SELECTED FACTORS INFLUENCING SUSTAINABILITY OF CEREAL BANKS AMONG MAIZE FARMER GROUPS IN KIMILILI SUB-COUNTY, KENYA

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DECLARATION AND RECOMMENDATION

Declaration

I declare that this thesis is my original work and has never been presented to any university or institution for any academic award.

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Recommendation

This thesis has been submitted for examination with our recommendation as University supervisors.

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DEDICATION

To my mum Felistas Kataka, daughter Cynthia Mukanda and son Hylliam Kisaka for their prayers, support, patience and perseverance during my study period.

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ABSTRACT

Cereal banks in Kenya were started by Government, non-governmental organizations (NGOs) and other civil society with the aim of enhancing local food security, improving incomes and livelihoods for maize farmers through collective marketing. Despite efforts of establishing them, majority have collapsed once outside support is withdrawn. Generally it is known that farmer organizations including cereal banks tend to collapse if there is no participation in group activities, poor group management, inadequate group managed produce and if they don't access extension services, credit and market. The purpose of this study was to identify factors influencing sustainability of cereal banks among maize farmer groups in Kimilili Sub-county, Kenya. A descriptive survey design was adopted with a target population of 15 farmer groups participating in cereal banking from a population of 138 registered groups in the study area. Proportionate sampling was used to select a sample size of 188 respondents from the 15 groups. Data was collected using a questionnaire and interview schedule. The instruments were validated by experts and peers. Reliability of the two instruments was ensured through a pilot-test using 30 farmers from Kanduyi, Bungoma South Sub-county practising cereal banking. A Cronbach's alpha reliability coefficient of 0.77 was also obtained for the questionnaire. The data was analysed using descriptive statistics aided by Statistical Package for Social Science (SPSS) version 17.0. A chi square test of independence was used to test the hypotheses at a significance level of 0.05 α. The study revealed that democratic governance and adequate technical skills was a major hindrance for successful management of cereal banks. Farmer groups were not bulking adequate quantities of maize to sustain the operations of the cereal banks. The study concluded that democratic governance and adequate technical skills was a major challenge to the sustainability of cereal banks in the study area since the management committees lacked the requisite competencies to manage the cereal banks. As a result of the findings the study recommends training of cereal bank management committees on management skills, networking, market linkage and storage pest management; establishing an apex cereal bank with an expanded mandate at the sub-county headquarters and formal registration of all cereal banks in the sub-county to enable them access additional finance from government and donor agencies.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank
CAO	County Agricultural Officer
CBs	Cereal Banks
CIG	Common Interest Group
CMS	Collective Marketing Scheme
CRS	Catholic Relief Services
DFID	Department for International Development
EPZA	Export Processing Zone Authority
EPZ	Export Processing Zone
IFAD	International Fund for Agricultural Development
KACE	Kenya Agricultural Commodity Exchange
KENFAP	Kenya national Federation of Agricultural Producers
KER	Kenya Economic Report
KCC	Kenya Cooperative Creameries
KFA	Kenya Farmers' Association
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KMDP	Kenya Maize Development Program
LCBs	Local Cereal Banks
MMM	Maize Marketing Movement project, 2002-2005
MOALF	Ministry of Agriculture Livestock and Fisheries
NAAIAP	National Accelerated Agricultural Input Access Programme
NASEP	National Agriculture Sector Extension Policy
NCPB	National Cereals and Produce Board
NGOs	Non- Governmental Organisations
POs	Producer Organisations
ROP	Rural Outreach Programme
RPK	Resource Projects Kenya
SACRED	Sustainable Agriculture Centre for Research, Extension and Development in Africa
SAPs	Structural Adjustment Programs
SCODP	Sustainable Community- Oriented Rural Outreach Project
SL	Sustainable Livelihood

SMM	Smallholder Marketing Movement project, 2004- 2006
SPSS	Statistical Package for Social Sciences
SRA	Strategy for Revitalizing Agriculture
USAID	United States Agency for International Development

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Agriculture has been regarded as the activity most essential to human survival and wellbeing (FAO, 1991). In mid 1980s, the Government of Kenya, with assistance from the World Bank, instituted the Structural Adjustment Programs (SAPs) to address the declining trend in economic growth. At the micro-level, the reforms were sector-specific. In the agricultural sector, commodity markets for maize, fertiliser and milk were liberalised, and commodity prices decontrolled. Trade restrictions such as licensing controls and commodity movement restrictions were reduced or removed altogether and the role of government in commodity marketing was minimized (Van Wijk & Makokha, 2000). This policy change set the stage for increased participation of private traders in such markets as maize, milk and farm inputs, previously handled by government-controlled marketing agencies like the National Cereals and Produce Board (NCPB), Kenya Cooperative Creameries (KCC) and Kenya Farmers' Association (KFA).

The impact of market liberalisation on input and output prices, crop and livestock production and marketing in Kenya have been a focus of many studies (Mbithi, 2000; Karanja 2002; Nyangito & Karugia, 2002). Despite the fact that price is an important factor in production, marketing, processing and consumption there are no proper mechanisms and forums for setting the price of maize. Various stakeholders try to optimise prices through political pressure, noise, threats and advocacy without objective or factual justification for the prices demanded. Nyangito and Karugia (2002) suggested the use of buffer stock, buffer funds and compensation funds to deal with price fluctuation. Whereas markets in the developing world are characterized by pervasive imperfections such as lack of information on prices and technologies, high transaction costs, and credit constraints by acting collectively farmers would be better positioned to reduce transaction costs for their market exchanges, obtain necessary market information, and secure access to new technologies (Meinzen-Dick, Markelova, Hellin & Dohrn, 2009; Jari, 2009).

In order to commercialize small holder farming, there is need for collective action where smallholder farmers can work together as a recognized legalized entity in order to strengthen their voice for articulating their needs, lobbying, buying, bulking and selling to take advantage of economies of scale (Rwelamira, 2015). Collective marketing requires that farmers get new skills in improving grain quality, record-keeping, financial management, marketing, accessing market information and leadership. This approach allows farmers to form their own marketing associations to produce, inspect, bulk, store and sell their produce to larger-scale buyers cutting out the middleman (The Sustainable Agriculture Centre for Research, Extension and Development in Africa [SACRED-Africa], 2004). A cereal bank (CB) is an example of a marketing association or group usually based at the village level, which seeks to improve market outlets for surplus grain and improve the quality of food. However, lack of markets and poor marketing strategies are arguably the greatest challenges facing the agricultural sector in Kenya and the rest of Africa (Ministry of Agriculture [MOA], 2009).

Agricultural extension services provide farmers with important information on crop prices, new seed varieties, crop management and marketing (Asian Development Bank [ADB], 2014). According to Rwelamira (2015), improved farm level competitiveness can be achieved through better cropping systems, seed selection, cultivation processes, sourcing and application of modern inputs, proper harvesting and post-harvest handling. The use of modern technologies, grading, sorting and agro-processing as well as through the volume leveraging of procurement, packaging, storage and transport can be achieved through access to agricultural extension. Agricultural production can also be improved by exposing small-scale farmers to appropriate technologies which increases their ability to optimize the use of their resources (Sunding & Zilberman; 2000; Nompozolo, 2000). Access to Agricultural extension also enables farmers to access market information which is vital to market participation that allows farmers to take informed marketing decisions related to supplying goods, searching for potential buyers, negotiating, enforcing contracts and monitoring. However, Smallholder farmers have difficulties in accessing market information, exposing them to a marketing disadvantage (Jari, 2009; Mukhwana, 2003). Farmers rely on informal networks (traders, friends and relatives) for market information due to weak public information systems (FAO, 2004; Muthoni, 2009). Yet, such individuals may not have updated reliable market information, making the usefulness of the information undependable.

Management is a major factor that affects sustainability of a project. Community based projects are complex and require multifaceted management skills hence the need to build the capacity of farmers organizations to operate within an agreed legal and operational framework upholding constitutionalism and democratic principles (Salles & Geyer, 2006; Rwelamira, 2015). Good management ensures that sufficient local resources and capacity exist to continue the project in the absence of outside resources (Oino, Kirui, Towett & Luvega, 2015). Cereal banks as business enterprises require a democratic process of governance that promotes the active participation of the members in important decision making processes. However, Borgen (2001) asserts that members will participate if they are involved and motivated through efficient communication processes which can only be achieved with competent leadership that guarantees freedom of expression among members of the group. Experience has also shown that where cereal banks are operated by "interest groups", they have a higher chance of succeeding. This is also experienced in Chad (Dramane, Mariko et.al, 2012) where profit oriented cereal banks operated by "interest groups" registered success than those banks run by communal leadership.

Project sustainability has become a major concern for the donor community. Although development aid to Kenya stood at $770m in 2005, reports indicate that aid effectiveness is a growing concern for the donor community (Oino et al., 2015). Khan (2000) asserts that a large number of projects implemented at huge costs often tend to experience difficulties with sustainability. Sustainability is a program's or project's ability to continue delivering intended services to their targeted audience over the long term in line with their program goals and objectives (International Fund for Agricultural Development [IFAD] 2009). IFAD (2009) further pegs sustainability of its projects on the continuation of production gains and increased income streams to the participating communities. According to Williams (2003), sustainability is reflected in the capacity of the community to cope with change and adapt to new situations. While Oino, et al., (2015) posit that project sustainability is the probability that a project shall continue long after the outside support is withdrawn. Consequently a project is sustainable if the community/beneficiaries are capable on their own without the assistance of outside development partners, to continue producing results for their benefit for as long as their problem still exists. The core indicators of sustainability for economic sector projects is economic and financial returns, whereas, the main indicator for social sector projects will be the extent and degree to which the delivery of goods and services, have been

continued and the proportion of target area population that continue to receive the benefits from project activities (Khan, 2000).

Like all other projects, the sustainability of cereal banks in Kenya has been wanting. For instance, the Rockefeller Foundation through SACRED-Africa funded two CB projects in Western Kenya. The Maize Marketing Movement (MMM) project exclusively in Bungoma County between the years 2002 to 2005 which resulted in the creation of five Local Cereal Banks (LCBs) linked to a Central Cereal Bank (CCB). The second project was the Smallholder Marketing Movement (SMM) project between 2004 to 2006 which targeted the neighbouring Counties of Kakamega and Siaya and resulted to the creation of a further 19 LCBs. In total the two projects resulted in the creation of 25 cereal banks (CBs) all of which collapsed by the close of 2006 (SACRED-Africa, 2004). Reasons for the failure are not clearly documented. This study sought to investigate the influence of selected factors on the sustainability of cereal banks in Kimilili Sub County, Kenya. Sustainability of the cereal banks was measured in terms of continued existence after support is withdrawn(years of existence), Increased income to the participating community (maize income) and growth in membership which is an indicator of the population that continue to receive benefits and guarantees access to adequate cereals for bulking.

1.2 Statement of the Problem

In the year 2008, the Government of Kenya through the Ministry of Agriculture initiated a Cereal Banking project which was funded by International Fund for Agricultural Development (IFAD) through the National Accelerated Agricultural Input Access Programme (NAAIAP) that aimed at uplifting the farmers to lead a better livelihood through farming. Sub-counties covered by the programme included; Kimilili, Bungoma South, Bumula in Bungoma County, Sabatia, and Butere in Kakamega County. In Kimilili Sub-county 15 cereal banks (CBs) were created. The efforts by the Kenya Government, non-governmental organizations (NGOs) and other civil society in establishing cereal banks in Bungoma County has not been successful as it is generally known that farmer organizations including cereal banks tend to collapse if there is no participation in group activities, poor group management, group managed produce is little and if they don't access extension services, credit and market. It's against this backdrop that this study sought to investigate how selected factors influenced sustainability of cereal banks among maize farmer groups in Kimilili Sub County, Kenya.

1.3 Purpose of the Study

The purpose of the study was to determine how selected factors influenced sustainability of cereal banks with the aim of recommending how more sustainable cereal banks can be established among maize farmer groups in Kimilili Sub-county, Kenya.

1.4 Objectives of the Study

The objectives of the study were:

i) To find out the influence of group management on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.
ii) To establish the influence of quantity of maize bulked on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.
iii) To determine the influence of farmers' access to extension services on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.
iv) To determine the influence of farmers participation in group activities on the sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.

1.5 Research Questions and Hypotheses

The study had two research questions and two hypotheses as follows:

1.5.1 Research Questions

The following research questions guided the study:

i)What is the influence of group management on sustainability of cereal banks among maize farmers groups in Kimilili Sub-county?
ii) What is the influence of quantity of maize bulked on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county?

1.5.2 Hypotheses

$Ho_{1:}$ Farmers' access to extension services has no statistically significant influence on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.

$Ho_{2:}$ Farmers' participation in group activities has no statistically significant influence on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.

1.6 Significance of the Study

Cereal banking as a concept is advantageous to maize producers as it enables production, bulking, storage and marketing of surplus maize. Findings of this study therefore, are likely to assist maize farmer groups to improve the management of their cereal banks and maize marketing for improved incomes and livelihoods. The findings would also be used by extension planners and providers to formulate effective policies to enforce establishment of more sustainable cereal banks to enable farmers' access better markets for their grains. Researchers and academicians may also find this study useful as it may contribute immensely to the existing body of knowledge on cereal banking and serve as a catalyst for further research on innovative ways of making cereal banks in Kenya more sustainable.

1.7 Scope of the Study

The study sought to investigate selected factors influencing sustainability of cereal banks among maize farmer groups in Kimilili Sub- County, Kenya. The focus was on influence of: group management, quantity of maize bulked, farmers' access to extension services and participation in group activities on sustainability of cereal banks. The study captured data from maize farmers involved in cereal banking activities.

1.8 Limitations of the Study

The study was limited:

i. By the scarcity of recent literature relating to cereal banking in Kenya. Most of the literature accessible was from Sahel countries, which is not always relevant to the local situation in Kenya.

ii. By failure to answer questions by some respondents because it was considered time consuming. The researcher endeavoured to create rapport and make appointments convenient to the respondents. However questionnaires that were still not fully completed were discarded during data analysis.

iii. Most of the farmer groups studied lacked proper financial records which could be used to determine accurately the financial performance of the cereal banks. Consequently, it was difficult to collect quantitative data that could be subjected to regression models so as to determine the level of influence of each individual factor. Therefore the researcher mainly used likert scales.

1.9 Assumptions of the Study

The study was conducted under the following assumptions:

i. That maize farmer groups in Kimilili Sub-county face similar socio- economic conditions which influence their participation in cereal banking activities.

ii. The participants are aware of and able (and willing) to respond to selected factors influencing sustainability of cereal banks under investigation to help draw conclusions to address the purpose of the study.

iii. The results of the study would be relevant to key stakeholders.

1.10 Definitions of Terms

For the purpose of this study the following definitions applied:

Access to Extension Services: This is accomplished by providing access to information and technologies but also by enhancing agricultural skills and practices, capacity to innovate, and address varied rural development challenges through training programs, improved management and organizational techniques (Christoplos, 2010). In this study access to extension services included knowledge and information from extension providers; on agronomic practices of maize production, sources of farm inputs, post-harvest maize handling practices, access to maize markets and improved agricultural technologies to farmer groups.

Access to Markets: Strong links to markets for small businesses is essential to securing their viability, growth and sustainability. Better access by small holders to domestic and international markets means that they can reliably sell more products at better prices. The ability of local farmers, in developing countries to participate in local, regional, national, and international markets (Chamberlin, Jayne & Muyanga, 2012). This study adopted the same definition.

Cereal: Is a crop that constitutes mainly carbohydrates. Crops classified as cereals include; maize, rice, wheat, sorghum and millets. (MoLF, 2015) In this study, cereal referred to unmilled maize which is the major crop that is collectively bulked, stored and traded in Kimilili Subcounty.

Cereal Bank: A cereal bank is a community-based institution in which a group of persons or the entire community is involved in the management of operations and the acquisition, stocking, pricing and supply of grains (Dramane, Sabina & Osman, 2012). According to this study, a cereal bank is a marketing venture that involves bulking of maize and selling it for better prices on behalf of the maize farmer group members.

Cereal Banking Group Activities: These are things that group members do in order to achieve their aims (Osterberg & Nilsson, 2009).The study operationalized Cereal banking group activities to include; bulking, storing and selling out the stocks when prices are higher as well as planning and implementing group activities, group meetings and sharing of benefits. Other activities included; table banking, merry go round and farming enterprises.

Farmer Group: Farmers enter movements by forming farmer groups that enable them to make connections to consumers and markets places. This is an institution of participatory

governance developed at grassroots constituted by smallholder farmers and their leadership, representing their interests, and with a certain level of accountability to them (Rwelamira, 2015). The study adopted the same definition.

Group management: Management is defined as involving decision-making processes and the capacity to implement decisions which should represent the interests of the group of people. It enables group members to achieve objectives, manage risk, comply with standards and improve quality (Chibanda, Ortmann, & Lyne, 2009). In this study group management referred to the leadership and management practices of cereal banks.

Group participation - This is defined as the involvement by individuals in specific informal or formal organizations for purposes of realizing not only utilitarian individual interests but also for attaining mutually satisfying collective interests (Amudavi, 2005). The definition was adopted in this study.

Quantity of maize bulked: This refers to amounts of maize deposited by each farmer in a cereal bank administered by the maize farmer group. The value is determined by noting the quantity and quality. In this study the quantity of maize bulked was operationalized to mean group members' ability to produce maize for bulking and storage. This was measured in terms of maize bags of ninety kilograms bulked.

Sustainability: Is the percentage of project initiated goods and services that are still being delivered and maintained five years after termination of project implementation, (Khan, 2000).In this study sustainability was operationalized to mean years of existence, income from maize and growth of membership of the cereal banks.

Sustainability of cereal banks: This refers to the ability of a cereal bank to maintain its operations, services and benefits during the project lifetime (Berger & Kent, 1998)**.** In this study Sustainability was measured in terms of number of years cereal banks had existed, access to improved markets, increased incomes from maize sales and growth in group membership.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The review of the literature related to the study was done under the following sub topics: Meaning and importance of collective marketing; Role of the National Cereals and Produce board; group management of CBs; quantity of maize bulked; Farmers access to extension services; farmers' participation in group activities and the concept of sustainability. The section also discusses the theoretical framework of the study and finally presents the conceptual framework.

2.2. Meaning and Importance of Collective Marketing

In the recent past farmer groups have increasingly become an important avenue for agricultural extension. Farmers' participation is considered as one of the essential conditions for sustainable development process. An effective farmers' voice is not only the basis of mutual respect and democracy, but it is also the true basis for agricultural and rural development. According to Nguyen (2002) numerous benefits accrue when farmers work in groups. These include; farmer groups make it easier for the government to provide services to farmers such as transfer of information, distribution of fertilizers, production and distribution of seeds and vaccination of animals. Important new skills are developed within the groups like technical skills, skills in group management, problem solving, economic cooperation, book keeping, verbal expression and grassroots democracy. These groups also increase farmers' capacity to help one another in solving their problems, instead of relying only on external support. Moreover, farmers become more confident in applying new techniques since group members can help one another in putting the new knowledge in practice and finally, farmers are able to jointly request for assistance from relevant institutions which may not be available to individuals.

The extent of participation of farmers in group activities is influenced by several factors which include; the degree of the farmer's dependence on the outputs of the organized activity, certainty of the availability of the outputs, the extent to which the outputs will be available only as a result of collective action, the rewards associated with the collective action will be distributed equitably and available within a reasonable time frame and the extent to which the rewards are commensurate with the costs associated with continued participation (Shingi &

Bluhm, 1987; Pertev, 1994). This implies that the level of farmer participation is greatly determined by the expected benefits from collective activity and fairness in distribution of benefits. Meinzen-Dick and Di Gregorio (2004) defined collective marketing as the voluntary action taken by a group to achieve common interests. Farmer organizations are therefore seen as a more formal expression of collective action and can provide farmers with many services that are critical to their success in accessing markets. Kariuki and Place (2006) stated that collective action facilitates low cost access to information thereby stimulating technology dissemination and adoption, reduces marketing costs, lowers cost of inputs, and facilitates labour sharing and act as informal insurance to the members. According to Singini and Van Rooyen (1995), collective action and bargaining has the potential to activate a range of services to small scale farmers including; access to credit, insurance, input provision, marketing, research, extension, managerial support, storage, agro-processing infrastructure and lobbying. Consequently, most community and agricultural development agencies have sought the support of farmer groups as an effective means of changing the structure of communities, harnessing their resources and improving agricultural development (Mathews-Njoku, Angba, & Nwakwasi, 2009).

Many producer organisations (POs) were organized under the auspices of NGOs and development projects in the wake of famines in the 1970s and 1980s to prevent farmers from over-selling at low prices and then buying back at high prices, to avoid exploitation by middlemen and help surplus producing farmers to find a better market for their grain (Mwamfupe, (2015). However, majority of these POs have proved institutionally unsustainable, tending to progressively de-capitalize and disappear once outside support was removed (Mukhwana, 2003; Mwamfupe 2015; Liu, 2016). Studies on cereal banks by Dramane, Sabina & Osman (2012) found that cereal banks established in Chad, Mali and Niger had succeeded in providing better grain marketing services to consumers. They attributed this to the simplicity of the system, low capital costs (traditional stores were used), high level of social cohesion among the membership, continuity of management and intensive training. This study sought to determine how selected factors influence sustainability of cereal banks among maize farmer groups in Kimilili Sub-County, Kenya.

2.3 Role of the Kenyan National Cereals and Produce Board in Collective Marketing

Kenya like many countries globally faces the challenge of fluctuating food prices particularly for maize. On one hand is the pressure to ensure that maize farmers receive adequate price

incentives to produce and market their crop. On the other hand, the desire to keep food prices low to promote the food security interests of a growing urban population, and of the many rural households who are net buyers of maize. To strike a balance between the two competing objectives, policy makers in Kenya have mainly used the operations of the National Cereals and Produce Board (NCPB), which procures and sells maize at administratively determined prices (Jayne, Myers & Nyoro, 2008).

The National Cereals and Produce Board of Kenya (NCPB) was established in 1985 under the National Cereals and Produce Board Act (Cap 338) of the laws of Kenya. It was mandated by the Government to regulate and control the marketing and processing of grains in Kenya (Export Processing Zone Authority [EPZA], 2005). Through the NCPB the government influences private market prices by buying and selling maize at administratively determined prices that are sometime above and sometimes below market prices. During years of surplus production, the NCPB sets the market price per 90 kilogram bag above market price to ensure the price does not fall too low for maize producers to benefit. During low production periods the market price is reduced to cushion consumers from maize deficit households. The NCPB also distributes maize for drought relief operations mainly in the pastoral areas and other food support programs in the country. Whereas the NCPB could provide a ready market for bulked grains by the cereal banks, Kenya National Federation of Agricultural Producers [KENFAP], 2011) established that most farmers stopped delivering their maize to NCPB partly because of delayed payment, high intake charges and long queues. Therefore, most traders supplying maize to the NCPB are large scale maize farmers and middlemen who purchase stocks from small scale farmers.

2.4 Management of Cereal Banks

Johnson and Johnson (1994) defined a group as comprising of two or more individuals in face-to-face interaction, each aware of his or her membership in the group, each aware of others who belong to the group and each aware of their positive inter-dependence as they strive to achieve mutual goals. Groups may be formal, having agreed on rules and procedures that give a group a status that enables members to own and manage their assets legally or may be informal as the case of self-help groups like rotating saving and merry go rounds (World Bank, 2008). In Kenya, groups have been formed in response to various social and development issues in the spirit of a mobilizing resources and organizing concept of harambee

(Karega, 1996). The nature of cereal banks as business enterprises also requires a democratic process of governance with the active participation of members in important decision making processes. Governance involves networking and assumes an accommodative orientation with a shared willingness to learn from each other. In this study, governance in a cereal bank was defined as involving decision-making processes and the capacity to implement decisions (Chibanda, Ortmann, & Lyne, 2009), which should represent the interests of the group members. Empirical studies have shown how governance can positively, or negatively, affect the organization's success by affecting member participation and their commitment (Borgen, 2001; Osterberg & Nilsson, 2009).

Leadership plays an important role in influencing the direction of an organisation. Leaders are meant to initiate, promote and defend the policies by which the organisation operates (Fulton, 2001). Leadership involves interpersonal relationships between the leader and the led and it aims to motivate a group of people, to act towards achieving a common goal (Yukl & Yukl, 2002). In a cereal bank, leadership involves a process of reaching consensus and then following through with the group's decision. Internal leadership is therefore crucial in the implementation of policies and activities which continually enhance the operations of the cereal bank. Competent leadership will encourage members to make decisions based on their values and it should be able to balance the internal and external tensions in order to create enduring groups. This would also call for empowerment of the people in order to maintain the transparency and accountability of the leaders.

According to Birchall (2004), empowerment is defined as the expansion of assets and capabilities of people to participate in, negotiate with, influence, control, and accountable to institutions that affect their lives. Creation of strong groups can also be developed through the building of interpersonal relationships as a source of strength (Bhuyan, 2007). However, members will only participate if they are involved and motivated through efficient communication processes. An efficient communication process would encourage member participation, ensure members are aware of what is going on and they feel being part of the organisation. Competent leadership ensures an efficient transfer of information from the organisation to its members and vice versa (Borgen, 2001). Borgen (2001), further asserted that the more the farmers identified themselves with their organization, the more confidence they have in the management of their group. Most leadership roles require a person to have

technical, conceptual and interpersonal skills (Yukl, 1989). It is, therefore, necessary for the leadership to have skills and knowledge of business enterprise, because the management of cereal banks relies heavily on their expertise. Studies have shown that a lack of adequate skills in management has contributed to failure of cereal banks (Dramane et al., 2012).

Cereal banks that maintained a small membership (up to 27 members) managed as interest groups had more committed members in group activities with a high level of group cohesion while those that were owned by the community and managed by leaders whose main criteria of selection was for one to be hardworking experienced a lot of challenges resulting to dismal performance and high dependency on donors for grain deposits. A third approach is a cereal bank that operated with business skills based on cooperative law which was found to be the most successful (Mwamfupe, 2015). Mukhwana (2003) argues that cereal bank management committees must be run by people with business acumen and be based on business principles to survive. Female managed cereal banks have also been found to be more successful than mixed management or exclusively male managed (Dramane et al., 2012). Liu (2016) in a practical guide to cereal banks recommend training of the management committee on topics such as; their duties and responsibilities to the community, record-keeping, financial management, storage methods, stock inventory and grain handling. Management with required skills would be able to strategize on business volume; type of product and product quality and for competing with other players in the market. This study sought to find out how governance, clear communication and technical skills of group management influenced sustainability of cereal banks among maize farmer groups in Kimilili Sub-county, Kenya.

2.5 Maize Bulking in Cereal Banks

Maize is a major staple food for the people of Kenya, providing 45 percent of the calorie intake of the average Kenyan household (Export Processing Zone [EPZ], 2005). Over 95 percent of the Kenyan farmers, who constitute about 80 percent of the population; grow maize across all agro ecological zones for consumption or commercial purpose (Nyameino, Kagira & Njukia, 2003). Maize remains by default the most potentially valuable staple crop that a Kenyan farmer can grow and it has the advantage of being relatively non-perishable (if properly dried) and relatively easy to store and transport in bags. From the early 1990s to 2007, maize farming and marketing in Kenya underwent a major transformation. The government reduced its role in markets for fertilizer and maize while also dedicating significant resources to constructing roads, building other types of rural infrastructure,

developing improved maize varieties, and promoting improved agronomic practices resulting to; major private investment in fertilizer and maize marketing and higher maize yields which have improved the welfare of both maize farmers and consumers.

In the year 2008, the Government through the Ministry of Agriculture initiated the Cereal Banking project which was funded by International Fund for Agricultural Development (IFAD) through the National Accelerated Agricultural Input Access Programme (NAAIAP) programme that aimed at uplifting the farmers to lead a better life through farming (MOA, 2012). Increasingly, donor investments have focused in helping smallholders develop maize farming as a family business, through initiatives such as the Kenya Maize Development Program (KMDP), USAID's Compete, and the One Acre Fund. The farmers were also expected to form groups, sell their maize collectively through a cereal bank and save their money in banks which would in turn help them access loans to start up other income generating activities. Kimilili Sub-County was one of the areas that benefited from the projects and started cereal banking. Maize production in the sub county between 2009 and 2013 is shown in Table 1.

Table 1: Maize Production Trends in Kimilili Sub-county (2009-2013)

Year	No. of Hectares Planted	Quantity Of Maize Harvested (Tonnes)
2013	9,019	20, 292.75
2012	10,388	28, 647
2011	11,335	30, 550.5
2010	10,468	28, 350
2009	11,295	30, 550.5

Source: Kimilili Sub-county Agricultural office Annual Report 2013

Community cereal banks operate by members depositing cereals when they are in abundance and with the prices at their lowest. Such deposits are made in anticipation that members will buy them during difficult times but at lower prices than what the opportunistic middlemen would have demanded. In situations where the banks have enough stock, members are allowed to borrow cereals and payback with a small interest during the harvest season but the

margin of profit is kept to affordable levels so that many more people can be accommodated. When this cycle of "purchase-store-sell" has been completed, automatically the prices of cereals will have stabilized between seasons (Mukhwana, 2003). Therefore, once the initial investment is made in the form of start-up stock or capital to purchase stock, the banks become self-supporting (Mwamfupe, 2015). Furthermore, since the bank is in the village, farmers do not have to travel long distances to buy grain which saves time and money. However, other studies reveal that cereal banks have had a poor success rate; have had difficulty competing in spatial arbitrage; and have suffered from accumulated consumer debt, slow collective decision making, corruption, and loss of original capital. Where depletion of capital was being avoided, an unsustainable level of external supervision was required (Mwamfupe, 2015; Msaki, Regnard & Mwenda, 2015).

Value-addition takes place when enhancement is added to a product or service by a company before the product is offered to customers. Given the relatively large stocks of grains they hold, Cereal banks can also do value addition which not only improves the value of the grains per unit sold but also the shelf life of the final product (Jari, 2009). Value adding can be in the form of grading, sorting, packaging in standard weights and processing of produce (Mather, 2005). In the case of maize products, they can be considered value-added if the original maize is modified, changed or enhanced to increase in value. This incorporates them into other 'secondary' products such as livestock and human feeds that have higher net worth. However, most small holder farmers in Kenya are locked out of the high value regional markets due to inability to do value addition, poor packaging for lack of value adding and agro-processing technologies (Jari, 2009; MOA, 2009; Kenya Economic Report [KER], 2012).

According to Catholic Relief Service (1998), CBs sold their grain at a 10 percent discount and by selling or lending grain at below-market rates, these cereal banks had tended to lose money, de-capitalize and eventually go out of business. The Catholic Relief Service, (1998) further noted that of the 4,000 cereal banks set up in the Sahel; only about 1,000 were continuing to buy and sell grain the rest were out of business. Another study found out that only 1 of the 100 cereal banks that FAO had created in Niger had survived more than a few years, and this was attributed to external support from another project in the area (CRS, 1998). Grain marketing is a competitive business, and the margins are generally thin, sales at below-market rates are likely to generate losses. Moreover, Cereal banks have shown that lending grain is a difficult business since defaults are common caused by little moral obligation to pay

back loans on the part of community because they perceive the cereal banks as a social institution. Defaults on grain loans have been reported as a major cause of bankruptcy of cereal banks (Dramane et al., 2012; Msaki, Regnard & Mwenda, 2015).

Developing the domestic maize value chain and market continues to be both a priority and a challenge for Kenya, in the face of erratic weather patterns, population growth and increasing urbanization (MOA, 2013; Kirimi, Sitko, Jayne & Karin, 2011). Despite global improvements in maize seed and fertilizer technology, many smallholder maize producers in Kenya find themselves in a cycle of poverty, merely surviving from season to season due to yield and marketing issues (Renkow, Hallstrom & Karanja, 2004). Collective maize storage also faces the challenge of infestation by the large grain borer and weevils. Prevention alone has not proven sufficient, causing SACRED-Africa to provide fumigation services to the banks in response to pest outbreaks which now became part of the operating costs of a cereal bank (Mukwana, 2003).

According to an extensive review by Chamberlin and Jayne (2012), market access refers to a variety of measures, including the distances to the nearest main road, rural market, district/town, development agent and input supply store; the travel times to each of these destinations; and whether an all-weather road passes through the farming area. Being able to go to the market and sell does not necessarily translate into profits. Jayne and Boughton (2011) found that despite improvements in smallholders' access to food commodity markets, household incomes did not necessarily improve. Market information is vital to market participation behaviour of smallholder farmers. Market information allows farmers to take informed marketing decisions that are related to supplying necessary goods, searching for potential buyers, negotiating, enforcing contracts and monitoring. Important information required by farmers includes; consumer preferences, quantity demanded prices, produce quality, market requirements and opportunities. Of equal importance is the source of market information because it determines accuracy of the information. For instance, Mangisoni (2006) and Jari (2009) explained that smallholder farmers usually accept low prices for their crops when the broker informs them that their produce is of poor quality mainly because they are unable to negotiate from a well-informed position.

Access to up to date and reliable market information from a reliable market source is the most important component for the efficiency of CB. Efforts towards improving the welfare of

smallholder maize farmers have often focused on improving yields through technology or improving access to commodity markets. The early push for smallholder access to improved technology improved yields to some degree, but in many cases it failed to link improved yields to the marketing of staple commodities in open markets (Shiferaw, Obare & Muricho, 2011; Shiferaw et al., 2008). Other studies identified several constraints that impede smallholder farmers' access to markets, particularly transaction costs (Fafchamps & Gabre-Madhin, 2006; Shiferaw, Obare & Muricho, 2008; De Silva & Ratnadiwakara, 2010). These studies indicate that smallholder farmers face poorly functioning markets that are thin, fragmented and lacking in transparent market information. Through linkages with the Kenya Agricultural Commodity Exchange (KACE), members of CBs can have improved access to market information. Daily prices from markets all over the country and demand and supply information can easily be accessed by the cereal banks for their daily operations. The CBs group leaders should make this information available to its members who could otherwise not access this pertinent information as they lack the access to cell phones and/or other media like radios used by KACE for dissemination of market information.

Smallholder maize producers in Western Kenya are trapped within a "good season, poor market" dilemma that discourages production of substantial crop surpluses. Opportunistic middlemen complicate this situation by offering to purchase the surplus maize, but pay extremely low gate prices to farmers who lack capital, access to market information and transport (Coulter, Burnett, Walker, & Mukhwana, 2000). Voices for Structural Reform and Market liberalization advice farmers to form marketing associations to overcome the situation, but few models are available for adoption (Nyoro & Jayne, 1999). This study therefore sought to determine how quantity of maize bulked influence sustainability of cereal banks in the study area.

2.6 Farmers' Access to Extension Services

Kenya's agriculture is predominantly small-scale farming accounting for 75 percent of the total agricultural output and 70 percent of marketed agricultural produce. Production is carried out on farms averaging 0.2 to 3 hectares mostly on commercial basis (Ministry of Agriculture Strategic plan, 2008-2012 [MOA], 2009). MOA strategic plan further observes that about half of Kenya's estimated population of 35.5 million people are poor with 7.5 million people living in extreme poverty while over 10 million people suffer from chronic food insecurity and poor nutrition. Therefore given the small land sizes for a majority of Kenyan farmers, it

becomes impossible to increase production by increasing the cultivable land. The only way to attain food security and increase farm income for such farmers is to increase the productivity of their farms and embrace the concept of cereal banking (Muthoni, 2009). With increased production, the small holder farmers will have adequate food for consumption and a surplus for bulking since it becomes impossible to think of banking cereals when there isn't enough for consumption (Mwamfupe, 2015).

The National Agriculture Sector Extension Policy [NASEP], 2008) underscores the role of extension service in sharing knowledge, technologies, agricultural information and also linking the farmer to other actors in the economy. The term 'extension' is here understood to mean 'advisory and other services' that help rural families to make the best possible use of the productive resources at their disposal (Katz, 2002). The major role of agricultural extension in developing countries has been to disseminate technologies generated by public sector and research organizations through strategies such as demonstrations, field visits, farmers' meetings and use of media (Sulaiman, Hall & Raina, 2006; Olubandwa, Kathuri & Wesonga, 2011). Agricultural extension services provide farmers with important information such as; crop agronomic management practices, new seed varieties, patterns in crop prices, and marketing. Exposure to such activities is intended to increase farmers' ability to optimize the use of their resources which makes extension service one of the critical change agents required for transformation of subsistence farming to modern and commercial agriculture.

In Kenya like many developing countries the farmer to extension staff ratio continues to remain high due to reduction of the number of extension staff through natural attrition and a freeze on new hiring. Consequently, the linear extension model of research to extension to farmer is no longer tenable to help farmers cope with the more complex, increasingly knowledge-based farming needed to participate in highly competitive globalized agricultural markets (Olubandwa et al., 2011). Farmers need the most current local and global information about consumer preferences, and from that, what to grow, when, where and how and where to market it for a profit (World Bank, 2011). The only way to provide information in this context is to use new e-agriculture resource platforms such as Kenya Agricultural Commodity Exchange (KACE) that will guarantee ease of access to information on real time at minimal information search costs (Kaddu, 2011).

In Kenya various reports attribute low productivity levels for most crops to high costs of farm inputs particularly fertilizer and seed (Kenya Vision 2030, 2007; MOA, 2009; GOK Second medium Term plan 2013-2017). To reverse these trends the Kenya government made deliberate effort to avail subsidized fertilizer to farmers through the National Accelerated Agriculture Input Access Programme (NAAIAP) with the aim of reducing production costs. As a result, Maize production in Kenya has increased consistently over the last three years reaching a production of 3,513,171 metric tonnes by 2014 (Ministry of Agriculture, Livestock and Fisheries [MOALF], 2015). With increased maize production farmers can have adequate stocks for consumption as well as sell the surplus through their cereal banks that give them a better bargaining power. The Kenya economic report of 2012 further indicates that only 17 out of 47 counties in Kenya produce adequate maize for their consumption. This implies that cereal banks with adequate stocks and access to reliable market information can exploit these local markets for higher returns.

Post-harvest losses are among the major challenges facing small holder farmers in developing economies. The Asian Development Bank [ADB], 2014) report that in developing countries, more than 40 percent of the food losses occur at postharvest and processing levels. The paper further asserts that post-harvest losses in low-income countries are mainly connected to; financial, managerial, and technical limitations in harvesting techniques, storage, packaging and marketing systems. Findings by Dramane et al., (2012) revealed that poor grain storage conditions were the main cause of cereal bank food losses in Niger, Mali and Chad. This was because warehouses were constructed with local materials without any specific design. As a result, the proposed warehouse was not appropriate for storing grains. Farmers can be equipped with adequate skills to reduce food losses through appropriate training on post-harvest grain handling and this would guarantee proper grain storage and enable cereal bank management to retain stocks for longer period in search of more profitable markets without fear of grain infestation.

Among the benefits of cereal banks listed by promoters of cereal banks is to facilitate access to improved agricultural technologies (Muthoni, 2009). However, this has not always been the case because CBs rarely make profits and therefore cannot subsidize other village activities such as literacy training or acquisition of improved technologies (Dremane et. al., 2012). The Kenya Vision 2030 Medium Term Plan of 2008-2012 established that one of the major challenges facing the agriculture sector is limited application of agricultural technology and

innovation as a result of limited access to extension services and lack of funds. The Ministry of Agriculture strategic plan (MOA, 2009) found that use of modern science and technology in production is still limited among small holder farmers in Kenya and the main cause for low agricultural productivity. This has been attributed to inadequate credit to finance inputs and capital investment in agriculture. The report further indicates that, while the Agricultural Finance Corporation (AFC), the Cooperative Bank of Kenya and the co-operative movement, have made considerable efforts to provide affordable credit to farmers, the high interest rates make it impossible for most farmers to access credit.

Other studies such as Mwamfupe (2015) citing Dramane et.al., (2012) argues that limited operating capital makes it difficult for cereal banks to finance other activities which is further exacerbated by the fact that most cereal banks sold or lent grain to their clients below the prevailing market prices therefore they rarely make a profit (Kent, 1998). Occasionally when cereal banks fund other activities they de-capitalize their own revolving funds. Consequently, low use of agricultural technologies could be attributed to cereal banks lack of adequate resources to purchase improved technologies for the members without the risk of de-capitalization.

This study points out that access to relevant extension services would enable maize farmer groups to acquire relevant information, knowledge and skills on agronomic practices for maize production, appropriate sources of quality inputs, access to markets, management of post-harvest losses and access to improved agricultural technologies which would ultimately result to improved production. With higher yields farmers will have adequate stock for consumption and surplus for bulking. Access to adequate stocks of maize for bulking would guarantee the sustainability of cereal banks. This study therefore sought to examine how access to extension services through acquisition of knowledge on sustainable agricultural production, post-harvest management and marketing practices influenced sustainability of cereal banks in Kimilili Sub-county.

2.6 Participation in Group Activities

Community involvement is an important factor for the sustainability of projects as it is the genuine involvement of local people as active participants and equal partners whose concerns and experience are intrinsic to the project's success (DFID, 1999; Majale, 2002; IFAD, 2009).

Bamberger & Cheema (1990) suggest the need to encourage active community participation at all levels of project design and implementation for sustaining those programs. This implies that farmer participation in group activities is greatly determined by the expected benefits from collective activity and fairness in distribution of benefits, participation in the governance and ability to translate members' needs into decisions (Fulton & Giannakas, 2001).

The main activities of the group that encompass member participation in a cereal banks include buying maize from members and other farmers at reasonable prices, storing cereals to ensure food security during dry seasons and marketing for better prices. Other activities include attending meetings; serving on committees; involvement in recruiting others; and patronage (Osterberg & Nilsson, 2009). Members of cereal banks are also patrons, that is, they are suppliers or buyers, but at the same time they are owners of the organisation. Their decisions to increase or reduce volumes and even withdraw have great implications on the cereal banks survival. Involving members in cereal bank activities improves their commitment to the success of the bank particularly in restocking the cereal bank.

Group performance is measured in terms of the benefits or outcomes that groups generate to members, which may be tangible or intangible (Amudavi, 2005). Amudavi (2005) further notes that belonging to a group does not necessarily assure equal distribution of benefits. Some members respond non-cooperatively or competitively to maximize their own share of resources. Other studies have established that various aspects of groups are key determinants of their survival. For instance, group composition has been found to influence group performance. According to Anandajayasekeram, Puskur, Workneh & Hoekstra, (2008) heterogeneous groups are more effective than homogenous groups since they possess a greater diversity of talents, skills and knowledge. However, excessive heterogeneity of membership has contributed to a breakdown in organizations' action (Cook, 1995 & Seabright, 1997)). Group size has also been found to influences cohesiveness. Burkey (1996) reported that groups of less than ten members are unviable while those with more than twenty-five members quickly become unparticipatory. Experience from Botswana indicates that farmer groups should not exceed 40 members if they are to be manageable.

According to Nguyen (2002) there are eight factors that make groups sustainable. These include: the enthusiasm and management capacities of the leaders' open and voluntary membership where members join the group and participate in group activities voluntarily

based on the group objectives and activities; the ability of the group to develop diverse activities for members since it is difficult to keep a big number of people for a long time together in a group by only organizing a single activity, once the objective is achieved, the members' motivation will decline unless new activities are set up; regular group meetings which involve everybody to provide information and solve members' problems; participants must live near each other in order to build up trust and cooperation, exchange information and attend meetings; the group is officially recognized by the village authorities which helps it access external services like credit; Some other organization is in charge of the group (group is looked after by some bigger organization, like Farmers Association for lobbying and advocacy) and finally the group must receive support from outside.

Groups therefore provide an important social capital that greatly influences the sustainability of cereal banks. Membership of groups and associations can extend people's access to and influence over other institutions which may positively influence the policy environment or facilitate access to high value markets. Without farmer groups, objectives of collective action as envisioned in cereal banking intervention may not be achievable. This study sought to determine how farmer participation in group activities such as involvement in planning, group meetings, sharing of proceeds and group size influence sustainability of cereal banks in the study area.

2.7 Sustainability of Cereal Banks

In developing economies, billions of shillings have been spent in communities to enhance the living situation of the poor people. However, one of the most critical hurdles is the extent to which the projects are able to persist despite the exit of donors. Project sustainability is a serious problem and as many as 40 percent of all new programs are not sustained beyond the first few years after termination of external funding (Bamberger & Cheema, 1990). There exist a number of divergent views on the concept of project sustainability; According to Williams, (2003), sustainability is reflected in the capacity of the community to cope with change and adapt to new situations. Consequently, a project that is seen as worth sustaining today may not be so in future due to changing economic, social or political conditions. While Oino, et al., (2015) advocate that project sustainability is the probability that a project shall continue long after the outside support is withdrawn. Accordingly, a project is sustainable if the community/beneficiaries are capable on their own without the assistance of outside

development partners, to continue producing results for their benefit for as long as their problem still exists. Khan, (2000) outlines the core indicators of sustainability for economic sector projects as economic and financial returns while the main indicator for social sector projects is the extent and degree to which the delivery of goods and services have been continued and the proportion of target area population that continue to receive the benefits from project activities.

In order to ensure project sustainability various researchers propose a number of attributes to consider; IFAD (2009) identifies four essential dimensions: Institutional sustainability – functional institutions will be self-sustaining after the project ends. Household and community resilience – resilient communities are readily able to anticipate and adapt to change through clear decision-making processes, collaboration, and management of resources internal and external to the community. Environmental sustainability – an environmentally sustainable system must maintain a stable resource base, avoid overexploitation of renewable resources and preserve biodiversity. Structural change – the structural dimensions of poverty are addressed through the empowerment of poor and marginalized rural households to overcome poverty through the use of marketable skills and access to social services. Khan (2000) proposes six dimensions namely: Logistics Dimension - has the project received necessary support (both budgetary and institutional) to enable it to maintain required level of facilities; Economic Dimension- continued flow of net benefits that guarantee an acceptable level of financial and economic return; Community Dimension - continued community participation which is important in stimulating new actions as well as for cost recovery; Equity Dimension- involving equitable sharing and distribution of project benefits; Institutional Dimension- has the project considered adequately the institutional requirements and thus made provisions so that management support to project operations continues, during the life of the project and Environmental Dimension- has the project considered environmental implications so that negative impacts on environment are either avoided or mitigated during the life of the project. Khan (2000) further argues that project sustainability should be concerned about three areas; the level of continuation of delivery of project goods and services, the continuation of local action stimulated or caused by the project and generation of new services and initiatives as a result of project. Bamberger and Cheema (1990) revealed seven research-based factors that guarantee sustainability of agricultural projects namely: leadership competence, effective

collaboration, understanding the community, demonstrating program impact, strategic funding, staff involvement and integration and program responsiveness.

Primarily, cereal banks are meant to prevent farmers from 'over-selling' at low prices and then buying back at high prices, to avoid exploitation by middlemen and help surplus producing farmers find a better market for their grain (Mukhwana, 2003). Like other economic projects that have achieved sustainability, cereal banks should continue to benefit farmers in terms of increased maize income, an increased level of community participation and survival beyond donor support. In this study Sustainability of the cereal banks was measured in terms of continued existence after support is withdrawn (years of existence), Increased income to the participating community (maize income) and growth in membership which is an indicator of the population that continue to receive benefits and guarantees access to adequate cereals for bulking.

2.8 Theoretical Framework

This study was grounded on Sustainable Livelihoods Framework (Figure 1) developed by the UK's Department for International Development (DFID). The sustainable livelihoods framework presents the main factors that affect people's livelihoods, and typical relationships which can be used in both planning new development activities/interventions and assessing the contribution to livelihood sustainability made by existing activities (DFID, 1999; Majale , 2002). The SLF is therefore meant to avoid a situation where interventions are unguided giving little positive impact or is at worst detrimental (Morse & McNamara, 2013). Therefore cereal banks like all other poverty eradication interventions should aim at achieving long lasting improved livelihoods.

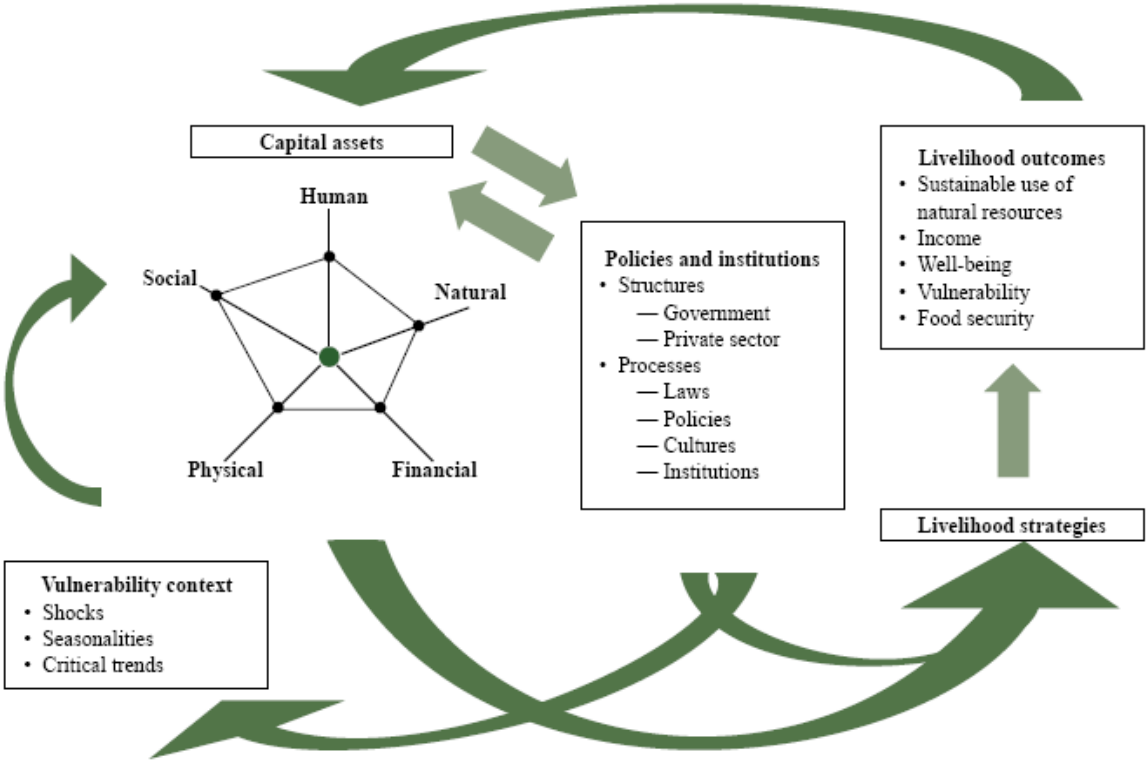


Figure 1. The sustainable livelihoods framework DFID. (1999)

The Vulnerability Context refers to external conditions over which people have little or no control that have a direct impact upon people's asset status and the options that are open to them in pursuit of beneficial livelihood outcomes. Shocks can destroy assets directly (e.g. floods, storms, civil conflict); trends are more predictable and have an important influence on rates of return (e.g. inflation, interest rates) and subsequently on peoples' access to capital assets and the chosen livelihood strategies. Seasonal shifts in prices, employment opportunities and food availability are some of the greatest hardships for poor people in developing countries. Maize farmers can be said to operate in a context of vulnerability, mainly affected by fluctuating maize prices and seasonality in food availability.

SLF identifies five types of capital assets upon which livelihoods are built namely; human capital (Health, knowledge, skills, information, source of labour), social capital (relationships of trust, membership of groups, networks, access to wider institutions), natural capital (land, water, wildlife, biodiversity, environmental resources), physical capital (sanitation, energy, transport, communications, housing and equipment of production) and financial capital (pensions, savings, supplies of credit). People's access to different levels and combinations of

assets has a major influence on their choice of livelihood strategies (Majale, 2002; Morse & McNamara, 2013). Some activities require particular skills or may be very labour intensive (high levels of human capital required) others require start-up (financial) capital or good physical infrastructure for the transport of goods (physical capital) or access to a group of people (social capital). According to Murray and Ferguson (2001), assets are the building blocks of sustainable livelihood by which individuals and households develop their capacity to cope with the challenges they encounter and to meet their needs on a sustained basis. Therefore people endowed with assets are more likely to be able to make positive livelihood choices that maximise their achievement of positive livelihood outcomes, rather than being forced into any given strategy because it is their only option.

Policy Institutions are **s**tructures which set policies and legislation in terms of delivery of services; purchase, trade, and perform other functions that affect livelihoods of public and private sector organizations that are supposed to implement these policies. Processes embrace the laws, regulations, policies, operational arrangements, agreements, societal norms, and practices that, in turn, determine the way in which structures operate (Serrat, 2008). They effectively determine access to various types of capital, to livelihood strategies and to decision-making bodies and source of influence, terms of exchange between different types of capitals and returns to any given livelihood strategy (DFID, 1999). Policies, institutions and processes also have a direct impact upon whether people are able to achieve a feeling of inclusion and well-being or not since they determine the degree to which an enabling or facilitating environment for livelihoods is in place, compared to an inhibiting or restrictive one (Majale, 2002). For instance, policies put in place by the government of Kenya have a direct influence on the vulnerability context for maize farmers. Policies established and implemented through structures such as the central bank affect trends directly (e.g. fiscal policy/economic trends). They can also help cushion the impact of external shocks (e.g. MOA policy on access to cheap inputs by the resource poor farmers). Well-functioning markets can help reduce the effects of seasonality by facilitating inter-area trade which will enable maize farmers receive higher income from sales.

A livelihood comprises people, their capabilities and their means of living, including food, income and assets. Livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future,

while not undermining the natural resource base. Livelihood strategies comprise the range and combination of activities and choices that people undertake in order to achieve their livelihood goals which are directly dependent on asset status and policies, institutions and processes. Livelihood outcomes are the achievements or outputs of livelihood strategies, such as more income, increased well-being, reduce vulnerability, improved food security and a more sustainable use of natural resources (DFID. 1999).

Primarily, cereal banks are meant to promote food security, avoid exploitation of maize farmers by middlemen and help surplus producing farmers to find a better market for their grain. The analysis of factors influencing sustainability of cereal banks was thus premised on SLF approach with emphasis on factors that cause poverty among maize farmers particularly the effect of seasonality, extend to which farmers possess or access capital assets, the role of government policies and institutions and whether the resultant outcomes were sustainable in terms of increased maize income, growth in membership as an indicator of increase in population accessing cereal bank benefits.

2.9 Conceptual Framework

The Conceptual Framework was derived from the SL framework which focuses on the current livelihood strategies and objectives of the poor in the context of vulnerability, the influence of policies, institutions and processes and current levels of access to capital assets. The SLF underscores the importance of social capital in terms of membership to groups and other networks. It posits that attempts to build social capital should focus on strengthening local institutions, either directly (through capacity building, leadership training or injection of resources) or indirectly through creating an open, democratic environment in which they flourish. Therefore the study sought to find out the influence of group management on sustainability as measured by; democratic governance, ability to initiate, promote and defend policies, clear communication policies and group constitution. Second variable was Quantity of maize bulked which was measured using ability to produce surplus maize, storage of maize, access to market information and value addition. This was aimed at determining if farmers in the study area had access or possess productive assets necessary to sustain the cereal banks. Access to agricultural extension was conceptualized to facilitate access to physical capital in form of agricultural technologies, improved maize farmers knowledge and skills on agronomic practices for maize production and information on market access

ultimately boosting the human capital for maize farmer groups in Kimilili Sub County. Finally level of participation in group activities was measured using planning and implementing group activities, group meetings and sharing of benefits. The SL approach places great emphasis on involving people in both the identification and the implementation of activities where appropriate. The participation of beneficiaries in the implementation of an intervention ensures that the proposed strategies are those agreed upon and not imposed by the donor (Majale, 2002). These factors were the independent variables. The moderating variables were the policies, middlemen and farm size that were controlled by the randomization of the sample. The dependent variable was sustainability of cereal banks measured by; income from maize sold through the CBs, years the CBs have been in existence and the growth of membership of groups in Kimilili Sub-county, Kenya. Figure 2 shows the schematic relationship between the independent and dependent variables of the study.

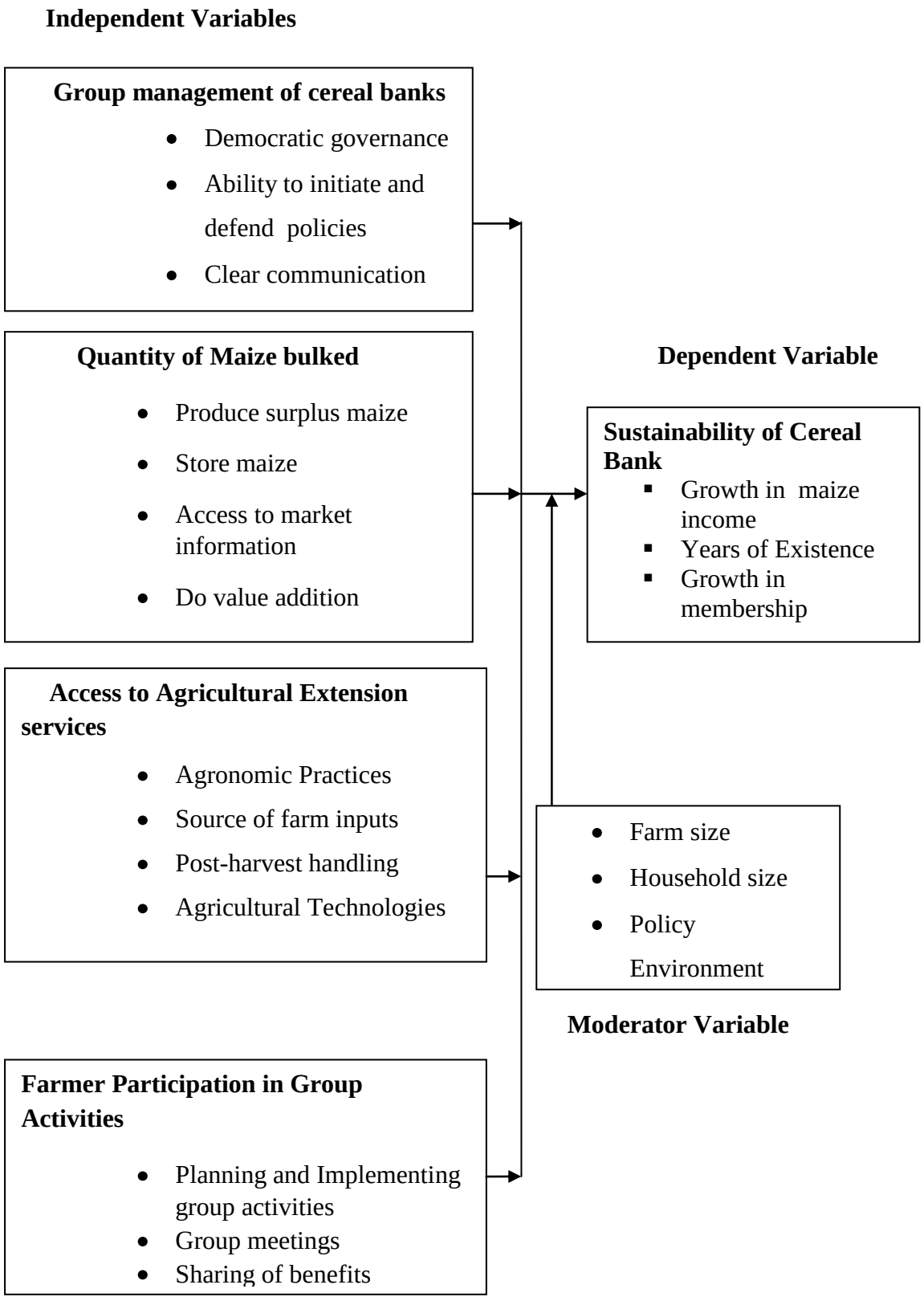


Figure 2. Conceptual framework showing the interaction between independent and dependent variables of the study

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides a description of how the research was carried out to meet the objectives of the study. Therefore, it presents the research design, study location, population of study, sampling procedure and sample size, research instruments, data collection procedure and data analysis.

3.2 Research Design

This study adopted a descriptive survey research design. This is because a descriptive survey research determines and reports the way things are and is also compatible with questionnaire and interview schedule which the researcher employed in collecting data (Mugenda & Mugenda, 2003). This design gives the advantage of collecting original data for purpose of describing a population which is too large to observe directly hence good for generalization (Cohen, Manion & Morrison, 2007; Guthrie, 2012).

3.3 Study Location

The study was carried out in Kimilili Sub-county, located in Bungoma County of the western region of Kenya. The study area has a two-season rain regime, the long rains covering March to July while the short rains start in August to October. The average precipitation ranges from 1250 mm to 1800 mm. Temperature variations are very moderate ranging from 21-25^{o} centigrade during the year. Maize is the predominant crop and is produced with a range of 1tonne – 2 tonnes per acre for the low input users to 4 tonnes per acre for high level input users. Maize is a major crop under production and cereal banking groups existed which were easily accessed by the researcher making the study location preferred.

3.4 Target Population

The target population for this study was farmer groups participating in cereal banking activities and Ward Extension Officers in Kimilili Sub County. According to the Department of Social services, fifteen (15) out of the 138 farmer groups in Kimilili Sub County were participating in cereal banking activities. The farmers' population in the fifteen groups was approximately 942 (Department of Social services, 2016). The study also targeted four Ward extension officers directly in charge of the wards with the cereal banks.

3.5 Sampling Procedure and Sample Size

The researcher adopted stratified proportionate sampling to get farmers from each of the 15 cereal banking groups in Kimilili Sub-County. This was because of the relative composition in different groups. The advantage with stratified proportionate sampling is that it ensures inclusion in the sample of every sub group and also reduces sampling errors (Kothari, 2004; Kasomo, 2006). According to Mugenda (2003) a sample size of 10 percent- 30 percent of the total population is adequate for a study in descriptive research. This research adopted 20 percent of the target population of 942 which gave a sample size of 188 maize farmers. Random sampling was used to select farmers from each group to participate in the study. Purposive sampling was used to select four (4) ward extension officers who were in charge of the wards where the cereal banks existed. The sample grid is summarized in Table 2.

Table 2: Sample Grid

Category of Respondents	**Name of Cereal Bank**	**Population (N)**	**Sample (n)**	**Percentage (%)**
Maize farmers	Sali CBO	177	35	20
	Sambogi CBO	316	63	20
	Kamasielo CBO	144	29	20
	Sisimusia	17	3	20
	Rural Enterprise	21	4	20
	Baraka	27	5	20
	Kimilili Christian Fellowship	23	5	20
	Urafiki	28	6	20
	Lukhuna	25	5	20
	Bisakhalwana	20	4	20
	Kitabani	28	6	20
	Amka Twende	26	5	20
	Wekelekha Nambilo	25	5	20
	Bumbocha	30	6	20
	Naporora	35	7	20
	Total	**942**	**188**	
Ward Extension Officers		**10**	**4**	

(Source: Kimilili Sub-County Agricultural Office, 2014)

3.6 Instrumentation

Primary data was collected using a researcher-administered questionnaire and an interview schedule. Questionnaire technique was preferred because it covers a wide range of areas; it reaches many respondents at a cheaper cost and also saves a lot of time (Kothari, 2004). A

structured questionnaire with both closed and open-ended questions was used. The questions were designed on a likert scale of three to five items. The likert scale was adopted by the researcher since the researcher needed the respondents to give an opinion on particular items of the study. The Interview schedule was used by the researcher to conduct a face to face interview with the ward extension officers to collect additional information on cereal banking in the study area.

3.6.1 Validity of the Research Instruments

According to Gall, Borg and Gall (1996) validity of an instrument is improved through expert judgement. For this study, content and construct validity were established by seeking the opinion of peers, two experienced supervisors and other lecturers in the department of Agricultural Education and Extension Egerton University in order to evaluate the exactness and adequacy of the instruments. Their suggestions and clarifications were used to improve the research instruments.

3.6.2 Reliability of the Research Instruments

To ensure consistency, the questionnaire and interview schedule were pilot tested using a random sample of 30 farmers from Kanduyi ward in Bungoma Sub-County since the area had similar characteristics as the study area and farmers were practising cereal banking. According to Kathuri and Pals (1993) the smallest number that can yield meaningful results is 10. The pilot study was done to understand the dynamics of the result from the questionnaire. Cronbach's alpha was used to compute a reliability coefficient for the questionnaire tool. According to Fraenkel and Wallen (2000), a threshold of 0.7 or higher for an instrument is accepted as good and reliable. A reliability coefficient of 0.77 was observed. This was within the threshold for reliability testing and therefore the instrument was found to be consistent and reliable.

3.7 Data Collection Procedure

The researcher obtained a letter of approval from the Graduate School of Egerton University and a research permit from the National Commission for Science, Technology and Innovation to conduct research in the study area. The Sub-county agricultural extension office in the study area was consulted to link the researcher to the ward extension officers who helped trace maize farmer groups involved in cereal banking. The questionnaires were administered by the researcher to the 188 respondents from the cereal banking groups. The interview with the

ward Agricultural extension officers was held at a convenient venue to them. Questions were in English, but they were presented in Kiswahili or Luhya, depending on literacy level of the respondents to enhance objectivity.

3.8 Data Analysis

After data collection, the information was coded and entered into the computer using SPSS version 17.0. Quantitative data was analysed using descriptive statistics (frequencies and percentages). Influence between independent and dependent variables was measured using cross tabulations (Guthrie, 2012; Kothari, 2004). Kothari (2004) recommends use of cross tabulations to measure correlations where data has been measured on ordinal and nominal scales. Qualitative data was analysed using content analysis and tallying. The hypotheses were tested using chi- square test of independence at 95 percent confidence level. Presentation of results was done by use of graphs, tables, and pie charts. The summary of how data was analysed as per the research questions and hypotheses is given in Table 3.

Table 3: Summary of Data Analysis

Research Questions/Research Hypothesis	Independent variable	Dependent variable	Method of analysis
Research question 1. How does group management of cereal banks influence sustainability of cereal banks among maize farmer groups in Kimilili Sub-county?	Group governance	Sustainability of cereal banks	Frequencies, percentages Cross tabulation
Research question 2. How does quantity of maize bulked influence sustainability of cereal banks among maize farmer groups in Kimilili Sub-county?	Quantity of maize bulked	Sustainability of cereal banks	Frequencies, percentages Cross tabulation
$\mathbf{H_{O1}}$ There is no statistically significant influence of access to extension services on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.	Access to Agricultural extension services	Sustainability of cereal banks	Chi –square
$\mathbf{H_{O2}}$ There is no statistically significant influence of participation in group activities on the sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.	Participation in group activities	Sustainability of cereal banks	Chi –square

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.1 Introduction

This study focused on factors influencing sustainability of cereal banks among maize farmer groups in Kimilili Sub-County, Kenya. This chapter presents the research findings and discussion in an attempt to find out how the selected factors influenced sustainability of cereal banks.

4.2 Demographic Characteristics of the Respondents

4.2.1 Response Rate

The researcher administered 188 questionnaires to the respondents out of which 180 questionnaires were analysed giving a response rate of 95.7 percent. Eight (8) questionnaires were found incomplete hence unsuitable for analysis. This response rate was found adequate since the minimum recommended is 50-70 percent (Mugenda & Mugenda, 2003; Nulty, 2008). Therefore the questionnaires were deemed adequate for analysis and reporting.

4.2.2 Gender of the Respondents

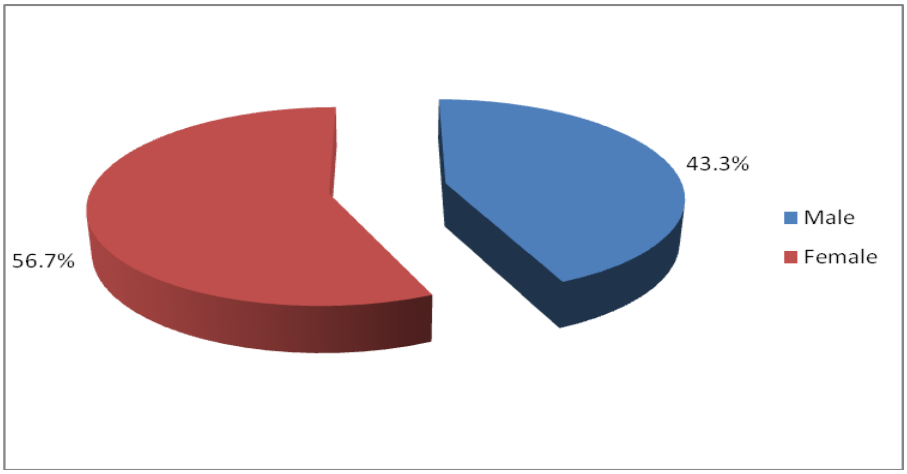


Figure 3. Gender of the respondents

Figure 3 shows that 56.7 percent of the respondents were female although males were also fairly well represented at 43.3 percent. Women are generally more associated with subsistence farming while men are associated with cash crop farming (Tura, Aredo & Tsegaye, 2010).

4.2.3 Age of the Respondents

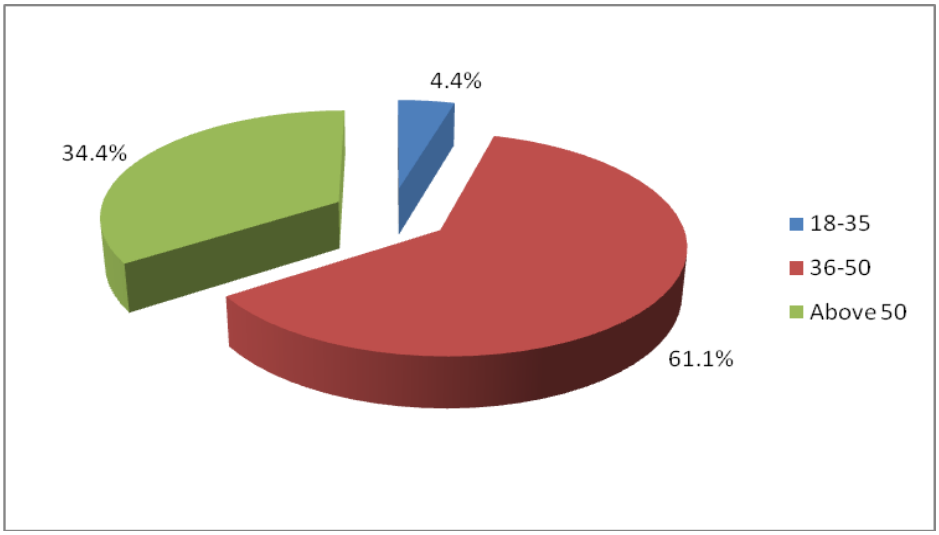


Figure 4. Age of the respondents

Figure 4 shows that 61.1 percent of the respondents were between 36 to 50 years of age, 34.4 percent above 50 years with only 4.4 percent between 18 to 35 years. This implies that majority of farmers were in adult age group of 36-60 years. Mature farmers have been found to be more experienced in farming and better decision makers (Muthoni, 2009). Muthoni (2009) further asserts that the low participation of the young people in farming could be attributed to the negative connotation and attitude towards agriculture hence they seek for white collar jobs. However, where they participate they tend to be more innovative and less risk averse.

4.2.4 Educational Attainment of the Respondents

The results as depicted in Figure 5 indicate that whereas only 10 percent had tertiary education, 1.7 percent had no education and 88.3 percent of farmers had either primary or secondary education implying that they may be able to adopt new technologies since they have the ability to read and write. These findings are in line with what was reported by Gebremedhin and Jalet (2010) that higher literacy level has a positive impact on market participation by farmers.

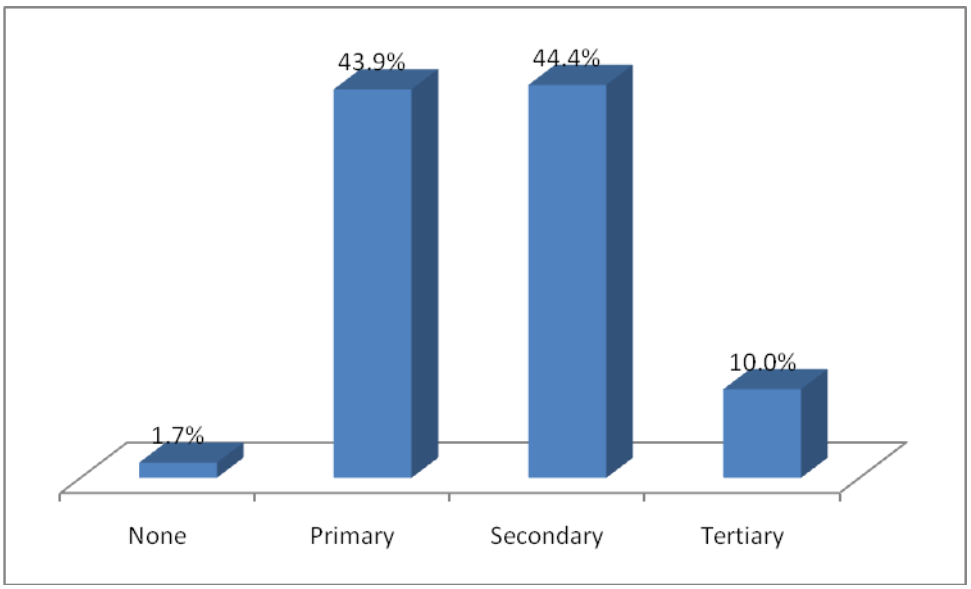


Figure 5. Educational attainment of the respondents

4.2.5 Size of Households of the Respondents

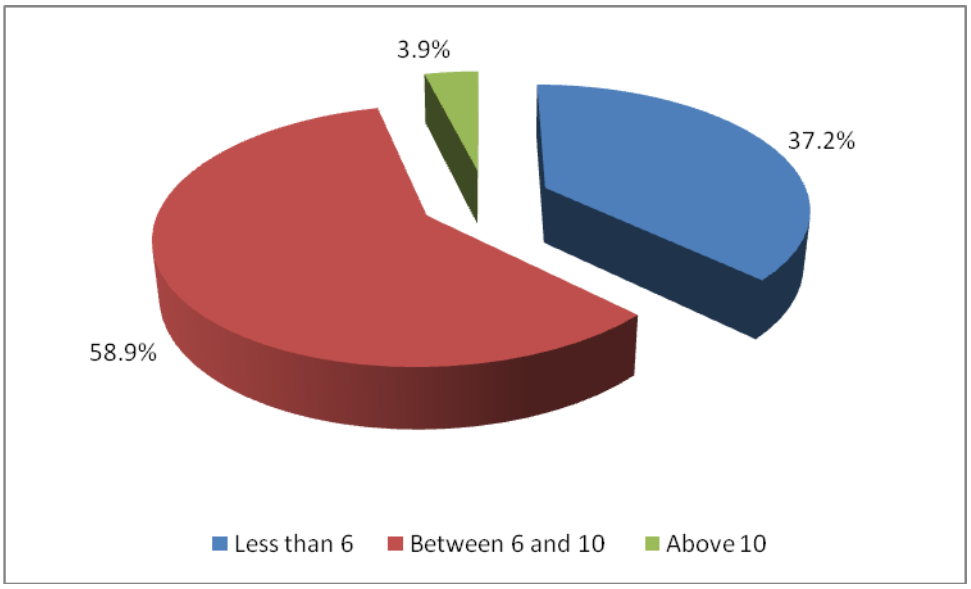


Figure 6. Size of household of the respondents

It was established that 58.9 percent of the respondents had households of 6-10 members, 37.2 percent were from households with less than 6 members while only 3.9 percent came from households with more than 10 members as shown in Figure 6. Large family size could explain why majority of the farmers were only bulking less than 5 bags. According to Mwamfupe

(2015) large household sizes limit the quantity of maize bulked since a large amount will be consumed.

4.2.6 Farm size of the Respondents

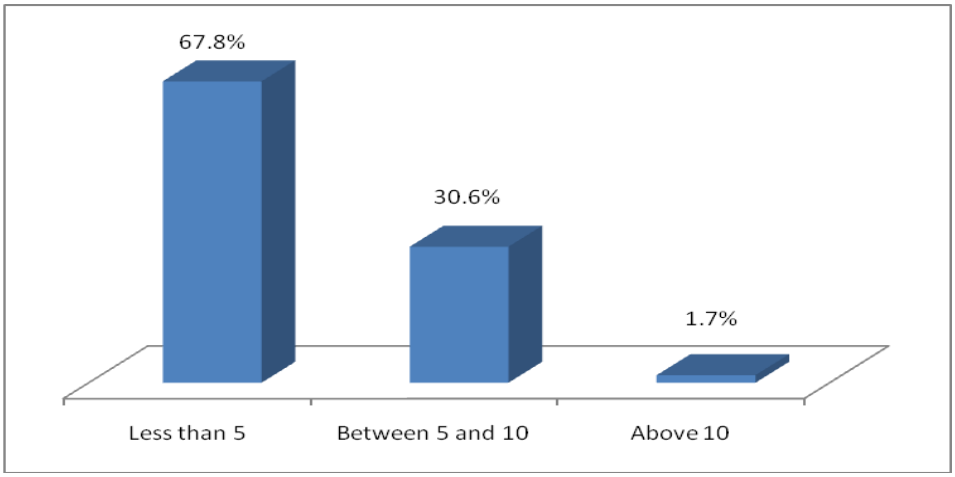


Figure 7. Farm size of the respondents

Findings as shown in Figure 7 indicate that majority of farmers (67.8%) had a farm size below five acres and only 1.7 percent above 10 acres. Farm size has been found to affect agricultural productivity. According to Muthoni (2009) the economic implication of the prevalence of small land holding among majority of farmers is that house hold farm income cannot be increased through expansion of cultivated land but only through land productivity and value adding technologies which include among others efficient use of fertilizers, agricultural technologies and reduction of post-harvest losses. The sustainable livelihood framework (DFID, 1999) asserts that the success of any intervention is greatly determined by the extent to which the community owns or has access to productive assets. Given the small land sizes and large family sizes by a majority of the farmers, bulking adequate maize for the cereal banks may be a challenge in the study area.

4.2.7 Size of the Farmer Group

Group size has been found to influence cohesion and member participation on group activities. Small groups with membership of less than 25 members are likely to be more cohesive and highly consultative as opposed to large groups where management committees make most of the decisions which eventually may cause mistrust leading to group disintegration. The study therefore sought to establish the size of the group that the respondents were affiliated to and the findings are shown in Figure 8.

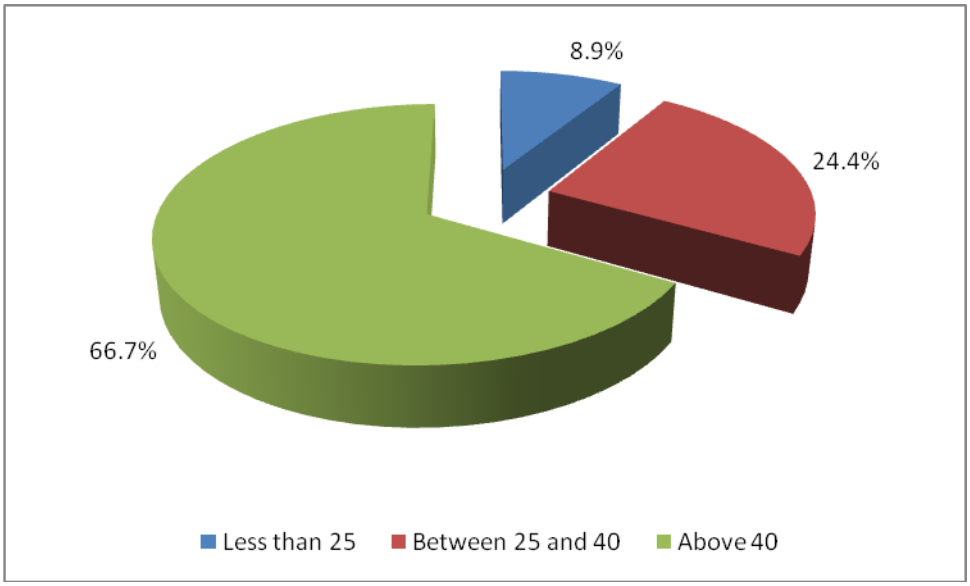


Figure 8. Group size of the maize farmers

The results as shown in Figure 8 indicate that, 66.7 percent of the groups had a membership of more than 40 members, 24.4 percent had between 25 and 40 and 8.9 percent had below 25 members. According to Mwamfupe (2015) and Dramane et al., (2012), group size has been found to influence cohesiveness. They asserted that small groups that operate as common interest groups perform better in terms of commitment to cereal bank activities. However, Mwamfupe cautions that few members with small grain deposits may threaten the adequacy of cereals for bulking and small groups also tend to serve interest of a few individuals which may fail to achieve the main social objective of cereal banks. Burkey (1996) reports that group sizes of less than 10 members are unviable while those with more than twenty five members quickly become non-participatory. On the other hand Heinrich (1993) from studies done in Botswana concluded that groups should not exceed 40 members if they are to be manageable. These studies therefore, reveal that a group size of forty members is ideal in terms of providing adequate stocks for bulking while at the same time ensuring that the group remains manageable.

4.3 Measuring sustainability of Cereal Banks

According to Murray and Ferguson (2001), assets are the building blocks of sustainable livelihood by which individuals and households develop their capacity to cope with the challenges they encounter and to meet their needs on a sustained basis. The study sought to measure sustainability with the indicators such as growth in maize income, years of existence of cereal banks and growth in membership.

4.3.1 Income from Maize through Cereal Banks

Respondents were asked how income from maize had been affected by their membership in the cereal banks. The results were as shown in Figure 9.

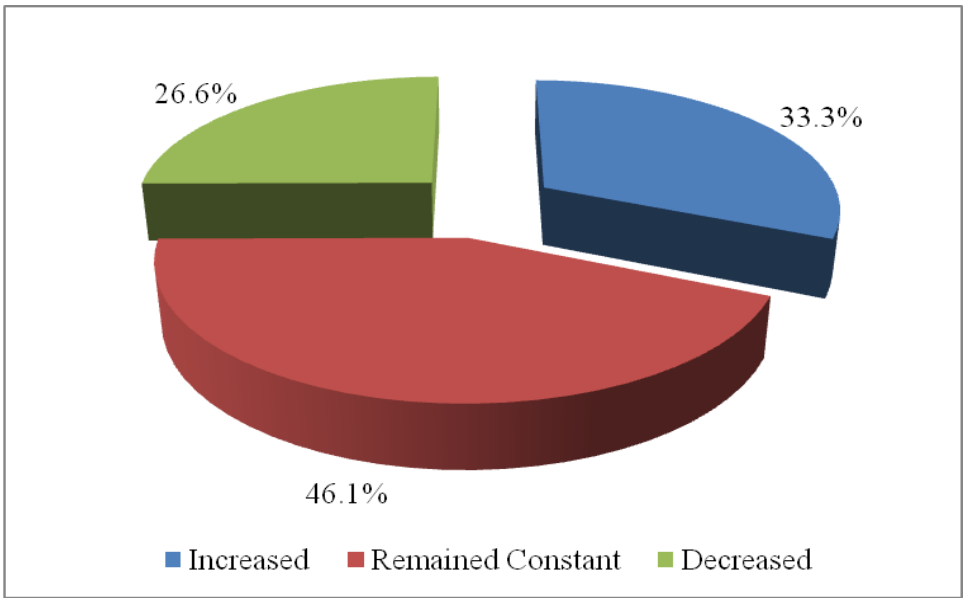


Figure 9. Income from maize through cereal banks

Findings as shown in Figure 9 indicate that 46.1 percent of the respondents cited that income from maize had remained constant, 33.3 percent said that their income had increased while 26.6 percent indicated that income had decreased. This may be attributed to lack of adequate market information to enable them access high value markets. Increased incomes would make maize farmers more independent and better able to operate their cereal banks without much external support. According to Jari, (2009), when farmers have difficulties in accessing marketing information it exposes them to a marketing disadvantage. Low maize income of the farmers groups could also be attributed to large household sizes and small land sizes that make them bulk less for marketing.

4.3.2 Years of Existence of Cereal Banks

A project is sustainable if it is able to continue long after the outside support is withdrawn (Oino, et al., 2015). Most cereal banks in Kimilili Sub County were established by the ministry of Agriculture through the NAAIAP programme. The study therefore sought to establish the years of existence of cereal banks in an attempt to explain their sustainability and the findings are given in Figure 10.

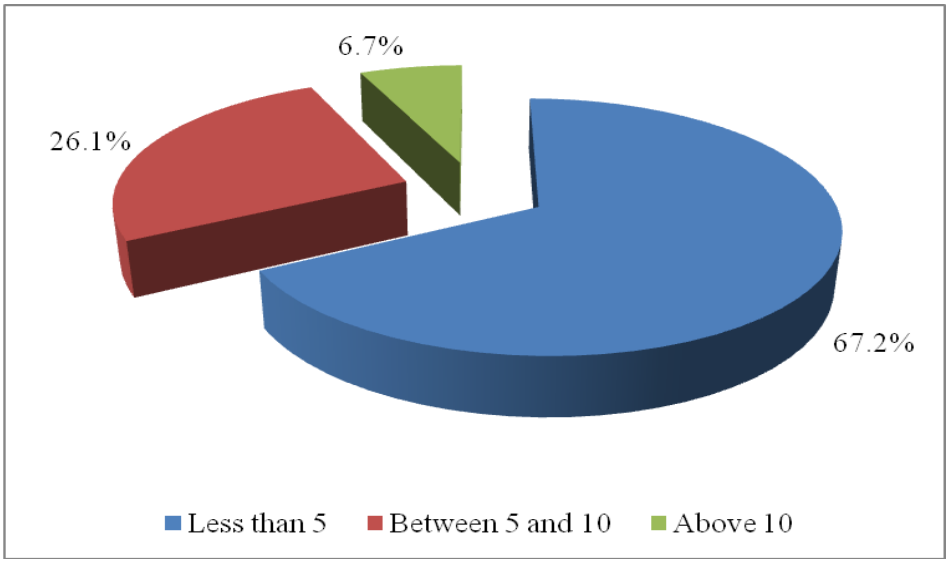


Figure 10. Years of existence of cereal banks

It was noted that 67.2 percent of the groups had been in existence for less than five years, 26.1 percent had been in existence for 5-10 years with only 6.7 percent surviving for more than 10 years. This implies a low rate of transition of these cereal banks to the next level of growth where only a few had survived beyond five years. These findings agree with assertions by Mwamfupe (2015), Dramane et al., (2012) and Mukhwana (2003) that most cereal banks tend to progressively de-capitalize and disappear once outside support is removed. Continued existence of the cereal banks for many years would guarantee access to the project benefits in terms of food and income security which would improve livelihoods in Kimilili Sub County and make farmers less vulnerable.

4.3.3 Growth in Membership

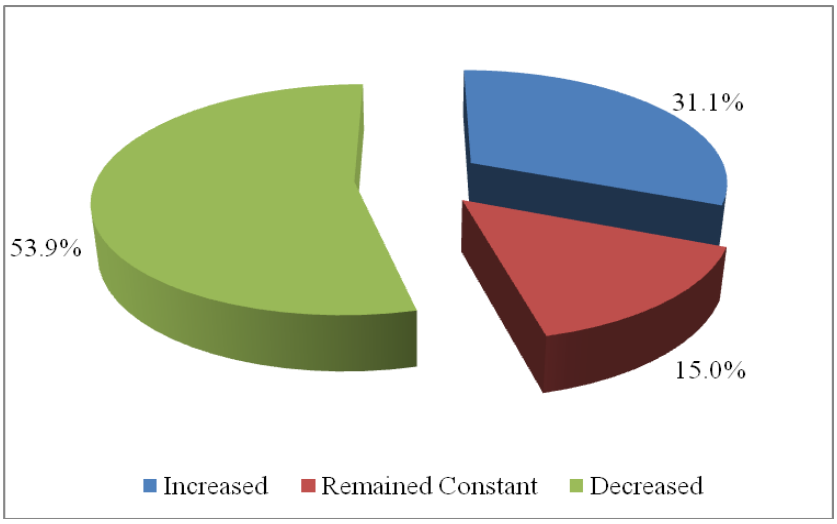


Figure 11. Growth in membership in the last 4 years

Results in Figure 11 reveal that 53.9 percent of the respondents indicated that their groups registered a decline in membership over the last four years, 31.1 percent registered growth while 15 percent said that membership in their groups had remained constant over the last four years. Growth in membership has a number of benefits to the cereal bank; such as increased cereal bank bargaining power useful for lobbying and advocacy, increased access to more maize for bulking and also increased population accessing the benefits of the cereal bank hence sustainability (Khan, 2000). A decline in membership may thus affect sustainability in terms of adequate cereals for bulking. Farmer groups are formed to facilitate access to better agricultural technologies, improve access to better markets for produce, financial security and household investments; access to credit where groups members acts as collateral for each other and to invest in agricultural value addition. Growth in membership is thus an indicator of the number of people accessing the benefits from farmer group's cereal bank.

4.4 Findings on selected factors influencing sustainability of cereal banks

Factors influencing sustainability of cereal banks were determined using four main variables namely; group management of cereal banks, quantity of maize bulked, access to extension services and level of participation in group activities. The variables were developed on an ordinal scale and therefore the main measure of central tendency used was the modal response as recommended by O'leary (2011) and Kothari (2004).

4.4.1 Group Management of Cereal Banks

The first objective sought to establish how the group management of cereal banks influenced their sustainability. Respondents were presented with five questions on a likert scale to state their level of agreement with the statement where SD= Strongly Disagree, D=Disagree, U= Unsure, A=Agree, SA= Strongly Agree. Table 4 presents a summary of the results.

Table 4: Group Management of Cereal Banks (n=180)

Group Management Characteristic	SD		D		U		A		SA	
	F	%	F	%	F	%	F	%	F	%
Democratic type of governance	25	13.9	72	40.0	13	7.2	62	34.4	8	4.4
Ability to initiate, promote and defend policies	18	10.0	58	32.2	15	8.3	70	38.9	19	10.6
A clear communication process(horizontal and vertical	8	4.4	28	15.6	4	2.2	93	51.7	47	26.1
Technical skills (entrepreneurial skills, storage loss reduction skills)	47	26.1	42	23.3	15	18.3	59	32.8	17	19.4
My group has a constitution that guides us on internal management of the group	6	3.3	10	5.6	4	2.2	69	38.3	91	50.6

Democratic governance and transparency among management committees have been found to contribute significantly to the sustainability of cereal banks (Liu, 2016). Findings on democratic governance reveal that 61.1 percent of the respondents strongly disagreed (13.9%), disagreed (40%) or were undecided (7.2 %) about the state of democratic governance in their groups. Only 38.8 percent agreed that their groups had democratic governance. Findings from the interviews with ward extension officers also indicated that management problems were among the major challenges facing cereal banks. Major issues highlighted included; lack of cohesiveness, lack of trust and fear of failure. This supports the assertion by Muthoni (2009) & Mwamfupe (2015) that most of cereal banks established in the 1980s in many Sahel countries failed due to management problems, embezzlement or a certain ambiguity of their social role. This reveals that management of the cereal banks in the study area is a challenge.

Findings on ability to initiate promote and defend policies revealed mixed results. Whereas almost half of the respondents (50.5%) strongly disagreed, disagreed or were undecided that their groups had the ability to initiate promote and defend policies, 49.5 percent agreed or

strongly agreed which could be attributed to the management challenges within the groups. Leadership skills of the management committee have been found to be a key factor on sustainability of farmer groups (Nguyen, 2000).

On communication processes, majority (77.8%) agreed or strongly agreed that their group had a clear communication process. These results validate findings by Borgen (2001) that an efficient communication process would encourage member participation and group cohesion which promotes sustainability of the group. Findings on technical skills reveal that 57.7 percent of the respondents strongly disagreed, disagreed or were undecided that their groups had adequate technical skills against 42.2 percent who agreed or strongly agreed. This supports findings by Dramane et al., (2012) who found that only a quarter of the managers had received formal training on cereal bank management while 28 percent had not received any training. Mwamfupe (2015) argues that although cereal banks are not business ventures they cannot be run like charity organizations instead they have to generate some profit to cover operation costs to avoid the risk of stock de-capitalization. Liu (2016) emphasizes the need to train the management committee in such aspects as; leadership skills, grain handling, storage methods, record keeping and financial management for effective management of cereal banks.

Even though the majority (88.9%) of the respondents agreed or strongly agreed that their group had a constitution that guided the internal management of the group, challenges in group governance and effective implementation of policies could imply that these constitutions are not being implemented. The importance of a group constitution for internal management of groups is emphasized in the first schedule of the Micro and Small Enterprise Act of 2012 which also highlights the key components to be included in its development.

A cross tabulation of group management characteristics and growth in membership was done to find out whether group management had any influence on sustainability of cereal banks as measured by growth in membership as summarized in Table 5.

Table 5: Cross Tabulation of Group Management Characteristics by Growth in Membership in the Last 4 Years (n=180)

Group management characteristic		Growth in membership in the last 4 years			
		Increased	Remained constant	Decreased	Total
Democratic governance	Strongly disagree	11	5	**9**	25
	Disagree	9	10	**53**	72
	Undecided	5	6	**2**	13
	Agree	**24**	6	32	62
	Strongly Agree	**7**	0	1	8
	Total	**56**	**27**	**97**	**180**
Initiate, promote and defend policies	Strongly disagree	12	1	**5**	18
	Disagree	6	10	**42**	58
	Undecided	5	3	**7**	15
	Agree	**22**	13	35	70
	Strongly Agree	**11**	0	8	19
	Total	**56**	**27**	**97**	**180**
Technical Skills	Strongly disagree	8	7	**32**	47
	Disagree	15	9	**18**	42
	Undecided	2	0	**13**	15
	Agree	**23**	11	25	59
	Strongly Agree	**8**	0	9	17
	Total	**56**	**27**	**97**	**180**

Findings in Table 5 on cross tabulations of group management characteristics and growth in membership revealed that the management strategies adopted had an influence on the growth in membership. In particular; out of the 97 respondents, who indicated that membership in their groups had decreased over the last four years, 64 respondents strongly disagreed, disagreed or were undecided on whether management in their group's demonstrated democratic governance, had the ability to initiate, promote and defend policies or had adequate technical skills. On the contrary, out of the 56 who indicated that their groups had grown in membership, 31 respondents either agreed or strongly agreed that the management of their groups had demonstrated positive aspects of the various skills tested. This implies that proper group management seems to have a positive influence on sustainability of cereal banks

in terms of growth in membership. Although cereal banks run by a few members as interest groups have been found to perform well, small numbers pose a threat to sustainability since the small holder farmers may fail to supply adequate stocks of cereals for bulking and may also not manage to raise sufficient resources for working capital making the cereal bank to collapse. A reasonable number of members are therefore necessary to sustain the cereal banks in the long run in terms of providing adequate stocks of cereals for bulking and working capital. A growth in membership is also an indicator of the increasing number of people accessing the benefits of the cereal bank which results to sustainability (Khan, 2000).

4.4.2 Quantity of Maize Bulked

Operating a community cereal banks require members to deposit cereals when they are in abundance and with the prices at their lowest. The availability of maize surpluses significantly depends on quantity consumed at household level as dictated by household size and the use of the alternative staples (banana, millet, sweet potatoes and cassava). Larger households are likely to consume more and consequently influence the availability of maize for bulking. Results on amount of maize bulked by farmers in the study area are shown in Figure 12.

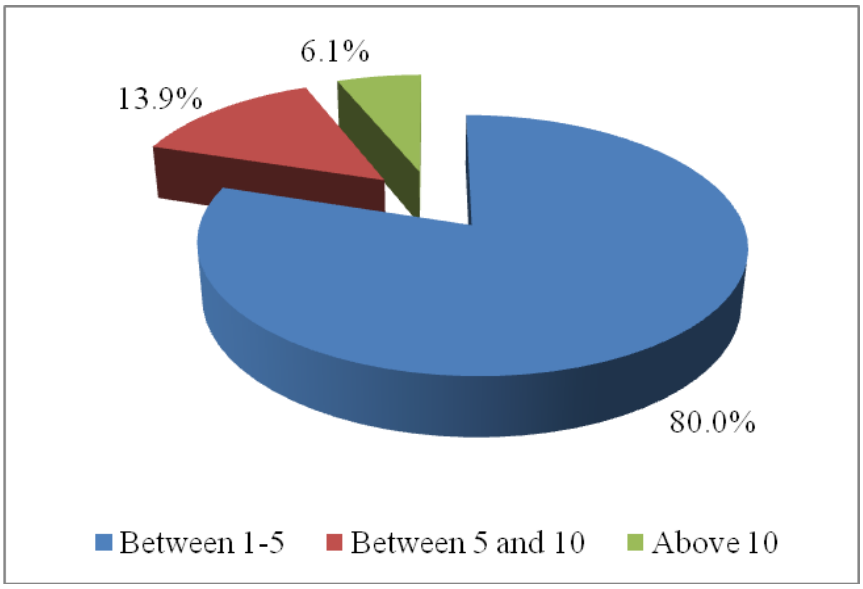


Figure 12. Amount of maize bulked in bags

Findings in Figure 12 revealed that 80 percent of the respondents were bulking between one and five bags per season, 13.9 percent were bulking between five and ten bags and only 6.1 percent were bulking more than 10 bags. According to Mwamfupe (2015), small quantities of cereal deposits attract a large number of small holder farmers to deposit their cereals with the

cereal banks but this makes it difficult to access adequate cereals to stock pile the bank which in turn may threaten the sustainability of the cereal banks.

The researcher sought to find out how characteristics on the maize bulked influence sustainability of cereal banks as shown in Table 6.

Table 6: Characteristics on the Maize Bulked (n=180)

	Responses									
Characteristic on the maize bulked	**SD**		**D**		**U**		**A**		**SA**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Produce surplus maize for bulking	11	6.1	32	17.8	3	1.7	96	53.3	38	21.1
Storage of maize	6	3.3	27	15.0	4	2.2	125	69.4	18	10.0
Access update and reliable market information	95	52.8	40	22.2	13	7.2	31	17.2	1	0.6
Do value addition to maize	99	55	48	26.7	15	8.3	8	4.4	10	5.6

Table 6 revealed that 74.4 percent of the respondents agreed or strongly agreed that they were able to produce surplus maize for bulking. However the quantity deposited to the cereal banks were limited by the small farm size and household size. These findings confirm assertions by Mwamfupe (2015) that although small deposits may attract many households to participate in cereal banking, this makes it difficult to attract large quantities to stock pile the bank which may affect sustainability. It was noted that, 79.4 percent of the respondents either agreed or strongly agreed that they were able to store maize. Ironically, findings from interviews with ward extension officers indicated that most of the groups lacked appropriate storage facilities and that poor storage conditions coupled with the threat of grain infestation by large grain borer forced some of the groups to sale their grain below market price. This is in line with findings by Dramane et.al, (2012) who established that many cereal banks failed for lack of appropriate warehouses to store the grains, limited space, poor ventilation and poor quality of roofs which caused grain damage leading to great losses.

It was noted that 75 percent of the respondents either strongly disagreed or disagreed that they had received adequate market information. Access to market information should allow farmers to take informed marketing decisions that are related to supplying the right goods, searching for potential buyers, negotiating, enforcing and monitoring contracts. Jari (2009) argues that smallholder farmers normally rely on informal networks (traders, friends and relatives) for market information due to weak public information systems. Therefore, such individuals cannot get up to date and reliable market information, making the usefulness of the information doubtful. Lack of reliable market information means that, the cereal bank groups may not able to negotiate from a well-informed position and may end up selling their stock at low prices threatening the sustainability of their cereal banks. These findings are similar to those of Coulter et al., (2000) who asserted that opportunistic middlemen complicate the situation by offering to purchase the surplus maize, but pay extremely low gate prices to farmers who lack capital, access to market information and transport.

Findings on whether respondents were able to do value addition indicated that 81 percent either strongly disagreed or disagreed that their groups were able to do value addition against only 10 percent who agreed or strongly agreed. Lack of value addition not only affects the quality of a product but also reduces its shelf life and limits access to high value markets. These findings validate assertion by Jari (2009) who found that with few exceptions, most smallholder farmers cannot add value to their produce because they do not know its importance and/or lack processing technology. The farmer groups did not have the capacity to do value addition as they lacked capital base and adequate technological skills.

A cross tabulation on aspects of quantity of maize bulked by income from maize was done to establish whether quantity of maize bulked influenced sustainability of cereal banks in terms of growth in income. Results were as summarized in Table 7.

Table 7: Cross Tabulation of Quantity of Maize Bulked aspects by Income from Maize (n=180)

Quantity of maize bulked Attribute		Growth in Maize income the last 4 years			
		Increased	Remained constant	Decreased	Total
Surplus maize for bulking	Strongly disagree	4	4	3	11
	Disagree	11	13	8	32
	Undecided	0	3	0	3
	Agree	**34**	43	19	96
	Strongly Agree	**17**	13	8	38
	Total	**66**	**76**	**38**	**180**
Store Maize	Strongly disagree	1	4	1	6
	Disagree	4	16	7	27
	Undecided	2	1	1	4
	Agree	**48**	50	27	125
	Strongly Agree	**11**	5	2	18
	Total	66	76	38	180
Access to market information	Strongly disagree	26	48	21	95
	Disagree	15	15	10	40
	Undecided	5	5	3	13
	Agree	20	7	**4**	31
	Strongly Agree	0	1	**0**	1
	Total	66	76	38	180
Do maize value addition	Strongly disagree	34	45	20	99
	Disagree	20	14	14	48
	Undecided	2	10	3	15
	Agree	6	2	**0**	8
	Strongly Agree	4	5	**1**	10
	Total	66	76	38	180

Findings as shown in Table 7 indicate that various measures of quantity of maize bulked had influence on sustainability of cereal banks in terms of maize income. In particular; out of the 66 respondents who recorded an increase in maize income majority accounting for over 77 percent either agreed or strongly agreed that they were producing surplus maize for bulking and were able to stock maize. On the contrary, low access to market information and inability to do value addition seem to have negative influence on income from maize obtained by the

small holder farmers in the study area. Out of the 38 respondents who recorded a decrease in maize income only four agreed that they had access to market information while only one confirmed that she/he was doing value addition. This implies that ability to produce surplus maize for bulking, storage of maize, access to vital market information and doing value addition has the potential to increase income from maize and may consequently improve the sustainability of cereal banks. Therefore, with increased income, the livelihoods of the farmers would improve and the cereal banks would be able to raise adequate working capital to finance various group activities such as purchase of value addition equipment, avail soft loans to farmers among others without the risk of de-capitalization. Therefore, from these findings, quantity of maize bulked seems to have a positive influence on sustainability of cereal banks.

4.4.3 Farmers Access to Extension Services

Agricultural extension services provide farmers with important information on patterns of crop prices, new seed varieties, crop management and marketing. This study contends that exposure to such activities is intended to increase farmers' ability to optimize the use of their resources that eventually leads to surplus production of maize for Cereal banking activities. Figure 13 shows respondents' contact with extension officers.

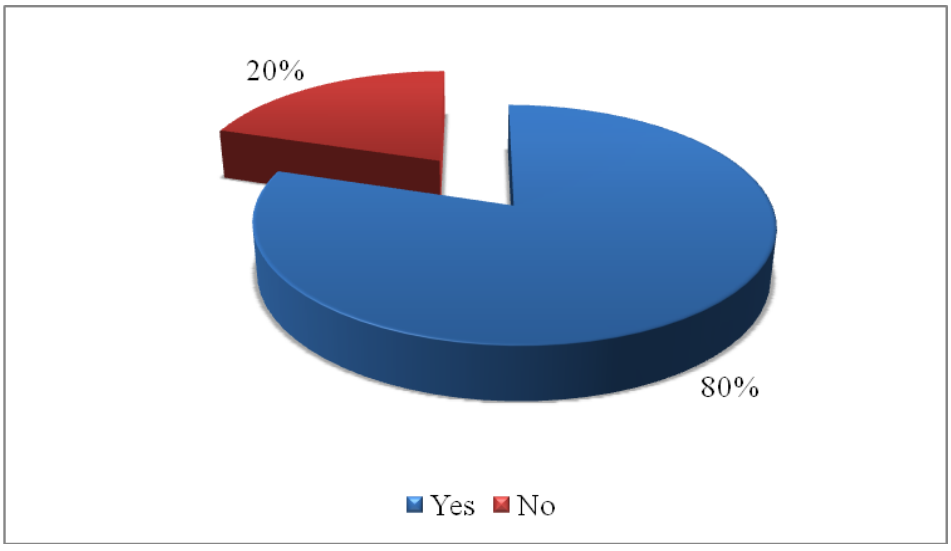


Figure 13. Farmers Contact with extension officers

Figure 13 show that 80 percent of the farmers from the groups had accessed extension services against 20 percent who had not. The National Agricultural Extension policy (2007)

underscores the importance of access to agricultural extension service as it plays a vital role in sharing knowledge, technologies, agricultural information and also linking the farmer to other actors in the economy. It was captured from the ward extension officers that cereal banking groups are visited and given information on maize production, how to access farm inputs and post-harvest handling practices of maize.

Maize famers' perceptions on access to agricultural extension service were also sought. Respondents were presented with five questions on a Likert scale to state their level of agreement with the statements where SD= Strongly Disagree, D=Disagree, U= Unsure, A=Agree, SA= Strongly Agree. The findings are summarized in Table 8.

Table 8: Maize Famers Perceptions on Access to Agricultural Extension Services (n=180)

Agricultural Extension Indicators	Responses									
	SD		D		U		A		SA	
	F	%	F	%	F	%	F	%	F	%
Agronomic Practices for maize production	14	7.8	11	6.1	0	0	60	33.3	95	2.8
Sources of Farm inputs	7	3.9	49	27.2	2	1.1	101	56.1	21	11.7
Post-harvest handling practices	8	4.4	13	7.2	6	3.3	103	57.1	50	27.8
Access to Markets	63	35.0	36	20.0	15	8.3	63	35.0	3	1.7
Access to improved Agricultural Technologies	85	47.2	27	15.0	26	14.4	37	20.6	5	2.8

Findings as shown in Table 8 indicate that agricultural extension services have enabled the farmers' to access information on various aspects of maize production. Specifically; 86.1percent of the farmers either strongly agreed (52.8%) or agreed (33.3%) that they had received adequate information on agronomic practices for maize production. On access to appropriate sources of farm inputs 67.8 percent either agreed or strongly agreed that they had received adequate information. This implies that most of the farmers were able to access farm

inputs. Low productivity levels for most crops have been attributed to high costs of farm inputs particularly fertilizer and seed (Kenya Vision 2030, 2007). The Government therefore made deliberate effort to avail subsidized fertilizer to farmers through the National Accelerated Agricultural Input Access Programme (NAAIAP) with the aim of reducing production costs for increased maize production (Kenya Economic Report, 2012). With high yields farmers are able to raise surplus maize for the market which can be sold through the cereal banks.

On post-harvest handling practices 80 percent of the respondents either agreed or strongly agreed that they had received adequate information on post-harvest handling of maize. Post-harvest losses in developing economies are as high as 40 percent which impacts negatively on food security and farm income (ADB, 2014). The Kenya vision 2030 strategy paper also affirms that post-harvest handling is a major challenge for a majority of Kenyan small holder farmers. With limited amount of cultivable farm available for production, reducing post-harvest losses would ensure that all the maize harvested is used for consumption and the surplus sold through collective marketing by cereal banks.

On access to markets, 55 percent of the farmers either disagreed or strongly disagreed that extension services had enabled them access adequate information against 36.7 percent who either agreed or strongly agreed. This implies that access to high value markets is still a challenge to the cereal banking groups. Although finding market for maize was one of the main objectives of establishing cereal banks in western Kenya by SACRED- Africa (Mukhwana, 2003), studies reveal that most cereal banks in developing economies have a "donor dependency syndrome" and fail to meet their objectives once the donor pulls out (Msaki et al., 2015; Mwamfupe, 2015). This means that cereal banking projects become unsustainable without external support. Findings by Muthoni (2009) revealed that the situation of small scale farmers is made worse by the fact that they lack business acumen to manage their cereal banks profitably. The Kenya Economic Report [KER], (2012) established that only 17 out of 47 counties produce enough domestic supply of maize to meet their consumption needs. This implies that cereal banks with adequate stocks of maize and access to transport services have an opportunity to sale to the maize deficit counties. Furthermore existence of the 30 percent procurement opportunities for women and the minorities (GOK, 2005) is another avenue whereby cereal banks can liaise with relief agencies and the department of special programmes to access government tenders to supply maize to the food

insecure counties, refugees, internally displaced persons and drought stricken areas. This would guarantee higher returns than the current practice where the cereal banks stock maize to be sold during the hunger season in their local markets.

Cereal banks are also supposed to facilitate access to improved agricultural technologies (Muthoni, 2009). However, findings on access to improved agricultural technologies revealed that 62.2 percent of the farmers surveyed either strongly disagreed or disagreed that extension services had enabled them access adequate agricultural technologies. These findings are supported by the Ministry of Agriculture Strategic Plan of 2008-2012 (MOA, 2009) which found out that use of modern science and technology in production is still limited among small holder farmers in Kenya and is the main cause for low agricultural productivity. This has been attributed to inadequate credit to finance inputs and capital investment in agriculture. Even though the Agricultural Finance Corporation (AFC), Cooperative Bank of Kenya and the co-operative movement have made considerable efforts to provide affordable credit to farmers, the high interest rates make it impossible for most farmers to access credit (MOA, 2009). Other studies by Mwamfupe (2015) and Dramane et.al., (2012) argue that limited operating capital makes it difficult for cereal banks to finance other activities which is further exacerbated by the fact that most cereal banks sold or lent grain to their clients below the prevailing market prices hence rarely making a profit (Kent, 1998). Occasionally cereal banks fund other activities but almost always by de-capitalizing their own revolving funds. Consequently, low use of agricultural technologies could be attributed to cereal banks lacking adequate resources to purchase improved technologies for the members without the risk of de-capitalization.

4.4.4 Farmers Participation in Group Activities

Objective four sought to establish whether farmer participation in group activities influenced sustainability of cereal banks. Participation in group activities would be an important indicator in developing farmers' understanding and appreciation of an organisation and contributes significantly to the sustainability of a group (Nguyen, 2000; Liu, 2016). Several factors contribute to members' commitment to the organization or group, such as the benefits that members receive; participation in the governance; and ability to translate members' needs into decisions which ultimately influences sustainability of cereal banks (Fulton & Giannakas, 2001; Osterberg & Nilsson, 2009). Findings by Nguyen (2000) established that groups with

several activities were more sustainable as they kept the members engaged in various activities for longer than those with only one activity where member's enthusiasm eventually wanes off once the objective is achieved. This study sought to find out whether the farmer groups undertook any other activities apart from cereal banking and the findings are indicated in Figure 14.

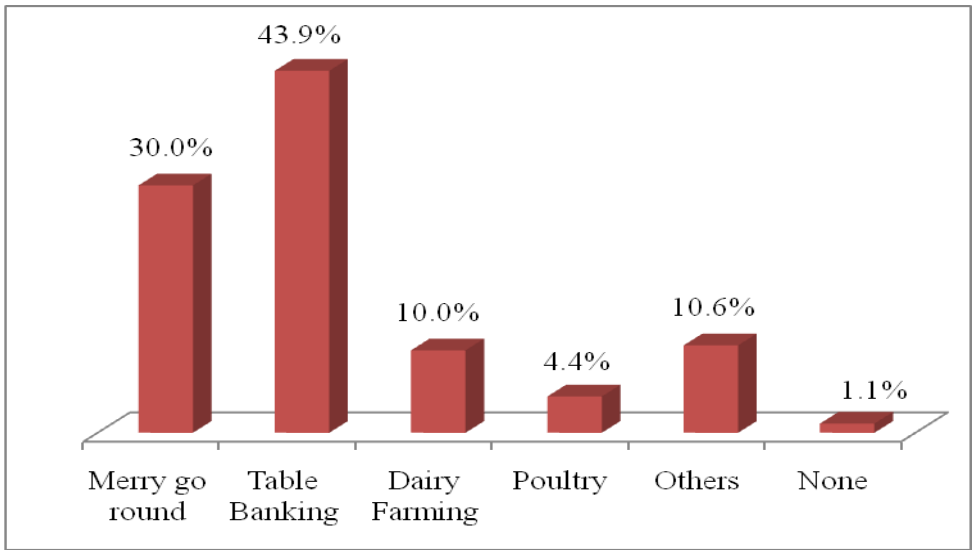


Figure 14. Activities undertaken by Farmer Groups

The results as shown in Figure14 indicate that other than cereal banking, most of the groups participated in table banking (43.9%), merry go round (30%) and dairy farming (10%) as the main income generating activities. Group performance is measured in terms of the benefits or outcomes that groups generate to members, which may be tangible or intangible significant association between group performance and sustainability. According to Nguyen (2000) to enhance the participation of members in group activities and boost farmers group cohesion, there is need to diversify activities for the group since it becomes difficult to maintain the motivation and participation of the group once the primary objective is achieved. The study sought to find out whether farmers were involved in group activities and the results are shown in Table 9.

Table 9: Participation in Group Activities (n=180)

Characteristics of Farmer participation	Responses									
	SD		D		U		A		SA	
	F	%	F	%	F	%	F	%	F	%
Planning and implementing group activities	29	16.1	73	40.6	5	2.8	50	27.8	23	12.8
Group meetings	24	13.3	68	37.8	2	1.1	42	23.3	44	24.4
Sharing of benefits accrued	27	15.0	59	32.8	5	2.8	53	29.4	36	20.0

Results in Table 9 indicate that 56.7 percent of the respondents strongly disagreed or disagreed that they were involved in the planning and implementing of group activities. On group meetings, about half (51.1%) strongly disagreed or disagreed that they fully participated in group meetings. Group meetings facilitate resolving of members problems, sharing of ideas and building of trust amongst members. Nguyen (2000) asserts that regular group meetings that involve everybody to provide information and solve members' problems are important to the sustainability of farmer groups. On the sharing of group proceeds results were mixed; 49.4 percent either agreed or strongly agreed that they were involved in sharing of group proceeds, while, (47.8%) either strongly disagreed or disagreed. This means that there is need to improve the process of sharing group proceeds satisfactorily, since dissatisfaction can easily result to conflicts that may make the group to collapse. Participation in group activities has been found to increase member commitment and improve group cohesiveness (Bamberger & Cheema, 1990; DFID, 1999; Nguyen, 2000).

This implies that majority of the cereal bank members were not involved in group activities which could result in mistrust among the group members hence threatening the group cohesion. According to Mwamfupe (2015) when members do not trust the management committees they tend to hold their stocks rather than depositing to the banks which ultimately affects sustainability in terms of adequate stocks for bulking. This implies that improving participation may consequently improve commitment of the members to cereal bank activities.

The study also sought to establish whether group size has any influence on group participation using cross tabulation. Respondents were presented with Likert scale to state their level of agreement with the statement where SD= Strongly Disagree, D=Disagree, U= Unsure, A=Agree, SA= Strongly Agree. The findings are summarized in Table 10.

Table 10: Cross Tabulation of Group Size by Participation in Group Activities (n =180)

	Group size	**SD**	**D**	**U**	**A**	**SA**	**Total**
		F	F	F	F	F	
Planning and Implementing group activities	<25	0	4	0	10	2	16
	25-40	7	11	0	19	7	44
	>40	22	58	3	23	14	120
		29	**73**	**3**	**52**	**23**	**180**
Group meetings	<25	0	3	0	4	9	16
	25-40	4	12	0	11	17	44
	>40	20	53	2	27	18	120
		24	**68**	**2**	**42**	**44**	**180**
Sharing of benefits accrued	<25	0	2	0	8	6	16
	25-40	4	10	0	19	11	44
	>40	23	47	5	26	19	120
	Total	**27**	**59**	**5**	**53**	**36**	**180**

Findings as shown in Table 10 reveal that small group size had a positive influence on participation as compared to large group size. Of the 29 respondents who strongly disagreed that they were involved in planning and implementing group activities 22 were from groups with more than 40 members with none from the groups with less than 25 members while of the 73 respondents who disagreed that they were involved in planning and implementing of group activities 58 were from groups of more than 40 members. On involvement in group meetings, of the 24 respondents who strongly disagreed 20 were from groups with more than 40 members with none from groups of less than 25 members while of the 68 respondents who disagreed 53 were from groups with more than 40 members with only 3 from groups with less than 25 members. Results on whether respondents were involved in sharing of proceeds accrued 23 out of 27 respondents who strongly disagreed and 47 out of 59 who disagreed were from groups with more than 40 members. This implies that large group size has a negative influence on participation in group activities and reducing the group size may improve group participation ultimately improving the sustainability of cereal banks.

A cross tabulation between group management and group size was done. Respondents were presented with Likert scale to state their level of agreement as shown in Table 11.

Table 11: Cross Tabulation of Group Size by Group Management Characteristics (n=180)

Group management Characteristics	Group size	Strongly disagree	Disagree	Undecided	Agree	Strongly Agree	Total
Democratic governance	<25	0	5	2	8	1	16
	25-40	4	17	3	17	3	44
	>40	17	47	8	44	4	120
Total		**21**	**69**	**13**	**69**	**8**	**180**
Initiate, Promote and defend policies	<25	1	4	2	7	2	16
	25-40	3	9	4	21	7	44
	>40	11	41	9	48	11	120
Total		**15**	**54**	**15**	**76**	**20**	**180**
Technical skills	<25	3	5	0	7	1	16
	25-40	6	13	2	18	5	44
	>40	38	24	13	34	11	120
Total		**47**	**42**	**15**	**59**	**17**	**180**

The findings in Table 11 indicate that similar trends were observed in a cross tabulation between group management and group size whereby those who were dissatisfied and undecided with the management of their groups with respect to democratic governance (103), ability to initiate, promote and defend policies (84) and technical skills (104) were mainly from groups with more than 40 members. This implies that large groups may have a negative impact on group cohesion since the dissatisfaction may result to mistrust and conflicts which may negatively affect the sustainability of the cereal bank.

4.5 Tests of Hypotheses

The study sought to establish whether access to extension services in terms of contact with extension officers influenced the sustainability of cereal banks among maize farmer groups in terms of growth in maize income. A chi squire test of independence was performed to test the Null Hypothesis;

> ***$Ho_{1:}$ Access to extension services has no influence on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.***

Table 12:Chi-Square Test (Contact with Extension Officers by Maize income)

	Value	Df	Asymp. Sig. (2-sided)
Chi-Square	**10.084[a]**	**2**	**.006**
Likelihood Ratio	10.126	2	.006
Linear-by-Linear Association	4.401	1	.036
N of Valid Cases	180		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.60.

Chi square test for the association between contact with extension staff and growth in maize income obtained a value of 10.084 with 2 degrees of freedom and a significance probability of less than 0.006 which was less than the conventional cut off point of 0.05.

This implies that access to extension services has an influence on the income from maize by farmer groups in Kimilili Sub- County. Hence, the null hypothesis ($H0_1$); *Access to extension services has no influence on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county* was rejected. Access to extension service facilitates sharing of knowledge, technologies, agricultural information and also links the farmer to other actors in the economy that enables farmers to make the best use of the productive resources at their disposal for improved farm productivity (Katz 2002; Olubandwa et al., 2011). Increased maize production would guarantee adequate cereals for bulking hence guarantee the sustainability of cereal banks in Kimilili Sub County.

Ho_2: Farmer Participation in group activities has no influence on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county.

The study also sought to establish whether the member's participation in group activities influenced sustainability of cereal banks among maize farmer groups as measured by maize income. A Chi Square test of independence was done and the results are summarized in Table 13.

Table 13: Chi-Square Tests (Farmer Participation in Group Activities by Maize Income)

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Chi-Square	8.715[a]	2	.013
Likelihood Ratio	9.197	2	.010
Linear-by-Linear Association	.521	1	.471
N of Valid Cases	180		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.80.

The results in Table 13 indicate that a chi square value of 8.715 with 2 degrees of freedom and a p value less than 0.013 was obtained which was less than the conventional cut off point of 0.05. This shows that members' participation in group activities seems to have influence on sustainability of the cereal banks in terms of income from maize. High level of participation in group activities has been found to increase member commitment and improve group cohesiveness (Bamberger & Cheema, 1990; DfID, 1999; Nguyen, 2000) this in turn increases the willingness of the farmers to share information and deliver their maize to the cereal bank for collective selling which gives them adequate stock and better bargaining power hence higher income. However ,where members have low participation in group activities they tend to have less trust in the management committee which makes them hold back their maize (Nguyen, 2000, Liu, 2016) this denies cereal banks adequate stocks for bulking. Consequently the available stocks are only sold in the local markets at throw away prices.

The second null hypothesis $Ho_{2:}$ *Farmer participation in group activities has no influence on sustainability of cereal banks among maize farmer groups in Kimilili Sub-county* was therefore rejected.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of key findings of the study and draws conclusions from the findings. It also offers recommendations to various stakeholders for effective policies to enforce establishment of Cereal Banks that are sustainable and also highlights areas for further research.

5.2 Summary

The purpose of this study was to investigate and determine the factors influencing sustainability of cereal banks among maize farmer groups in Kimilili Sub-County, Kenya. The four objectives addressed; Group management of cereal banks, Quantity of maize bulked, Farmers access to agricultural extension services and Farmer participation in group activities with a view to establish whether these factors had any influence on the sustainability of cereal banks. Objective one sought to establish whether group management influenced sustainability of cereal banks among maize farmer groups in Kimilili Sub County. Findings established that 77.8 percent of the farmers surveyed agreed that there was effective communication processes in their groups and 88.9 percent confirmed that their groups had a constitution to guide them in the day to day management. It was noted that, 61.1 percent disagreed that there was democratic governance in their groups, 50.5 percent disagree that their management committees had the ability to initiate, promote and defend policies and that 57.7 percent disagreed that their management committee had adequate technical skills to manage the cereal banks effectively. Group management aspects were also found to influence sustainability of cereal banks in terms of growth in membership.

On quantity of maize bulked the study revealed that, 74.4 percent of the respondents agreed that they were able to produce surplus maize for bulking and were also able to store maize. However a contrary opinion was given by ward agricultural extension officers who indicated that majority of the groups lacked appropriate storage facilities and faced the threat of grain infestation by large grain borer which forced some of the groups to sale the grain below market price. The study established that the quantity of maize deposited to the cereal banks was limited by the small farm sizes and large household sizes. It was also established that 75% of the respondents had not accessed appropriate market information while 81.7 percent

were not able to do value addition on maize which may not only affect the quality of the maize but may also reduce shelf life and limit access to high value markets. Study findings also revealed that quantity of maize bulked influenced the sustainability of cereal banks in Kimilili Sub County in terms of maize income.

Access to agricultural extension services have enabled the maize farmer groups to access information on various aspects of maize production which include; agronomic practices for maize production, appropriate sources of farm inputs and post-harvest handling practices for maize. However, 55 percent of the respondents disagreed that they had accessed adequate information on available markets and improved agricultural technologies. This was mainly attributed to lack of working capital by the cereal banks to purchase improved agricultural technologies. Findings from chi square test of independence also indicated that access to extension services had a significant influence on the sustainability of cereal banks as measured by maize income.

Objective four sought to establish whether farmer participation in group activities influenced sustainability of cereal banks in the study area. Despite the fact that participation in group activities has been found to increase member commitment and improve group cohesiveness, results from the study indicated that the modal response on all the aspects of participation was disagree. A chi square test of independence revealed that farmer participation in group activities had significant influence on the sustainability of cereal banks in terms of maize income.

5.4 Conclusions

In light of the key findings of this study, the following conclusions were made:

i. Group management of the cereal banks in terms of democratic governance and adequate technical skills is a major challenge in the study area since the management committees lacked the requisite competencies to manage the cereal banks successfully. Group management strategies were also found to influence sustainability of cereal banks in terms of growth in membership.

ii. The maize farmer groups were not bulking adequate quantities of maize to sustain the operations of the cereal banks due to; small deposits bulked, lack of access to appropriate market information which made it difficult to access high value markets, and lack of appropriate storage facilities. Therefore income from maize for most groups either remained constant or decreased threatening the sustainability of their

cereal banks. To produce surplus maize for bulking, storage of maize, access to vital market information and do value addition was found to influence sustainability of cereal banks in terms of maize income.

iii. Access to agricultural extension services had enabled the maize farmer groups to access information on agronomic practices for maize production, access to inputs, and information on post-harvest handling of maize. However, access to high value markets and use of improved agricultural technologies was a challenge to the farmer groups in the study area due to lack of working capital. Farmer's access to agricultural extension services had a significant influence on the sustainability of cereal banks as measured by maize income.

iv. Farmers in most of the cereal bank groups with large membership were not satisfied with their participation in group activities which could threaten group cohesion. Farmer participation in group activities had a significant influence on sustainability of cereal banks in terms of maize income. Therefore, big group size negatively affects participation in group activities ultimately influencing sustainability of cereal banks.

5.5 Recommendations

In order to address the problem of cereal bank sustainability in Kimilili Sub-County and based on the study conclusions the following recommendations were made:

i. Bungoma County Government through the Ministry of Agriculture should organize training programs for cereal bank management committees on; group leadership, post-harvest handling of maize and basic financial management skills to enable them create and maintain appropriate records on the performance of the cereal banks. This would improve the management of the cereal banks and guarantee their sustainability.

ii. Bungoma County Government through the Ministry of Agriculture should also establish one apex cereal bank in each sub-county that will be jointly owned by the existing cereal bank groups in the sub-county. This bank should operate on purely business principles and be managed by professionals. This umbrella cereal bank should receive membership shares in form of maize deposits from participating cereal bank with an expanded mandate to borrow development loans from the Medium and Small Enterprises Association fund to purchase improved agricultural technologies and value addition technologies for use by member cereal banks at a subsidized hiring

fee. This will go a long way in promoting the sustainability of the participating cereal banks.

iii. The extension service providers in Kimilili sub-county should train maize farmers on storage pest management, networking, how to access vital market information particularly through e-agriculture platforms, maize value addition and sensitize them on how to access government tenders to supply maize to government entities and market linkage with processors. This will boost their knowledge and skills on maize handling which would increase income from maize ultimately improving the sustainability of their cereal banks.

iv. As a policy the County Government through the Ministry of Agriculture should ensure that all cereal bank groups are registered as self-help groups under the social services department with membership limited to 40 members to ensure that they remain manageable and unified. These formal groups should then be sensitized to obtain loans from government agencies such as Uwezo Fund, Women Enterprise Fund and Youth Fund depending on their composition to boost their capital base.

5.6 Suggestions for Further Research

Cereal banks need to be sustainable in order to remain useful in the long run. While some scholars propose a model based on cooperative law, others propose that establishing cereal banks based on micro finance model would be better. Research should be done to develop a model for adoption to guide the operations of cereal banks in the country which combines the social objective for the community and business principles to enable them make profit. Existing cereal banks have mainly been based on the social objective but have failed to sustain.

REFERENCES

Amudavi, D. (2005). *Linking Institutional Partnerships, Community Groups and Livelihood Improvements in Kenya* (Unpublished PhD Thesis). Cornell University, Ithaca, New York.

Anandajayasekeram, P., Puskur R., Workneh S. & Hoekstra D. (2008). *Concepts and Practices in Agricultural Extension in Developing Countries*: *A Sourcebook*. IFPRI (International Food Policy Research Institute), Washington, DC, USA, And ILRI (International Livestock Research Institute), Nairobi, Kenya.

Asian Development Bank (ADB). (2014). *Research and Development and Extension Service in Agriculture and Food Security* Working Paper NO 425.

Bamberger, M. & Cheema, S. (1990). Case studies of project sustainability: Implications for policy and operations from Asian experience. *Economic Development Institute for the World Bank*. Washington, DC: The World Bank.

Berg, E. & Kent, L. (1991). *The Economics of Cereal Banks in the Sahel.* Consultancy Report Prepared for USAID. Bethesda, Maryland, USA: Development Alternatives Inc. (DAI).

Bhuyan, S. (2007). The people Factor in Cooperatives: An Analysis of Members' Attitudes and Behaviour. *Canadian Journal of Agricultural Economics 55*(3), 275-298.

Birchall, J. (2004). *Co-operatives and the Millennium Development Goals*. ILO, Geneva

Borgen, S. (2001). Identification as a Trust-Generating Mechanism in Cooperatives. *Annuals of Public and Cooperative Economics, 72*(2), 209-228.

Burkey, S., (1996). *People First: A Guide to Self-Reliant, Participation in Rural Development.* London, UK: Zed Books, Ltd.

Buzzanell, P., Ellingson, L., Silvio, C., Pasch, V., Dale, B., Mauro, G. (1997). Leadership Processes in Alternative Organizations: Invitational and Dramaturgical Leadership. *In Communication Studies, 48*(4), 285-310.

Catholic Relief Service. (1988) *Notes from the Workshop on: Community-Level Grain Storage Projects (Cereal banks); Why Do they Rarely Work and What are the Alternatives?* Workshop in Dakar, Senegal, Sponsored By CRS with Funding from USAID/OFDA.

Chibanda, M., Ortmann, G., & Lyne, M. (2009). Institutional and Governance Factors Influencing the Performance of Selected Smallholder Agricultural Cooperatives in Kwazulu-Natal. *Agrekon, 48*(3), 293-315.

Christoplos, I. (2010). *Mobilizing the potential of rural and agricultural extension.* Rome, Italy: Food and Agriculture Organization (FAO) of the United Nations and the Global Forum for Rural Advisory Services.

Cohen, L., Manion, L., & Morrison, K. (2007) *Research Methods in Education*, Routledge.

Cook, M. (1995). The Future of US Agricultural Cooperatives: A Neo-Institutional Approach. *American Journal of Agricultural Economics*, 1153-1159.

Coulter, J.P., Burnett, D., Walker, D.J. & Mukhwana, E. (2000). *A Feasibility Study on Development of a Warehouse Receipt System in the Grain Sector for the Western Region of Kenya.* Consultancy Report to the World Bank.

Department for International Development (1999). *Sustainable Livelihoods Guidance Sheet: Introduction*. Http://Www. Livelihoods. Org/Info/Info _ Guidancesheets. Html#1.

De silva, H. & Ratnadiwakara, D. (2010*). Using ICT to Reduce Transaction Costs in Agriculture Through Better Communication*: A Case Study from Sri Lanka. LIRN Easia, Colombo.

Dramane, M., Sabina, M., & Osman, M. (2012). *Building Resilience in the Sahel through Cereal Bank*. Food for peace West Africa

EPZA (2005). *Grain Production in Kenya.* Retrieved on 12/07/2016. From: http://www.epzakenya.com/UserFiles/files/GrainReport.pdf.

Fafchamps, M., & Gabre-Madhin, E. (2006). Agricultural markets in Benin and Malawi. *African Journal of Agricultural and Resource Economics*, 1(1), 67 – 94.

Food and Agriculture Organization of the United Nations (FAO). (1991). *The Den Bosch Declaration and Agenda for action on Sustainable Agriculture and Rural Development*. Proceedings of FAO/Netherlands Conference of Agriculture and The Environment. S-Hertogenbosch, the Netherlands, 15-19 April, 1991.

FAO. (2004). Changing patterns of Agricultural trade. The evolution of trade in primary and processed agricultural products. Online: *http://www.fao.org/docrep/007/y5419e/y5419e05.htm. Accessed: 09-04-17.*

Fulton, M. (2001). Leadership in Democratic and Participatory Organizations. *Canadian Journal of Agricultural Economics/Revue Canadienne D'agroeconomie*, *49*(4), 381-394.

Gall, M. D., Borg, W.R & Gal J.P. (1996). *Educational Research*: An Introduction. New York: Longman Publisher.

Gebremedhin, B., & Jaleta, M. (2010). *Commercialization of smallholders: Does market orientation translate to market participation?* (Working Paper No. 2). Addis Ababa, Ethiopia: International Livestock Research Institute.

Government of Kenya (GOK). (2005). *Sessional Paper No.2 of 2005; Development of Micro and Small Enterprises for Wealth Creation, Employment Generation and Poverty Reduction*.

Government of Kenya. (2007). *Kenya Vision 2030: A Globally Competitive and Prosperous Kenya.*

Government of Kenya. (2008). *National Agricultural Sector Extension Policy* (NASEP).

Government of Kenya. (2013). *Second Medium Term Plan, (2013-2017) Transforming Kenya Pathway to Devolution , Socio-economic development, equity and National Unity.*

Guthrie, G. (2012). *Basic Research Method: An entry to Social Science Research*: USA, Sage Publications.

Heinrich, G. (1993). *Strengthening farmer participation through groups*. Experience from Botswana. ISNAR. Hague, Netherlands.

IFAD (2009). Sustainability of Rural Development projects. Tango International. Retrieved on 20th March 2017 from: *https://www.ifad.org/documents/10180/538441f4-bb55-4e99-9e23-854efd744e4c*

Jari, B. (2009). *Institutional and Technical Factors Influencing Agricultural Marketing Channel Choices amongst Smallholder and Emerging Farmers in the Kat River Valley.* University of Fort Hare.

Jayne, T.S. & Boughton, D. (2011). *What kind of agricultural strategies lead to broad-based growth: implications for country-led agricultural investment programs.* Policy Synthesis No. 86. East Lansing, Michigan, USA, Michigan State University. http://fsg.afre.msu.edu/number _86.pdf (accessed19 December 2013).

Jayne, T. S., Chamberlin, J., & Muyanga, M. (2012). Emerging land Issues in African Agriculture: Implications for Food Security and Poverty reduction strategies. In *paper presented as part of Stanford University's Global Food Policy and Food Security Symposium Series, sponsored by the Center for Food Security and the Environment and the Freeman Spogli Institute for International Studies, Stanford, California* (Vol. 12).

Jayne, T. S., Myers, R. J., & Nyoro, J. (2008). The effects of NCPB marketing policies on maize market prices in Kenya. *Agricultural Economics, 38*(3), 313-325.

Johnson, D. W., & Johnson, R. T. (1994). *Learning together and Alone: Cooperation, Competition, and Individualization* (4th Edition.). Englewood Cliffs, NJ: Prentice Hall.

Kaddu, S. B. (2011). *Information and Communication Technologies (ICT) Contribution to Access and Utilization of Agricultural Information by Rural Women in Uganda,* Makere University.

Karanja A. M. (2002). *Liberalization and Smallholder Agricultural Development:* A Case Study of Coffee Farms in Central Kenya. PhD Thesis, Wageningen University.

Kariuki, G. & Place, F. (2006). *Initiatives for Rural Development through Collective Action*: The Case Study of Household Participation In-Group Activities in the Highlands of Central Kenya. Washington DC: IFPRI.

Kasomo, D. (2006) *Research methods in Education and Hu-manities,* Njoro: Egerton University Press.

Kathuri, N., & Pals, D. (1993). *Introduction to Education Research*. Njoro : EMC Egerton University.

Katz, A. (1981). Self-Help and Mutual Aid: An Emerging Social Movement? *Annual Revised Sociology*, 7, 129-55.

Kent, L., 1998. Why cereal banks rarely work: A summary of findings Available from http://www.foodaid.org/pdfdocs/cmgmt/grainstoragesummary.pdf.

Khan, M. A. (2000). Planning for and monitoring of project sustainability: A guideline on concepts, issues and tools. *Retrieved on June, 25*, 2016. From; http://www.mande.co.uk/docs/khan.htm

KENFAP (2011).The Role of Warehouse Receipt System and Financial Services in Improving Produce Marketing by Small holder Farmers in Kenya. *http://www.esfim.org/wp-content/uploads/ESFIM-Case-Studies-WRS-REPORT-*

KIPPRA, (2012). Kenya Economic Report 2012: *Imperatives for Reducing the Cost of Living in Kenya.*

Kothari, C.R. (2004). *Research Methodology: Methods and techniques*. (2nd revised Ed.). New Delhi, New Age International.

Kirimi, L., Sitko, N., Jayne, T.S., Karin, F., Muyanga, M., Sheahan, M., Flock, J., and Bor, G. (2011). *A Farm Gate-To-Consumer Value Chain Analysis of Kenya's Maize Marketing System*. MSU International Development Working Paper No. 111, January 2011.

Majale, M. (2002). *Regulatory guidelines for urban upgrading: towards effecting pro-poor change*. Warwickshire: Intermediate Technology Development Group (ITDG**)**

Markelova, H., Meinzen-Dick, R., Hellin, J., & Dohrn, S. (2009). Collective Action for Smallholder Market Access. *Food Policy, 34*(1), 1-7.

Mathews-Njoku E.,Angba, A., & Nwakwasi, R., (2009). Factors Influencing Role Performance of Community-Based Organization. Agricultural Development. *International NGO Journal*, Vol 4, (6): 313-317.

Mbithi, L. M. (2000). *Effects of Agricultural Policy on Maize Production in Kenya*. University of Ghent.

Meinzen-Dick, R. & Di Gregorio M. (2004). *Collective Action and Property Rights for Sustainable Development.* 2020 Vision. Focus 11. Brief 1 of 16. Washington, D.C.: International Food Policy Research Institute.

Meinzen-Dick, R., Markelova H., Hellin J. & Dohrn, S. (Eds) (2009). Collective Action for Smallholder Market Access. *Special Section of Food Policy 34* (1): 1−59.

Ministry of Agriculture, (2013). *Bungoma Agricultural Annual Report*, Kenya.

Ministry of Agriculture (2009). *Ministry of Agriculture Strategic Plan 2008-2012*.

MoALF (2015). Economic Review of Agriculture [ERA] 2015. Kenya National Bureau of Statistics Nairobi Kenya. Retrieved on 20th March 2017 from; *http://www.kilimo.go.ke/wp-content/uploads/2015/10/Economic-Review-of-Agriculture_2015-6.pdf*

Msaki, M., Mwenda, I. M., & Regnard, J. I. (2015). *Cereal Banks as a necessary Rural Livelihood Institute in Arid land, Mokoja Village, Dodoma-Tanzania*: Asian Economic Financial Review 3 (2) 259-269.

Mugenda. O. M., & Mugenda, A. G. (2003). *Research Methods: Qualitative Approach.* Nairobi: Acts Press.

Mukhwana E.J. (2000). Food Security and the Impact of Agricultural Development in Kenya: Problems and Opportunities. *Agricultural Research and Extension Newsletter*. 41, 21-26.

Mukhwana, E.J. (2003). Using community based cereal banks to improve smallholder's access to markets in Kenya: African Crop Science Conference Proceedings Volume (6) 718-721.

Murray, J. & Ferguson M. (2001). *Women in Transition out of Poverty*. Toronto: Women and Economic Development Consortium. Retrieved from http://Www.Cdnwomen.Org/Eng/3/3h.Asp.

Muthoni, L. (2009). *An economic Analysis of cereal Banks in Bungoma, Butere and Mumias Districts of Western Kenya*: University of Nairobi.

Mulwa, F, (2010). Demystifying Participatory Community Development. Revised edition, *Paulines Publications Africa,* Nairobi.

Mwamfupe, D. G. (2015). The Experience of Community Cereal Banks in Food Deficit Areas of Semi-Arid Tanzania: *International Journal of Scientific Research Publications* Vol. 5(6).

Nguyen, T.K. (2002).Establishment and Maintenance of Farmers' Groups (FGs). *Agricultural Extension Network Updates* .Retrieved on 20 /10/2016 from: http://www.mekonginfo.org/assets/midocs/0001413-farming-establishment-and-maintenance-of-farmers-group.

Nompozolo, S. (2000). An Analysis of the Characteristics and Constraints of Smallholder Commercial Farmers in the Transkei Region, the Eastern Cape, South Africa. (Unpublished Master of Agriculture Dissertation). *Department of Agricultural Economics and Extension, University of Fort Hare, Alice.*

Nyameino, D. Kagira, B. and Njukia, S. (2003b). *Maize market assessment and baseline for Kenya.* Nairobi. Regional Agricultural Trade Expansion Program (RATES).

Nyangito, H. O. & Karugia, J. T. (Eds) (2002). *The Impact of Recent Policy Changes on the Agricultural Sector and Public Agricultural Research in Kenya in Globalisation and the Developing Countries: Emerging Strategies for Rural Development and Poverty Alleviation.* The Hague: CABI Publishing.

Oino, P. G., Towett, G., Kirui, K. K., & Luvega, C. (2015). The Dilemma in Sustainability of Community-Based Projects in Kenya. *Global journal of advanced research*, 2(4) 757-768.

Okello, J. J. Al-Hassan, R., Okello, R. M. (2010). A framework for analysing the role of ICT on agricultural commercialization and household food security. *International Journal of ICT and Research Development, 1*, 38-50.

O' Leary, Z. (2011): *The Essential guide to doing your research project*. Sage South Asia.

Olubandwa, A. M., Kathuri, N. J., & Wesonga, E. O. (2011). Agricultural Extension and Rural Development. *Effective Methods for Increased Food production in Kakamega Disrtict*, Volume 3 (5) 95-101.

Osterberg, P., & Nilsson, J. (2009). Members' Perception of their Participation in the Governance of Cooperatives: *The Key to Trust and Commitment in Agricultural Cooperatives. Agribusiness (New York), 25*(2), 181-197.

Pertev R.. (1994).The role of farmers and farmers organizations CIHEAM, pages 27-31.Retrieved from: http://om.cih eam.org/article.ph p?ID PD F=9 4400041.

Rwelamira, J. (2016). Strengthening Farmer's Organizations and Civil Society Organizations. *An action plan for African agricultural transformation. African Development Bank, Dakar,Senegal:Retrievedon,27March2017from*. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Events/DakAgri2015/Strengthening_Farmers_Organ.

SACRED-Africa. (2004). Cereal Banking Thrives in Western Kenya. *Farmer's Journal*, May-June Issue. Biznet Communications, Nairobi. Pp. 7-9.

Seabright, P. (1997). Is Cooperation Habit-Forming? *The Environment and Emerging Development Issues, 2*, 283–307.

Serrat, O. (2008). The sustainable livelihood approach, knowledge solutions. Asian development bank, Philippines.

Salles, M., & Geyer, Y. (2006). *Community-based Organisation Management: Handbook Series for Community-based Organisations*. Idasa. Pretoria South Africa.

Shingi, P. M., & Bluhm, L. H. (1987). Participation in irrigation projects: changing patterns in North Western India. *Research in Rural Sociology and Development.* Greenwich: Jai Press. *Volume 3*, p. 65-84.

Shiferaw, B., Obare, G. & Muricho, G. (2008). *Rural market imperfections and the role of institutions in collective action to improve markets for the poor*. Natural Resources Forum, 32(1): 25–38.

Singini, R. & Van Rooyen, C.J. (1995). *Serving Small Scale Farmers*. Midrand, SA: DBSA.

Sulaiman V.R., Hall A., & Raina R., (2006*). From Disseminating Technologies to Promoting Innovation: Implications for Agricultural Extension*. Paper Prepared for the SAIC

Regional Workshop on Research-Extension Linkages for Effective Delivery of Agricultural Technologies in SAARC Countries (20-22 November, 2006).

Sunding, D. and Zilberman, D. (2000). *The agricultural innovation process: Research and technology adoption in a changing agricultural sector*. A handbook of Agricultural Economics.

Liu, L. (2016). *A practical Guide to Cereal Banks*. UK .Tearfund.

Van Wijk, M. S. & Makokha, S. N. (2000): *Macro-Economic Policy Reforms and the Economic Environment of Farmers in Kenya*. In EPIDODE Working Paper E-WP05: Kenya Agricultural Research Institute, Wageningen University, Development Economics Group.

Wanzala M., Jayne T.S., Staatz J.M., Mugera A., Kirimi J. & Awour J. (2001). *Fertilizer Markets and Agricultural Incentives: Insights from Kenya.* In Tegemeo Agricultural Monitoring and Policy Analysis (TAMPA) Project, Egerton University and Michigan University.

Wesley, A. S., & Faminow, M. (2014) ADB economics working paper Series *Research and Development and Extension Service in Agriculture and Food Security* Working Paper NO 425.

Williams, M. (2003). Sustainable development and social sustainability. Hull, QC: Strategic research and Analysis, Department of Canadian Heritage. SRA-724.

World Bank (2008). *Gender in Agriculture Source Book. The International Bank for Reconstruction and Development*, World Bank, Washington D.C.

World Bank (2011). ICT in Agriculture: Connecting Small Holders to Knowledge Networks and Institutions Online: http://www.ictinagriculture.org/ictinag/ Accessed on 09-04-2017.

Yukl, G., & Yukl, G. (2002). *Leadership in Organizations*: Prentice Hall Upper Saddle River, NJ.

Yukl, G. (1989). Managerial Leadership: A Review of Theory and Research. *Journal of Management, 15*(2), 251.

APPENDICES

APPENDIX A: CEREAL BANK FARMERS' QUESTIONNAIRE

INSTRUCTIONS:

Dear Respondent,

My name is Everlyne Kataka a student of Egerton University undertaking a Master of Science in Agricultural Extension doing a research on "Factors Influencing Sustainability of Cereal Banks among Maize Farmer Groups in Kimilili Sub-county, Kenya. This study will benefit Kimili sub-county in particular and other sub-counties in the country. Your response will be treated with strict confidence and your name will not be mentioned in the report.

Thank you

Everlyne Kataka

PART A: DEMOGRAPHICS (Tick the option of your choice)

1. Gender; □ Male □ Female
2. Age: □ 18-35 □ 36-50 □Above 50
3. Educational Attainment:
   □ None □ Primary □ Secondary □ Tertiary
4. What is the size of your household?
   □ <6 □ 6-10 □>10
5. What is the total size in of your land in acres?
   □ <5 □ 5-10 □ Above 10 acres
6. What quantity of maize do you supply to your cereal bank per season?
   □ 1<5 □ 5-10 □ Above 10

PART B. MEASURING SUSTANABILITY OF CEREAL BANKS

1. State whether, in the last four years, the income from maize sold through CBs has;
   □ Increased □ Remained constant □ Decreased
2. How many years has your CB been in existence
   □ <5 years □ 5-10 □ 10 and above

3. Indicate whether, in the last four years, the membership of the group has;
   □ Increased □ Remained constant □ Decreased

PART C: GROUP MANAGEMENT OF CEREAL BANKS

Please answer to the following statements by indicating whether you; 1. Strongly Disagree 2. Disagree 3. Undecided 4. Agree 5 Strongly Agree.

The Management Committee in my group demonstrates the following aspects;

S/NO	Aspects on group management	1	2	3	4	5
1.	Democratic type of governance					
2.	Has the ability to initiate, promote and defend policies					
3	Has put in place clear communication process (both horizontal and vertical)					
4	Technical skills such as (entrepreneurial skills and storage loss reduction skills)					
5	My group has a constitution that guides us on internal management of the group (e.g terms of office bearers, conflict resolution and sharing of proceeds).					

PART D: QUANTITY OF MAIZE BULKED

Please answer to the following statements by choosing whether you; 1. Strongly Disagree 2. Disagree 3. Undecided 4. Agree 5 Strongly Agree.

The group has the capacity to;

S/NO	Aspects on quantity of maize bulked	1	2	3	4	5
1.	Produce surplus maize for bulking					
2.	store maize					
3	Access up to date and reliable market information					
4	Do value addition to maize					

PART E: ACCESS TO EXTENSION SERVICES.

1. a) Are you visited by the Agricultural Extension officers from the Ministry of Agriculture?
   Yes [ ] No [ ]

   b) Please answer the following statements by choosing whether you; 1.Strongly Disagree 2. Disagree 3. Undecided 4. Agree 5 Strongly Agree.

Extension service providers have enabled us access information on;

S/No	Extension Services	1	2	3	4	5
1.	Agronomic Practices for maize production(land preparation, crop management)					
2.	Appropriate Sources of farm inputs					
3	Post harvest maize handling practices such as storage and pest control.					
4	How to access better maize markets					
5	Access to improved agricultural technologies for maize production e.g Value addition.					

PART F: LEVEL OF PARTICIPATION IN GROUP ACTIVITIES

1. How many members does your group have?

   □ <25 □ 25-40 □ Above 40

2. What other activities are being carried out by your group?

   □ Merry go round

   □ Table banking

   Other specify.....

3. Please answer to the following statements by choosing whether you; 1. Strongly Disagree 2. Disagree 3. Undecided 4. Agree 5 Strongly Agree.

We are all involved;

S/NO	**Aspects on level of level of participation**	**1**	**2**	**3**	**4**	**5**
1.	Planning and implementing group activities					
2.	Group meetings					
3	Sharing of benefits accrued					

Thank You

APPENDIX B: INTERVIEW SCHEDULE FOR WARD AGRICULTURAL EXTENSION OFFICERS

Dear Respondent,

My name is Everlyne Kataka a student of Egerton University undertaking a Master of Science in Agricultural Extension doing a research on "Factors Influencing Sustainability of Cereal Banks among Maize Farmer Groups in Kimilili Sub-county, Kenya. This study will benefit Kimili sub-county in particular and other sub-counties in the country. Your response will be treated with strict confidence and your name will not be mentioned in the report.

Thank you

Everlyne Kataka

1. What kind of information do you disseminate to farmers groups participating in cereal banking?_____
   _____
   _____

2. In your opinion, do you think farmers participating in cereal banking have adequate skills and knowledge on group management?_____
   _____
   _____

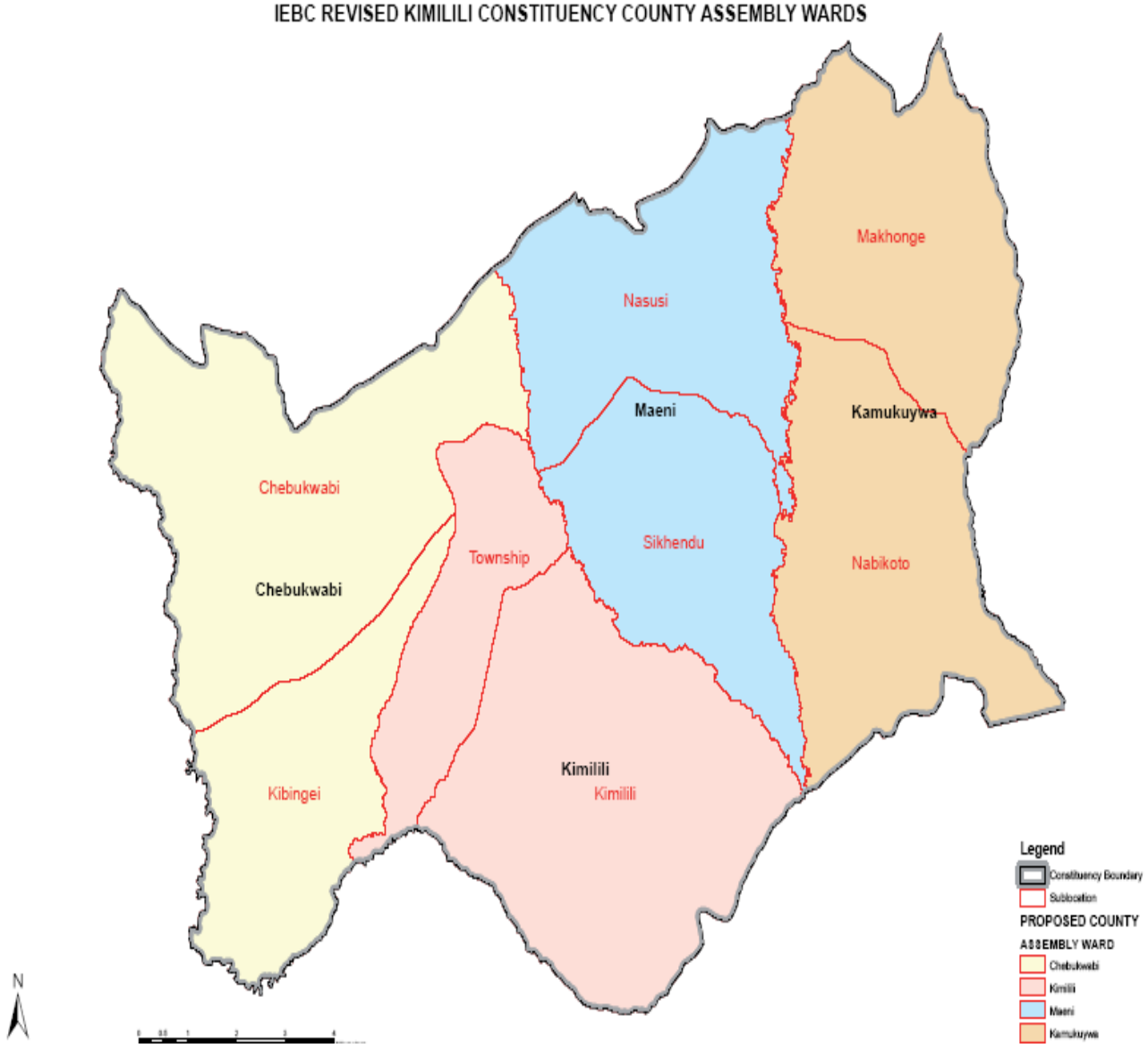
3. Do you think the groups undertaking cereal banking have the capacity to bulk the maize, manage storage risks and do value addition?_____
   _____
   _____

4. In your opinion, what measures can be put in place to promote farmers' participation in cereal banking?_____
   _____
   _____
   _____
   _____

5. What challenges do farmers face in cereal banking?_____
   _____
   _____

6. What are your recommendations for smooth running of cereal banks?_____
   _____
   _____
   _____

APPENDIX C: STUDY AREA MAP OF KIMILILI SUB COUNTY



APPENDIX D:RESEARCH PERMIT

CONDITIONS

1. **You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit.**
2. **Government Officer will not be interviewed without prior appointment.**
3. **No questionnaire will be used unless it has been approved.**
4. **Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
5. **You are required to submit at least two(2) hard copies and one (1) soft copy of your final report.**
6. **The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice**

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

RESEACH CLEARANCE PERMIT

Serial No.A 11894

CONDITIONS: see back page

THIS IS TO CERTIFY THAT:
MS. EVERLYNE KISAVULI KATAKA
of EGERTON UNIVERSITY, 0-50105 BUKURA,has been permitted to conduct research in *Bungoma County*

on the topic: *FACTORS INFLUENCING SUSTAINABILITY OF CEREAL BANKS AMONG MAIZE FARMER GROUPS IN KIMILILI SUB-COUNTY, KENYA.*

for the period ending:
29th August,2017

Permit No : NACOSTI/P/16/7341/13096
Date Of Issue : 31st August,2016
Fee Recieved :Ksh 1000

.....
Applicant's Signature

.....
Director General
National Commission for Science, Technology & Innovation

APPENDIX E: LETTER OF RESEARCH AUTHORIZATION

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone:+254-20-2213471,
2241349,3310571,2219420
Fax:+254-20-318245,318249
Email:dg@nacosti.go.ke
Website: www.nacosti.go.ke
when replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/16/7341/13096**

Date: **31st August, 2016**

Everlyne Kisavuli Kataka
Egerton University
P.O. Box 536-20115
EGERTON.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Factors influencing sustainability of cereal banks among maize farmer groups in Kimilili Sub-County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Bungoma County** for the period ending **29th August, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Bungoma County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Bungoma County.

The County Director of Education
Bungoma County.