and Disadoption of improved maize seed, 11
- Panell, D. J., (2001). *Uncertainty and adoption of sustainable farming systems*. SEA Working Paper 99/01. Agricultural Resource Economics, Nedlands.
- Pande, I. M. (1997). *Financial Management*, 7<sup>th</sup> Edition. Nature of Financial Management, 3 - 14
- Rogers E. M. (1962). *Diffusion of new Innovations*. New York, NY: New York Free Press.
- Sekoba, B., Negasa, A., Mwangi., Musa, A. (1993). *The level of maize technology adoption in the Bako area, Ethiopia*. National Maize Workshop of Ethiopia, Addis Ababa, 5 – 7 May 1992. FAO of the United Nations.
- Serunkuma, D. (2005). The adoption and impact of Improved Maize and Land Management Technologies in Uganda. *Uganda Journal of Agricultural Sciences: Agricultural and Development Economics*, Vol.2, No. 1. 67 – 84
- Tuan Anh Nguyen. (1996). *Expenditure policy analysis in Uganda*.  
 Contributing to the national food strategy to meet the challenge of poverty reduction and growth in Uganda, 56 – 68.

Vanclay, F., (1992). *Barriers to adoption: A general overview of the issues.* Rural Society, 2 (2): 10 – 12.

### MAP OF IGANGA DISTRICT



# FINANCIAL FACTORS INFLUENCING THE ADOPTION OF MAIZE TECHNOLOGIES IN IGANGA DISTRICT, UGANDA

## QUESTIONNAIRE

Name: .....(Optional).  
 District: .....  
 County: ..... Sub-county: .....  
 Parish: ..... Village: .....  
 Date: .....

Instruction: Please fill in or tick ☒ that which applies to you.

### SECTION A. SOCIO ECONOMIC INFORMATION

- A.1 Respondent's sex  
 Male ☐ Female ☐
- A.2 Age \_\_\_\_\_ years
- A.3 Formal education (highest Level attained)  
 1. No formal education  
 2. Primary education  
 3. Secondary education  
 4. Tertiary education
- A.4 Respondents occupation.....
- A.5 Number of family members who are  
 1) Above 18years  
 2) Less than 18years
- A.6 What is the household size?

### SECTION B MAIZE PRODUCTION

- B.1 Total area owned .....acres
- B.2 Area cultivated last season .....acres
- B.3 Area under maize production last season ..... acres
- B.4 Did you grow any improved maize varieties last season?  
 Yes ☐ No ☐
- B.5 If yes, what was the area under improved maize varieties.....acres
- B.6 How many years have you been growing maize?  
 1) >5years  
 2) 6 – 10 years  
 3) 11 – 15years  
 4) > 15years
- B.8 What is the purpose of growing improved maize varieties?  
 1) Cash ☐ 2) Food ☐ 3) Both ☐
- B.7 What is the main source of labour for growing maize?  
 Family ☐ Hired ☐ Both ☐

## SECTION C: CROPPING SYSTEMS, YIELD FOR MAIZE LAST SEASON AND INPUTS USED

### C.1 Maize cropping systems and yield

| Maize Variety                                      | Total Acreage | Total Amount harvested | Estimated yield (Kg/acre) |
|----------------------------------------------------|---------------|------------------------|---------------------------|
| C.2 Pure improved variety                          |               |                        |                           |
| C.3 Mixed variety                                  |               |                        |                           |
| C.4 Pure local variety                             |               |                        |                           |
| C.5 Intercrops (specify crops and maize varieties) |               |                        |                           |
| .....                                              |               |                        |                           |

### C.2 Cost of input materials for improved maize production

| Input type                                                  | Varieties/<br>agrochemical | Input<br>source     | Total amount used/<br>applied (kg or litres) | Unit cost | Total value<br>(ug shs) |
|-------------------------------------------------------------|----------------------------|---------------------|----------------------------------------------|-----------|-------------------------|
| 1. Cost of improved seed and other inputs/materials         |                            |                     |                                              |           |                         |
| Local seed                                                  |                            |                     |                                              |           |                         |
| Improved seed                                               |                            |                     |                                              |           |                         |
| Organic fertilisers                                         |                            |                     |                                              |           |                         |
| Inorganic fertilisers                                       |                            |                     |                                              |           |                         |
| Pesticides                                                  |                            |                     |                                              |           |                         |
| c.3. Cost of fixed inputs for improved maize production     |                            |                     |                                              |           |                         |
| Input type                                                  | Number of<br>inputs        | Year of<br>purchase |                                              | Unit cost | Total cost              |
| Hand hoes                                                   |                            |                     |                                              |           |                         |
| Pangas                                                      |                            |                     |                                              |           |                         |
| Sprayers                                                    |                            |                     |                                              |           |                         |
| Ox-ploughs                                                  |                            |                     |                                              |           |                         |
| Irrigation                                                  |                            |                     |                                              |           |                         |
| Others (specify)                                            |                            |                     |                                              |           |                         |
| c.4 Labour employed and costs for improved maize production |                            |                     |                                              |           |                         |
|                                                             |                            | No. of<br>workers   | No. of days                                  | Cost/day/ | Total cost              |
| Land preparation                                            |                            |                     |                                              |           |                         |
| Seed bed<br>preparation and<br>planting                     |                            |                     |                                              |           |                         |
| Fertilizer<br>application                                   |                            |                     |                                              |           |                         |
| Transporting to the<br>market                               |                            |                     |                                              |           |                         |
| Marketing                                                   |                            |                     |                                              |           |                         |
| others (specify)                                            |                            |                     |                                              |           |                         |
| Total cost                                                  |                            |                     |                                              |           |                         |

C.5 Do you store improved maize grain after harvest?  
Yes ☐ No ☐

If yes, what storage means do you use?

- 1) Local granary
- 2) Residential house
- 3) Improved granary
- 4) Others (specify).....

Why do you prefer that type of storage means above?

- 1) Availability of funds for construction? Yes ☐ No ☐
- 2) Construction done on credit? Yes ☐ No ☐
- 3) Others (specify) .....

#### SECTION D: SUPPORT SERVICES (EXTENSION AND CREDIT)

D.1 Where did you get the knowledge of the maize varieties?

- 1) NARO
- 2) Other Research Institutions
- 3) Other farmers
- 4) Others (specify) .....

D.2 Do you have access to credit?

Yes No

If no, what is your other source of funding for producing maize?

- 1) Own savings
- 2) Sale of crops/animals
- 5) Others (specify)

D.3 Did you acquire loan for improved maize production last season?

Yes ☐ No ☐

D.4 If yes, how much money did you receive? .....(Amount in Ug shs)

D.5 Is it profitable to use credit on maize production?

Yes ☐ No ☐

If not profitable, why?

- 1) Interest rates high ☐
- 2) Pay back period ☐
- 3) Risky ☐
- 4) Others (specify) .....

## SECTION E: MAIZE MARKETING AND UTILISATION LAST SEASON

| Maize variety | Name | Amount produced | Amount consumed(kg) | Amount given away | Amount sold | Unit price (Ug shs) | Total value (Ug shs) |
|---------------|------|-----------------|---------------------|-------------------|-------------|---------------------|----------------------|
|               |      |                 |                     |                   |             |                     |                      |
|               |      |                 |                     |                   |             |                     |                      |
|               |      |                 |                     |                   |             |                     |                      |

E.2 Does maize fetch good prices? (good = profitable)

1) Yes ☐ 2) No ☐

E.3 Do you always sell the surplus?

1) Yes ☐ 2) No ☐

If yes,

E.4 What is the distance to the market? ..... (km)

E.5 What was the means of transport to the market during the last season?

.....

E.6 What was the cost of transporting maize grain to the market during the last season?

.....

## SECTION F ADOPTION OF IMPROVED MAIZE VARIETIES (Adopters only)

F.1 How long have you been growing improved maize?

.....

F.2 What proportion of land was devoted to improved varieties last season/year?

| Year/Season | Variety | Total acreage under maize production | Area under improved varieties | Acreage under local/ mixed varieties | Seed rate (kg) |
|-------------|---------|--------------------------------------|-------------------------------|--------------------------------------|----------------|
|             |         |                                      |                               |                                      |                |
|             |         |                                      |                               |                                      |                |
|             |         |                                      |                               |                                      |                |

| Variety | Cost of seed | Number of extension visits during growing season | Market price for maize that season (Ug shs) | Cost of agro-chemicals |
|---------|--------------|--------------------------------------------------|---------------------------------------------|------------------------|
|         |              |                                                  |                                             |                        |
|         |              |                                                  |                                             |                        |
|         |              |                                                  |                                             |                        |

F.3 Why do you prefer each of the above varieties grown? (Use codes below)

| Improved variety | Reasons |
|------------------|---------|
|                  |         |
|                  |         |
|                  |         |

- 1) Fetches high market price
- 2) Low seed price
- 3) Availability of credit
- 4) Others (specify).....

F.4 If you have stopped growing improved varieties, how long ago did you stop growing them? .....(Years ago)

F.5 What is the main reason for abandoning improved varieties?

- 1) High cost of seed. ☐
- 2) Unprofitable to grow/ low market price ☐
- 3) No credit facilities. ☐
- 4) Others (specify)

## SECTION G: FARMER PARTICIPATION IN RESEARCH

G.1 Number of times farmer participated in adaptive research trials, demonstrations, training courses, field days in previous years?

| Activity                 | Number of times |
|--------------------------|-----------------|
| Adaptive research trials |                 |
| Demonstrations           |                 |
| Field days               |                 |
| Training courses         |                 |
| Others (specify).....    |                 |

G.2 Are you aware of research activities on maize?  
Yes ☐ No ☐

If yes,  
From where?

.....

G.3 What type of maize research activities was carried in the area?

- 1) Demonstrations ☐
- 2) Field days ☐
- 3) Training courses ☐
- 4) Others (specify).....

G.3 Did you participate in any of these activities?  
Yes ☐ No ☐

If yes, specify which activity.....

G.4 In what way do you actively participate in maize research activity?

- 1) Plant demonstrations ☐
- 2) On farm trials ☐
- 3) Planning and deciding research priorities ☐
- 4) Others (specify) .....

G.5 How regularly do researchers visit you?

- 1) Once a month ☐
- 2) 4 times a month ☐
- 3) More than 4 times a month ☐

G.6 Do you receive extension information?

Yes ☐ No ☐

G.7 What is the main source of extension information?

- 1) Extension staff ☐
- 2) Other farmers ☐
- 4) Researchers ☐
- 5) Others (specify).....

G.8 How many times did extension agent visit your farm during the last season?  
.....times

G.9 What new information did he/she bring during the visit?

- 1) Taught new methods of production ☐
- 2) Find out production problems ☐
- 3) Carry out demonstrations/trials ☐
- 4) Others (specify) .....

## SECTION H:

H.1 What major improved maize seed acquisition problems do you encounter?

- 1)
- 2)
- 3)

H.2 Suggest ways of solving them in H.1 above.

- 1)
- 2)
- 3)

H.3 What major maize production problems do you encounter?

- 1)
- 2)
- 3)

H.4 Suggest ways of solving them in H.3 above.

- 1)
- 2)
- 3)

- H.5 What major maize harvesting problems do you encounter?  
1)  
2)  
3)
- H.6 Suggest ways of solving them in H.5 above  
1)  
2)  
3)
- H.7 What major maize marketing problems do you encounter?  
1)  
2)  
3)
- H.8 Suggest ways of solving them in H.7 above  
1)  
2)  
3)
- H.9 What problems do you encounter in storing the maize grain?  
1) Pests ☐  
2) Expensive to maintain ☐  
3) Storage structures expensive ☐  
4) Others (specify).....
- H.10 Suggest ways of solving them in H.9 above  
1)  
2)  
3)

**Thank You**

**Interview guide for Key NARO Maize Research Scientists**

- 1 What maize research technologies have been developed and disseminated by NARO in Iganga district?
- 2 What are the attributes of the maize technologies released to farmers in Iganga district?
- 3 What are the major constraints/ challenges faced in the maize technology transfer process in Iganga district?
- 4 In your view, what possible measures can be taken to solve the mentioned problems?
- 5 What are the achievements so far made in the dissemination and adoption of maize technology in Uganda?
- 6 What are your future plans for increasing the adoption of maize technologies in Iganga district.

Thank you for your support

**Makerere University Business School**

**P O Box 1337,**

**Kampala**

22<sup>nd</sup> October 2004

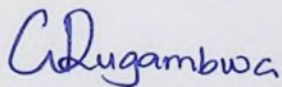
Dear Sir/Madam

**Re: Letter of Introduction**

I am a graduate student of Makerere University Business School, Kampala. In partial fulfillment of my academic requirements for a masters Degree in Finance and Accounting, I am carrying out a research of financial factors influencing the adoption of maize technologies in Iganga district.

I would kindly ask you to avail me with the necessary information to enable me put forward my findings and recommendations to enable an efficient and effective maize technology transfer process in Uganda.

Thank you for your invaluable support.



Grace Busingye Gertrude Rugambwa  
MSc (Finance and Accounting) Student  
Makerere University Business School  
KAMPALA