

**AN EVALUATION OF ACCESS TO AND USE OF AGRICULTURAL
INFORMATION BY EXTENSION SERVICE OFFICERS: A CASE STUDY OF
MAKUENI COUNTY, KENYA.**

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DECLARATION

I, Francis Njoroge Ng'ang'a do hereby declare that this dissertation is my original work and has not been presented for an award of a degree in any other university.

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DEDICATION

To my wife Tabitha and our Children; Esther, Rahab, Beatrice and Mary for their steadfast support and prayers.

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LIST OF ACRONYMS AND ABBREVIATIONS

AEOs-Agricultural Extension Officer(s)
AES-Agricultural Extension Services
AESy-Agricultural Extension System
AKIS-Agricultural Knowledge and Information Systems.
AICM-Agricultural Information and Communication Management
AI-Agricultural Information
AIS-Agricultural Information Services
AISy-Agricultural Information Systems
ASAL-Arid and Semi Arid Lands.
ASARECA-Association for Strengthening Agricultural Research in Eastern and Central Africa
CBO -Community Based Organizations
CDA -County Director of Agriculture
CIARD - Coherence in Information for Agricultural Research for Development.
DAO-District Agricultural Officer
EAs-Extension Agents
ES-Extension Service
ESO –Extension Service Officer
FEO-Frontline Extension Officer
FF- Farm Families
ICT-Information and Communication Technology
ICM-Information and Communication Management
IFAD-International Fund for Agricultural Development
IT- Information Technology
ITK-Indigenous Technical Knowhow/Knowledge
KBS-Kenya Bureau of Statistics
KWADP-Kwara State Agricultural Development Project (Nigeria)
MAICM-Masters in Agricultural Information and Communication Management
MoAL&F-Ministry of Agriculture, Livestock and Fisheries
MOA-Ministry of Agriculture
MOLD-Ministry of Livestock Development
MRSP -Multistage Random Sampling Procedure

NASEP-National Agricultural Sector Extension Policy

NAFIS-National Farmers Information Service

NGO-Non-Governmental Organisation

RAILS-Regional Agricultural Information and Learning Systems

SMSs -Subject Matter Specialists

TV-Television

MEANING OF WORDS

Extension unit-Refers to the area which a single public frontline agricultural extension officer provides extension service. The Ministry of Agriculture, Kenya, recommends the area to have a ratio of 1:640 (Frontline Extension Officer (FEO): Farm Families (FF)) and generally it falls under one administrative location.

Impact messages-Refers to the specific; simplified and “actionable” technical or skilled agricultural information on practice(s) that extension officers interpret from detailed or complex Agricultural Information and knowledge and advise clients (farmers) with.

Information Objects-An information object is a set of attributes defining the semantics of a data object. An information object may refer to a piece of music, a film or a webpage. It can be static, dynamic or realistic world objects including streams and services (Börje et al 2009).

Effectiveness is “ensuring that the output from any given activity is achieving the desired results” or “extent to which objectives have been achieved and the relationship between the intended and actual impacts of activities; in short, achieving the stipulated aims, objectives and set targets” e.g. Spending less without reducing the extent and impact of the program or lowering their quality, (Muriuki, Lecture, Kenya School of Government (KSOG) 2013.

ABSTRACT

This study did evaluate access to and usage of agricultural information by extension service officers in Makueni County, Kenya. Agricultural extension is the delivery of information inputs to farmers and refers to a form of education that introduces new knowledge and technology to farmers. Most farmers in Makueni County have minimal knowledge on the use of agricultural information facilities like computers/internet. The goal of this study was to determine the accessibility, usage and constraints to access and use of agricultural information by extension service officers. The study used primary data. Multistage random sampling procedure (MRSP) was used to select divisions in the County to participate. A questionnaire was used to collect data in the field. Quantitative data was analysed using statistical package for social science (SPSS) version 16, while Qualitative data was derived from analysing the narrative responses of the open-ended questions. The findings indicated that extension service officers ranked field days highest for access to and use of agricultural information. The majority of the extension service officers are over 40years old and used analogue rather than digital methods of access to and use of agricultural information. It is recommended that to increase agricultural productivity by farmers, hybrid access to and use of agricultural information should be used by extension service officers.

Key Words:

Access; Use of Agricultural Information; Extension Service Officers; Makueni County
Kenya.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Improved access to and use of agricultural information is essential if present-day global problems such as food insecurity, climate change, sustainable and more effective use of natural resources and biodiversity are to be addressed, (CIARD, 2011). Currently agricultural information is often not immediately accessible and the benefits that could be derived from its use are restricted. Enhanced access by Extension service officers' (ESOs') would stimulate effective extension service delivery that would result in better use by farmers and other agriculture sector players along the value chain. Duplication of efforts would be reduced and broader participation would ensue. In turn, this would result in greater equity of access to and use of agricultural information by extension service officers, farmers and among communities. Ultimately agricultural extension would have a greater impact than at present, (CIARD, 2011).

Extension service officers are major stakeholders in food security provision. In the very traditional and conservative rural settings it is difficult for extension service delivery to reach target farmers and other clientele. Extension service officers are professionals who are concerned with agricultural information that will eventually be accessed and used by relevant clientele in the long run. However, it is only when the extensionists are aware of, have access to, and can use expert and ever advancing agricultural information that they can effectively discharge their agricultural information communication functions effectively. This study therefore evaluates access to and use/utilization of agricultural information by public agricultural extensionists in Makueni County, Kenya.

1.2 Agricultural extension service (AES).

Agricultural extension service is the delivery of information inputs to farmers and refers to a form of education that introduces new knowledge and technology to farmers. There were approximately 500,000 agricultural extension officers worldwide in 2005, with 95 per cent of these working in public agricultural extension services (Anderson et al., 2000).

Yet despite decades of investment in and experience with a variety of public extension programs, evidence of their impact upon agricultural knowledge, adoption and productivity remains limited. Furthermore, the extension services (ES) themselves have been in general “decay”, primarily due to high costs, problems of scale and low levels of accountability (Aker, 2010).

The role of agricultural extension services in the agriculture sector in Kenya as emphasised in the National Agricultural Sector Extension Policy-NASEP (Republic of Kenya, NASEP, 2012) is that it plays an important role in sharing knowledge, technologies and agricultural information, and in linking the farmer to other actors in the economy. The agricultural extension service is therefore one of the critical change agents required to transform subsistence farming to modern and commercial agriculture. This is critically important in promoting household food security, improving incomes and reducing poverty.

Agricultural extension service facilitates the transfer of knowledge and good practices to farmers. The traditional agricultural extension is mainly done by an extension officer visiting a farmer or farmer field schools, however in most developing countries, there are few extension officers to serve many farmers; for example, in Kenya the ratio of farmers to extension officer is 753:1; hence there is a need to determine ways in which the same few extension officers can serve a larger group of farmers with minimum effort (Sanga et al., 2013).

Extension service activities do bring changes in farmers' way of thinking, attitude, knowledge and application of technology. Extension activities can bring the changes in technology such as the spread of new hammer mill and also the changes in the way farmers' think of farming methods such as conservation farming (Ministry of Agriculture and Cooperatives, Zambia, 2010).

The primacy of agricultural extension in the information dissemination process for agricultural development in Nigeria cannot be overemphasized. Akpabio et al., 2007 declared that extension service officers are the most effective source of information for farmers. Extension service officers can never be cost-effective or efficient in a developing country of many illiterate farmers like Kenya despite an effective ES delivery. Further more Information and Communication Technologies (ICT) can be used to increase the effectiveness and efficiency of extension work especially where extension messages are mainly delivered through campaigns in Barazas, Farmers Field days, Trainings and Farm visits.

According to Anderson et al., 2000, re-organization of the extension system has evolved to include four broad forms of delivery systems that include; Public delivery and public finance which essentially comprises the traditional government agricultural extension that continues to persist although with greatly diminished outreach and constrained by a lack of sufficient funding; Public delivery and private finance whereby government staff is contracted by private agencies to deliver extension services; Private delivery and private finance whereby commercial entities provide their suppliers with the extension services required to improve their technical efficiency. This mode of delivery is prevalent in commodity out-grower schemes and highly commercialized high-value agriculture; and Private delivery and public finance which entail the outsourcing of responsibility for extension delivery to private sector providers such as Non-governmental organizations (NGOs) and Community based organizations (CBOs).

The Agricultural Extension System (AESy) can also be defined as an agricultural information exchange system which shows the actors, people and institutions, their interactions and communication networks among these actors to coordinate the information related processes (from generation to transfer, utilize and diffuse). The agricultural extension services in Kenya and other actors who provide extension and other services (such as training, education, advice and expertise) are in both public institutions and private organizations. Agricultural extension activities are mainly performed by the Ministry of Agriculture, Livestock and Fisheries (MoAL& F). In addition, some farmers' associations, agricultural cooperatives, Non-Governmental organizations (NGO), agro chemical marketing firms have been involved in farmer training and extension activities. Ministry of Agriculture, Livestock and Fisheries (MoAL& F) is directly responsible for public agricultural extension activities in Kenya.

The need for current agricultural knowledge and information system (AKIS) by farmers and the use of conventional communication channels such as farm/home visit, personal letters, and use of contact farmers, for disseminating agricultural information is counterproductive (Salau et al., 2008). This calls for the adoption of better agricultural information communication mediums/channels by extension service officers in order for them to transmit relevant agricultural information to farmers and other sector players in the most efficient ways and means possible.

The importance of agricultural extension services in rural development is widely acknowledged, particularly in developing countries where the majority of the population lives. Since Kenya's independence in 1963, agricultural extension services were largely provided by the government until the late 1980s. Through the 1990s, the established modes of delivery of extension services began to shift in favour of those that involved farmers in the design or prioritization of these services. This re-orientation of extension towards participatory processes was catalyzed by the increasing realization that effective and

sustainable extension programs could only be achieved with the more active participation of the various end-users, especially farmers.

1.3 Agricultural Extension Service Officers (ESOs).

Agricultural extension service officers provide the link between agricultural research and farming communities for technology transfer in support of agricultural development. Very competent extension officers are needed to make decisions on the future role of extension service and to implement these decisions (Van Den Bau et al., 1996).

An Agricultural Extension Officers' job or purpose is to provide agricultural extension services in order to facilitate dissemination of agricultural information and technologies for improved agricultural development hence improving the famers' livelihoods and wellbeing through increase in production and productivity.

The extension activities extension service officers execute include: (among others) undertaking trainings; technical support; performance management (work plans execution); avail agricultural advisory and consultancy services on agricultural technology and knowledge; identify appropriate local or indigenous technical knowhow (ITK) and implement on-farm/pilot activities of the practices; technical appraisals from time to time; providing a catalyst role between farmers; sector players and the government; counselling and guidance to famers; collection; Analysis; documentation and reporting of relevant agricultural data and information.

Extension service officers perform subject matter specialists (SMS) roles by providing specific, specialist and professional agricultural information of the various disciplines (as crops, agribusiness, research, engineering, livestock, fisheries among others) within the broad agriculture subject to clients; The officers' also perform coordination functions that enhance performance, consensus and collective action on vision and issues affecting the

improvement of agriculture and joint designing of objectives and activities of the various agricultural stakeholder and collaborators.

Extension officers must make every effort not only to pass on what he/she knows to farmers but also to assist farmers in improving their own capability to solve their immediate problems with farming. Extension officer must try to motivate farmers' own initiative/self-reliance in tackling agricultural issues in their situation.

Extension service officers provide farmers with agricultural information based on needs expressed by farmers without intention of guiding farmers by providing preselected information. It is up for farmers to decide what information to be adopted and how it should be utilized.

1.4 Agricultural Information (AI) .

Agricultural information is defined as the data for decision-making and a resource that must be acquired and used in order to make an informed decision, (Samuel, 2001).

Umali (1994) classified agricultural information into two broad groups: pure agricultural information and agricultural information inherently tied to new physical inventions. Pure agricultural information refers to any information which can be used without the acquisition of a specific physical technology. It includes all types of self-standing advice on practices such as production techniques, farm management, marketing and processing and community development. On the other hand agricultural inventions or technologies are those that come in the form of agricultural inputs, management technologies facilitating farm management, and marketing and processing equipment.

In this study the researcher conceptualized the meaning of agricultural information as agricultural messages or impact messages via extension service and agricultural information that is embodied in agricultural technologies; innovations and transferred between the agricultural extension service officers and actors in the agricultural extension system.

According to Oladele (2011), knowledge and information are transformational tools for food security and rural development. And that the Green Revolution of Asia and the Near East was realized through good use of knowledge and information. Information is therefore a veritable tool for development that helps people to make effective farming decisions.

Rege (2005), argues that agricultural information is a critical ingredient for extension service officers as it is the most important resource for them to have in order for them to be able or have the capacity and competencies to advise clients as farmers and other agricultural stakeholders for the increased agricultural sector development for the County and nation. This is because agriculture is the mainstay of the Kenya economy accounting for 60% of the national employment and earning 45% of the government revenue. Rege (2005), further states that Kenya has accumulated a significant amount of agricultural information relative to other countries in sub-Saharan Africa, but consolidated information on the agricultural sector is neither here nor there. This is partly because there are no systematic procedures for information collection, analysis, storage and dissemination and partly because each development agency collects own information with little or no coordination with the rest. The available information is often outdated and is characterised by poor timeliness and unknown reliability. The sector is further challenged by constrained financial, human and technical capacities to generate, manage and disseminate accurate agricultural information.

Agricultural Information is an important resource which is required for effective mobilization and utilization of resources, policy formulation and implementation and other activities involved in agricultural development. Relevant information has to be made readily available to various users including policy makers, researchers, extension officers and farmers among others engaged in the agricultural sector. Agricultural Information Resource Centre (AIRC) in Kenya is one such information source with specialised agricultural information dedicated to serve a wide range of audience in the agriculture sector by Collecting, repackaging and

disseminating Agricultural Information through mass media. The centre works on the principle of providing quality agricultural information and skill training to farmers and stakeholders in order to enhance farmers' ability to increase agricultural output (AIRC, 2013).

According to Kacharo (2007), if all actors in the agricultural sector need agricultural information, how does this agricultural information actually flow at the grassroots level to influence the development process? The actors build their capacity for integrating agricultural information and knowledge into their various agricultural development activities within their organization. Such capacity empowers them to solve intelligently the problems that exist in their community. The spread of new information in society follows a four-step process: the awareness stage; the interest stage; the examination and testing stage; and the adoption/rejection stage.

Gholamreza and Naser (2005) investigated the factors influencing information-seeking behaviour of Extension workers in Zanjan Province, Iran. His research showed that there was a significant relationship between age, level of education, years of experience, and the worker's level of job-related information with information-seeking behaviour. The main reason for seeking information by extension officers was holding training courses, followed by solving daily problems of farmers and up-dating their information, respectively. According to Gholamreza and Naser (2005), Provincial Extension Specialists who were working for the Ministry of Jihad-e Sazandegi reported radio, television (TV), computer, seminars and training courses as their five most used information sources and channels. They indicated the lack of knowledgeable and skilled information personnel as the main problem of the information system of the Ministry of Jihad-e Sazandegi in Iran.

An agricultural information policy with regard to a multifunctional approach to agriculture can be finalized to correct the main sources of market failures thus inaccessibility to information; quality, adverse selection and externalities.

In the 'information society' era extension service officers face new opportunities as well as challenges. Modern communication mediums may alter the use of traditional information and training systems currently operated by extension services and, thus, the role of extension officers (Lasley et al., 2001).

1.5 Access and use of agricultural information

Access to agricultural information is the mining of agricultural related information content and knowledge from its' authentic sources such as libraries; news papers; web contents; other extension officers whereas use of agricultural information refers to the dissemination or sharing of the knowledge acquired from this information with the target clients such as farmers (Adebayo and Adesope, 2007).

Agricultural extension officers have varies sources of agricultural information. This sources range from the analogue such as extension or farm visits to the Modern ones such as digital or ICT based such as internet and broadcast media. However, every source of agricultural information presents challenges to extension service officers when it comes to its understanding and disseminations (Davis 1989).

Traditionally, disseminations of agricultural information were a top-down affair and a role that was mostly played by the public extension services. However, the role of providing this information has changed over the time to include public private partnership with the aim of providing a justified opportunity of increasing the rate of access of new technologies by farmers

Several factors make access to and use of information in agriculture highly imperfect. They range from spatial and temporal dispersion of production resources, presence of ever increasing large number of small producers, prices and quantities fluctuations. Constrains to information diffusion are also represented by lack of infrastructures. Extension service officers might not find it easy to access and use agricultural information in remote areas while farmers in the same areas may not have the skills that are needed to access to and use of existing information. Agriculture is the main source of livelihood, and access to information is generally costly (Wanga, 1999).

Coherence in Information for Agricultural Research for Development (CIARD) is a global movement that was established in 2008 with the specific aim of enhancing access to and use of agricultural data and information in the public domain to improve agricultural development based on agricultural research results (CIARD, 2011). The movement (CIARD) Argues that a more coordinated approach in enabling and supporting accessibility and use of agricultural data and information in the public domain globally would relieve many smaller organizations on agricultural research and extension of the need to develop and operate their own systems from first principles. Coherence in Information for Agricultural Research for Development campaigns for broad consensus on needs for sharing agricultural data and information among individual actors in the agricultural field; at regional, national and global levels. According to CIARD partners, joint consultations to understand and analyze the features of data and information access to and use/sharing problems is the sustainable way of design of a framework and action plan to improve access to and use/sharing of agricultural data and information.

1.6 Problem statement.

To bring about agricultural development, the provision of agricultural information plays a decisive role (Tadesse, 2008). Agricultural information is a vital resource and has its

application in rural, agricultural, social and industrial development (Nwachukwu et al., 2009). A prime challenge of the typical rural farmer is the dearth of timely, up to date agricultural information, in spite of several research findings lying in shelves in various research organizations. The most useful asset a farmer can have to help with the management is accurate and timely agricultural information. There are many sources of agricultural information available to farmers. However, the most appropriate place to access and use information depends on the need and type of risk with which the farmer is concerned with, (Ingrid Nya Ngathou, 2006).

Agricultural Extension Officers are the direct link bridging the communication gap between the agricultural researchers and the farmers. In order to perform this role effectively and efficiently, agricultural extension officers must have steady “access to” and up to date agricultural information. This brings to fore, the need for a comprehensive and well-articulated agricultural information system within an extension program which ensures adequate and timely delivery of this vital Agricultural Information Services (AIS) to farmers if meaningful growth is to be achieved in the agricultural sector (Omotesho et al., 2012).

Increased access to and use of information is being utilized for developmental efforts in Africa and Kenya but according to the International Fund for Agricultural Development this trend is not being replicated in the food production and rural livelihood system. It therefore becomes imperative to ascertain reasons for this dismal trend. Gelb and Offer (2006) reported that adoption of Modern information communication mediums and methods for increased access to and use of advancing agricultural information in rural areas for agricultural purposes faces unique challenge and has long been of specific public concern with regional, national and international strategic significance.

Wide accessibility and use of agricultural information on agricultural technologies and innovations by agricultural based sectors is important to agricultural development.

Agricultural extension officers must have easy, uninterrupted access to and use of it in their immediate working environment. Public and private extension systems are innovating approaches for the transfer of technology and information to farmers so as to empower them to face the challenges of globalization (Adhiguru et al., 2009).

The benefits inherent in the utilization of Modern and ever advancing methods in accessing and usage of agricultural information for agricultural extension and training purposes are well documented (Hafkin et al., 2002). It is however, expected that the sources of information for extension activities would ultimately transform extension service officers into catalysts, who would play empowerment, problem solving and educational roles for farmers.

In the Kenyan context, the frontline agricultural extension officers have not fully embraced the use of Modern and advancing methods of accessing; use or dissemination of agricultural information. They still rely on the traditional methods of delivering it, which requires them to move from one place to another. It is therefore necessary to know the reasons for the non-utilization of Modern and advancing methods in accessing and usage in enhancing food productivity and rural livelihood systems, as is being done for in other developmental efforts. Makueni County was purposively selected for this study because the serving agricultural extension officers require effective; efficient and steady access to and use of the most advanced and applicable agricultural information to address the negative effects of recurrent food insecurity experienced from time to time. The County is located in the ASALs, where adverse climate change effects are rapidly reducing the depended on, long rains and short rains that support rainfed agricultural food production seasons, leading to frequent droughts and high crop failure.

According to Kiteme (2009), in Makueni County there also exists widespread poverty, high crop and livestock pests/diseases occurrences, poor market prices, inadequate market information, exploitation of farmers by middle men, high cost of farm inputs, lack of water

for irrigation, poor access roads, lack of technical knowledge, lack of adequate feeds (pasture), shortage of water, lack of credit facilities, livestock in-breeding, lack of value addition and socio- cultural issues in the county.

These problems are compounded by the farmers themselves not being able to individually or collectively access and use advancing agricultural information to complement the information acquired from extension service officers. Some of the famers cannot correctly follow the given instructions. This scenario is worsened by the inadequacies of the types and sources of agricultural information that are at the disposal of extension service officers in the county.

This study therefore evaluated the accessibility and usage of agricultural information by serving public agricultural extension officers in order to determine the sources of this information; how it is accessed; used and the challenges encountered when accessing and using this information to enhance their productivity.

1.7 Purpose of the study

The purpose of the study was to evaluate the accessibility and usage of agricultural information by serving agricultural extension officers in Makueni County.

1.8 Specific Objectives

1. To determine the accessibility and usage of Agricultural Information by agricultural extension officers in Makueni County, Kenya.
2. To investigate the constraints to access to and use of Agricultural Information by extension service officers in Makueni County, Kenya.

1.9 Research questions

1. What are the constraints to access to and use of agricultural information by extension service officers in Makueni County?

2. What are the uses of the agricultural information that is accessed by extension service officers in Makueni County?

1.10 Hypothesis

Access and use of Agricultural information by extension service officers in Makueni County is not effective.

1.11 Justification of the study

Access to, and usage of agricultural information by extension service officers; farmers and agricultural sector stakeholders in Makueni County and other remote ASALs in Kenya encounters challenges. Broadly the most common problem directly related to agriculture that Makueni residents face is food insecurity, (CDA Report, March 2013). This occurs due to various challenges that include: unfavourable weather, recurrent droughts, crop pests and diseases, post-harvest losses, human wildlife conflict among others. There is need for agricultural information to address farmers' ability to overcome these challenges and increase productivity from extension service providers, hence the need for evaluating the accessibility and usage of agricultural information by serving extension officers in the County.

Kamula, J.M (2008) states that a consensus exists when extension services functions effectively and improve agricultural productivity through providing farmers with information that helps them to optimize their limited resources. He further argues that, extension provision is generally skewed towards high agricultural potential regions and high value crops. Remote areas with sporadic rainfall patterns and low value crops with little marketable surplus are poorly served.

As most farmers in Makueni are illiterate, live in expansive dry and hot rural areas and have no knowledge nor the capacity to use information facilities like computer/internet, it is expected that public agricultural extension service officers' and other extension service

providers will rise up to this challenge by providing requisite agricultural information. The fact that minimal improvement on status of food security periodically occurs in selected areas of the County in different seasons and little or no change is noticeable in the farmers' agricultural practices call to question the quality of public and private agricultural extension officers. This study evaluated access to and use of agricultural information by extension service officers in Makueni County.

1.12 Scope of the study

The study focused on how public extension service officers from the agriculture sector organizations working in the study area source; access; utilize and manage challenges associated with agricultural information in their routine work. The findings, discussions, conclusion and recommendations were drawn from analysis of primary data obtained from public extension service officers in Makueni County.

1.13 Limitations of the study

The limitations of this study included:

- (a) Finances –Lack of adequate finances limited the area covered by the study and minimized the respondents reached.
- (b) Competencies/Incentives-There were difficulties in getting responses from some respondents as they expected incentives, while others suspected their technical competencies was being audited.

1.14 Organization of the Dissertation

This dissertation has five chapters. These are, chapter one which consists of the introduction. Chapter two is the literature review. Chapter three is the methodology used in the study; Chapter four is composed of the analysis of the findings and discussion while chapter five consists of summary of findings, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter reviews the related literature on access to and use of agricultural information as well as the importance of effective access to and use of agricultural information by extension service providers. Agricultural information is an input or resource in enhancing agricultural extension service delivery for increased agricultural development and it is discussed in relation to the research area of the study. The last part of this chapter gives the theoretical and conceptual framework upon which this research is anchored on.

2.1 Agricultural Extension services

Agricultural Extension services are an important aspect of agricultural development agenda (Nagel, 2003). These services have also been a major contributing factor in promoting agricultural development in many countries. The services have played a major role in the achievement of the Asian Green Revolution. The key driver of this extension services is the agricultural information that is available through the extension service officers (Regina et al., 2006)

There is a significant potential of raising agricultural productivity through new technologies and improved extension but, these gains will not materialize without increased investment in Agricultural Extension services (FAO, 2011). Governments, aid bodies and Agribusiness around the world invest considerable amounts of funds on extension services. It is estimated that the USA alone spends about 1 billion USA Dollars annually on agricultural extension. The world over, the expenditure is in excess of 6 billion USA Dollars per year, (Marsh et al., 2004).

This shows that effective agricultural production, be it at regional, national or individual

levels depends on effective delivery of agricultural innovation information to the farmers. It has been shown that in spite of the relevance of agricultural innovation to production, many farming activities are embarked on without or with minimal knowledge production systems (Okafor and Fabiyi, 2011). One may ask why the case is so. Traditional extension meant dissemination of information on specific technologies but recently that scope has expanded to include issues of marketing as well as partnership with various agricultural service providers (Birner et al., 2006).

Dogliotti et al., 2013 asserts that the role of the extension has to change from mere consulting to supporting the processes of farm planning and evaluation. This cannot be achieved without proper information and communication. With the declining national and international support for agricultural advisory services proper access, use and effective dissemination of extension service information is paramount (Regina et al., 2006). However dissemination of this information is not only constrained by the agents, but also its form and the way it is accessed by the officers who have to use it.

Omotayo (2005) observes that agricultural extension depends largely on information exchange between and among farmers and a broad range of other actors. Frontline extension officers using the Agricultural Knowledge and Information Systems (AKIS) are well positioned to access expert knowledge or other types of information that could facilitate the accomplishment of improved agricultural activities to farmers (Adebayo, et al., 2007). Information and communication technology has penetrated all other forms of accessing extension service information and has tended to compliment and not to replace them (Meera et al., 2004). This calls for transformational effects on the part of extension officers into knowledge workers just like in any other industry (Adebayo et al., 2007).

2.2 Access to Agricultural Information by extension service officers.

Information accessing is a broad term encompassing the ways individuals as extension officers articulate their agricultural information needs. Accessing Information is purposive in nature and is a consequence of a need to satisfy some goal. In the course of agricultural accessing information, extension officer(s) may interact with people, manual information systems, or with computer-oriented agricultural information systems. Barriers that prevent extension officers from accessing and getting information are also of great importance in understanding the information accessing and seeking behaviour of individuals, and organizations.

Gholamreza and Naser (2005) investigated the factors influencing information accessing behaviour of extension officers in Zanzan Province, Iran. His research showed that there was a significant relationship between age, level of education, years of experience, and the worker's level of job-related information with information accessing behaviour. The main reasons for accessing information by extension officers were holding training courses, solving daily problems of farmers and up-dating their information respectively. According to Gholamreza and Naser (2005), Provincial Extension Specialists who were working for the Ministry of Jihad-e Sazandegi reported radio, TV, computer, seminars and training courses as their five most used information sources and channels.

Agricultural extension officers depend on many sources of agricultural information that they must take advantage of, for them to be effective in making significant changes in the evolution of agriculture (Regina et al., 2006).

Agricultural information has been shown to increase farm productivity among its recipients. The major constraints to information access is the complexity of information and the costs associated with the modes of presentation of the information in question; be they radios,

internet, focus groups among others. However these complexities of access should not override the importance of simplification of access to agricultural information (Nlerum et al., 2012).

Oladele, 2010 points out that the relevance of use of improved agricultural practices depends on the quality of information sources available to extension officers. However, there is no universal source that can adequately provide access to all the available information to all audiences of agricultural information (Claudine and Liza, 2013). This means that agricultural extension officers rely on complementary sources of information to effectively serve their clientele. These sources include mass media, Internet, farmers meetings, libraries among others (Qiong et al., 2012).

Agricultural extension officers are also faced with the dilemma of wide variation of the clientele they serve that require different forms of information presentation in order to adequately serve them (Ming et al., 2007). This variation ranges from illiterate clients that can only understand (local languages) verbal communication to those who can read and write and can access and use agricultural information in digital form.

The agricultural officers themselves have limitations when it comes to accessing information from various sources as Akinbile and Otolay (2008) notes that extension agents are only conversant with a few sources of information and efforts should be made to upgrade their knowledge in as many sources as possible to ensure skillful use of these sources for efficient diffusion of agricultural knowledge.

The effective use of broadcast/mass media sources such as radio, television, bulletins, and billboards; group media sources such as farm demonstrations, workshops, seminars, and agricultural shows; interpersonal sources such as person-to-person contact; and information communication technologies such as Internet and audio-visuals require different skills on the part of agricultural officer not only different skills on how to mine the information but also

the way to combine the various channels used in the dissemination of the information (Yahaya, 2003).

Mila et al., 2009 contends that the availability of ICTs as sources of agricultural information does not make the information easily accessible especially in developing countries because of inadequacies associated with lack of connectivity and limited knowledge of use of ICTs. The same can be said for libraries that are few and wide apart as well as audio-visual equipments. This presents a dilemma in the access to and use of Agricultural information especially in developing countries like Kenya.

According to (Monty, 2012), the volume of scientific and technical information is doubling every five years, but its accessibility to the public proceeds far less rapidly. In addition, the gaps that restrict information flows between actors in agricultural innovation systems have not been bridged by the universal penetration of digital media. Everyone has experienced frustration in trying to get hold of data and information to help them in their work, even in the so-called 'information age', with apparently easy access to the information-packed Internet. Frequently it proves impossible. In agriculture, there is a major barrier that effectively stops people getting what they need. Many agricultural innovation organizations invest only a small fraction of their resources in communicating their results and ensuring they are well adapted to the needs of rural society, and most provide their available information in forms that are inaccessible. The lack of access to and use of agricultural data and information are serious because their application to rural livelihoods could go a long way to alleviating the hardships suffered by so many of the poorest. What can be done to address the all too common barriers to opening access to data and information? There is so much valuable information generated that can guide decisions and resolve problems, but so little seems to be accessible when it is needed.' CIARD partners have made a collective commitment to

improving access to data and information and ensuring that it is used to the best effect, where it really counts – among the poor, particularly the rural poor’, (Monty, 2012)

Scientists and researchers increasingly communicate among themselves and with the public through informal channels such as web-based newsletters, social networking sites and blogs. This allows much more data and information to enter the public realm than is possible if research results are solely presented at specialist meetings and published in specialist journals. However, a substantial amount of potentially useful data and information remain hidden and can only be accessed through personal contacts, and knowledge leaves an organization when their employee(s) leaves (Monty, 2012).

2.3 Use of agricultural information by extension service officers

Information use is a behaviour that leads an individual to the use of information in order to meet his or her information needs. Information use is an indicator of information needs, but they are not identical. As Line (1973) pointed out, individuals do not use all the information they seek partly because of inaccessibility, irrelevance and inability to decipher the information. In addition, sometimes, individuals do not seek all the information they intend to use.

Knowledge about the information needs and information use of extension officers and other actors in the extension systems is crucial for effectively meeting their agricultural information needs. According to Shin and Evans (1991), the main use of agricultural information by Illinois agriculture and horticulture extension officers/advisors was to answer client inquiries. In their study, they categorized information sources into three types: oral, written and electronic. Written-only sources accounted for the largest single share (45.9%), followed closely by written and oral combination (43%). Less than three percent used electronic information sources. Radhakrishna and Thomson (1996) found that extension officers regularly seek agricultural information to carry out their day-to-day work. Extension officers

frequently communicate with a variety of information sources. Prominent among these were: clients, another officer in the office, another extension officer in another county, extension specialists, their immediate supervisor, local news agencies, local business organizations, state and federal agencies, and local school teachers and administrators.

Thimpu, (2012) argues that one of the contentious issues in Information and Communication Management (ICM) for agricultural development is the inadequacy of useful and relevant agricultural information, its further generation and access. Generating and opening access to relevant and useful information for smallholder farmers, producers and small rural entrepreneurs engaged in agricultural related businesses and livelihoods needs high attention by all actors in agricultural development in the region.

Access to agricultural information and its effective use by smallholder farmers require collective actions to implement policies and practices with targeted investment and capacity building in ICM, improved governance of agricultural information systems and strengthening partnerships and networks in support of opening access for greater sharing of agricultural data, information objects and knowledge by agricultural organisations, communities, extension service officers and other players in the agricultural sector.

According to (ASARECA report, 2010), availing and sharing of agricultural information of technologies and innovations is key to advancements in the agricultural based sectors. To enhance usage of agricultural information enhanced access of it is a prerequisite and this involves increasing visibility of institutions possessing agricultural information processes; agricultural information networks and providing wide accessibility to agricultural technologies and innovations which is the aim of the regional agricultural information and learning systems (RAILS).

Increased investment in agricultural information possessing institutions and in the extension services in terms of infrastructure to gather and disseminate or access and use information

ensures that there is flow of information within and between the different agricultural stakeholders. By doing so there would be increase in effective sharing or use of agricultural information resources, (ASARECA report, 2010).

2.4 Theoretical framework

In this study, a theoretical framework is used to explain the assumptions that exist between the different concepts that influence access to and use of agricultural information by extension service officers, farmers and other agriculture sector players. The Media Richness Theory by Daft and Lengel is used. The Theory was developed in 1986. This theory provides a framework describing a communication medium's ability to reproduce the information sent over it without loss or distortion.

Two main assumptions of this theory are: people want to overcome equivocality and uncertainty and a variety of media that is used would work better for some tasks than others. Daft and Lengel, 1986 presented a media richness hierarchy using four criteria arranged from the highest to the lowest levels of richness, to illustrate the capacity of media types to process various forms of communication. They introduced an approach considering information-richness as a major factor in information processing and media selection by managers. They also defined information-richness as “the potential-carrying capacity of data”, and stated that the medium used in communication determines the potential richness of the information processed, and thereby the effect(s) of a communication act. They further suggested that media differ in their potential capacity of transmitting the meaning of information in four information factors that can be ranked from “rich” to “lean”. The factors are:

- (a) Interactivity or the availability to obtain instant feedback: rich media provide the opportunity for immediate feedback so that participants may adjust their messages “in response to signals of understanding or misunderstanding, questions, or interruptions. Synchronous media are richer than asynchronous media in this respect.

- (b) Multiple cues: rich media allow transmission of a full range of multiple cues such as body language, voice tone, verbal, paralinguistic, intonation and inflection to not only the literal content of ideas, but also intensity and subtleties of meaning. These “surplus” cues are sometimes confusingly called “social” cues. Lean media put constraints on the range of cues that may be used in communication. Face to face meetings are rich media in this respect, while text is lean.
- (c) Language variety or the use of natural language: These addresses the range of meaning that language symbols may convey. Numbers convey greater precision of meaning than natural language. Visual or graphic symbols carry a greater range of interpretations. Higher-variety languages are not only more ambiguous, but may also be used to organize a large amount of information, given that a shared understanding of the language has been established. Rich media such as video conferencing allow the use of a high-variety language; lean media such as shared numeric databases restrict language use to low-variety language.
- (d) Social-emotional cues or the personal focus of the medium: rich media permit communications to have “personal feelings and emotions infuse the communication. Some messages may be tailored to the frame of reference, needs, and current situation of the receiver.” In this respect face to face meetings are richer than e-mail.

A medium’s potential richness can be thought of as the sum of scores on each of these information-richness factors. In other words “medium richness” is defined by the information-richness that a medium potentially transmits. “Potentially” is added because the actual richness of a medium is determined by how users use it.

Face-to-face communication is viewed as the richest communication medium in the hierarchy followed by telephone, electronic mail, letter, note, memo, special report, and finally, flier and bulletins. The media richness theory (Daft, and Lengel, 1986) suggests that effective

extension officers would make rational choices of communication medium(s) to a specific task or objective and to the degree of richness required by that task, see figure 1 of the media richness model, (Kessler, 2010) below:

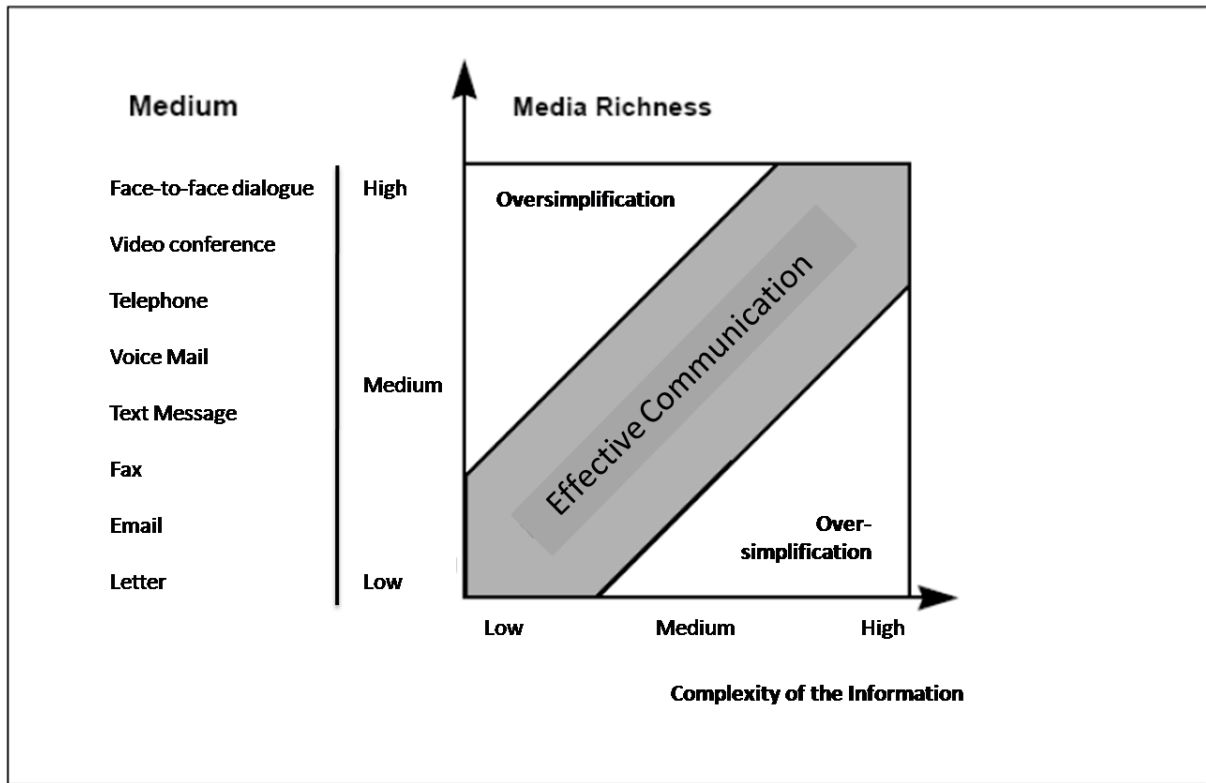


Figure 1 Information Richness Model. Source: Daft and Lengel 1986

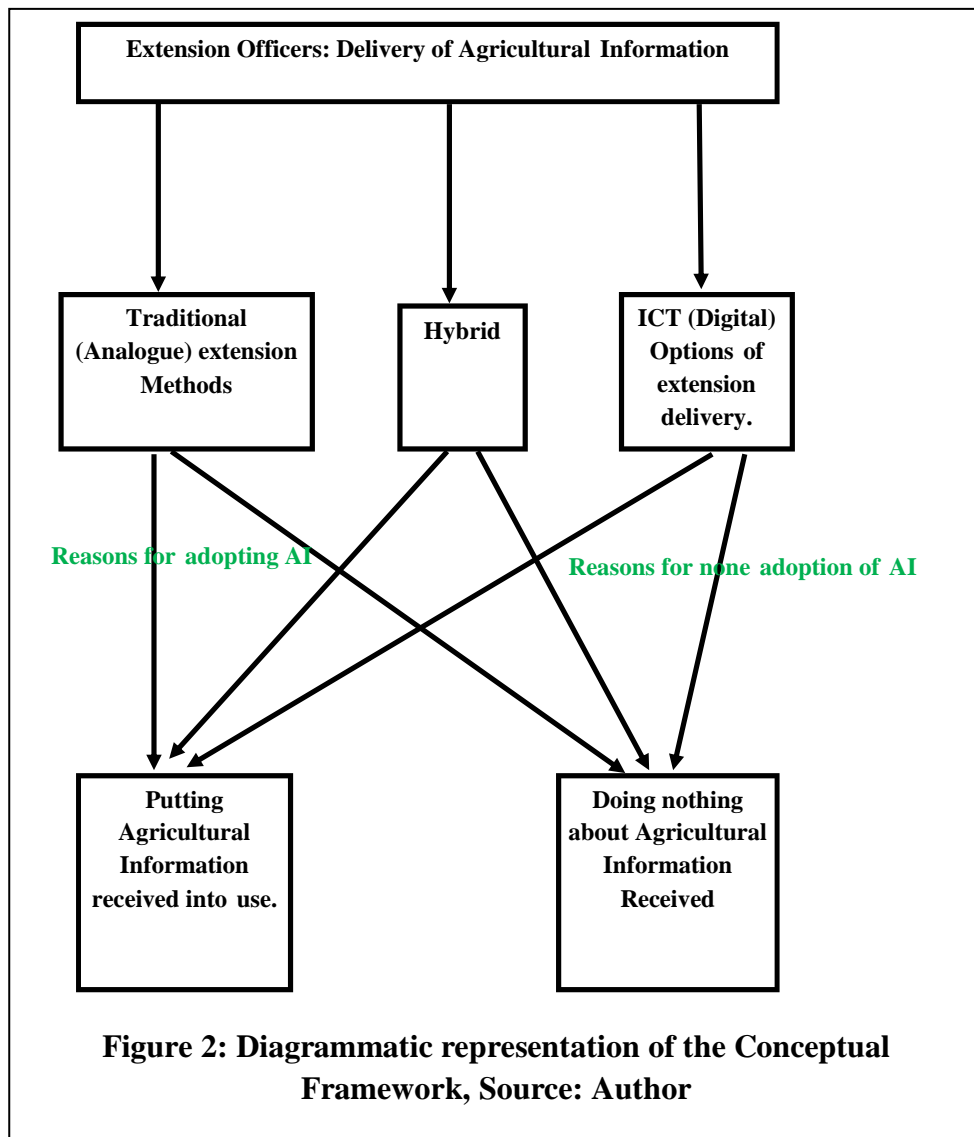
Agricultural information can be accessed in various forms, the same with the way it can be used. Sources that are information rich would make the information easier to access and to understand it; hence easier to use. Face to Face dialogue medium such as extension visit; field days; agricultural shows; trade fairs ; refresher trainings; individual farm visit among others are information rich sources of agricultural information. Therefore they can be used to communicate complex information because they make it easier to understand. Daft and Lengel (1986).

Letters; emails; fax are less information rich because they are not effective in disseminating complex information which will require detailed information such as those that require face

to face communication. This type of communication tools require interpretation that may not be available at the point of access; making it harder to access and use/disseminate this type of information. Newspapers; Databases; libraries; broadcast media fall under this category of information poor mediums because they hardly provide feedback. Daft and Lengel (1986) Information rich sources would provide extension service officers with more comprehensible information which would be easier for them to use hence easier to disseminate to clients. (This observation by the researcher was confirmed by the media richness indexing of the agricultural information sources in the study based on the MRT and respondents rating of the usefulness of the sources-see table 7). However, most of the information rich sources in developing countries are analogue or traditional and yet the world is moving towards digital communication mediums some of which are less information rich such as emails. These calls for a combination of all forms of mediums of communication; be they rich or poor as long as they equip the extension service officers with the right agricultural information that is varied and can adequately address the ever changing needs of their clients.

2.5 Conceptual framework

Agricultural information and knowledge is becoming an increasingly significant factor in production and marketing for small scale agriculture. Timely information and knowledge about innovative farming methods, improved crop and livestock varieties, skills, practices and techniques are important for the decision making of rural farmers. In this study agricultural information is to a large extent expected to be accessed and used through sharing by extension service officers during refresher training, newspapers, extension visits, internet, broadcast media, and agricultural shows among other extension communication methods. It is expected that dissemination of agricultural information through extension service officers will make a difference resulting to positive impact on farmers' financial and food security situation (family food sufficiency, increased income) as conceptualized in figure 2:



In ideal situation where the agricultural information delivered by an extension officer is important to the farmer, it would be internalised and put into action. However the ideal situation calls for effective extension delivery method and appropriate technology that is applicable in the farmer’s situation. The result in an ideal situation is characterised by food security, good standard of living and wellbeing. In cases where the target farmer receives agricultural information and does nothing about it, then it means that there is either a gap in terms of the delivery method or the technology being promoted is inappropriate to the farm situation. This is thus characterised by food insecurity; poor standards of living and increased poverty.

CHAPTER THREE

METHODOLOGY

3.0 INTRODUCTION

This chapter describes the research methodology used in conducting the research. It gives the description of the study area, sampling framework, research design, target population and sampling size as well as methods of data collection. It also gives the operational definition of variables, validity and reliability adopted by the study and data presentation.

3.1 Description of the Area of Study

Makueni County is located in the lower eastern region of Kenya as shown in figure 3 below:

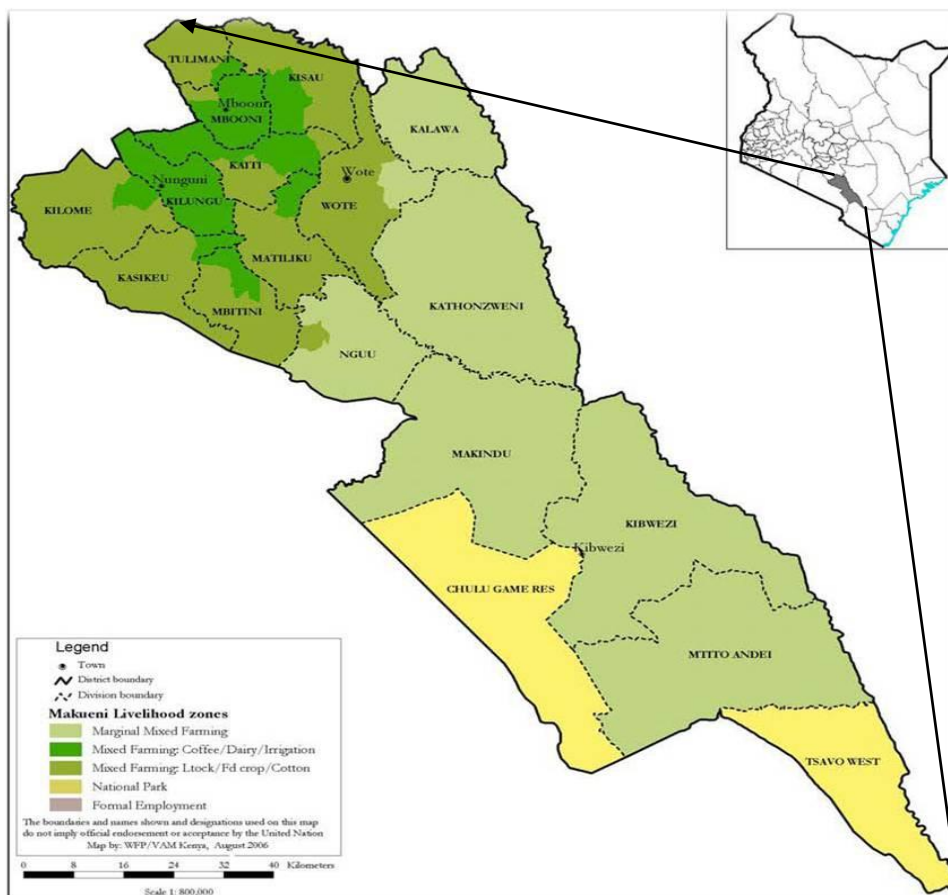


Figure 3: Map of Makueni County and its location in Kenya (Source: CDA (2012) Makueni County Profile)

3.2 County Geographical Information

Makueni County is located in the Eastern region of Kenya. The county borders Kitui to the east, Machakos to the north, Kajiado to the west and Taita Taveta to the south. The county was formerly called the larger Makueni District. It is comprised of 9 Sub Counties which include: Makueni, Kathonzi, Mbooni East, Mbooni west, Nzau, Mukaa, Kilungu, Makindu and Kibwezi

The County's population is 887,547 persons (Census, 2009, CBS). The area is mainly arid to semi arid and experiences a bimodal rainfall pattern. The main industrial crops grown are cotton, coffee and sisal while the main cereal food crops grown are maize, sorghum and millets. The main pulses are beans, pigeon peas, green grams, Dolichos lab Lab and cowpeas while the root crops are sweet potatoes, cassava and arrow root.

Horticulture is a major enterprise in the region. The major horticultural crops grown being vegetables and fruits for both local and export market. The vegetables include; kales, capsicum, baby corn, cabbages, tomato, and Asian vegetables while the fruits are citrus, mangoes, pawpaw, avocados, banana and watermelon. The annual rainfall is bimodal with the short rains occurring in October-December and the long rains in March-May. The annual precipitation ranges from 200-600mm in the lower parts and 1340-1900mm- mm in the upper parts.

3.3 Sampling framework

To establish the number of agricultural extension officers in Makueni County the researcher made inquiries from the DAO Makueni who was holding brief for the County Director of Agriculture-Makueni County. From the county agricultural human resource records for technical officers it was established that there were 210 ESOs'. For more statistical details see appendix III. This formed the target population of the study.

The study used primary data obtained from agricultural extension officers in Makueni County. A questionnaire was used to acquire data from respondents. All 9 Districts of Makueni County were included; thus Makueni, Mbooni West, Mbooni East, Mukaa, Kilungu, Kibwezi, Nzau, Kanthozweni and Makindu; due to the fact that public agricultural extension officers are in all the districts. Multistage random sampling procedure (MRSP) was used in selecting the study divisions. The MRSP was followed in each district. A list of all Divisions in the County was obtained from Makueni county profile (2012), and from it, two divisions from each district were randomly selected. All the ESOs were listed in the selected Divisions. 5 respondents were randomly selected and interviewed in each of the selected divisions. The same procedure was done for all the 9 districts.

To determine a representative sample size from the target population, Cochran (1963) formula for cross sectional studies was used. The formula is presented as follows:-

$$n_0 = \frac{z^2 pq}{d^2}$$

n_0 = Desired sample size

z = standard deviation (1.96) which corresponds to 95% confidence interval

p = Expected prevalence of proportion in this case it is 0.1 of respondents in the study who have access and use Agricultural Information.

q = 1- p

d = Degree of desired accuracy set at 0.05

$$n_0 = \frac{1.96^2 \times 0.1 \times 0.9}{0.05^2}$$

$n_0 = 138$

$$n = n_0 \times \frac{N}{N + n_0}$$

N = Uncorrected population which for the study was 210 (Makueni county technical staff as at August 2012).

n = corrected sample size.

$$n = 138 \times \frac{210}{210 + 138}$$

$$n = 83.27$$

Therefore the minimum sample size will be 83.

3.4 Research Design

This is the blueprint for data collection, measurement and analysis (Cooper and Schindler, 2006). The study involved descriptive research which enabled the researcher to study a small part of the population and make generalised observations on the entire population (Cooper and Schindler, 2003). It used quantitative data analysis techniques to obtain results about variable relationships. This method allows flexibility in the data collection process and use of questionnaire as the data collection tools

3.5 Target Population and Sample Size

The target population was the public agricultural sector extension service officers working in Makueni County. They include ESOs' employed in the agriculture sector in the County. The County had an establishment of 210 ESOs' who formed the target population or accessible population, distributed throughout the 9 districts. Out of the 210 ESOs' 83 of them were randomly selected as respondents for the study as per formula stated in the sampling framework section.

3.6 Methods of Data Collection

Data was collected from primary data sources through administration of a questionnaire (see appendix 2). Data was collected over a three months' period of September, to December, 2012. There were 9 Sub-Counties widely dispersed and movement had to be planned

accordingly. The DAOs' of the respective Sub-Counties assisted in the logistics of data collection.

3.7 Operational Definition of Variables

The following table shows the operational variables.

Table 1: Operational Definition of Variables

Objectives	Variables	Indicator	Measure	Tools of analysis
1. To determine the accessibility and usage of Agricultural information by agricultural extension officers. 2. To investigate constrains to access and use of Agricultural information by agricultural extension officers in Makeni County.	1. Sources of agricultural information. <ul style="list-style-type: none"> • Sources of accessible Agricultural information • Ease of access to Agricultural Information sources • Ease of use of accessed Agricultural information 2. Challenges of accessing and using Agricultural information by agricultural extension officers. <ul style="list-style-type: none"> • Challenges of existing information sources 	<ul style="list-style-type: none"> • How much agricultural extension officers know about sources and types of Agricultural information and communication mediums • How they value this information • Whether they disseminate this information to end users 	<ul style="list-style-type: none"> • Number of agricultural extension officers who are able to access and use the sources and types of Agricultural information and communication mediums 	<ul style="list-style-type: none"> • Frequencies • Regression analysis

3.8 Validity and Reliability

The validity of research determines whether the data collection method that is used will accurately elicit similar information across in different situations ((Kothari, 2004). In this study, validity in this research was achieved by counterchecking questions in the questionnaire to verify and clarify their respective answers, (Kothari, 2004).

Reliability was achieved by looking at the level of consistency of a measurement tool and was done by pretesting the instrument and using the outcome to improve on it (Mugenda and Mugenda (2003).

3.9 Methods of Data Analysis

The data collected from the returned seventy questionnaires was cross checked for data quality and completeness. Quantitative data was then analysed using statistical package for social science (SPSS) version 16 to generate descriptive statistics which included frequency distributions and measures of central tendencies. The software generates frequency tables and measures of central tendencies and it computes several measures that ensure that multicollinearity is identified and where possible, eliminated. SPSS can analyze data in a way that makes it easy to present and interpret the results.

Qualitative data was derived from analysing the narrative responses of the open-ended questions.

A multiple regression model was generated and used to analyse the data at 0.05 two tailed level of significance test (p-value). Multiple regression is commonly used to explore relationships between one dependent variable against several independent variables. It is an appropriate measurement tool because it is able to show how the dependent variable is influenced by multiple independent variables. Multiple regression also assesses the level of significance of contribution of an independent variable to the variance of the dependent variable and it generates linear multiple regression equations that give the relationships between the variables.

The equation for this study is presented as follows:

The model for the first hypothesis is given by:

$$A = y_0 \pm y_1(Q_1) \pm y_2(Q_2) \pm y_3(Q_3) \pm e \dots\dots\dots I$$

Where (A) is the dependent variable (Access to and use of Agricultural Information by Agricultural extension officers), and Q_1 (Ease of access to Agricultural Information sources), Q_2 (Ease of use of accessed Agricultural information), Q_3 (Challenges of existing information sources) are the independent variables.

y_0 is the constant term or the y-intercept and y_1, y_2, y_3 are the coefficients of regression. e is the error term describing any other outside factors that may affect the model.

y_0 or the coefficient, estimates what (A) “Access to and use of Agricultural Information by Agricultural extension officers” would be if the regression’s independent variables were zero and it is the y-intercept of the regression line or curve.

3.10 Summary of the Chapter

The researcher collected data using questionnaires and analyzed using statistical measures of central tendencies. A multiple regression was used to analyze the relationships of both the independent and the dependent variables. The research instrument was validated through verification piloting with some of the targeted respondents.

CHAPTER FOUR

RESULT AND DISCUSSION

4.0 INTRODUCTION

This chapter is composed of the analysis of the collected data. It also has the discussion of the analysed data. First, there is a report on the response rate of the study. This is followed by the social demographic characteristics, sources of agricultural information, ranking of accessibility, ratings of usefulness of agricultural information, uses of accessed agricultural information, challenges encountered in the use of accessed agricultural information, regression results of the hypothesis test are reported and finally the discussion of the findings.

4.1 Response rate

The study targeted a sample size of 83 respondents from Makueni County. The response rate was 84% as 70 questionnaires were duly answered and returned for analysis. The researcher considered the response rate adequate for analysis and drawing of conclusions.

4.2 The Socio demographic characteristics of the respondents.

The researcher investigated the socio-demographic characteristics of the respondents to establish their level of comprehension of the questions and obtain responses for analysis in the study as follows:

4.2.1 Sex of respondents

The research sought to establish the Male: Female ratio in order to identify any gender specific attribute in relation to access to and use of agricultural information in the county as shown in figure 4:

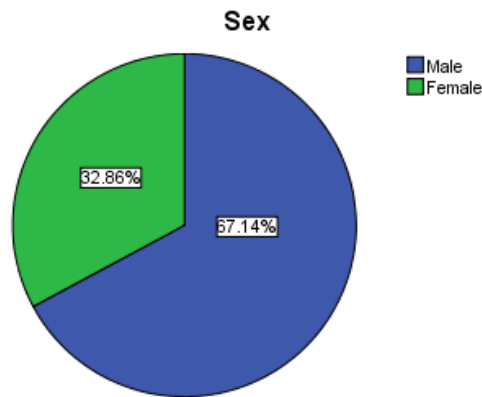


Figure 4: Percent Male: Female Ratio of Respondents

Out of the 70 respondents 47(67.1%) were males while 23 (32.9%) were females thus the ratio of Male: Female was 2:1. The ratio indicated the study met the one third gender rule of participating ESOs; hence respondents were gender sensitive as stipulated in the current Kenya constitution, 2010.

4.2.2 Age of respondents:

The researcher sort to know the age bands of the respondents in order to understand the length of exposure and experience they may have acquired while accessing and using agricultural information through traditional (analogue) or ICT (digital) means while schooling and working in the extension service as indicated in figure 5 below:

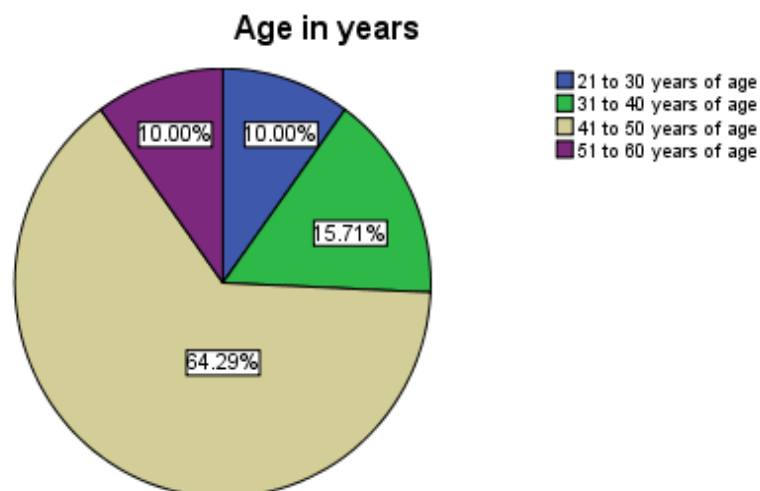


Figure 5: Percent Age Brackets of Respondents

The study established that 64.3% (45) of the respondents were between 41-50 years old , followed by those in the age bracket 31- 40years at 15.7% (11), age brackets of 21-30years and 51-60 years 10% (7) each. 74.3% (52) of the extension service officers were over 40years old while 25.7% were below 40years old.

4.2.3 No. of years worked in public extension service.

The researcher sort to know the period the respondents had worked in the public extension service to understand/establish their experience in accessing and usage of agricultural information as shown in figure 6 below:

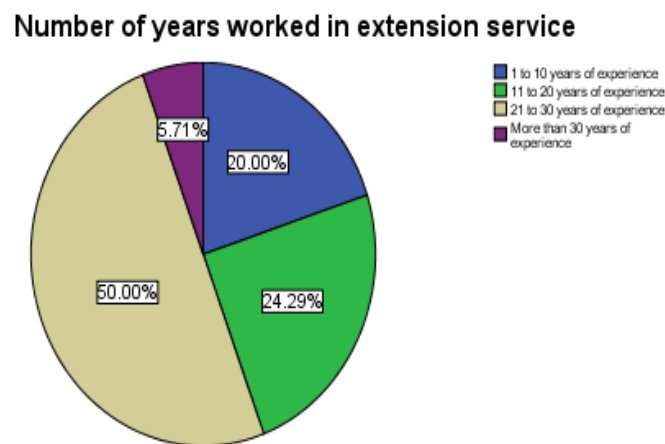


Figure 6: Percent No. of years worked in extension

The results showed that 50% (35) of the respondents had worked for between 21-30years; 24.3% (17) between 11-20years; 20% (14) between 1-10 years and 5.7% (4) had worked for over 30 years while 55.7% (59) of respondents had worked for more than 21 years in the extension service. These findings suggest that the respondents were “seasoned” or experienced in sourcing/accessing and usage of agricultural information for routine extension service delivery; hence they comprehended the questionnaire and gave reliable answers for the study.

4.2.4. Education level of Respondents.

The study endeavoured to establish the respondents' level of education as shown in figure 7 below. This aimed at gauging their technical capacities and competencies in public agricultural extension service delivery.

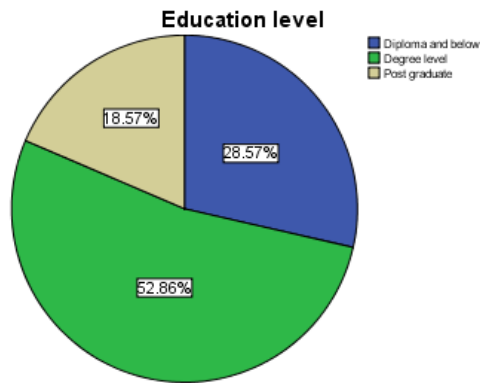


Figure 7: Percent Education Level

The study established that the respondents with a degree (undergraduate) constituted 52.9% (37); those with diploma and certificate holders were 28.6% (20) while 18.6% (13) had post graduate education.

4.2.5 Marital status of respondents.

Figure 8 below, shows the respondents' marital status.

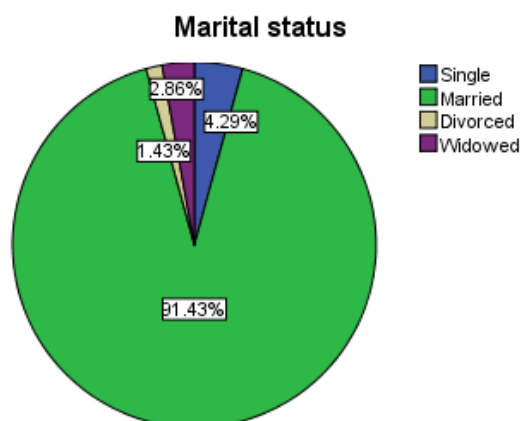


Figure 8: Percent Marital status

91.43% (64) of the respondents stated that they were married. This status suggests that majority of the ESOs have other (family) responsibilities apart from extension service.

4.2.6. Training in Extension Service.

All the 100 % (70) respondents indicated that they had undergone training in agricultural extension service at different levels thus from certificate, diploma, graduate and post-graduate. This implies there are differences in levels of abilities and competences on access to and use of agricultural information amongst them.

4.3 Current Rank as per the organization.

The researcher sought to find out the current organisational rank in the county’s extension service shown in Figure 9 below. “Others” in the figure refers to the rank naming of extension service officers from sector ministries other than (but equal to) those of the Ministry of Agriculture.

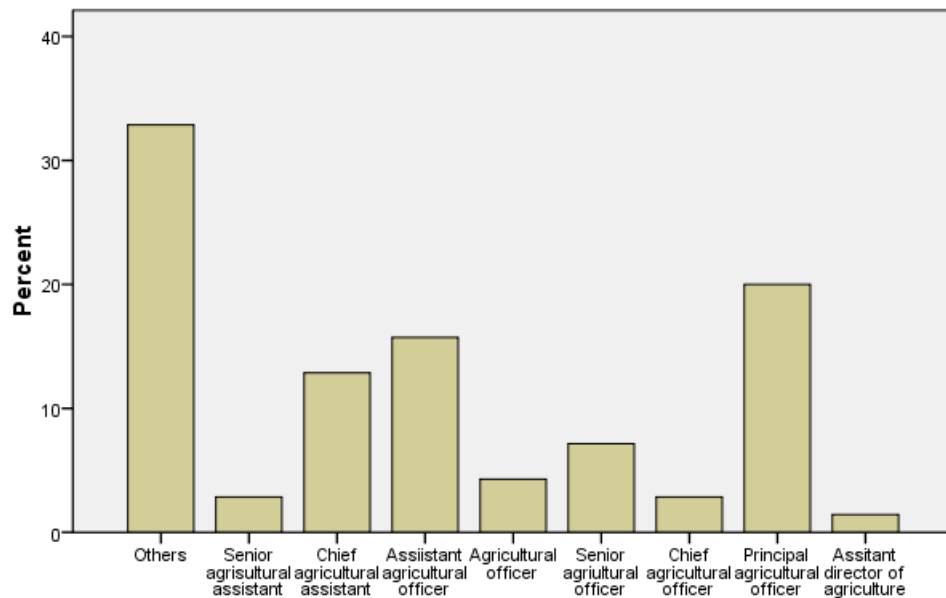


Figure 9: Current Rank as per the Organization

The findings show that the technical ranks of respondents that serve agricultural clients in the county are mainly Diploma and Degree holders who double up as technocrats and managers. The bar graphs show that the numbers of certificate holders (Senior Agricultural Assistants-

SAA's and Chief Agricultural Assistant-CAA's) who directly serve farmers at the "extension unit" level or at the Frontline extension unit or administrative location level to be very low hence have minimal "quality contact" with cliental. These scenarios suggest that digital methods of access to and dissemination (use) of agricultural information are more feasible to compliment traditional or analogue methods as group approaches in public extension service delivery.

4.4. Sources of Agricultural Information.

The researcher sought to establish the sources of agricultural information in the county.

Table.2 shows the findings of agricultural information sources and their order of preference from (1 = most preferred to 14 = least preferred) as reported by the respondents.

Table 2: Sources of Agricultural Information

S/No.	Source of Agricultural Information	Frequency	Count	Percentage (%)	Rank in order of preference by the respondents
1	Refresher Trainings	62	70	88.6	6
2	Formal Education	61	70	87.1	7
3	Newspapers	60	70	85.7	8
4	Extension visits	65	70	92.9	3
5	Mobile phone	60	70	85.7	8
6	Agricultural shows & Exhibitions	63	70	90.0	5
7	Trade Fairs	59	70	84.3	9
8	Research Fora	37	70	52.9	14
9	Other Extension Officers	68	70	97.1	1
10	Progressive Farmers	64	70	91.4	4
11	Field days	67	70	95.7	2
12	Exposure visits	58	70	82.9	10
13	Internet	56	70	80.0	12
14	Databases	38	70	54.3	13
15	Libraries, Books	57	70	81.4	11
16	Broadcast media	57	70	81.4	11

The five most important sources of Agricultural Information in a descending order the respondents in the county prefer are: other extension officers (97.1%); field days (95.7%); extension visits (92.9%); progressive farmers (91.4%) and agricultural shows & exhibitions (90.0%).

The five least preferred sources of agricultural information by the respondents in an ascending order are: research fora (52.9%); databases (54.3%); internet (80.0%) and libraries, books and Broadcast media each at (81.4%).

Analogue or traditional sources of Agricultural Information are more preferred than digital or ICT sources.

4.5 Ranking of Accessibility as a reason for choosing specific Agricultural Information source

The respondents were asked to rank accessibility of the different Agricultural Information sources as a reason why they use or prefer that particular source. The study assumed that the more accessible the source the more effective it was to the extension service officers in the County.

The findings are recorded in Table 3 below:

Table 3: Ranking of Accessibility as a reason for choosing specific Agricultural Information source

S/No.	Source of Agricultural Information	Frequency	Count	Percentage (%)	Rank in order of preference by the respondents
1	Refresher Trainings	6	70	8.6	12
2	Formal Education	7	70	10.0	11
3	Newspapers	19	70	27.1	4
4	Extension visits	18	70	25.7	5
5	Mobile phone	20	70	28.6	3
6	Agricultural shows & Exhibitions	10	70	14.3	8
7	Trade Fairs	8	70	11.4	10
8	Research Fora	3	70	4.3	13
9	Other Extension Officers	18	70	25.7	5
10	Progressive Farmers	18	70	25.7	5
11	Field days	17	70	24.3	6
12	Exposure visits	10	70	14.3	8
13	Internet	22	70	31.4	2
14	Databases	9	70	12.9	9
15	Libraries, Books	13	70	18.6	7
16	Broadcast media	23	70	32.9	1

The respondents who ranked accessibility of analogue or traditional sources of Agricultural Information as a reason for choosing the source were 66.5%, while those that ranked accessibility of digital or ICT based sources as a reason for choosing the source were 33.5%. The five most accessible sources of agricultural information to the respondents in a descending order were broadcast media (32.9%); internet (31.4%); mobile phone (28.6%); newspapers (27.1%) while other extension officers, progressive farmers and extension visits tied at 25.7% each. These sources are digital or ICT based except “other extension officers”, “progressive farmers” and “extension visits” which scored the least. The level of accessibility of 32.9%; 31.4% and 28.6% respectively of the most accessible sources is far below the expected 100% mark, hence suggesting that the effectiveness of access to Agricultural Information by ESOs in the County is poor.

The five least accessible sources of agricultural information to the respondents in an ascending order were research fora (4.3%); refresher trainings (8.6%); formal education (10.0%); trade fairs (11.4%) and databases (12.9%). These sources are basically traditional except databases to the extension officers. Their extremely low ranking by the respondents may suggest their inefficiency and ineffectiveness in facilitating Agricultural Information accessibility to them. These low levels of Agricultural Information access by extension officers imply they have minimal “technical messages” to share or disseminate resulting in poor extension service delivery.

4.6 Extension service officers’ perception by rating “usefulness” of Agricultural Information obtained from named sources.

The researcher sought to understand the extension service officer’s perceptions of the usefulness of agricultural information received from the variety of information sources researched on as shown in Table 4 which forms the basis for Table 5, 6 and 7 respectively. The perceptions would assist in identifying the source(s) that respondents perceive to obtain

useful Agricultural Information, that enable effective accessibility and usage of agricultural information by Extension officers in the County and factors that explain the variation in ESOs' attitudes toward these sources. The insights gained from the study should help improve the effectiveness with which Extension service officers develop targeted outreach activities that ensures that farmers receive adequate, relevant and timely agricultural information in a format they appreciate and understand.

Table 4: Respondent's (perception) rating of Agricultural Information obtained from named sources

S/No.	Source of Agricultural Information	Percent (%) Rate of Usefulness of Agricultural Information accessed				
		Not useful at all	Slightly useful	Useful	Very useful	Extremely useful
1	Refresher Training	4.3	4.3	18.6	41.4	31.4
2	Formal Education	7.1	12.9	24.3	28.6	27.1
3	Newspapers	4.3	37.1	40.0	15.7	2.9
4	Extension visits	2.9	5.7	30.0	40.0	21.4
5	Mobile phones	2.9	25.7	44.3	21.4	5.7
6	Agricultural shows; exhibitions	2.9	5.7	28.6	48.6	14.3
7	Trade Fairs	4.3	10.0	34.3	38.6	12.9
8	Field days	2.9	5.7	20.0	35.7*	35.7*
9	Research Fora	4.3	11.4	27.1	34.3	22.9
10	Other extension officers	2.9	11.4	35.7	32.9	17.1
11	Progressive farmers	4.3	12.9	37.1	31.4	14.3
12	Exposure visits	2.9	8.6	31.4	40.0	17.1
13	Internet	4.3	12.9	48.6	24.3	10.0
14	Databases	10.0	12.9	37.1	30.0	10.0
15	Libraries; Books	10.0	27.1	21.4	31.4	10.0
16	Broadcast media; (TV, Radio)	5.7	31.4	35.7	20.0	7.1

*same rating in the two categories

In the first (Best) category of ranking- “extremely useful”; 35.7% of the respondents rated field days as the most useful (effective) source of agricultural information.

In the second best category of ranking “very useful”; the respondents rated the usefulness or effectiveness of the Agricultural Information sources as indicated in table 5 below:

Table 5: Respondents' rating of "very useful" category

S/No.	Agricultural Information source	% (usefulness) rating of “very useful” category	Rank or Position	Remarks
1	Agricultural shows, exhibitions	48.6	1	Most useful=effective Agricultural Information source among “very useful” category
2	Refresher Training	41.4	2	
3	Extension visits	40.0	3*	
4	Exposure visits	40.0	3*	
5	Trade Fairs	38.6	4	
6	Field days	35.7	5	Least useful= effective Agricultural Information source among “very useful” category

*Equally rated by respondents.

In the third best category of ranking-“useful”; the respondents rated the usefulness or effectiveness of the Agricultural Information sources as indicated in table 6 below:

Table 6: Respondents' rating of "useful" category

S/No.	Agricultural Information source	% rating of “Useful” category	Rank or Position	Remarks
1	Internet	48.6	1	-Most effective Agricultural Information source among “useful” category and highest rating of ICT based sources.
2	Mobile Phones	44.3	2	
3	Newspapers	40.0	3	
4	Progressive Farmers	37.1	4*	
5	Databases	37.1	4*	
6	Broadcast Media (TV; Radio)	35.7	5	Least effective Agricultural Information source among “useful” category

The findings show that the respondents rate (perceive) the usefulness of traditional Agricultural Information sources to be in the second category of “very useful” whereby agricultural shows, exhibitions; refresher trainings and extension visits/exposure visits scored 48.6%; 41.4%; while extension visits/exposure visits each obtained 40.0% respectively.

The respondents rate (perceive) the usefulness of Digital or ICT based sources of Agricultural Information in the third category of “useful” whereby internet; mobile phones and databases scored 48.6%; 44.3% and 37.1% respectively.

The researcher observed that the rating of the usefulness of the agricultural information sources in the study by the respondents concurred with the media richness hierarchy used by Daft and Lengel, 1986 as shown by the Media Richness Index of the agricultural information sources in table 7 below:

Table 7: Media Richness Index of agricultural information sources in the study

S/no.	Source of Agricultural Information	% usefulness	Category of usefulness	Media Richness Index (rank)	Information richness indexed from 1=most rich source.....14=most lean source
1	Field days	35.7*	1 st category-“Extremely useful”	1	Most information rich source
2	Agricultural shows, exhibitions	48.6	2 nd category-“very useful”	2	
3	Refresher Training	41.4	2 nd category-“very useful”	3	
4	Extension visits	40	2 nd category-“very useful”	4	
5	Extension exposure	40	2 nd category-“very useful”	4	
6	Trade Fairs	38.6	2 nd category-“very useful”	5	
7	Research For a	34.3	2 nd category-“very useful”	6	
8	Other extension officers	32.9	2 nd category-“very useful”	7	
9	Progressive farmers	31.4	2 nd category-“very useful”	8	Medium information rich source
10	Libraries, Books**	31.4	2 nd category-“very useful”	8	
11	Databases	30.0	2 nd category-“very useful”	9	
12	Formal Education**	28.6	2 nd category-“very useful”	10	
13	Internet	24.3	2 nd category-“very useful”	11	
14	Mobile phones	21.4	2 nd category-“very useful”	12	
15	Broadcast Media (TV; Radio)	20.0	2 nd category-“very useful”	13	
16	Newspapers**	15.7	2 nd category-“very useful”	14	Most information Lean source

***% Response in 1st and 2nd categories hence the most information rich.**

**** Not digital sources of information**

The Media Richness Index in Table 7 is for the agricultural information sources in this study.

It is based on the Media Richness Theory by Daft and Lengel, 1986 and is presented from the highest to the lowest levels of information richness of the source and its’ potential

capacity as a media of transmitting the meaning of the information factors ranked from “rich” to “lean”. The sources indexed 1-8 are basically analogue or traditional while those indexed 9-14 are digital or ICT based (except Libraries, Books; Formal Education and newspapers), thus traditional sources are more information rich than ICT based sources.

4.7 Uses of agricultural information accessed by ESOs.

Table 8 below shows the various uses of agricultural information by respondents.

Table 8: Response by ESOs on the uses of Agricultural Information they access from listed sources

S/No.	Type of use	(%) Yes	(%) No	Count	Rank of use of Agricultural Information in descending order
1	Dissemination to Farmers for improving agricultural practices	100	0	70	1*
2	For Reporting and Documentation	100	0	70	1*
3	For Sharing with Collaborators and Stakeholders	98.6	1.4	70	2
4	For sharing with other extension Officers	95.7	4.3	70	3
5	For Academic Purposes	57.1	42.9	70	4
6	For Research Purposes	55.7	44.3	70	5
7	For Policy Formulation	48.6	51.4	70	6

* Indicates a tie of the ranking.

The findings show that all extension service officers use accessed agricultural information from various sources first for dissemination to farmers for improving agricultural practices and for reporting and documentation. The second use is for sharing with Collaborators and Stakeholders while the third ranked use is for sharing with other extension Officers. 57.1% (40) of the respondents use the accessed agricultural information for academic purposes while 55.7% (39) use it for research purposes. More than half 51.4(36) of the extension service officers do not use accessed agricultural information for policy formulation.

4.8 Challenges ESOs encounter in the use/dissemination of Agricultural Information

Table 9 below shows the challenges encountered by respondents in the use of Agricultural Information.

The findings show that the three main challenges ESOs face in the use/dissemination of Agricultural Information during their routine work in Makueni County include: Low funding /facilitation; No access/lack of equipments & materials e.g. ICT; demonstration kits; manuals and Clients not putting what they are taught into practice (low adoption) respectively.

Table 9: Response on the challenges ESOs encounter in the use/dissemination of Agricultural Information during their day to day work

S/No.	Challenges	Count	Rank in order of importance
	Low funding /facilitation	21	1
	No access/lack of equipments & materials to use in Agricultural Information dissemination i.e. ICT; kits; manuals	12	2
	Clients not putting what they are taught into practice (low adoption)	12	2
	Low farmer literacy levels	11	3
	Lack of transport	10	4
	Inadequate technical exposure /information	8	5
	Language barriers	5	6
	Weather unpredictability	4	7
	others	19	N/A
	TOTAL COUNT OF NARRATIVE RESPONSES	102*	

*The 70 respondents gave multiple narrative answers.

4.9 Regression Results for the hypothesis

The models below represent the explanatory variables used in the regression analysis to test the hypothesis.

The relationship is given by the following equation.

$$A = y_0 \pm y_1(Q_1) \pm y_2(Q_2) \pm y_3(Q_3) \pm e \dots\dots\dots 2;$$

Where:

Where (A) is the dependent variable (Access to and use of Agricultural Information by Agricultural extension officers), and Q₁ (Ease of access to Agricultural Information sources), Q₂ (Ease of use of accessed Agricultural information), Q₃ (Challenges of existing information sources) are the independent variables.

y₀ is the constant term or the y-intercept and y₁, y₂, y₃ are the coefficients of regression. e is the error term describing any other outside factors that may affect the model.

The correlations results shown in table 10 below indicate that there is strong correlation between the variables.

Table 10: Correlations results

Correlations					
		Access and use of Agricultural information	Ease of access to Agricultural information sources	Challenges of existing information sources	Ease of use of accessed Agricultural information
Pearson Correlation	Access and use of Agricultural information	1.000	.730	.801	.806
	Ease of access to Agricultural information sources	.730	1.000	.858	.876
	Challenges of existing information sources	.801	.858	1.000	.894
	Ease of use of accessed Agricultural information	.806	.876	.894	1.000

The table 11 below, on coefficients shows the collinearity diagnosis of the variables. The results rule out any multicollinearity.

Table 11: Collinearity Diagnostics

Collinearity Diagnostics							
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	Ease of access to Agricultural Information sources	Challenges of existing information sources	Ease of use of accessed Agricultural information
1	1	3.825	1.000	.01	.00	.00	.00
	2	.131	5.400	.89	.01	.02	.03
	3	.024	12.586	.06	.80	.53	.01
	4	.019	14.020	.04	.19	.45	.96

Using the constant and the beta values in the following Table 12, the model becomes:

$$A = 2.160 - 0.030(Q_1) + 0.409(Q_2) + 0.467(Q_3) \pm e \dots\dots\dots 3$$

Table 12: The model, on using the constant and the beta values

Coefficients													
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.160	.117		18.441	.000	1.926	2.394					
	Ease of access to Agricultural Information sources	-.032	.164	-.030	-.198	.844	-.359	.294	.730	-.024	.014	.205	4.889
	Challenges of existing information sources	.345	.139	.409	2.483	.016	.068	.622	.801	.292	.172	.177	5.645
	Ease of use of accessed Agricultural information	.294	.111	.467	2.654	.010	.073	.515	.806	.310	.184	.155	6.444

The results in table 12 shows Tolerance and VIF values are as follows: Ease of access to agricultural information sources; Tolerance = 0.205 and VIF = 4.889; Challenges of existing information sources; Tolerance = 0.177 and VIF = 5.645 and Ease of use of accessed Agricultural information: Tolerance = 0.155 and VIF = 6.444. These values are more than 0.1 and less than 10 respectively and therefore multicollinearity is ruled out (Pallant, 2011).

From the Sig. column of table 12, it is concluded that one variable (Ease of access to agricultural information); Sig. = 0.844 is making a less significant contribution to the model because its Sig. value is more than 0.05 than the other variables (Challenges of existing information sources; Sig. = 0.016 and Ease of use of accessed Agricultural information; Sig. = 0.010).

4.10 Evaluation of the model

Table 13: Summary of the regression model of the Hypothesis

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.826 ^a	.682	.668	.387	.682	47.269	3	66	.000

From the Model summary table 13, R square value 0.682 (i.e. 68.2%) is the level of variance of the dependent variable (Access to and use of Agricultural Information by Agricultural extension officers) that is explained by the causal variables. The adjusted R square (0.668) gives the value of the population variance and could have been used if the sample was small. (Pallant, 2011).

4.11 The hypothesis test

The ANOVA table 14, below from the SPSS was used to test the hypothesis.

Table 14: ANOVA of the Hypothesis

ANOVA						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.213	3	7.071	47.269	.000
	Residual	9.873	66	.150		
	Total	31.086	69			

From the analysis $F(3,69) = 47.269$, $p = 0.000$. The F value from table is **2.76** at 0.05 significant level and therefore the null hypothesis $H_0 =$ "Access and use of Agricultural information by extension service officers in Makueni County is not effective." is accepted and the alternative hypothesis $H_1 =$ "Access and use of Agricultural information by extension service officers in Makueni County is effective." is rejected.

4.12 Discussion

The respondents' ranks or cadre analysis established that there were 17 low cadre ESOs' out of 70. This number of frontline extension personnel are few; and indicate that there exist a

deficit of ESOs at the extension unit level in the county, hence with the use of analogue extension communication methods there is minimal “quality contact” between the frontline extension officers and (farmers) clientele. These findings concur with Sanga C. et al (2013) who argued that to access and use the sources for agricultural information physical contact/presence of both the extension service officer and the client is required. This is limited by the low number of extension staff: farm family in Kenya as the current ratio is 1:753. The Ministry of Agriculture, Kenya recommends the ratio of frontline extension officer: farm family of 1:640 while Makueni County has an average ratio of 1:1,693. (See: Appendix III). This implies that one frontline extension officer in post in the County is working in place of $(1693/640=2.65\approx 3)$ three frontline extension officers.

The study established that the five most preferred sources of Agricultural Information were: other extension officers (97.1%); field days (95.7%); extension visits (92.9%); progressive farmers (91.4%) and agricultural shows & exhibitions (90.0%). These sources are traditional or “analogue” which the older generation of extension officers and farmers/clients are at “home” with as opposed to younger generation of both successor extension officers and farmers/clients, who would rather access/source and use digital means. The five least preferred sources of Agricultural Information in an ascending order were: research fora (52.9%); databases (54.3%); internet (80.0%) and libraries, books and Broadcast media each at (81.4%). These sources are rather academic and “digital” as the extension officers’ need to have facilities, environment (space and time), positive attitude, funds and be kept abreast with rapidly changing digital communication systems and equipments in order to access and use latest and advancing research of required agricultural information.

The researcher observed that respondents exposed to and having ability to access ICT preferred databases and internet though access costs were prohibitive. In this regards (Mila et al., 2009) contends that the availability of ICTs as sources of Agricultural Information does

not make the information easily accessible especially in developing countries because of inadequacies associated with lack of connectivity and limited knowledge of ICTs.

The high difference in preference percentage between the most preferred source, “other extension officers” (97.1%) and the least preferred source, “research fora” (52.9%) indicates the wide gap in Agricultural Information communication between field agricultural extension officers and relevant research organizations despite existence of liaison officers.

The high percentage of preference respondents gave their colleagues “other extension officers” shows the high confidence they have amongst themselves as sources of accurate and reliable agricultural information. This implies the ESOs perceive their colleagues to be competent in and to possess high agricultural information source credibility, in terms of technical information content as “technical or impact messages”; agricultural knowledge as on national agricultural development news and moderate agricultural information content as general farming news.

Negative attitude towards a reading culture; lack of libraries and relevant books may be the reason for libraries, books being ranked 5th least preferred as a source of Agricultural Information at 81.4% by the respondents in the county.

Sourcing and use of agricultural information among individual extension service officers depended on factors other than basic training such as agriculture sector department’s or organization’s status or level of existing structures that facilitate agricultural information processes of acquisition/sourcing; documentation; storage; retrieval; repackaging; transfer/dissemination and use/utilization. Training is influenced by ability to access and use ICT equipments, software, their maintenance; funding and attitude of the individual extension service officer as willingness to continually learn especially on the job learning. However, according to (Claudine and Liza, 2013) there is no universal source that can adequately

provide access to all the audiences of agricultural information. This means ESOs have to rely on complementary sources of Agricultural Information to effectively serve their clientele that include mass media, internet, farmer meetings among others (Qiong et al, 2012).

The findings show that the most accessible sources of agricultural information to the ESOs are digital or ICT based except “other extension officers”, “progressive farmers” and “extension visits” which scored the least. The level of accessibility of 32.9% for broadcast media: 31.4% for internet and 28.6% for mobile phone respectively of the most accessible sources is far below the expected 100% mark, hence suggesting that the effectiveness of access to Agricultural Information by ESOs in the County is low. Similarly, the least accessible sources of agricultural information to the respondents are research fora (4.3%); refresher trainings (8.6%); formal education (10.0%); trade fairs (11.4%) and databases (12.9%). These sources are basically traditional or analogue except databases. Their extremely low ranking by the respondents may suggest their inefficiency and ineffectiveness in facilitating Agricultural Information accessibility to them. These low levels of Agricultural Information access by extension officers imply they have minimal “technical messages” to share or disseminate resulting in poor extension service delivery.

The sources rated as most accessible may not contain credible, reliable, accurate and authentic agricultural information as any author, other than a professional or expert can post, broadcast or write. Broadcast media, internet and mobile phone are ICT based sources and do require recognized, learned expert and professional input done through various methods such as interactive agricultural technical broadcast programmes; published scientific documentation materials as Journals, papers, reports, book and literature posted in the internet as databases, websites, VCDs, DVDs and other advancing technologies for enhanced accessibility. For effective and efficient access and use of ICT based sources of Agricultural Information both the extension service officers and clients should have the capacity in terms

of skills of operating the ICT equipments; requisite connectivity to the internet; funding for maintenance of equipments, replacement of obsolete technology with the rapidly advancing ICT technologies and access fees as membership fee or levies for recommended agricultural knowledge based databases, websites, e-libraries. These observation by the researcher are in line with Omotayo (2005), in the literature review who observed that, in spite of the abundant agricultural information hoisted on the internet, farmers' productivity has continued to be hindered by poor access to timely information as most farmers are illiterate, live in rural areas; hence have no knowledge on the use of information facilities like computer/internet. Although it is expected that agricultural extension will rise up to this challenge, the fact that little or no change is noticeable in the farmers' agricultural practices call to question the competencies of agricultural extension officers who possibly are themselves not aware of agricultural information most of which is available on-line due probably to inadequate access to the ICT.

Although the gap between the most preferred Agricultural Information source (Broadcast media at 32.9%) and the least preferred source (research fora at 4.3%) is 28.6%; it is important to note that both are too low to the expected excellent 100% mark and suggest that percentage efficiency level of access to Agricultural Information is wanting. These imply that the percentage increase of efficiency levels of access to Agricultural Information from the most and least preferred sources by extension service officers in Makueni County is a necessary measure. These relates with Akinbile and Otitolaye (2008) who noted that extension officers are only conversant with a few sources of information and efforts should be made to upgrade their knowledge in as many sources as possible to ensure skill full use of these sources for efficient diffusion of agricultural knowledge.

The study established that graduate respondents constituted 52.9% (37); those with diploma and certificate holders were 28.6% (20) while 18.6 % (13) had post graduate education.

These results on education levels show that public extension service officers in the county are highly learned as 71.5% (50) hold a minimum of degree level of education; hence have the capacity to identify sources; access to and utilization of targeted agricultural information. This concurs with Gholamreza and Naser (2005) who showed that there was a significant relationship between level of education, years of experience, age and job related information with information accessing behaviour. In general the ESOs' have the potential of addressing farmers' needs in Makueni County with the accessed agricultural information. However, the results also concurs with the findings by Kibett et al., (2011), that the curricula for undergraduate agricultural programmes should also focus on emphasising professional skills as computer applications and use in communication, audio/video material development and data/information management that enhance the ability of the individual ESOs' to manage the context of extension service delivery. There is need to make agricultural information more accessible to ESOs' by promoting open content and common standards (in reports, documentation and other information processes) and tools that support sharing/dissemination/transfer to farmers and other clientele.

The findings demonstrated that the ESOs' agricultural information needs and seeking means and ways were similar in the County. The major sources of information for farmers were predominantly locals followed by public extension services. Apart from radio and cell phones, advanced technologies and printed materials were used at a low rate despite their existence in the communities.

The study provided a deep understanding of access to and use of agricultural knowledge and information in the rural areas, which necessitates a need for demand-led and client-based knowledge and information services in order to meet the disparate farmers' needs.

Hypothesis test

From the regression results, it is concluded that challenges posed by the existing sources of agricultural information as well as the ease of use of the said information affects the delivery of services by the extension service officers.

The null hypothesis H_0 = “*Access and use of Agricultural information by extension service officers in Makueni County is not effective.*” was tested and accepted while the alternative hypothesis H_1 = “*Access and use of Agricultural information by extension service officers in Makueni County is effective.*” was rejected.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 INTRODUCTION

This final chapter summarizes the findings of the results presented in chapter four. It also gives recommendations on policy, planning, and other relevant issues on access to and use of agricultural information. The final part of this chapter presents some suggestions on areas that need further research and study.

5.1 Summary of Findings

The study focused on access to and use of Agricultural Information by ESOs'; the case of Makueni County, Kenya. The study utilized primary data that was collected from extension service officers' through a questionnaire. The data was analysed using descriptive statistics. The results showed that over 75% of the ESOs' were seasoned or experienced in accessing and use of Agricultural Information for routine extension service delivery. Over 81% of the ESOs' had an educational level of a degree and above. The ESOs' are predominantly males at 67% and females at 33%.

The low cadre ESOs are remunerated less than the middle and high cadre officers. This results to the low cadre officers having minimal ability to acquire personal equipments (as for ICT) and personal finances for access to and use of agricultural information (as for internet and mobile) as opposed to the high cadres. For middle and high cadre officers the limitation to effective access to and use of Agricultural Information could be, attitude or non willingness; non-exposure and conservatism rather than changing to advancing digitalization of the extension communication methods by their organization. There is need for more sustainable ways and means of enabling ESOs with unlimited access to and use of advancing agricultural information especially the low cadre officers in the field in order to complement the basic trainings and avail advances in Agricultural Information.

The fact that the respondents prefer analogue or traditional sources of Agricultural Information rather than digital or ICT sources; suggests that the ESOs in the County have not been exposed nor fully realized the benefits of digital sources adequately. This scenario implies that though digital methods of access to and use (dissemination) of agricultural information are more feasible they need to compliment traditional or analogue methods as group approaches in public extension service delivery as there uptake takes root through the e-extension launched by the government in 2013.

5.2 Conclusions

Hardship areas like Makueni County tend to have a skewed ESOs' gender deployment as evidenced by the 2:1 male: female ratio. However, both genders face similar circumstances and challenges in the work front in regard to access to and use of agricultural information.

From the findings, 74.3% (52) of the extension service officers are over 40years old and are used to traditional or analogue rather than digital (ICT) methods of access to and use of Agricultural Information; retraining programmes on digital methods are a priority for the ESOs. The human resource administrators need to consider increasing the number of "successors" or youthful ESOs who are competent in digital methods of information communication. All age bands require suitable working equipments, space, security, facilitation, motivation, attitude change, electricity connectivity and continuous supply, internet connectivity and good infrastructure among other needs for effective agricultural information processes accomplishment.

Though the respondents were drawn from the larger agriculture sector service providers working in the study area; the findings established that all of them had gone through basic extension training up to different levels. These imply that they possess varying abilities and competences in terms of knowledge and personal finances due to differential remuneration as it is pegged on education levels. These differences suggest that lower cadre ESOs

(Certificate and diploma holders) might be disadvantaged in terms of having been imparted with less complex or advanced agricultural information as opposed to middle and higher qualified cadres (graduates and Post graduates respectively) hence their deployment at the frontline or “extension unit” level where more of skilled and practical extension work is required and where there exist less or no facilities for digital connectivity and infrastructure as electricity connectivity.

5.3 Recommendations

The study was focused on access to and use of Agricultural Information by ESOs’ in Makueni County. I recommend the following:

- a) The ministry of Agriculture should build up the skills base and provide incentives for greater cooperation and sharing of agricultural information among agricultural sector organizations and individual extension service officers. This approach would lead to the application of agricultural information to solve real client problems and food insecurity.
- b) The ministry of Agriculture should develop more sustainable ways and means of enabling ESOs with unlimited access to and use of advancing agricultural information. This should be done alongside, motivating all ESOs to be early adopters of innovations in agricultural information communication methods.
- c) Promotion of collaboration on development of methodologies and indicators for measuring the outcomes of enhancing access to and use of agricultural information by ESOs.”
- d) The ministry of Agriculture should promote regular studies; workshops; in-service or on the job training on agricultural information needs for extension service officers, map ESOs' knowledge and information sources, create awareness of information sources and knowledge culture, use participatory methods in design and development

of technologies and facilitate ESOs' use of multiple or hybrid sources and sharing methods of agricultural information to deliver relevant information to farmers.

The way forward is to seek funding for further research to establish trends of agricultural productivity by farmers' as a result of enhanced access to and use of agricultural information by extension service officers'.

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APPENDICES

Appendix I: Introduction Letter for Data Collection

UNIVERSITY OF NAIROBI
COLLEGE OF AGRICULTURE AND VETERINARY SCIENCES
FACULTY OF AGRICULTURE
DEPARTMENT OF AGRICULTURAL ECONOMICS

4 July 2012

Ref: uon/cavs/agec/7/4/1

To Whom It May Concern

Dear Sir/Madam

RE: FRANCIS NJOROGE NG'ANG'A A56/64080/2010

The above named person is a second year student in MSc. Agricultural Information and Communication Management. He is currently collecting data on his project titled "An Evaluation of Access and Use of Agricultural Information by Extension Service Agents: The Case of Makueni County."

Please accord him any necessary help that he may require during his data collection.

Yours faithfully

DR. FRED I. MUGIVANE
CHAIRMAN
DEPARTMENT OF AGRICULTURAL ECONOMICS

Fred I. Mugivane 3/7/2012


Appendix II: Data Collection Questionnaire

SURVEY QUESTIONNRE AN EVALUATION OF ACCESS TO AND USE OF AGRICULTURAL INFORMATION BY EXTENSION SERVICE OFFICERS: THE CASE OF MAKUENI COUNTY.

Name of respondent: _____ Sub County _____ Date _____

The information provided will strictly be used for academic purposes only.

A) The Socio economic characteristics of the respondent.

a. Fill in the provided spaces as per the **coding instructions** in italics in the table below.

Sex <i>1 = male, 2 = Female</i>	Age in years <i>Please enter the years.</i>	Number of years worked in the extension service <i>Please enter the years.</i>	Years of schooling <i>Please enter the years.</i>	Marital status <i>1 = Single, 2 = Married, 3=Divorced, 4=Separated, 5=Widowed, 6=In a relationship, 7=Others.</i>	Training in Extension Service. <i>1 = Yes, 2 = No</i>

2. What is your current rank as per your organisation?

Coding instructions:

1=Senior Support Staff up grader

2=Senior Agricultural Assistant

3= Chief Agricultural Assistant

4=Agricultural Assistant Officer

5=Agricultural Officer

6=Senior Agricultural Officer

7=Chief Agricultural Officer

8=Principal Agricultural Officer

9=Assistant Director of Agriculture

10=Others (Specify) _____

B) Sources of Agricultural Information

1. Which of the following sources of information do you use/not use? **Coding instruction:** *1=Yes 2=No*

Sources of information	Use/not use
Refresher training	[]
Formal education	[]
Newspapers	[]
Extension visits	[]
Mobile phone	[]
Agricultural shows, exhibitions	[]
Trade Fairs	[]
Research For a	[]
Other extension officers	[]
Progressive Farmers	[]
Field days	[]
Exposure visits	[]
Internet	[]
Databases	[]
Libraries, Books	[]
Broadcast media (TV, Radio)	[]
Others (specify).....	[]

2. What are the reasons for using the information sources in the table below? *Please you are allowed to choose more than one reason from the coding list.*

Sources of information	Coding instructions	Reasons
	1=Better facilitation 2=Relevance 3=Accuracy 4=Usefulness 5=Reliability 6=Timeliness	7=Level of Detail 8=Confidence in the source 9=Accessibility 10=Awareness of the source 11= Affordability 12= Availability 13= Others (specify)
Refresher training		
Formal education		
Newspapers		
Extension visits		
Mobile phone		
Agricultural shows, exhibitions		
Trade Fairs		
Research For a		
Other extension officers		
Progressive Farmers		
Field days		
Exposure visits		
Internet		
Databases		
Libraries, Books		
Broadcast media (TV, radio)		
Others (specify).....		

3. What are the reasons for not using the information sources in the table below?

Please you are allowed to choose more than one reason from the coding list.

Sources of information	Coding instructions	Reasons
	1=No facilitation 2=Irrelevance 3=Inaccuracy 4=Non-usefulness 5=Unreliability 6=Non-timeliness	7=Low Level of Detail 8=Non-Confidence in the source 9=Inaccessibility 10=Ignorance 11=Costly 12=Unavailability 13=Others (Specify)
Refresher training		
Formal education		
Newspapers		
Extension visits		
Mobile phone		
Agricultural shows, exhibitions		
Trade Fairs		
Research For a		
Other extension officers		
Progressive Farmers		
Field days		
Exposure visits		
Internet		
Databases		
Libraries, Books		
Broadcast media (TV, radio)		
Others (specify).....		

4. Rank the listed Agriculture Information sources in a scale of 5 (5 being the most wanted and 1 being the least wanted) that you would like to use in ideal conditions).

Coding instructions: Most wanted =5, 2nd Most wanted =4, 3rd Most wanted =3, 4th Most wanted =2, 5th Most wanted. =1

Sources of information	Rank
Refresher training	[]
Formal education	[]
Newspapers	[]
Extension visits	[]
Mobile phone	[]
Agricultural shows, exhibitions	[]
Trade Fairs	[]
Research For a	[]
Other extension officers	[]
Progressive Farmers	[]
Field days	[]
Exposure visits	[]
Internet	[]
Databases	[]
Libraries, Books	[]
Broadcast media (TV, radio)	[]
Others (specify).....	[]

5. Are there challenges you face in accessing agricultural information? []

Coding instructions: 1=Yes, 2= No

6. In your opinion rate the level of challenges you face in accessing agricultural information from the listed sources?

Coding instructions: 1= Not challenging, 2 = Slightly challenging, 3= Moderately challenging, 4 = Very challenging

Sources of information	Rating
Refresher training	[]
Formal education	[]
Newspapers	[]
Extension visits	[]
Mobile phone	[]
Agricultural shows, exhibitions	[]
Trade Fairs	[]
Research For a	[]
Other extension officers	[]
Progressive Farmers	[]
Field days	[]
Exposure visits	[]
Internet	[]
Databases	[]
Libraries, Books	[]
Broadcast media (TV, radio)	[]
Others (specify).....	[]

7. What type(s) of Agricultural Information do you acquire from the available sources?

Coding instructions: 1=Yes, 2= No

Type of agricultural information	Types
Crop husbandry practices & principals	[]
Indigenous agricultural knowledge	[]
Livestock husbandry Practices & Principals	[]
Agribusiness Processing & Marketing	[]
Environmental Conservation Practices	[]
Agricultural and Livestock skills	[]

Formal Agricultural Education	[]
Agriculture & Livestock Research Information	[]
Other (specify)	[]

8. What are the challenges you encounter in the use/dissemination of Agricultural Information?

.....
.....
.....

9. For dissemination purposes, rate the usefulness of agricultural information that you obtain from the following sources?

Coding instructions: 1= Not useful at all, 2= Slightly useful, 3= Useful, 4= Very useful, 5 = Extremely useful

Source	Rate
Refresher training	[]
Formal education	[]
Newspapers	[]
Extension visits	[]
Mobile phone	[]
Agricultural shows, exhibitions	[]
Trade Fairs	[]
Field days	[]
Research For a	[]
Other extension officers	[]
Progressive Farmers	[]
Exposure visits	[]
Internet	[]
Databases	[]
Libraries, Books	[]
Broadcast media (TV, Radio)	[]
Any Others (Specify).....	[]

10. How often do you come across agricultural information from the named sources?

Coding instructions: 1= Very often, 2= Often, 3=rarely, 4=Very rarely, 5= Never

Source	
Refresher training	[]
Formal education	[]
Newspapers	[]
Extension visits	[]
Mobile phone	[]
Agricultural shows, exhibitions	[]
Field days	[]
Research for a	[]
Other extension officers	[]
Progressive Farmers	[]
Exposure visits	[]
Internet	[]
Databases	[]
Libraries, Books, Print media	[]
Broadcast media (TV, Radio)	[]
Any Others (Specify).....	[]

11. For each of the following characteristics shown below please rate the level of importance you attach to the source using the following scale:

Coding Instruction: 1= Not important at all, 2= Slightly important, 3=Moderately important, 4=Very important 5=Extremely important

Level of importance										
Source Xtics	Formal education	Refresher training	Formal training	Broadcast Media	Extension visits	Internet	Agricultural shows/exhibitions	Field days	Other Extension Service Officers	Libraries, Books, print media
Relevance	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Accuracy	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Usefulness	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Reliability	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Timeliness	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Level of detail	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Confidence in the source	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]

C) **Uses of Agricultural information.**

1. What are the uses of agricultural information you access from the various Agricultural Information sources?

Coding instructions: 1=Yes, 2= No

Dissemination to farmers for improving agricultural practices []

For sharing with other extension officers []

For policy formulation []

For research Purposes []

For academic Purposes []

For sharing with collaborators and stakeholders []

For reporting and documentation []

Others (Specify) [] _____

2. Who are the beneficiaries of the Agricultural Information that you acquire from the sources?

Coding instructions: 1=Yes, 2= No

Farmers []

Other extension officers []

Training institutions []

Others (specify) [] _____

3. In what fora do you deliver the different types of agricultural information?

Coding instructions: 1=Yes, 2= No

Barazas []

Farm visits []

Group visits []

Seminars/Trainings/Workshops []

Field days []

Others (specify) [] _____

Thanks for dully filling this questionnaire. God bless you.

Appendix III: Makueni County Agricultural Statistics

Makueni County administrative units and agricultural extension coverage statistics.

SUB COUNTY	Population	Constituency	Ward	Division	Locations	Sub-location	Extn Units	House Holds	Farm Families	Average Farm Size	Large Scale Farmers	Small Scale Farmers	Staff (MOA) Farmer Ratio
	(No.)	(No.)	(No.)	(No.)	(No.)	(No.)	(No.)	(No.)	(No.)	(Ha)	(No.)	(No.)	
Makueni	109,318	2(Makueni/Kaiti)	5	3	11	25	11	23,756	22,665	2.1	0	22,665	1:1,333
Mukaa	87,918	1(Kilome)	3	4	9	19	9	19,631	14703	0.75	1	29406	1:1,941
Kilungu	60,601	1(Kaiti)	2	2	7	16	16	12,524	11,950	0.7	0	13,000	1:1,625
Mbooni East	87,315	1(Mbooni)	6	6	14	38	14	14,395	17475	3	0	17475	1:1,456
Mbooni West	97,309	1(Mbooni)	2	4	13	22	13	20,317	18,066	1.5	0	18,066	1:2,258
Kathonzweni	76,605	1(Makueni)	3	5	10	19	5	14,314	8223	3	0	14413	1:1,433
Nzau	116,757	1(Makueni)	5	5	21	52	21	24,562	24,082	3	0	24,082	1:2,006
Makindu	70,302	1(Kibwezi)	4	1	4	15	4	15,495	9,750	3	0	9,750	1: 1,218
Kibwezi	181,402	1(Kibwezi)	7	3	10	20	10	37,554	29,909	2.1	25	21,917	1: 2,719
TOTAL	887,527	8	36	33	96	224	100	182,548	156,823	2.0	26	170,774	1:1,693

(Source: Makueni County Profile-November 2012 MOA)

