AN ASSESSMENT OF THE IMPACT OF AGRICULTURAL EXTENSION EDUCATION IN KABONDO DIVISION, HOMA-BAY COUNTY: A CASE STUDY OF FARMERS UNITED

BY

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DECLARATION

This Research Project is my original work and has not been submitted for a Degree award in this or any other University

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I …. do not cease to give thanks for you, making mention of you in my prayers … Ephesians 1: 16

DEDICATION

To the memory of my mother,

Mrs. Helidah Awino Osedo

"A woman full of strength and commitment."

And to my grandmother,

Maria Anditi daughter of Nyaywera,

The pioneer of education in our family.

"Her children rise up and call her blessed;

Her husband also, and he praises her."

-proverbs 31:28

ABSTRACT

Agricultural extension education is considered as an important agent in the increment of agricultural food production. The study therefore sought to assess the impact of agricultural extension education programme by Farmers United in Kabondo division. In particular, the study investigated the effectiveness of teaching techniques, delivery systems and the level of training of the extension educators. For this reason, the perceptions of the field manager, extension educators and farmers were sought. The study adopted a case study design. The main instruments for data collection were; questionnaires, an interview schedule and an observation checklist. Sixteen extension educators and three hundred and fifty eight farmers participated in the study. Results indicated that all the sixteen extension educators were educated up to KCSE level but none was professionally trained as an agriculturalist. The results also indicated that demonstration teaching technique and training and visit delivery system were the most effective. The study also established that the programme left out some teaching techniques and delivery systems that the farmers themselves indicated that they would prefer yet these are techniques and systems that have been documented in the past as effective. The study therefore recommends that extension educators should use multiple teaching techniques and delivery systems in order to take care of interests, preferences and several learning styles of various farmers.

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LIST OF ABBREVIATIONS

ADP - Agricultural Development Programme

B. Ed - Bachelor of Education

EU - European Union

FAO - Food and Agricultural Organization

FU - Farmers United

HND - Higher National Diploma

ICTs - Information Communication Technologies

IRDP - Integrated Rural Development Project

IFPRI - International Food Policy Research Institute

KCSE - Kenya Certificate of Secondary Education

MBPP - Master Beef Producer Programme

MDG - Millennium Development Goals

M. Sc - Master of Science

M. Ed - Master of Education

NAADS - National Agricultural Advisory Services

NGO - Non – Governmental Organization

OND - Ordinary National Diploma

OAF - One Acre Farm

PADETES - Participatory Demonstration and Training Extension System.

Ph. D - Doctor of Philosophy

SSA - Sub – Saharan Africa

WB - World Bank

CHAPTER ONE

1.0. Introduction

1.1. Background to the Study

The world's concern about the human condition in the 21st Century is voiced in the millennium declaration which calls on governments to put in place actions that will lead to noticeable improvements in the human condition by 2015 (UN Millennium Project, 2002). This dream is given concrete expression in the Millennium Development Goals (MDGs) which give governments a common framework for structuring policies and practices (UN Millennium Project, 2002). The first MDG is on eradicating extreme poverty and hunger whose target 2 is to reduce the population who suffer from hunger by half by 2015 (UN Millennium Project, 2002).

Current statistics reveal that about 936 million people worldwide are chronically hungry, a figure that represents 33% of the world's population. It is estimated that hunger kills 24,000 people each day, 16000 of whom are children under five years of age (FAO, 2012). Nearly one half of the world's hungry are in South Asia and one third is in Sub-Saharan Africa (SSA). 98 percent of those who do not have enough to eat live in developing countries (FAO, 2012). Kenya like the rest of the developing countries is also hit by the hunger phenomenon (Government of Kenya, 2007). Given this pervasive world hunger scenario, international bodies such as Food and Agricultural Organization (FAO), the World Bank (WB), as well as individual nations, have made concerted efforts to reduce poverty and hunger. For example, The World Bank committed to spend $ 8 – 10 billion a year in support of agriculture in order to reduce poverty and hunger throughout the World between '2013 – 2015' (World Bank, 2013). Similarly, FAO has a programme known as 'Action Against Hunger' which operates in

40 countries in order to reduce hunger. The programme benefits 5 million people world wide each year (FAO, 2013). On May 18, 2012 President Barrack Obama also joined in by reading a speech in which he affirmed the United States commitment to support the promotion of a programme known as 'New Initiative to Tackle Hunger in Africa', in which he announced $3 billion in support of this programme (Obama, 2012). In Kenya, about 13million people, mostly in the Northern part, have been affected by hunger due to a number of factors including the drought of 1991, 1992 and 2001. This triggered a number of hunger relief efforts in the country such as 'Kenya Freedom from Hunger Walk', and 'Kenyans for Kenya' (Government of Kenya, 2007).

About 70 percent of the populations in the developing countries depend on farming to drive their livelihoods (Strange, 2012). One way of increasing food production is by using public or private agricultural extension education (Neuchatel Group, 1999). Agricultural extension education is the entire set of instruction that support and facilitate people engaged in agricultural production to solve problems and obtain information on skills and technology to improve their livelihood and well-being (Birner et al., 2006).

Although considered to be crucial in increasing agricultural productivity, agricultural extension has had a mixture of successes and failures. In fact the impact of agricultural extension education per se is very difficult to show (Purcell and Anderson, 1997; Anderson, 2007; Birkhaeuser, Evenson and Feder, 1991). The authors argue that many infrastructure variables and other factors affect agricultural performance in complex ways that make benefits difficult to quantify. For example the United States, the Netherlands and New Zealand had government sustained delivery types which had to be revived and revitalized because they were inefficient and unsustainable and irrelevant to the needs of farmers.

They had to be privatized and had to be made to charge fees for services rendered to farmers (Dillman, 1986; Gustafson, 1991; Le Gouise, 1991; Hercus, 1991).

There are several agricultural extension education services in Kenya including Kabondo Division. However, according to Mwangi (2006), agricultural extension education in Kenya has had several challenges that have exacerbated recurrent food insecurity in the country. Such challenges include un-sustainability, poor coordination and ineffective management of the existing agricultural extension education agencies in the country. Other challenges that impede the work of the agencies are related to natural occurrences such as harsh climatic conditions and natural disasters beside economic factors such as prohibitive cost of farm input (Mwangi, 2006). These challenges also hinder effective and efficient agricultural productivity in Kabondo Division.

Farmers United (FU) is such an agricultural extension education service provider whose efforts have been hampered by such challenges. The Non-Governmental Organization (NGO) operates in Kabondo Division of Homa-Bay County. FU's main objective is to train farmers in the division so that they can participate in the increment of agricultural food production. In this regard, the NGO has attempted to provide farmers and its personnel with agricultural education as follows: (a) Training farmers at the local level in order to increase their receptivity, participation and ability to increase agricultural production. (b)Training agricultural extension educators (trainers) in order to improve technical and administrative performance. (c) Training high level administrative staff to improve the quality of policy formulation, degree of coordination and overall effectiveness of implementation.

Coombs (1979) points out that for any training of rural people to have an impact, there must be technically competent trainers who are able to understand the problems and constraints

which face such rural people for whom they work. The trainers must also possess the ability to communicate their knowledge effectively. Coombs adds that the training programmes need to be evaluated continuously and critically to ascertain their impact. This study therefore sought to assess the impact of FU's educational programmes on agricultural food production in Kabondo division. It was hoped that through this research, a working model of agricultural extension education which is consistent with the way of life and practices of the community would be proposed so that a proper direction is charted for an effective and efficient food security framework in the community.

1.1.1 Agricultural Extension Education

Agricultural extension education is a service or system which assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering the levels of living and lifting social and educational standards (Maunder, 1973). The term extension was first used by the University of Cambridge and Oxford in 1867 to describe teaching activities that extended the work of the institutions beyond their campuses. Most of these earlier activities were not, however, related to agriculture.

The birth of modern agricultural extension education has been attributed to events that took place in Ireland in the middle of the 19th Century. Between, 1845 – 1851, the Irish potato crop was destroyed by fungal disease and a severe famine occurred. The British government thus arranged for "political instructors" to travel to rural areas and teach small scale farmers how to cultivate alternative crops. This scheme attracted the attention of government officials in Germany, who also organized their own system of instructors. By the end of the 19th Century, the idea had spread to Denmark, Netherlands, Italy and France.

In the 20th Century, colleges in the United States also started conducting demonstrations at agricultural shows and giving lectures to farmers' clubs. Eventually, agricultural extension education spread to Africa and Asia during colonization.

1.1.2 Profile of Farmers United

Farmers United is an NGO which was formed in 2006. It was listed at number eighteen on the Global Journal's list of the world's top one hundred NGOs in 2013. The NGO offers agricultural extension education to small holder farmers in Kenya, Rwanda and Burundi. Each of these countries is referred to as a field under a field director below which there are assistant field managers, regional field directors and at the grassroots, agricultural extension educators. Kenya is its first country of operation especially in Western and Nyanza provinces. Bungoma in Western province; is currently its global headquarters.

The NGO's main aim is to impart knowledge and skills that can enable the small holder farmer to double her income on every planted acre. It hopes to achieve this by supplying them with affordable farm inputs such as fertilizers and seeds on credit and by training them on correct modern agricultural practices. And lastly, by giving the farmers harvest sales support at profit. The NGO had reached over one hundred and thirty five thousand farm families so far. It targeted to reach two hundred and fifty one farm families in Africa by 2014.

1.2. Statement of the problem

Agricultural extension education is considered as an important agent in the increment of agricultural food production and therefore, hunger reduction. If applied successfully, agricultural extension education should result in outcomes which include observable changes and adoption of new agricultural technologies. However, on implementation,

different types and models of agricultural extension education have yielded mixed results of failures and successes. This has always necessitated that they be reformed worldwide in order to be farmer-led, demand-driven and therefore be adaptable to local conditions. The result of such reforms is the rise of new public, private and non-governmental agricultural extension education systems. FU is an example of such an improved agricultural extension education provider. The NGO operates in Kabondo division.

It was noted that despite the heavy investment and reforms of agricultural extension education systems in SSA, food shortages and hunger had not yet been adequately addressed in the region. This scenario therefore called to attention the need to constantly assess, evaluate and reform the existing agricultural extension education systems in order to propose working models that could be effective and efficient in increasing agricultural productivity. There was an information gap about the capacity, quality of service and performance of the newly risen agricultural extension education systems in SSA. As such, urgent information was needed about them on areas such as the effectiveness of their training techniques, methodologies, delivery systems and on the professional abilities of their agricultural extension educators. This amounted to an investigation into the impact that they had on agricultural productivity and hunger reduction. If such an investigation was not undertaken, then the quest to meet Millennium Development Goal 1 target on hunger reduction by 2015 would not be realized. It is against this background that the study sought to assess the impact of FU on agricultural food production and hunger reduction among farmers of Kabondo division, Homa-Bay County.

1.3. Objectives of the study

The main objective of this study was to assess the impact of FU's agricultural extension education services in Kabondo Division, Rachuonyo South District in Homa-Bay County. The following were the specific objectives of the study:

(i) To establish the effectiveness of the training techniques used.

(ii) To evaluate the effectiveness of delivery systems employed in the management of the training programme.

(iii) To assess the level of training of the agricultural extension educators in the training programme.

1.4. Research Questions

(i) How effective are the training techniques used in the programme?

(ii) How effective are the delivery systems employed in the management of the programme?

(iii) What is the level of training of the agricultural extension educators in the training programme?

1.5. Assumptions of the study

The study was based on the following assumptions:

(i) That there was a significant relationship between the agricultural extension education services offered by FU and agricultural productivity in Kabondo division.

(ii) That, farmers in Kabondo division participated in the educational programme of FU.

1.6. Significance of the study

There existed an information gap about the capacity, quality of service and performance of the newly risen agricultural extension education systems in SSA. This was equally true of the ones that operated in Kabondo division. As such, urgent information was needed about such

systems in areas such as the effectiveness of their training techniques, their methodologies and the professional abilities of their trainers, coordinators and administrators. Alongside these, information was also required as concerns their strengths, weaknesses and challenges. This study has therefore provided data upon which understanding of these issues can be based in order to chart direction for an effective and efficient food security framework in Kabondo division by proposing a workable agricultural extension education model that can be consistent with the way of life and practices of the community.

The data will be useful to various stakeholders such as the government of Kenya policy makers, organizations that are concerned with hunger reduction such as Food and Agricultural Organization (FAO), and the World Bank (WB), farmers in Kabondo division and FU itself. It is hoped that the findings are not only useful in the mitigation of hunger in Kabondo division, but also in the whole country.

1.7. Limitations of the study

One limitation was in the fact that the data collected could not necessarily be generalized with accuracy to all agricultural extension education systems in the community. The study was also faced by constraints such as lack of adequate resources and unavailability of enough time to cover all the targeted population. Nevertheless, these shortcomings were addressed through an appropriate sampling procedure to arrive at a reasonable sample size.

Another limitation was related to getting information from FU officials. They were not willing to give information that they thought were sensitive and confidential. This was addressed by building a sense of trust and confidentiality between them and the researcher.

1.8. Delimitations of the study

The study was carried out on FU and in Kabondo division of Rachuonyo South District in Homa-Bay County only and was basically limited to this organization in this division.

1.9 Definition of Significant Terms

Agricultural Extension Education: - The term is used in this study to mean the training that is given by FU to farmers in Kabondo division in order to make them acquire information, skills and technology that can make them increase agricultural productivity in the region.

Assessment: the judgment of FU's impact in Kabondo Division.

Case Study: The detailed study of FU in Kabondo Division.

Education: The term is used in the study to mean any training programmes given by FU to farmers and its staff in order to enable them acquires modern agricultural skills and knowledge in order for them to increase agricultural productivity.

Food Security: Refers to when all people have enough, safe and nutritious food to meet their dietary needs for an active healthy life.

Impact: the powerful effect that FU has on agricultural production in Kabondo Division.

CHAPTER TWO

2.0 LITERATURE REVIEW AND THEORITICAL FRAMEWORK

2.1 Introduction

This chapter covers literature review related to the objectives of this study. These include effectiveness of training techniques, delivery systems employed, and training and competence of extension education agents. The researcher reviewed literature about how these independent variables impact on extension education and farmers' satisfactions that result into agricultural productivity.

2.2 Agricultural extension education and farm productivity

2.2.1 Effectiveness of training techniques

There is a lot of debate on how teaching effectiveness may be defined (Braskamp and Ory, 1994). For instance, Centra (1993), defines effective teaching as "that which produces beneficial and purposeful student learning through the use of appropriate procedures (p. 42). Later, Braskamp and Ory (1994, p.40) included teaching and learning in their definition, defining effective teaching as the "creation of situations in which appropriate learning occurs; shaping those situations is what successful teachers have learnt to do effectively."

According to research by Theall and Franklin (1990), the most accepted criterion for measuring effective teaching is the amount of student learning which occurs. It is now believed that traditional methods of teaching can no longer produce graduates who can solve problems through creative and critical thinking (Teo and Wong, 2000). For this reason, education institutions are moving towards teaching methods which are problem-based and that can encourage students to learn how to learn via real-life problems (Boud & Feletti,

1999). The current study endeavored to investigate the relationship between FU's teaching methods and their impact on agricultural productivity in Kabondo Division.

Coombs (1975) conducted a survey on skill training programmes for rural areas in Columbia. The study sought to measure the impact of the training programme. This was done by attempting to determine whether the participants had applied what they had learnt in their lives. The results of the study indicated that 86% of the respondents had indeed put into use the skills and knowledge gained from the course. Asked what in particular enabled them to apply their knowledge, 20% of the respondents indicated that it was because of the additional technical advice while 60% indicated that it was as a result of the training received.

Sajjad (n.d.) conducted a study to determine the effectiveness of various teaching methods used for teaching students at graduate level. He interviewed two hundred and twenty students of the University of Karachi, Pakistan. The students were selected through purposive sampling. Their opinions were sought about the most effective teaching method (as perceived by them) used by their teachers, and the reasons for highly rating a particular method. They were asked to rate different methods of teaching used by their teachers on a scale of 1 to 5, one being the least important and five being the most important teaching method. The results of the study were compiled and analyzed by percentage method. The study revealed that most students rated lecture method as the best teaching method out of the eleven that were presented. Group discussion was rated second best method while case study was rated the least important. Although this study sought to determine the effectiveness of various teaching methods, it did not assess the level of competence of the extension education agents in the use of such teaching methodologies and application of

andragogical theories that could enrich their teaching. This study therefore, sought to fill this gap.

Strong, Harder and Carter (2010) conducted a study whose purpose was to explore and describe the teaching strategies selected by extension agents for adult participants in the Master Beef Producer Program (MBPP) in Tennessee State, U.S. Specifically, the objectives of the study were:

(1) To describe the teaching strategies agents utilized in the adult educational programme and

(2) To describe the adult teaching strategies agents felt were the most and least effective.

Qualitative research was used as the method of the study. Its justification was that Denzin and Lincoln (1994) indicated that qualitative research strives to explore the extent to which social understanding is built and defined by asking questions. Data was collected using interviews as per the recommendation of Lincoln and Guba (1985). Nine Extension Agents were purposively and objectively sampled (Green, 2000) for the study. One was female while eight were male. They had 14 – 33 years of Extension Education experience.

A semi-structured interview guide was used to explore how agents select teaching strategies for the MBPP programme. The interview guide focused on which teaching strategies agents used in the MBPP programme and the perceived effectiveness of those strategies for teaching adults. The researcher used open-ended questions to allow the participants to contemplate their thoughts and convey their motives (Bogdan & B – Iklen, 1998).

The study found out that the agents used multiple teaching tools such as videos, lectures, and PowerPoint presentations to teach the cattlemen. It also found out that 'hands-on experience was the most effective teaching strategy since it enabled the cattlemen to pay attention watching and doing what the agents taught such as hay storage, demonstrations

and identifying weeds in the field. The hands-on experiences also provided the learners with the opportunity to socialize, that is, learn what one another were doing that was successful. Overall, the approach made the learners get more knowledge that enabled them to change their practice. However, both agents identified time, travel funds, and administrative responsibilities as barriers to employing the hands-on experiences strategy through field days and demonstrations.

The agents determined that lectures were the least effective strategy in this study. The agents reported that the adult learners found lectures dull and uninteresting as such the learners participation decreased in the educational programmes where lectures were utilized. They also reported that lectures restricted the opportunity for socialization. This study by Strong, Harder and Carter (2010) too, did not assess the level of competence of the extension education agents in employing andragogical teaching methodologies. This study therefore sought to assess how far F.U. agents are competent in applying andragogical training techniques.

Hackathorn, Solomon, Blankmeyer, Tennial, and Garcynsk (2011) conducted an empirical study which sought to examine the effectiveness of four teaching techniques (Lecture, demonstrations, discussions, and in-class activities) in the classroom. The students (n = 51) at a Midwestern University, agreed to participate in the study. They were 18 men and 33 women, with an average GPA of 3.31 (SD = 66). During a social psychology course, various constructs were taught using one of the aforementioned, techniques: lecture, demonstration, discussion, or in-class activities. As each technique offers different benefits, the effectiveness of each technique was expected to vary by depth of learning on Bloom's (1956) - Taxonomy (knowledge, comprehension and application).

Student learning was subsequently assessed through six quizzes and four exams, which tested the constructs on three of Bloom's cognitive levels: Knowledge, comprehension and application. To examine the effectiveness of each teaching technique on each of the levels of assessment, four repeated measures ANOVAs were conducted examining differences between the three levels of Bloom's taxonomy on items within the same teaching technique.

The findings indicated that each teaching technique has its own unique benefits and is effective for various levels of learning. Additionally, the findings supported the notion that active techniques do aid in increasing learning. In-class activities led to higher overall scores than any other teaching method while lecture methods led to the lowest overall scores of any of the teaching methods. The study also grappled with the issue of effectiveness of teaching techniques. However, it did not assess the competence of the extension educators in these teaching techniques, which this study also sought to assess.

2.2.2 Delivery methods

Several researches have documented the value of various educational delivery methods in effectively communicating information to farmers and other clientele. Fedel (1985) suggested that information delivery is done by a number of methods. For example, print based information serves the clientele with specific answers to a myriad of topics. Audio-visual method such as radio and video tapes often provide information without personally involving extension educators. Mass media delivery methods such as radio, television and newspapers are used to advertise events, foresee client needs, and report agricultural business information. These methods are used in a variety of ways and in a number of contexts, depending on the needs of the farmers.

Richardson (2001) classified educational delivery methods into three groups: experiential, reinforcement and integrative. According to Richardson, to promote effective and efficient learning, a delivery system should include methods wherever possible, that provide desired experiential opportunities for the learners, reinforce the learning, and provide opportunity for the learner to integrate new information with existing knowledge and skills.

Further, Richardson identified several factors that should be considered in delivery of educational information. These include; target audience, educational objective, characteristics of the delivery method and, type and content of the message being provided.

A host of researchers and educators have examined the perceptions of farmers and other clientele towards delivery of educational information (Suvedi, Campo, & Lipinski, 1999; Trede & Whitaker, 1998; Caldwell & Richardson, 1995; Laughlin & Schmidt, 1995; Gamon, Bounaga, & Miller, 1992). Consensuses from these studies suggest that various media and methods are used by extension educators to communicate new and emerging technologies to farmers. Amin and Stewart (1994) found the Training and Visiting Approach to be effective in increasing crop yields. However, using meetings and conferences to deliver extension programmes may not be as effective as it once was (Gamon, Harrold, & Creswell, 1994). Research further suggests that the best type of delivery method to use depends on the audience maturity, educational level, background, and objectives (Rollings, & Golden, 1994; Obahayujie, & Hillison, 1988). Additionally, for teachers to be effective, clientele need to have knowledge of what educational delivery method works best for them (Cano & Garton, 1994; Torres & Cano, 1994).

Chizari, Karbasioun, and Lindner (1998) conducted a research whose purpose was to assess the viewpoints of extension agents regarding the most appropriate methods for teaching

adult farmers in Esfahan province, Iran. The population included all extension agents in the province who were involved in teaching processes and practices to adult farmers (N = 120). Data were collected through a questionnaire mailed to each extension agent. The response rate was 83%.

The majority of the extension agents (66%) said that result demonstration is the most effective method for teaching their clientele. Result demonstration involved showing farmers the impacts of using versus not using a particular agricultural practice. The second most effective method identified by extension agents was method demonstration (38%). Method demonstrations are the processes of showing farmers how to implement or perform a particular agricultural practice. Formal group meeting was rated third at 29%, informal discussion fourth, at 22%, field visits fifth at 17%, mass media channels sixth at 14%, lecture method seventh, at 13% while folk media was found to be the least effective at 6%. However, this study did not particularly assess the perception of extension education agents on the impact (effectiveness) of delivery systems such as workshops seminars, residential classes, and field visits. FU uses these delivery methods. There was therefore need for this study.

Radhakrishna, Nelson, Franklin and Kessler (1998) conducted a study whose purpose was to determine the characteristics of longleaf pine landowners in South Caroline and their preferred use of educational delivery methods. The landowners were asked to rate the usefulness of educational delivery methods on a scale 5 = very useful, 4 = useful, 3 = uncertain, 2 = not very useful, 1 = not at all useful. In declining order of utility, landowners rated newsletters (mean = 4.17) as most useful, followed by publications (mean = 4.15), field tours (mean = 3.73), video (mean = 3.45), workshops (mean = 3.40), evening meetings

(mean = 3.38), short courses (mean = 3.30), formal classes (3.00), and the internet (mean = 2.82). This study too, did not assess extension education agents' perception on the impact (effectiveness) of workshops, seminars, residential classes and field visits. This study wished to fill this gap.

2.2.3 Training and competence of extension education agents

There has always been a concern about the inability of agricultural extension education systems to cope efficiently with agricultural development and rural problems in general (Omokore, 2000). A strong extension education system staffed by skilled and competent personnel can play valuable role in improving rural livelihoods (Swanson & Rajalahti, 2010). Extensionists must posses and be able to use diverse set of competencies to maintain the strength of extension as educational leaders (Liles 2004). Radhakrisha & Thompson (2006) stated that extension education agents particularly require experiential learning that provides them with the opportunities to relate to rural people in an interactive process that combines scientific technical knowledge with local indigenous knowledge in client-centered problem solving activities. To satisfy this requirement, there is regular need to analyze the technical competence and job performance of extension staff in an organization (Yondeowei & Kwarteng, 2006). Training is defined as the act of increasing the knowledge and skills of an employee in doing a particular job (Flippo, 2005) while competency is broadly defined as the skills and knowledge that allows for the successful performance of specific tasks (Liles, 2004).

Harder, Ganpat, Moore, Strong, and Lindner (2013) conducted a study whose purpose was to determine the competency for which professional development is needed in the area of programming for agricultural education officers in selected Caribbean countries of Belize,

Grenada and Saint Lucia. Specific objectives of the study were: - One, to describe the perceived level of importance assigned to officers to programming competencies. Two, to compare proficiency and importance of levels for each competence. Three, to determine priority training needs of the officers. The survey instrument used to collect data was derived from the Essential Competencies for Programme Evaluators Model (Ghere, King, Stevann, & Minnema, 2006), Teacher Sense of Efficacy Scale (Tschannen – Moran & Woolfolk Hoy, 2001), and researcher developed statements. The instrument included four sections: (a) programme planning, (b) interacting with learners (c) teaching tools and methods, and (d) programme evaluation areas. A Borich (1980) model of needs assessment was used to measure participants' perception of 38 programming competency statements. The results of the study suggest that extension officers in the surveyed countries felt very confident in their teaching abilities but were less prepared to design and evaluate extension programmes. The study however did not investigate agricultural extension educators' ability to use teaching methods which this study sought to investigate.

Various studies conducted in Nigeria revealed a number of facts about socio-economic and educational characteristics of agricultural extension educational workers. Aireman (2005) reported in his findings that the bulk of extension workers were junior staff who hold ordinary national diploma (OND) from Colleges of agriculture. He also found out that many others were primary school leavers without formal training in agricultural sciences. Their major qualifications were merely being able to read, write and record field observations. Oluwo (2004) gave out figures such as that 37% of the extension agents attended farm centre training course after their primary school education. This number was followed by about 28% of those with OND, and about 14% with secondary education and 14% with HND,

while only 4% had university degrees with non having a Ph. D. Madukuwe (2004) found out that most of the staff occupying very sensitive administrative positions in the country had relatively very little training in basic extension principles and extension administration. Oluwo (2004) in his findings said almost 47% of the extension agents were found to be in the age bracket of 21 – 30 years and about 40% were to be between the ages of 31 – 40 years. He therefore concluded that 90% of the extension agents were young and energetic men and women who were not less than 20 and not more than 40 years old. An overwhelming majority (93%) of the extension agents were however males and 7% were females.

Emmanuel (2012) conducted a study about training needs of agricultural extension education workers in Nigeria's Gombe State Agricultural Development Programme. He used simple random sampling to select five village extension agents from each local government area, giving a total of fifty five (55) respondents. The main instrument of data collection was structured questionnaire. Both primary and secondary sources of data were used for this study. The method of data collection was direct contact with the respondents. The descriptive statistics employed included percentage, mean and frequency count. The study established that there was training needs for extension workers in ADP of Gombe state. The majority of the staff (36.4%) had Higher National Diploma (HND), little (7.2%) had B. Sc / B.Ed only 5.5% had M.Sc. while none had a Ph. D. 12.7%. More than 50% had their qualification below HND therefore there was need for further training of the extension workers. These studies however did not investigate the competency level of the agricultural extension education agents especially in their knowledge of andragogical theories and use of delivery methods which this study sought to investigate.

2.3 Empirical review

According to Evenson (1997), review of 57 economic impact studies of government centralized public agricultural extension education systems, seven of which were in African countries; there was a wide range of impact, from no significant difference to highly significant differences with regard to awareness, adoption and productivity. The variability in result shows that some programmes have been highly effective while others have not been. The results further showed that the highest payoffs to agricultural extension education occurred in developing countries that are catching up with industrialized countries and with farmers who have access to school and technology. According to a review by the World Bank's Operation Evaluation Department of Research and Extension Investments in the 1980s and 1990s, three out of five agricultural extension education projects in Africa were 'satisfactory' (Purcell & Anderson, 1997). However, government centralized public extension systems such as the training and visit (T & V) system, came under attack in the 1980s due to their un-sustainability, irrelevance, ineffectiveness, and lack of equity (Rivera, 1988). For example, in Ethiopia, Dejene (1989) found that the communication system from contact farmers to the rest of the community did not work as expected, and up to 25% of contact farmers did not have the necessary knowledge and skills. In Cameroon, Asiabaka and Bamisile (1992) found that only 30% of respondents had contact with the extension agents, and furthermore, had difficulty applying the recommendations. In Nigeria, it was found out that extension agents lacked communication skills, transportation and faced cultural barriers.

Although Bindlish and Evenson (1997) study showed that the T & V management system made extension more effective, led to agricultural growth, and realized high rates of return,

in Kenya, however, it was found that it only had benefits in terms of staff training, increased geographical coverage and increased linkages with research. Overall, the study revealed that the system was inefficient, ineffective and financially unsustainable. Anderson, Feder & Granguly (2006) observe that T & V was being promoted by the World Bank. However, the system has come under criticism from within the bank itself where it is referred to as 'tongue-in-cheek', 'talk and vanish' and 'tragic and vain' (Axinn, 1988). However, T & V has shown to be more successful in Asia where there is more homogeneity within farming systems and higher capacity among agents and farmers.

Bekele, Anandajayasekeram & Kisamba (2006) conducted a study of Ethiopia's Participatory Demonstration and Training Extension System (PADETES). PADETES uses demonstration plots and links technologies to inputs through a package deal. The study found out that although 55% of the respondents used the package, a good number of farmers later abandoned package components such as fertilizer or improved seed. Moreover, extension workers saw their role mostly as distributors of fertilizer and credit rather than technical advisers.

Benin, Nkonya, Okecho, Pender, Nahdy, Mugarura et al. (2011) conducted a qualitative assessment of Uganda's decentralized, market oriented farmer-centered National Agricultural Advisory Services (NAADS) in 2005. The study showed that NAADS had positive impacts on availability and quality of services. However, there was no significant difference in yield growth between NAADS and non NAADS areas for most crops. Although decentralized, NAADS is a government run agricultural extension education provider. The present study focuses on the study of an NGO.

Anderson (2002) conducted a study of the Integrated Rural Development Project (IRDP) which was used in many countries including Kenya and Malawi, starting in the 1970s. IRDP was supported by the World Bank to implement an integrated extension approach. The IRDP's goals were to address constraints of small holders by working synergistically in health, nutrition, agriculture and education. In agriculture, this included inputs such as research, irrigation credit, roads, water, and electricity. The researcher collected data from project documents and interviews with farmers and project staff. The study found out that the IRDP had weakness such as exclusion of crucial issues such as training, linkages with research and management. It was also found to be too much supply – driven, inflexible and unsustainable with a disregard to cost recovery or privatization measures. The present study will also therefore focus on the above gap of the educative element which FU provides, with a view of assessing its effectiveness and impact on agricultural productivity in the community.

The failure of many of these extension models to meet their goals effectively, coupled with limited budgets for supporting public extension, has led to the implementation of reforms in SSA countries. For example, Qamar (2005) has provided a guide for policy makers for reforming extension systems. Reforms include use of pluralistic extension providers and approaches, decentralization, privatization, contracting in and out, cost-sharing, demand – driven (participatory) approaches, fee for service and use of information communication and technologies (ICTs). However, most of such reforms are yet to be evaluated for their effectiveness (Davis, 2006). FU falls within this category.

Researchers at the International Food Policy Research Institute (IFPRI) have put together a framework for designing and analyzing extension education (Birner, et al. 2006).

The framework focuses on the following:

a) The design elements of a system of extension – governance structures, capacity and management, and education methods – and their comparative advantages under different frame conditions;
b) Performance measurement and quality management in the provision of agricultural advisory services and
c) Impact assessment of the costs and the benefits of different ways of providing and financing extension

The framework thus, is a call for a move from 'best practice' – imported standardized models – to "best fit" – where location specific participatory, sustainable and effective, "smart" models are used. This study of FU will also be based on this framework and will also be geared towards the realization of the call to make extension education to be more compatible with local demands.

2.4 Theoretical Framework

The study is based on the andragogical model of adult learning. The model was proposed by Knowles (1973). Andragogy is a concept used in the description of educational activities for the development of adult learners. It refers to the art and science of teaching adults.

According to Knowles (1980) the goal of adult education should be self-actualization thus the learning process should involve the whole emotional, psychological and intellectual being. The mission of adult educator is to assist adults to develop their full potential, and andragogy is the teaching methodology used to achieve this end. In Knowles view, the teacher is a facilitator who aids adults to become self-directed learners (Darkenwald & Merriam, 1982). Malcolm Knowles distinguished between the pedagogical and andragogical

theories of learning. That is, between teacher- directed learning activities usually considered appropriate for children and self-directed activities that are seen as appropriate for adults. According to Knowles, the former refers to the art and science of teaching children. The andragogical model is based on several assumptions that are considered very necessary for incorporation into instructional design and development programmes. The assumptions are as follows:

The need to know

Adults need to know why they need to learn something before undertaking to learn it. Tough (1979) found out that when adults undertake to learn something on their own, they will invest considerable energy in probing into the benefits they will gain from learning it and the negative consequences of not learning it. Consequently, the first task of the adult learning facilitator is to help learners become aware of the need to know why they need to learn.

The learners self concept

Adults have a self-concept of being responsible for their own decisions for their own lives. Once they have arrived at that self-concept, they develop a deep psychological need to be seen by others and treated by others as being capable of self-direction.

The role of the learner's experience

Adults come into an educational activity with both a greater volume and a different quality of experience. By virtue of simply having lived longer, they have accumulated more experience than they had as youths. This difference in quality and quantity of experience means that in any group of adults there will be a wider range of individual differences. Any

group of adults will be more heterogeneous in terms of background, learning style, motivation, needs, interests and goals.

These differences in experiences among adult learners also mean that the richest resources of learning reside in the adult learners themselves. Hence, the greater emphasis in adult education is on experiential techniques and techniques that tap into the experience of the learners, such as group discussions, simulation exercises, problem-solving activities, case methods, and peer helping activities.

Readiness to learn

Adults become ready to learn those things they need to know and be able to do in order to cope effectively with their real life situations. An especially rich resource of readiness to learn is the developmental tasks associated with moving from one developmental stage to the next. The critical implication of this assumption is the importance of timing learning experiences to coincide with these developmental tasks.

Orientation to learning

Adults are life-centered or task – centered in their orientation to learning. Adults are motivated to devote energy to learn something to the extent that they perceive that it will help them perform tasks or deal with problems that they confront in their life situations. Furthermore, they learn knew knowledge, understanding, skills, values and attitudes most effectively when they are presented in the context of application to real life situations.

Motivation to learn

While adults are responsive to some external motivators, such as better jobs, promotions, high income etc. the most potent motivators are internal pressures such as desire for

increased work satisfaction, self-esteem, quality of life etc. Tough (1979) found in his research that all normal adults are motivated to keep growing and developing but that this motivation is frequently blocked by such barriers as negative self-concept, inaccessibility of opportunities or resources, time constraints and programmes that violate principles of adult learning.

2.5 Conceptualization

The study utilized the model of andragogy (Knowles, 1973) to conceive the following variables which were very significant for FU extension education services in Kabondo division. These included training techniques, delivery methods used as well as the level of training and competence of the extension education agents. If manipulated well, these variables would result into an effective learning of farmers and hence their acquisition of modern agricultural knowledge and skills which in turn would make FU's educational extension services have an impact on the agricultural productivity in the division.

IMPACT OF FU IN KABONDO DIVISION

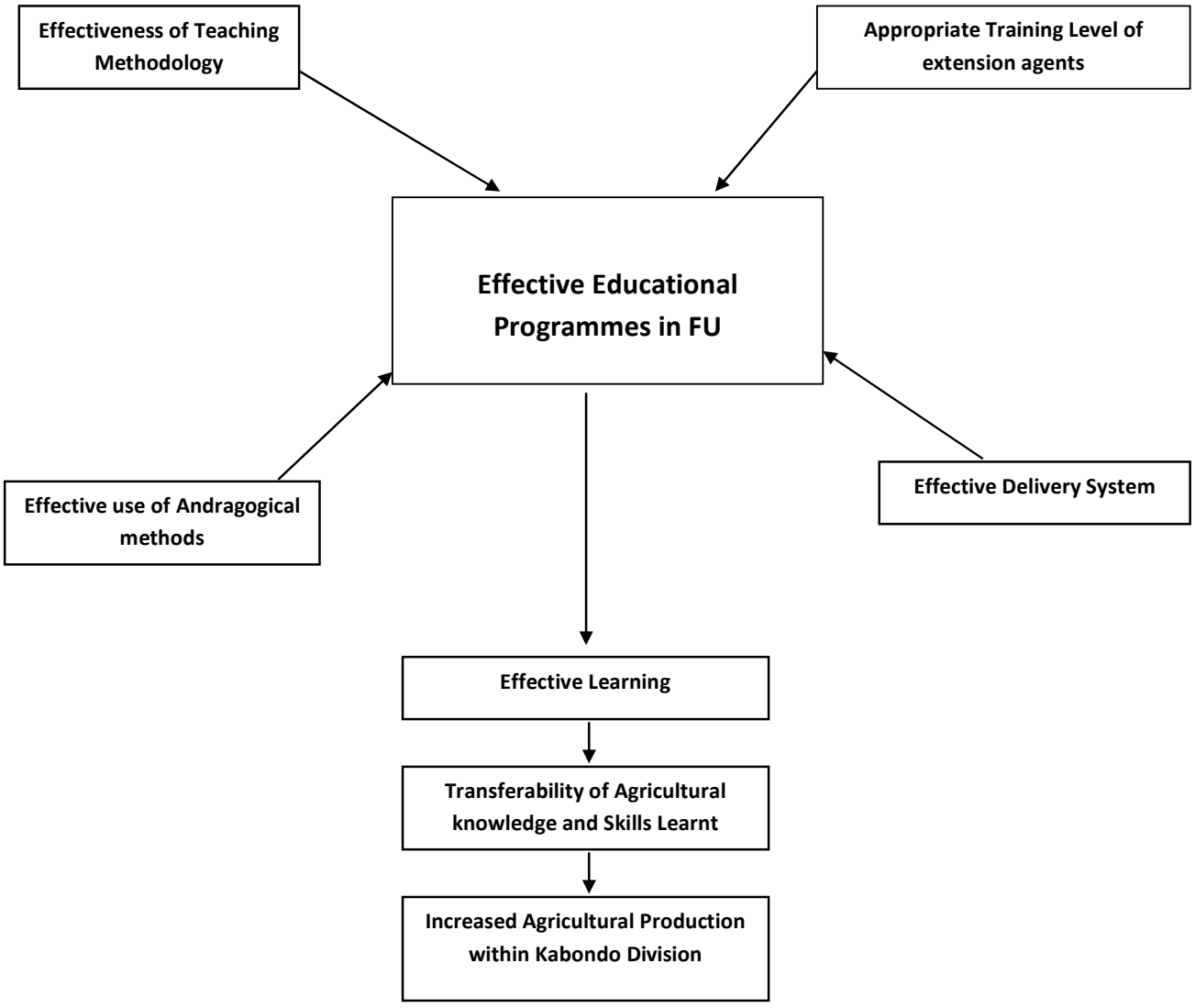

Figure 1: Conceptual Framework

CHAPTER THREE

3.0 RESEARCH METHODLOGY

3.1 Introduction

This chapter describe

es the methodologies that were used in conducting the study. It describes the research design, target population, sample size, and sampling procedures, sampling techniques, data collection instruments and procedures, and data analysis techniques, and ethical considerations in the study.

3.2 Research Design

The study used case study research method. Yin (1984) defines case study research method as “an empirical inquiry that investigates a contemporary phenomenon within its real life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used”. In most cases, case study method selects a small geographical area or a very limited number of individuals as the subjects of study. The method facilitates the exploration and investigation of contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships. The role of case study is very prominent when issues with regard to education (Gulsecen & Kubat, 2006; Grassel & Schirmer, 2006) and community based problems such as poverty, unemployment, drug addiction and illiteracy, are raised. Case study research method is also important in education in that it can be applied to assess the effectiveness of educational programmes and initiatives (Stake, 1995).

There are a number of advantages in using case studies. First, the examination of the data is most often conducted within the context of its use (Yin, 1984). This would contrast with

experiment, for instance, which deliberately isolates a phenomenon from its context, focusing on a limited number of variables (Zaidah, 2003). Second, case studies allow for both quantitative and qualitative analyses of data. Tellis (1997) states that through case study method, a researcher is able to go beyond the quantitative statistical research and understand the behavioural conditions through the actor's perspective. By including both quantitative and qualitative data, case study helps explain both process and outcome of a phenomenon through complete observation, reconstruction and analysis of the cases under investigation. In examples such as education, where evaluative research can be conducted to assess the effectiveness of educational programmes and initiatives, limiting the analysis to only quantitative methods would obscure some of the important data that need to be uncovered qualitatively. At the same time, the use of quantitative analysis in case study gives the study elements of the empirical-analytical scientific approach. Case studies are therefore flexible enough to allow both quantitative and qualitative analyses. Third, the detailed qualitative accounts often produced in case studies not only help to explore or describe data in real-life environment, but also help to explain the complexities of real-life situations which may not be captured through experimental or survey research. However, case studies have been criticized for lack of rigour, susceptibility to biasness and for being difficult to generalize from since it is a research conducted on a single case (Yin, 1984). To ensure validity of case study method in this research, the intrinsic case study method which sets to investigate and solve the specific problems of an individual case, that is, one farmer or one farmer group within FU was not used. According to Stake (1995), intrinsic case study involves the study of a particular individual case such as a specific programme, a particular individual or agency in order to understand it comprehensively. If used in this study, intrinsic case study would therefore be limiting to a single case within FU. That is, one farmer or one

farmer group. Instead, collective case studies of 358 farmers within 273 farmer groups of FU was the focus of the study. Stake (1995) refers to collective case study as an involvement of a coordinated set of case studies (multiple case studies). Collective case study involves more than one case, which may or may not be collocated with other cases. A collective cases study may be conducted at one site (e.g. a school, hospital or university) by examining different types of departments or other units of that one site. Each unit is studied as part of collection of the whole. Johnson and Christensen (2008) observed that there are potential advantages of studying more than one case. For example, cases can be studied comparatively in order to explore similarities and differences or if to test a theory, having more cases provides a more convincing test than just one and generalizability can be made more convincing by coordinating and aggregating evidence from a number of individual case studies. The study of many farmers and many farmer groups within FU reasonably allowed for generalization of findings to the larger FU. Zaidah (2003), advices that collective case study approach may ensure validity in case studies.

This study, therefore, was conducted through an assessment of the impact of FU as a case study of agricultural extension education provision in Kabondo Division. FU was purposively selected based on the following factors: Firstly, many studies before had analyzed government or state agricultural extension programmes. Today, there is an increasing greater number of NGOs that provide agricultural extension education programmes at the community level. It was therefore critical to conduct an in-depth investigation on the impact of one single example of such NGO so as to draw a general conclusion over all of them. Secondly, FU had been in existence for over 4 years which is a reasonable period to warrant such an investigation because its aim has been to educate farmers in the division in order to

increase agricultural productivity. Thirdly, FU also had a significant agricultural extension education component especially the fact that it had trained over 5400 farmers through a network of 273 farmer groups and 16 extension educators who utilized various educational techniques and delivery methods in order to improve agricultural practices of FU farmers.

3.3 Target population

The target population for this study were all the 5400 farmers of Farmers United in Kabondo Division. Kabondo was purposively selected because of its proximity to the researcher that permitted a more detailed and intensive study.

3.4 Sample size and sampling procedures

3.4.1 Sample size

The sample comprised 358 farmers in FU in Kabondo Division. This sample size was determined according to Krejcie and Morgan (2006) table for determining sample sizes for finite populations (see Appendix V). Krejcie and Morgan recommend a sample of 358 for a population of 5400 at .05 level of confidence and 5.0% percent margin of error. One (1) Field Manager and 16 extension educators of FU in Kabondo Division were purposively sampled for this study.

3.4.2 Sampling techniques

The study adopted simple random sampling and purposive sampling techniques to select individual respondents. FU had 1 Field Manager and 16 agricultural extension educators for the 13 sub-locations and 5400 farmers within FU's training programme. A list of all the 16 extension educators were sought from the Field Manager while a list of all the farmers in each sub-location was sought from each extension educator of each sub-location. The Field Manager and all the 16 extension educators participated in the study because they

constituted a small number. The Field Manager was responsible for the coordination and supervision of extension educators, farmers and FU's agricultural activities in the division. The 16 extension educators were responsible for teaching the farmers new agricultural techniques and also acted as link between the farmers and FU's top administrators in terms of programme implementation, supervision and feedback. Thus, by virtue of their position and responsibilities, the Field Manager and the 16 extension educators were considered to have special information on the training techniques, delivery systems and competencies that this study sought to investigate. The 1 Manager and the 16 agricultural extension educators were therefore be all purposely handpicked because they were informative and possessed the required characteristics with respect to the objectives of this study (Mugenda & Mugenda, 2003). From Krejcie and Morgan's table (2006) of determining sample size, a population of 5400 farmers came to 358 sample size. The 358 were then be selected using simple random sampling technique for inclusion in this study.

3.5 Research instruments

The study employed interview, questionnaire, and observation instruments to collect data.

3.5.1 Interview schedule

Interview data were collected through key informants' technique (or in-depth interview), following the interview schedule in Appendix I. The interview schedule was used to collect data from the Field Manager of FU in Kabondo Division. The Field Manager was deemed to hold vital information on FU's agricultural training programme in Kabondo Division by virtue of his position. In-depth interview enabled the researcher to obtain detailed information on training techniques, delivery methods and extension educators' competence. It enabled collection of information that is not directly observable. It also enabled the researcher to

capture the stories behind respondents' experiences through pursuing in-depth information around an issue of interest raised by the interviewee. Due to flexibility inbuilt in interviews, it allowed on spot improvements, explanations, adjustments and variations to be introduced at various stages in the data collection process - following respondents' incidental comments - using facial and bodily expressions, tone of voice, gestures, reactions and feelings and attitudes. These considerations made the interview the ideal technique for this category of respondents. Interview sought information on the methods of delivery systems, training techniques, and extension knowledge and farmers productivity from the point of view of the Field Manager.

3.5.2 Questionnaires

The study used questionnaires (Appendix II & III) to collect data from extension educators and farmers. The questionnaires for farmers sought information about their training and productivity in Kabondo Division because issues such as level of training could not be directly observed. Secondly, the sample size of 358 farmers that was used in this study was large, and given the time constraints, questionnaires were ideal tools for collecting data. The study used self-constructed semi-structured questionnaires that enabled the collection of quantitative data from the closed-ended sections, and qualitative data from the open-ended sections. The questionnaires had a section on the biographic information; a section on training techniques, on delivery system, on agricultural extension and on farmers productivity. The questionnaires for extension educators sought information about the level of education, work experience, teaching techniques and delivery methods they used.

3.5.3 Observation schedule

Observation schedule was used to collect data on the actual application of new agricultural techniques in the field by farmers of FU. Observation schedule (see Appendix IV), enabled the researcher to check on items such quality of cultivation, seed selection, spacing, fertilizer application, weed control, pest and disease control, farm records and quantity of produce. Each farmer was observed as they applied the newly taught agricultural techniques and the indicators were scored on a five-point rating scale to indicate the level of mastery of the technique (competence). The following rating scale was used: -

1 – Very Poor

2 – Poor

3 _ Satisfactory

4 – Good

5 – Very Good

3.6 Quality control

3.6.1 Piloting of instruments

The researcher tried out the instruments on a small sample of 30 farmers to determine whether or not the study would produce the expected results, and to enable the researcher to detect problems or weaknesses that could be encountered during the main research, and therefore took precautions before the major study. The instruments were piloted in Kabondo Division.

3.6.2 Validity of instruments

Validity of the instruments was ensured through use of expert judgment. The questionnaires, the interview guides, and the observation checklists were given to the supervisor (expert) to evaluate and rate each item in relation to the objectives as not relevant or relevant on a 1 - 4 scale. Content validity index was then determined from the assessors agreement scale as $n_{3/4}/N$, where $n_{3/4}$ is the number of items marked 3 or 4 by the supervisor, and N the total number of items assessed. The items were modified until a validity index of at least .70 was attained. An index of .70 is the least accepted value of validity in research (Oso & Onen, 2009).

3.6.3 Reliability of instruments

Reliability was ensured through a test-retest reliability technique. The instruments were administered to a convenient sample of 30 farmers of United Farmers in Kabondo Division. Thirty is the least acceptable sample size in correlation studies. The responses were correlated using Oso (2013) correlation formula. The instruments were improved until a reliability index of at least 0.7 was attained. This is the lowest acceptable reliability index in research (Kathuri & Pals, 1993).

3.7 Data collection procedures

The researcher first prepared a proposal for approval. Once the proposal was accepted, the researcher sought permission from the university to process a research permit. Once the university permission was granted and obtained, the researcher applied for a research permit from the National Council for Science and Technology. Once the permit was obtained, the researcher also sought permission from the head of FU in Kabondo Division, and from all involved in the management of farmers in Kabondo Division. Once the

necessary permits were obtained, the researcher proceeded to the field and collected data from 358 farmers. The questionnaires were administered by the researcher through a drop-wait-and-collect method. The researcher approached the farmers and requested them to fill the questionnaires as he waited. The key informants' interview was conducted by the researcher on appointment with the concerned party after seeking an appointment with them.

3.8 Data analysis techniques

This study collected and analyzed both qualitative and quantitative data. Quantitative data was analyzed through percentages and analysis of variance (ANOVA) technique, using the SPSS software, and presented in tables. The percentages technique was used to describe demographic characteristics and to show the face values of the effectiveness of agricultural extension education on productivity of farmers. ANOVA technique was used to determine the actual influence of agricultural education extension on the farmers' productivity in Kabondo Division.

Qualitative data was processed and analyzed using thematic analysis technique, which was undertaken as an activity simultaneous with data collection. The data was organized along key thematic areas and summarized into daily briefs and field notes. The responses were described to produce interim reports, and areas that required additional information identified and the requisite data sourced. Thirdly, there was a systematic analysis and interpretation of the interim report. These were then integrated with quantitative data in the main report. There were constant memo writing and comparisons of data to document ideas or insights emerging from the data. The emerging constructs were used to organize data into meaningful clusters or broader patterns.

3.9 Ethical considerations

The study took care of all ethical concerns in research. The study sought and obtained informed consent of all respondents at the institutional and at the individual level. The study did not proceed until all the necessary research permits were obtained. The study protected the privacy of the respondents and the confidentiality of the information provided by the respondents. Any information collected was not passed to third parties in any form whatsoever without express permission of the source. Further, and to avoid individual exposure, the study reported data as a pool in terms of farmers of United Farmers in Kabondo Division instead of individual respondent's data. Individual data was only reported with the permission of those respondents. Further, the study did not insist on the identities of the respondents as a precondition for participation in the study. Respondents had the freedom to withhold their identities. But even for those who provided their identities, the study did not make them salient features in reporting findings. Finally yet importantly, the researcher remained objective and ensured that findings, conclusion and recommendations were based solely on data rather on personal feelings and prejudices. There was no fudging of results in any way whatsoever.

CHAPTER FOUR

4.0. ANALYSIS OF DATA, INTERPRETATION AND DISCUSSION

4.1. Introduction

The results of this study are presented and discussed in this chapter. The main purpose of the study was to assess the impact of FU's agricultural extension in Kabondo Division of Homa-Bay County. To achieve this, the study analyzed the characteristics of: extension educators, farmers and the field manager. The effectiveness of training techniques, delivery systems and the level of training of the extension educators are also analyzed and interpreted. These were the main objectives of this study that the chapter discusses with a view of trying to answer the research questions raised at the beginning of this study.

Much of the data in this study is both qualitative and quantitative. For this reason, both qualitative and quantitative methods of analysis are used. These include the use of descriptive statistics to analyze quantitative data, such as the use of frequency distribution tables and percentages to explain and support discussions. Explanations and descriptions have also been used to describe qualitative data that could not be quantified.

4.2. Personal characteristics of agricultural extension educators

Many studies on teacher effectiveness have revealed that a teacher's personal characteristics such as gender, age, educational level, marital status and religion, greatly influence their performance and effectiveness on the training of farmers. The main characteristics investigated in this study were: age, gender, marital status, religion, educational level and professional training. Sixteen (16) agricultural extension educators were therefore interviewed.

4.2.1. Gender

Gender of the extension educators was analyzed. Results of the analysis indicated that 62.5% were female. Only 37.5% were male. This indicates a gender disparity amongst the extension educators (see table 1 below).

Table 1: Gender distribution of extension educators

Gender	Frequency	Percentage (%)
Female	10	62.5
Male	6	37.5
Total (N)	**16**	**100**

According to these results, there were more women extension educators than males. Previous studies have yielded contradictory results. For example, a World Bank report (World Bank, 1997) on trained manpower in Africa revealed that only 3.0% of the agricultural trained personnel working in the public sector in Africa were women and only 13.0% students enrolled in agricultural schools, were female. The current participation of women in agricultural extension education could be attributed to many factors. Some of them are: high enrolment of women in agricultural related courses, high number of girls in secondary schools and low attrition of female extension educators due to appropriate logistical support and less female responsibilities at home (Abdullah, 1989). The high number of female extension educators is beneficial to FU's extension education programme. Studies by Skapa (1988) reveal that communication with and participation of females in agricultural programmes is effective when female extension agents are used.

4.2.2. Marital status

Marital status was another personal characteristic of the extension educators that was investigated in this study. Results of the analysis indicated that all the 16 extension educators interviewed were married.

4.2.3. Age of extension educators

Results of the analysis indicated that extension workers age ranged between 36 and 50 years. None was below the age of 35 years or above 50 years (see table 2). The results revealed that all FU's extension educators were mature enough to handle adult farmers.

Table 2: Age Distribution amongst extension educators

Age Bracket	Frequency	Percentage (%)
21 – 35 yrs	0	0
36 – 50 yrs	16	100
Total (N)	**16**	**100**

4.2.4. Formal education of extension educators

Results of the analysis indicated that all the extension educators (100%) were secondary school graduates. None had a certificate, a diploma or a degree qualification (see table 3).

Table 3: Extension educators' highest completed level of education

Level of Education	Frequency	Percentage (%)
KCSE	16	100
KCPE	0	0
College Certificate	0	0
Diploma	0	0
Degree	0	0
Total (N)	**16**	**100**

It is evident from the analysis that most of the extension educators were KCSE holders. Most of them live within the communities in which they work as extension educators for FU. This is advantageous because they are viewed by the local farmers for whom they work as part and parcel of the community membership and not as a lien intruders with exotic ideas that can not work. The physical closeness of the extension educators also make them accessible and available to farmers most of the time.

4.2.5. Training in agriculture

The study also sought to investigate the type of professional training in agricultural education that the extension educators had received. The results indicated that none had any professional training in agriculture either at certificate, diploma or degree level (see table 4)

Table 4: Level of agricultural training for the extension educators

Training Level	Frequency	Percentage (%)
Certificate in Agriculture	0	0
Diploma in Agriculture	0	0
Degree in Agriculture	0	0
Total (N)	**0**	**0**

Asked how they acquire knowledge about modern agricultural principles and practices, 100% of the extension educators said they are normally subjected to consistent series of in-service training on new agricultural methods and trends which keep them a breast with such requirements. Such trainings are organized by the extension coordinators and are held every year. During such seminars, subject matter specialists normally give lectures on required agricultural techniques to be taught to farmers. The seminars also act as good fora for exchange of ideas and feedback from the field.

4.2.6. Extension educators length of service (experience)

The length of service of the extension educators was in this study assumed as having an impact on the extension educators' competence which would also in turn influence the quality of training service rendered to the farmers of FU. Analysis of the data indicated that eight (50%) of them have worked for four years and above; that is, since the inception of FU. Two (12.5%) had a working experience of three years while six (35.5%) had a working experience of two years. None had an experience of less than one year. The results reveal that FU has experienced extension educators (see table 5 below).

Table 5: Extension educators' length of service

No. of Years	Frequency	Percentage (%)
1 Year	0	0
2 Years	6	35.5
3 Years	2	12.5
4 Years and above	8	50.0
Total (N)	**16**	**100**

4.3. Perception of extension educators

4.3.1. Effective delivery systems for adult farmers as viewed by extension educators

Reaching adult farmers with useful information has become a challenging task for extension educators. Fedel (1985) suggested that information to farmers can be delivered by a number of methods. Therefore objective three of this study was to investigate the effectiveness of delivery systems used by FU extension educators. Each FU extension educators was asked to indicate the educational delivery method that they found most effective in delivering information to the farmers. Sixteen extension educators (100% indicated that training and farms visits (T & V) was the most effective delivery method. Twelve (75%) indicated seminars as the most effective delivery method. None indicated workshops, residential classes and mobile classes as effective methods of delivering information to farmers.

Table 6: Effective delivery methods for adult farmers as viewed by extension educators

Delivery Method	Frequency	Percentage (%)
Training and Farm Visit	16	100
Seminars	12	75
Workshops	0	0
Residential Classes	0	0
Mobile Classes	0	0

4.3.2. Effectiveness of teaching techniques (methods) as viewed by the extension educators

Objective one of this study was to asses the effectiveness of the teaching techniques used by the extension educators as perceived by the extension educators themselves. As shown in table 7 below, 100% of the extension educators stated that demonstration method was the most effective in teaching adult farmers. The second most effective method identified by the extension agents was question and answer method (80%). This was followed by hands–on experience (60%), problem solving (40%), discussion method (67%), and lastly followed by lecture method (0%) which was rated as the least effective teaching method by the extension educators.

Table 7: Rank, Frequency and Percentage of Effective Teaching Methods

Rank	Purposes	Frequency	Percentage (%)
1	Demonstration	16	100
2	Question and answer	12	80
3	Discussion	10	67
4	Hands-on experience	9	60
5	Problem solving	6	40
6	Lecture	0	0

4.3.3. Manner of organization of learning groups

Results from this study indicated that both group and individual approaches were used in the organization of farmers for learning purposes. This two-pronged approach can be very effective with extension work in many ways. Firstly, meeting farmers individually may be cumbersome and time consuming especially where the households are scattered and transport facilities are inadequate. Therefore, organizing farmers in groups tends to solve the problems that arise with individual extension education service. However, individual extension education service can complement and also supplement group extension. For instance, farmer follow-ups can be made using the individual approach. This study revealed that FU's group extension orientation has proved to be cost effective for example when it comes to holding seminars or supplying farm inputs such as fertilizers to the groups.

Results of this study indicated that group sizes range from 4 farmers to 16 farmers. Many of the extension educators (80%) indicated that they were in charge of more than 17 groups.

4.3.4. Visiting of farmers by the extension educators

The study also sought to find out how often the extension educators visit farmers for the purpose of educating and supervising them. The study established that the extension educators normally spend five days a week in the field with the farmers and one day in the Office during which time they write reports, have meetings with the coordinators or the Field Manager.

4.3.5. Objectives of FU's training as viewed by the extension educators

The extension educators were asked to state the objectives of FU's education. The extension educators stated that learning of great land preparation, use of fertilizers, use of high yield disease resistant seeds, correct spacing, weed control, pest control and record keeping, are the objectives of FU's farmer education in the division.

Table 8: Objectives of FU as viewed by the extension educators

Objectives	Extension Educators Response Frequency (n)	Percentage (%)
Great land preparation	16	100
Use of suitable high yield seeds	16	100
Crop spacing	16	100
Fertilizer application	16	100
Weed control	16	100
Disease control	15	94
Pest control	14	87
Record keeping	16	100
Harvesting	16	100
Storage	16	100
Marketing	0	0

4.3.6. Instructional resources used by the extension educators

The extension educators were asked to indicate the instructional resources that they normally use during training of farmers. 100% indicated that they use of fertilizers, measurement strings, fertilizer scoops, photos and different types of suitable seeds. None (0%) indicated that they use heavy farm machinery such as tractors (see table 9 below).

Table 9: Instructional resources used by extension educators

Objectives	Frequency	Percentage (%)
Fertilizers	16	100
Fertilizer scoops	16	100
Measurement strings	16	100
Different varieties of seeds	16	100
Photos	16	100
Demonstration farms	16	100
Farm machinery	0	0

Asked if the above indicated resources were adequate for use in educating farmers, 14 (87.5%) of the extension educators indicated that they were. Only 2 (12.5%) of the extension educators indicated that they were not adequate (see table 10 below).

Table 10: Adequacy of instructional resources

Response	Frequency	Percentage (%)
Yes	14	87.5
No	2	12.5
Total (N)	**16**	**100**

4.3.7. Crops farmers are trained to cultivate

The extension educators were also asked to state the crops that they train farmers to grow. 100% indicated maize, millet, sorghum and beans. Neither cassava nor any other crops were indicated (see table 11 below).

Table 11: Crops farmers are trained to grow.

Crops	Frequency (n)	Percentage (%)
Maize	16	100
Beans	16	100
Millet	16	100
Cassava	0	0
Others	0	0

4.3.8. Perception of extension educators on crop yields

Other than the crops grown by farmers, this study also sought to establish whether the farmers had increased crop yields after FU's education on modern agricultural practices. Results of the analysis indicated that the production of maize increased from 1 to 7bags per

½ an acre, beans increased from 1bag to 2½bags per ½ an acre while millet increased from 1 to 3 bags per ½ an acre (see table 12 below).

Table 12: Perception of extension educators on crop yields

Crop	Acreage	Output before training	Output after training
Maize	½ an acre	1 – 2 bags	7bags
Beans	½ an acre	½ bag	1½ bags
Millet	½ an acre	1bag	2 ½ bags
Sorghum	½ an acre	1bag	2 ½ bags

From the analysis, it can be noted that there was significant increment in crop yield by farmers after FU's training. This shows that FU's agricultural education programme is effective in mitigating hunger in the division.

4.3.9. Challenges faced by the extension educators

This study also sought to identify the challenges that FU's extension education faces as perceived by the extension educators themselves. Most extension educators (87.05%) mentioned severe climatic effects as the main challenge. It was followed by pests and diseases at 81.25%, then with poor attendance by farmers at 68.75%. The least considered as a challenge was insufficient funding of the extension work 6.25% (see table 13 below).

Table 13: Challenges faced by extension educators

Rank	Purposes	Frequency	Percentage (%)
1	Severe climatic effects	14	87.05
2	Pests and diseases for crops	13	81.25
3	Poor attendance by farmers	11	68.75
4	Insufficient funding of extension work	1	56.25
5	Illiteracy among farmers	6	37.05
6	Lack of enough time	5	31.25
7	Lack of means of transport & communication	4	25.00
8	Lack of farmer receptivity	4	18.75
9	HIV/AIDS epidemic	3	12.05
10	Insufficient farm input	9	6.25

4.3.10. Recommendations by the extension educators

The study also sought to find out the extension educators views as concerns what could be done to improve FU's extension education programme in the division. Table 14 below summarizes what the extension educators stated as their recommendations. 100% of the extension educators recommended that there is need for FU to lower the cost farm input such as fertilizers and seeds. 92% recommended that FU should move in to help control crop disease outbreaks. A case in point was the outbreak of maize lethal necrosis fungal disease which nearly wiped out some of the maize farms. 90% recommended that the number of demonstration plots be increased while 53% recommended that the organization

should also teach and assist farmers financially so as to enable them engage in other farming activities of their own interest.

Table 14: Recommendations by the extension educators

Recommendations	Frequency	Percentage
Lowering farm input cost	16	100.00
Control of pest and diseases	14	87.5
Desertification of farming activities	8	50.0

4.4. FARMERS PERSONAL CHARACTERISTICS, PERCEPTIONS AND AGRICULTURAL PRACTICES

This section presents an analysis of farmers' personal attributes such as gender, age, marital status and education. It was a concern of this study to establish the impact of FU's extension educational programme on farmers in Kabondo Division as also perceived by the farmers of the division themselves. This section is divided into two main sub-sections. Section one presents data regarding personal attributes of the farmers while sub-section two presents data on perceptions and receptivity of the farmers.

4.5. Farmers' Personal Characteristics

One of the main concerns of this study was to analyze farmers' personal characteristics so as to establish how these attributes affect their responsiveness towards FU's extension education programme. Previous studies have indicated that variables such as age, sex and marital status among other personal characteristics are important determinants of individual responsiveness to learning and adoption of farm innovations.

Schultz (1964) found that education enhances the possibility of adopting a new presumably superior technology. This study therefore also sought to find out how farmer personal attributes relate to FU's extension education programme.

4.5.1. Gender distribution

Results of the analysis indicated that majority of the farmers (83.24%) were females while only 16.76% were males. The results imply that more females have embraced FU's extension education programme than males (see table 15 below).

Table 15: Gender distribution of farmers

Gender	Frequency (n)	Percentage (%)
Female	298	83.24
male	60	16.76
Total (N)	**358**	**100.00**

4.5.2. Farmers' Age

Lionberg (1960) found out that there is a significant relationship between age and a farmer's responsiveness to adoption of farm innovation. It was therefore considered of interest in this study to find out the relationship between farmers' age and their participation in FU's extension educational programme. Results of this study indicated that farmers' ages ranged between 21 to 65 years with majority (50.28%) being between ages 36 and 50 years. (30.17%) were between 21 to 35 while (19.98%) were between 51 to 65 years (see table 16 below).

Table 16: Age distribution amongst farmers in FU

Age (in Years)	Frequency	Percentage (%)
Under 20	00	00.00
21 – 35	108	30.17
36 – 50	180	50.28
51 – 65	70	19.55
Total (N)	**358**	100.00

As table 16 shows, no farmer was below 20 years of age and very few (19.55 %) were 51 to 65 years of age. It is observed therefore that not many young elderly farmers are participating in FU's agricultural extension education programme.

4.5.3. Marital status

Gender responsibilities are undergoing rapid change in Africa due new circumstances. More rural women are becoming more responsible for household food security. The female headed rural household in many counties in Africa is an indicator of this fact (World Bank, 1997). Therefore, this study also investigated farmers' marital status in order to find out if it affected their participation in FU's extension education programme. The results of the analysis indicated that (80%) were married, 13% widowed, 3% divorced, 2% single and another 2% are single (See table 17 below)

Table 17: Marital status amongst farmers of FU

Marital Status	Frequency (n)	Percentage (%)
Married	286	80
Widowed	48	13
Divorced	10	3
Separated	7	2
Single	7	2
Total	**358**	**100**

4.5.4. Farmers' educational level

According to Schultz (1964) education is a very important contributor to agricultural productivity because it increases a person's awareness of his environment, his ability and his speed to learn new skills and techniques. This study therefore also sought to investigate the educational level of FU's farmers in order to find out how it contributed to their receptivity and participation in the programme. Results from the study revealed that 50% of farmers had completed primary school, 30% had secondary education while 5% had 'A' level education. 3% had university degree and only 2% had a master's degree (See table 18 below).

Table 18: Highest completed level of education by farmers of FU

Rank	Highest Completed Education	Frequency	Percentage (%)
1	Primary	180	50
2	Secondary	107	30
3	No formal education	35	10
4	A – level	17	5
5	Graduate	12	3
6	Master	7	2
Total (N)		**358**	**100**

As the result of table 18 shows, most of the farmers (50%) had completed primary education; what appears therefore is that a few highly educated people in the division participate in FU's extension education programme. This observation could be explained by either the fact that once individuals attain higher education, they focus more in looking for white-collar jobs in urban centres, or that the educated, are engaged in other activities that bar them from participating in the programme. To increase the impact of FU's programme, there is need to improve the basic education of those farmers (10%) without formal education by improving their skills such as numeric and literacy. There is also need to involve the educated in the agricultural programme.

4.5.5. Other occupations of the farmers:

The study also investigated the relationship between other occupations by the farmers and their participation in FU's extension education programme. For instance, farmers whose sole occupation is farming are more likely to respond to the extension education

programme more positively and with a greater commitment than those who take farming as their second or third occupation.

The results of this study indicated that the majority (66%) were mainly involved in farming. 23% were both farmers and business persons while only 11% were both teachers and farmers at the same time (see table 19 below).

Table 19. Other occupations of farmers of FU

Occupation	Frequency	Percentage (%)
Farmer	236	66
Farmer / Business Person	83	23
Farmer / Teacher	39	11
Total (N)	**358**	**100**

4.5.6. Factors motivating farmers to join FU's programme

Maslow (1954) stated that people are motivated to achieve certain needs. Motivation is an inner drive or force that serves as a catalyst to act and is one of the basic variables that affect the learning process of any kind (Hertzberg, 1966). This study therefore, also investigated the factors that motivate farmers in Kabondo division to participate in FU's agricultural extension education programme. Asked about what really motivated them to participate in the programme majority (70%) indicated that they wished to increase their crop yields. (20%) stated that they wished to learn new farming methods. (10%) stated that they joined FU's programme because it provides subsidized seeds, fertilizers and solar lighting systems (see table 20 below).

40% stated that they joined because FU offers flexible repayment of credit (soft loans) . 50% stated that they joined because FU makes them access farm inputs on time with the onset of plating seasons.

Table 20: Factors motivating farmers to join FU's programme

Rank	Responses	Frequency (n)	Percentage (%)
1	To increase my crop yield	250	70
2	Access to input on time	179	50
3	Flexible repayment of credit	143	40
4	To improve my farming methods	71	20
5	To access subsidized farm inputs	35	10

What motivates an adult learner is a primary determinant of the impact of any learning process or programme. Knowles (1973) noted that adults are self and task centered in their orientation to learning. Adults are motivated to learn something if only they perceive that it will help them perform tasks in their life situations. Knowles (1973) referred to this type of adult learning motivation as orientation to learning. It means that adults are motivated to learn new knowledge and skills most effectively when they are applicable to real life situations. This study found out that most of the reasons given by the farmers' in the programme are applicable to their immediate needs – that is to increase their crops yields so as to be food secure.

4.5.7. Agricultural practices (techniques) taught by FU

This study also sought to investigate the agricultural practices that FU's agricultural extension educators teach farmers. The main aim was to find out whether there were any new farming practices taught to the farmers and if so, how far have the new learnt practices led to the improvement of farming and increment of crop yields. To assess this, the farmers were asked to identify the new agricultural practices that they were taught and to state whether they found the knowledge they were taught useful or not. Results of this study are shown in table 21 below.

Table 21: Agricultural practices taught by FU as viewed by farmers

Rank	Taught practices	Frequency	Percentage
1.	Use of fertilizers	315	88
2.	Use of suitable high yield seeds	304	85
3.	Spacing of crops	300	84
4.	Record keeping	297	83
5.	Land preparation	293	82
6.	Weed control	275	77
7.	Pest control	268	75
8.	Disease control	261	73

As shown in table 21, 88% of the farmers stated that use of fertilizers was the most improved farming practice that they had been taught. The second most improved farming practice was use of suitable high yield seeds (85%). Third most improved practice was

spacing of crops (84%) followed by record keeping (83%), then with land preparation (82%), and lastly, with pest control (73%).

4.5.8. Farmers' perception of the extension educators

Close and positive relationships between teachers and their students make the students like the school, become more self-directed, more cooperative and more engaged in learning (Klem and Connell, 2004). The attitudes of learners towards their teachers determine the way the learners react to a learning activity (Albrecht et al., 1990). Based on this assumption it was considered important in this study to establish the relationship between the farmers and their extension educators. To achieve this, the farmers were asked a number of questions regarding what they felt about or how they perceived their extension educators. Specifically, they were asked to indicate whether the extension educators were encouraging, responsible, supportive, active, unpleasant or slow. The farmers were also asked to indicate whether they were satisfied with the training or not. Analysis of the results showed that the farmers related very well with the extension educators and had a positive attitude towards them (see table 22 below)

Table 22: Farmers' perception of the extension educators

Rank	Statement	Frequency	Percentage
1	Ext. educator was encouraging	315	88
2	Ext. educator was responsible	311	87
3	Ext. educator was supportive	304	85
4	Ext. educator was active	300	84
5	Ext. educator was loyal	207	58
6	Ext. educator was difficult to work with	17	5
7	Ext. educator was slow	7	2
8	Ext. educator was unpleasant	3	1
9	Ext. educator was lazy	0	0

As table 22 reveals, FU farmers perceive their extension educators as very helpful and effective. 88% indicated that the extension educators were encouraging, 87% indicated that they were responsible, 85% indicated that they were supportive, 84% indicated that they were active while 58% indicated that the extension educators were loyal. Very few farmers indicated any negative statements about the extension educators. A negative statement describing the extension educators as lazy received a nil response.

4.5.9. Crop output before and after FU's training:

Results of the analysis indicated that before the inception of FU in Kabondo Division, 100% of the farmers planted maize, 40% planted beans, 10% planted sugarcane. The study revealed that FU selectively introduced intensive and more improved methods of maize, beans and millet cultivation. Consequently, farmers in the study area have realized an

increment in the quantity of maize, beans and millet produced per acreage (see table 23 below);

Table 23: Crop output before and after FU's training

Crop	Acreage	Output before FU's training	Output after FU's training
Maize	½ an acre	1 to 2 bags	7bags
Beans	½ an acre	½ bag	1 ½ bags
Millet	½ an acre	1 bag	2 ½ bags
Sorghum	½ an acre	1 bag	2 ½ bags

4.5.10. New farm implements

This study also sought to find out if FU taught the farmers to use new farm implements in order to increase agricultural productivity. As shown in table 24. All the farmers (100%) stated that they learnt to use fertilizer scoops, planting strings and measurement sticks (see table 24 below).

Table 24: New Farm Implements

Implement	Frequency	Percentage (%)
Fertilizer scoops	358	100
Planting strings	358	100
Measurement sticks	358	100

4.5.11. Farmers' perception about other benefits from FU

An equally important variable that was investigated in this study were the other benefits that farmers got from FU's agricultural education extension programme. The farmers were asked to state what they perceived to be the other benefits that they got from FU's extension education programme. Table 25 below summarizes the farmers' perception about the variable (see table 25)

Table 25: Farmers perception about other benefits from FU

Rank	Response	Frequency	Percentage
1.	Funeral insurance	322	90
2.	Supply of solar power system	261	73

As shown in table 25, 90% of the farmers stated that FU developed a burial and benevolent welfare scheme through which they are insured against funeral expenses. Seventy three percent (73%) of the farmers stated that they benefited from solar power system supplied by FU under a soft loan system.

4.5.12. Problems that farmers encounter

Table 26, below summarizes the major problems hindering farmers under FU in Kabondo Division from increasing their crop yields. The majority 82%) of the respondents stated that high cost of farm inputs was an obstacle hampering them from increased farm productivity 72 % stated that they find it difficult to realize good yields because of unreliable weather while 52% stated pests and diseases, and 46%, small land sizes as the causes while 45% indicated lack of credit.

Table 26: Problems that farmer encounter

Rank	Reponses	Frequency	Percentage (%)
1.	High cost of input (seeds, fertilizers)	293	82
2.	Unreliable weather	257	72
3.	Pests and diseases	186	52
4.	Small land sizes	164	46
5.	Lack of credit	161	45

4.5.13. Suggested solutions by the farmers

This study also sought to find out farmers' views as concerns what could be done to improve FU's extension education programme in the division. Table 27 below summarizes what the farmers stated. 97% of the farmers stated that FU should lower the cost of farm inputs, 95% stated that FU should increase the quantity of fertilizer while 28% stated that FU should diversify farming activities (see table 27 below).

Table 27: Suggested solutions by the farmers

Rank	Solutions	Frequency	Percentage (%)
1.	Lowering cost of farm input	347	97
2.	Increasing fertilizer quantity	340	95
3.	Diversification agricultural activities	100	28

4.5.14. Observation of farmers' training and agricultural practices

The observation of agricultural practices taught to farmers by FU was considered very necessary in this study. The agricultural practices that FU teaches were considered to be

significant in relation to the farmers' need for food security. Knowles (1973) points out that adults are life centered or task centered in their orientation to learning. They devote their energy in learning something to the extent that they perceive that it will help them perform tasks or deal with problems that confront them in their daily lives. Tyler (1949) also points out to the same and notes that one of the criteria of content selection is that content selected should be of importance to the learners. Farmers of FU in the division were therefore observed as they applied agricultural practices taught to them.

Observation was done in order to corroborate and complement information given by the farmers themselves, extension educators and the field manager. Prior, an observation schedule was developed (see Appendix IV). The main agricultural practices observed were: land cultivation, seed selection, spacing of crops, fertilizer application, weed control, pests and disease control, harvesting, storage, produce output and record keeping. In this section, results of the observations are presented. Qualitative approaches are used in the presentation of these results.

(a) Practice One: Land Cultivation

The first practice observed was the way farmers turn farm land soil into a fine tilth that can support optimum crop life. FU refers to this activity as great land preparation which is divided into primary and secondary cultivation (ploughing). The extension educators teach farmers that proper primary and secondary cultivation enhances water retention and aeration of the soil. It also enhances better crop-root establishment and elimination of weeds. It was noted that primary cultivation means the first ploughing, while secondary cultivation means second ploughing. It was observed that nearly all the farmers use ox-plough to till land. It was also observed that Primary cultivation begins in November and

ends in late January. Most of the secondary cultivation begins in mid February and ends in mid March. As the cultivation goes on, the agricultural extension educators' move a round the farms instructing and supervising. It was observed that most farmers manage to cultivate their farms averagely well.

(b) Practice Two: Seed Selection

This was the second practice that was observed. It was noted that FU through the extension educators and farm input supply agents, give its farmers maize and, bean seed varieties that are suitable to the different ecological zones in the division.

The seeds are supplied to the farmers at a subsidized cost. It was observed that FU gives its farmers maize seed varieties such as 614 and DH04 from Kenya Seed Company and also supplies its farmers with PN 4M 21, FN 4M 67 and PN 4M 691 from Pana Seed Company.

The bean seed varieties that are given to the farmers include KK8 Roscoco while the sorghum seed given to the farmers is known as seredo. Most of these seeds are high yield and early maturing types.

(c) Practice Three: Crop Spacing

Crop spacing was the third practice that was observed. The extension educators teach the farmers correct crop spacing that can result into adequate acreage carrying capacity and consequently, higher yields. According to FU, the best spacing for maize should be 25cm by 75cm while it should be 50cm by 10cm for beans. The extension educators and the group leaders supervise the practice to ensure that these spacing are adhered to. It was also observed that the farmers are taught to plant one maize seed per hole so that plants do not compete for nutrients.

(d) Practice Three: Fertilizer Application

Fertilizer application is yet another practice that farmers under FU are taught. The teaching about this practice revolves around identification of different types of fertilizers, their purposes and how and when they are to be applied. It was observed that the farmers have learnt to use Dia-Ammonium Phosphate (DAP) and Calcium Ammonium Nitrogen (CAN). The farmers are taught to apply DAP at the time of planting for root and stem development while CAN is applied after crops develop seven leaves and are knee height. CAN application, which is also known as top-dressing, is applied in order to supply the young crops with nutrients for leaf development which in turn, enhances its growth and ability to manufacture food. The second round of CAN is applied when the crops are shoulder height just before tussling. The extension educators teach the farmers the use of fertilizer application implements known as scoops which are small fertilizer scooping containers that measure the right amount of fertilizer to be applied per hole. The farmers are also taught that upon application the fertilizer are to be well mixed with the soil so as to avoid

concentrated contact with the seeds or plants. An observation of farms under FU farmers revealed that the crops in them appeared healthier than those of non-FU members.

(e) Practice four: Record keeping

To find out whether the farmers keep records or not, farmers record keeping practices were observed.

The observation was focused on record keeping practices in areas, such as purchases of inputs, planting, harvesting and outputs. FU provides the farmers with what are known as work sheets on which they record these essentials. The observation revealed that nearly all of the farmers keep records on farm items and farming activities. The extension educators are provided with contact books while the group leaders are provided with passbooks in which they record details of group members such as names, numbers, acreage and credit repayment trends. The observer rated the level of record keeping by the farmers at 3.

(f) Practice Five: Pest and disease control

High yield and safe storage of crop produce, can partly result from effective crop disease and pest control. It was therefore considered important to observe whether the farmers are educated on crop disease and pest control. It was observed that to this end, FU supplies its farmers with certified and treated seeds against foraging insects and other animals. It was also observed that FU teaches the farmers how to identify and deal with crop diseases and pests. It was noted that the lethal necrosis maize disease and root rot bean disease have been on a number of occasions led to crop failure with much intervention from FU. Education on disease and Pest control was therefore rated at 4.

(g) Practice Six: Harvesting and storage

It was also felt important to observe harvest and post harvest practices such as pre-drying in the field, threshing, winnowing, drying and storage of grains.

It was observed that the farmers have been taught these functions well. For example, most of the farmers leave their maize crops to dry well in the farms as advised by the extension educators. They also harvest at the right time, dry and winnow the produce well before storing them. The observation therefore rated harvesting and storage practice at 4.

(h) Produce Output

It was also found important to observe the amount of yield that the farmers get after FU's agricultural education. This was to corroborate the information that farmers themselves had given. Table 28 below indicates the observed, yields of each crop per ½ an acre after FU's education.

Table 28: Produce output after education

Crop	Acreage	Output after FU's training
Maize	½ an acre	7bags
Beans	½ an acre	1 ½ bags
Millet	½ an acre	2 ½ bags
Sorghum	½ an acre	2 ½ bags

As table 28 above indicates, there was a significant increase in the quantity of maize, sorghum, millet and beans produced per ½ an acre parcel of land.

Perception of the Field Manager

Personal characteristics of the Field Manager

(a) Gender, marital status and age

Gender, marital status and age of the Field Managers were also analyzed. The study revealed that the Field Manager was a married male aged 31 years.

(b) Academic and professional qualifications

The study also revealed that the Field Manager is a K.C.S.E. holder with a Certificate in Agriculture. He also undergoes in-service training in agriculture by FU annually to up-date his skills.

(c) The Field Managers' perception about training

The study also sought to find out the perception of the Field Manager about how effective the farmers are educated on farming techniques. The interview with the Field Manager revealed that the main objective of FU's agricultural extension education programme is to enhance food security for farmers in Kabondo Division. For this reason, the programme aims to educate farmers in the division on the following: Selection of and use of improved seeds, practice of correct spacing, quality land preparation, identification and application of appropriate fertilizers, better storage and recording of farm produce. The interview also revealed that FU aims to make the farmers food secure by supplying them with subsidized farm inputs. Through the interview, it was learnt that to date, FU has managed to create 273 farmer groups through which it has trained 5400 farmers in the division on modern agricultural practices. It was also learnt that in order to raise the living standards of the farmers further, FU also supplies them with subsidized solar lighting systems.

(d) The field managers' perception on training and supervision of extension educators

The quality of training and supervision of extension educators may determine the effectiveness of an extension education programme. Benor and Harrison (1977) introduced some principles which are considered appropriate in facilitating the impact of any agricultural extension work. The principles are: intensive contact with the farmers, that is, some four days in the field to one day in the Office, continuous training of all extension educators, close contact with research and concentration on agriculture and not other activities. Based on these principles, this study therefore also sought to assess how effective the extension educators are trained and supervised as perceived by the Field Manager through the interview. It was revealed that all the 16 extension educators had a secondary school (K.C.S.E.) qualification. It was further revealed that none of the 16 extension educators had any professional training. However, when they get employed by FU, they get in-service training on modern agricultural principles and practices on a yearly basis.

(e) Perception of the field manager on impact and challenges

The interview also sought to investigate the Field Manager's perception about the impact of FU and the challenges that it faces. The interview revealed that farmers adoption rate of newly learnt agricultural practices is reasonably high especially their adoption of improved maize and bean seeds, correct application of fertilizers, spacing and qualitative preparation of seed beds. However, the interview also revealed that most farmers are not very good at record keeping. It was also revealed that HIV/Aids epidemic, severe climatic effects, transport difficulties, inadequate funds, pests and disease invasions, are the main challenges of the programme. Asked about what he would recommend as solutions to these challenges, the Field Manager suggested that there should be increased funding for FU's

agricultural activities. And farmers should also be encouraged to be more receptive to the new agricultural techniques. He further suggested that farmers should also be taught how to combat crop pests and diseases as this is not well covered by FU`s educational programme.

4.4 Summary

This chapter presented data concerning personal characteristics of the extension educators, farmers and the field manager. It also presented data regarding the perception of the above respondents as concerns delivery systems, teaching methods, objectives, instructional resources, agricultural practices, challenges and solutions to those challenges that affect FU's extension educational programme.

The result of the analysis indicated that the field manager, many of the extension educators and farmers are satisfied with FU's agricultural extension education. The analysis further reveals that they believe that FU has enabled the farmers to acquire agricultural knowledge that has led to crop production increment in the division.

CHAPTER FIVE

5.0 SUMMARY OF MAIN FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The purpose of this study was to assess the impact of FU's agricultural extension education in Kabondo division. The study therefore sought to asses the viewpoints of its extension educators, farmers and the Field Manager regarding the objectives of the study.

Farmers are mostly adults; therefore, the study used theories of adult learning to examine the factors affecting the effectiveness of FU's agricultural extension education component. A questionnaire, an interview schedule and an observation guide were used in the collection of data. In this chapter, the main findings are summarized and recommendations made, suggestions are also made on areas for further research.

5.2 A Summary of main findings based on objective one

Objective one of the study was to establish the effectiveness (impact) of the training techniques that the extension educators used. The extension educators were therefore asked to indicate the teaching technique that they found most effective. Results revealed that most extension educators (87%) indicated that the use of demonstration was the most effective method of teaching farmers. According to Dunn (2008), demonstrations involve the use of activities that show how a phenomenon works. It is an active learning method because students are able to get involved and see first-hand the construct or phenomena present itself in the real world as it also provides an enjoyable experience for the learners (Forsyth, 2003). The use of demonstration by FU's extension agents has therefore created

an impact on agricultural productivity in the division because it conforms to Knowles et al. (2005) advice that adults in their orientation to learning learn new knowledge when it is presented in the context of application to real life situations.

Hands-on experience was indicated by only 60% of the extension agents as an effective teaching method. This contradicts Dollisso and Martin's (1999) finding that hands-on experience was the most preferred strategy by farmers for learning. According to Dollisso and Martin's (1999), hands-on experience enables the extension educators to demonstrate their knowledge and experiences to the learners. It also enables extension educators to get face to face feedback from the learners. This study also found out that only 40% of the extension educators indicated problem solving as an effective method of teaching the adult farmers. It is therefore recommended that FU's educational programme should strengthen the use of these latter two methods so as to be consistent with Creswell and Martin's (1993) finding that extension agents should use multiple teaching strategies to take care of several learning styles of various farmers. The two methods of teaching would also compliment the findings from Knowles et al. (2005) that adults in their orientation to learning, learn new knowledge when it addresses real life situations. If used this way, then FU's agricultural extension education programme in the division would have a greater impact.

5.3 A summary of main findings based on objective two

This study also sought to assess the effectiveness (impact) of the delivery methods used by FU to pass information to farmers. This was the second objective of this study. Laughlin and Schmidt (1995) found out that extension educators need to find out the best possible means of delivering information during extension work. This study therefore sought to assess the effectiveness of the delivery methods by determining the perception of the extension

educators and the farmers as to which delivery methods they found most effective. Results of the study indicated that the extension educators (100%) found Training and Visit was the most effective delivery system. 75% of the extension educators indicated seminars as the second most effective delivery method. None indicated workshops, residential, classes or mobile classes as effective methods of delivering information to the farmers. Probed on which delivery methods they would prefer in receiving agricultural information from the extension educators, the farmers themselves stated that they would prefer field days, field tours and video shows alongside seminars and training and visit, which the extension educators used. These point to the fact that FU's extension education agents should use the best delivery methods according to the preference of the farmers for the extension education programme (Dollisso & Martin, 1999) to have a greater impact in the division.

Many researchers have found out that different delivery methods have different values that could be utilized in communicating effectively to farmers and other clientele. For example, Fedele (1985), suggested that delivering information to farmers be done by a number of different delivery methods such as video tapes and the mass media so as to pass information to them effectively. Richardson (2001) too suggested that extension educators should use varied delivery methods that provide different experiential opportunities for the learners. He argues that such varied delivery methods would help the learners integrate new information with knowledge and skills that they had acquired before. It is therefore recommended that FU's extension educators should use as many different delivery methods and media as possible so as to effectively communicate existing, new and emerging agricultural techniques to farmers.

5.4 A summary of the main findings based on objective three

To assess the level of training of FU's extension educators was the third objective of this study. According to Swanson and Rajalahti (2010), a strong extension backed by skilled personnel can play a valuable role in improving rural livelihoods. This study therefore sought to assess the level of training of FU's extension educators as a variable that could have an impact on agricultural productivity in the division. Well-trained and skilled extension educators are competent in programme implementation, subject knowledge and teaching methods (Brinkman et al., 2007), they are also competent in interpersonal and communication skills (Harder et al., 2010).

Results of this study indicated that all the 16 (100%) extension educators were holders of KCSE (Kenya Certificate of Secondary Education). This was a positive indicator since extension educators with this level of education were likely to grasp new knowledge in agricultural techniques during their training than those who had lower levels of academic achievement. They were also likely to be competent in programme implementation and interpersonal skills. This view was supported by 88% of the farmers who indicated that the extension educators were encouraging in the way they related with the farmers (Klem & Connell, 2004), 87% that the extension educators were responsible in the way they handled farmers, implements and inputs and 84% that the extension educators were actively involved in demonstrating new skills to the farmers. These results revealed that the extension educators had an impact on the farmers in the division. However, it is recommended that FU should also employ extension educators who have higher academic levels of education such as holders of diploma and bachelor degrees in agricultural training

in order for the programme to have a greater impact on agricultural productivity in Kabondo division.

5.5 Conclusions

5.5.1 Empirical conclusions

The study assessed the impact of FU `s agricultural extension in Kabondo division in order to find out whether the programme has led to the increment of food production. One of the specific objectives was to establish the effectiveness of the programme`s teaching techniques.

It was found in order of frequency that the extension educators used the following teaching techniques: Demonstrations, questions and answers, hands – on experiences, problems solving approaches discussions and lectures. The study established that the use of demonstrations, questions and answers and hands – on experience teaching techniques led to farmers' adoption of modern agricultural techniques. Consequently, food production has increased amongst farmers who participated in the programme. In view of this finding, the study concludes that the use of these teaching techniques had an impact on agricultural productivity in the division. However, the study recommends that the extension educators should also use discussions and problem-solving approaches which have been documented in the past as some of the most effective andragogical agricultural teaching techniques.

Another important objective of this study was to evaluate the effectiveness of delivery methods used by the extension educators. The study found out in order of frequency that the extension educators used the following delivery methods: Training and visit and seminars. The extension educators viewed workshops, residential and mobile classes as

least effective delivery methods. The study therefore concludes that the use of training and visit and seminars had an impact on agricultural productivity. However, for greater impact, field tours, field days and video shows should also be used. The latter three were suggested by the farmers themselves. This means that delivery methods used could also be selected based on the viewpoint of the farmers.

The level of training of the extension educators was another important objective that the study assessed. The study established that all FU's extension educators were all KCSE holders but none had any professional training in agriculture. In view of this finding, the study concludes that FU could have had far greater impact on agricultural productivity were it that it had professionally trained agricultural extension educators.

5.5.2 Theoretical conclusions

This study was based on Malcolm Knowles andragogical theory of adult learning (1973). Knowles (1980) defined andragogy as the "art and science of helping adults learn". Andragogy is hinged on six important hypotheses concerning the characteristics of adult learners (Knowles et al, 2005). The study established that the principles of andragogy were reasonably utilized by FU's extension educators. For example, the extension educators used demonstrations and hands-on experiences as their teaching techniques. The two are practical teaching methods which the adult farmers found suitable because by their nature, adult learners are able to apply new information and skills effectively when the knowledge is applicable to them practically (Knowles et al., 2005).

Although the study also established that the extension educators used andragogical teaching techniques to address adults' nature of learning, some important techniques such

as discussions and problem-solving approaches were not fully utilized. In the overall, the study concludes that FU's agricultural extension education programme had an impact on food production increment in Kabondo division.

5.6 Recommendations of the study

This sub-section presents recommendations for policy intervention and further research.

5.6.1 Recommendations for policy intervention

The core of the study was to investigate the educative element in FU's extension programme, therefore the following recommendations are mainly educationally inclined: -

(a) Agricultural extension education organizations should also employ some professionally trained agricultural educators in order for their extension programmes to have greater impact.

(b) Agricultural extension education organizations should consider sponsoring their untrained agricultural educators for professional courses in agriculture in higher institutions of learning.

(c) Agricultural extension education programmes should use multiple teaching techniques and delivery systems in order for the programmes to take care of the interests, preferences and several learning styles of various farmers. Farmers are mostly adults, therefore the teaching techniques and delivery systems should be based on andragogical model of adult learning which was proposed by Knowles (1973).

5.7 Suggestions for further research

This study was an attempt to assess the impact of FU's agricultural extension education in Kabondo division. Results revealed a number of areas where the programme had positive impact. It also revealed some challenges that constrain the effectiveness of the programme. However, like any other research, this investigation was not exhaustive. There are many other aspects of FU's extension education that would still require further research.

For example, more research could be conducted to assess the agricultural needs of the farmers in the division in order to determine the factors that could make them more participative and receptive to extension education programme. Research may also be conducted to assess the needs of the extension educators as concerns their motivation and capacity development. The impact of FU's extension education on the social and economic wellbeing of farmers participating in the programme could also form an interesting area for research.

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APPENDIX I

INTERVIEW SCHEDULE FOR FIELD MANAGER

(KEY INFORMAT)

Background information

Name:…….

Division ……

Please put a tick (✓) in the box representing your appropriate response for the following items: -

1. Your Sex

   Male ☐

   Female ☐

2. Your age (in Years)

   Under 20 years ☐

   20 – 35 years ☐

   36 – 50 years ☐

   51 – 60 years ☐

   65 and above ☐

3. Your marital Status

   Married ☐

   Single ☐

   Widowed ☐

   Divorced ☐

   Separated ☐

Other (Specify) ……
……

4. Your highest completed level of education

Primary School ☐

Secondary School ☐

'A' Level ☐

Graduate ☐

Masters Degree ☐

Any other (Specify) ……
……

5. What kind of agricultural training have you had?

Certificate ☐

Diploma course ☐

Degree course ☐

Masters Degree ☐

Any other (Specify) ……
……

6. Are you given a regular in-service training?

Yes ☐

No ☐

7. What are the objectives of FU's agricultural training programme?

i. ……

ii. ……

iii. ……

iv. ……

8. How many farmers have you successfully managed to train since the programme began?

9. When they report on duty, are the extension educators given any special induction training to the job?

10. How often do you train the extension educators?

11. Do you monitor the work of the extension educators in the field?

12. What do you consider to be the impact of FU's farmers training programme in Kabondo Division?

13. What are the biggest challenges that FU's training programme faces in Kabondo Division?

14. What recommendations in your opinion can you suggest to improve the suggest to improve the effectiveness of farmer training in Kabondo Division?

APPENDIX II

QUESTIONNAIRE FOR EXTENSION EDUCATORS

Designation ……

Background information

Name:…….

Division ……

Please put a tick (✓) in the box representing your appropriate response for the following items: -

1. Your Sex
   - Male ☐
   - Female ☐
2. Your age (in Years)
   - Under 20 years ☐
   - 20 – 35 years ☐
   - 36 – 50 years ☐
   - 51 – 60 years ☐
   - 65 and above ☐
3. Your marital Status
   - Married ☐
   - Single ☐
   - Widowed ☐
   - Divorced ☐

Separated ☐

Other (Specify) ……
……

4. Your religion

None ☐

Christian ☐

Muslim ☐

Other (Specify) ……..
……

5. Have you grown up in a farming background?

Yes ☐

No ☐

6. Do you own your own farm?

Yes ☐

No ☐

<u>Information on Education and Training</u>

7. Your highest completed level of education

Primary School ☐

Secondary School ☐

'A' Level ☐

Graduate ☐

Masters Degree ☐

Any other (Specify) …….
……

8. What kind of agricultural training have you had?

No training ☐

Short courses ☐

In-Service ☐

Certificate ☐

Diploma ☐

Any other (Specify) …….
……

9. When you got employed by FU, were you given any induction training?

Yes ☐

No ☐

10. Are you given any regular In-service training by FU?

Yes ☐

No ☐

Information on Training Activities

11. For how long have you been in employment by FU?

Less than 1year ☐

1 – 2 Years ☐

3 – 5 Years ☐

6 – 10 Years ☐

10 years and above ☐

12. (a) What delivery system(s) do you normally use in management and training of farmers?

Workshops ☐

Seminars ☐

Residential classes ☐

Mobile classes ☐

Farmer Visit and Training (V&T) ☐

Training and Farmer Visit (T & V) ☐

Any others (Specify) ……..…..

……

12. (b) Which delivery system do you find most effective in reaching and educating the farmers?

Workshops ☐

Seminars ☐

Residential classes ☐

Mobile classes ☐

Visit & training (V & T) ☐

Training and Visit ☐

13. How are the farmers organized for training?

In groups ☐

Individually ☐

Any others (Specify) …….

……

14. If in groups, what is the average size of the group?

5 – 10 ☐

11 – 15 ☐

16 – 20 ☐

20 & above ☐

Any others (Specify) ……..

……

15. How often do you visit the farmers?

Daily ☐

Weekly ☐

Monthly ☐

Any others (Specify) ……
……

16. What are the objectives of this training?

i. ……
ii. ……..
iii. ……..
iv. ……

17. Identify the main agricultural techniques that you train farmers on;

Soil preparation (cultivation) ☐

Use of fertilizers ☐

Use of high yield /disease resistant seeds ☐

Weed control ☐

Disease control ☐

Pest control ☐

Produce storage ☐

Record storage ☐

Marketing ☐

18. What instructional resources do you normally use during the training?

Demonstration farm ☐

Farm machinery ☐

Varieties of seeds ☐

Fertilizers ☐

Measurement strings ☐

Fertilizer scoops ☐

Photos / pictures ☐

Any others (Specify) …….

……

19. In your opinion, do you think these resources are adequate?

Yes ☐

No ☐

20. (a) What method(s) of teaching do you normally use in the training?

Lecture ☐

Question and answer ☐

Problem solving approaches ☐

Discussion ☐

Hands-on experience ☐

Method demonstration ☐

Result demonstration ☐

Any others (specify) …….

……

20. (b) Which method of teaching farmers do you find most effective?

Lecture ☐

Question & Answer ☐

Problem solving ☐

Hands-on experience ☐

Demonstration ☐

Discussion ☐

21. Which crops do you train farmers to produce?

Maize ☐

Beans ☐

Millet ☐

Cassava ☐

Any others (specify) …….

……

22. In your opinion, has there been an increment in the yield of crop production since you started training farmers?

Yes ☐

No ☐

23. What are the challenges that you face as an extension educator?

v. ……

vi. ……..

vii. ……..

viii. ……

24. What recommendations would you like to make for the future improvement of FU's training programme?

ix. ……

x. ……..

xi. ……..

xii. ……

APPENDIX III

QUESTIONNAIRE FOR FARMERS

Designation ……

Background information

Name:…….

Division ……

Please put a tick (✓) in the box representing your appropriate response for the following items: -

1. Your sex
   - Male ☐
   - Female ☐
2. Your age (in Years)
   - Under 20 years ☐
   - 20 – 35 years ☐
   - 36 – 50 years ☐
   - 51 – 60 years ☐
   - 65 and above ☐
3. Your marital Status
   - Married ☐
   - Single ☐
   - Widowed ☐
   - Divorced ☐

Separated ☐

Other (Specify) ……
……

4. Your highest completed level of education

Primary School ☐

Secondary School ☐

'A' Level ☐

Graduate ☐

Masters Degree ☐

Any other (Specify) ……
……

5. Your occupation(s)

Farmer ☐

Teacher ☐

Business person ☐

Any other (Specify) ……
……

6. What factors encouraged you to join FU training programme?

i. ……
ii. ……
iii. ……
iv. ……

7. Which agricultural technique have you been taught by the extension educators of FU?

i. Land preparation ☐
ii. Use of high yield seed variety ☐
iii. Use of fertilizers ☐

iv. Pest control ☐

v. Disease control ☐

vi. Weed control ☐

vii. Record keeping ☐

viii. Spacing of crops ☐

8. (a) Which delivery system used by extension educators have you found to be most effective?

Workshops ☐

Seminars ☐

Residential classes ☐

Mobile classes ☐

Visits & training ☐

Training & visit ☐

8. (b) Which delivery method would you prefer FU to use in order to pass information to you as a farmer?

Workshops ☐

Seminars ☐

Residential classes ☐

Mobile classes ☐

Visits & training ☐

Training & visit ☐

Newsletters ☐

Field tours ☐

Videos ☐

Farm field days ☐

Visit to agricultural shows ☐

Anyother(specify)……..

……

9. Which teaching technique used by the extension educators did you find most effective?

   Lecture ☐

   Question & answer ☐

   Problem solving ☐

   Discussion ☐

   Hands-on experience ☐

   Demonstration ☐

   Anyother(specify)……..

   ……

10. Have you found the knowledge that you have been trained on useful?

    Yes ☐

    No ☐

    If yes, please list down the important topics that you have actually been able to put into practice.

    i. ……

    ii. ……..

    iii. ……..

    iv. ……

11. Were you satisfied with the training?

    Not satisfied ☐

    Fairly satisfied ☐

    Satisfied ☐

    Very Satisfied ☐

12. Please describe the extension worker as they related to you?

Encouraging ☐

Slow ☐

Responsible ☐

Difficult to work with ☐

Active ☐

Lazy ☐

Loyal ☐

Supportive ☐

Unpleasant ☐

Stubborn ☐

13. How would you rate the extension educators in the following attributes?

Motivation ☐

Supportiveness ☐

Knowledge ☐

Commitment ☐

Information on Farming Activities

14. Which particular food crops were you normally growing before you joined FU training programme?

Maize ☐

Beans ☐

Millet ☐

Cassava ☐

Any other (Specify) …….

…….

15. What was the average output of the food crops mentioned in 12 above per season?

Food crop	No of Bags / Kgs
Maize	……
Beans	……
Millet	……

Any others (Specify) ……..
……

16. What is the average out put of the food crop mentioned in 13 above after you had joined FU's training programme?

Food crop	No of Bags / Kgs
Maize	……
Beans	……
Millet	……

Any others (Specify) ……..
……

17. What new farm implements have you learnt to use due to FU's training programme?

i. ……
ii. ……..
iii. ……..
iv. ……

18. In what other ways have you benefited from FU training programme and project?

Getting credit ☐

Supply of farm implements ☐

Supply of quality seeds ☐

Supply of fertilizers ☐

Marketing of produce ☐

Any others (Specify) …….

……

19. What problems do you experience in your farming activities?

i. ……

ii. ……..

iii. ……..

iv. ……

20. What do you think could be done to improve FU's training programme?

i. ……

ii. ……..

iii. ……..

iv. ……

APPENDIX IV

OBSERVATION CHECKLIST

Item	Rate				
	1	2	3	4	5
Primary cultivation (1st ploughing)					
Secondary cultivation (2nd ploughing)					
Seed selection					
Spacing of crops					
Fertilizer application (DAP)					
Fertilizer application (UREA, Top-dressing)					
Weed control					
Pest and disease control					
Harvesting					
Storage					
Produce output					
Records and recording					

Key

1 – Very poor

2 – Poor

3 _ Satisfactory

4 – Good

5 – Very good

APPENDIX - V

TABLE FOR DETERMINING SAMPLE SIZE

Population	Sample Size at Confidence = 95%				Sample Size at Confidence = 99%			
	Margin of Error - Percent				Margin of Error – Percent			
	5.0	3.5	2.5	1.0	5.0	3.5	2.5	1.0
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173

Population	Sample Size at Confidence = 95%				Sample Size at Confidence = 99%			
	Margin of Error - Percent				Margin of Error – Percent			
	5.0	3.5	2.5	1.0	5.0	3.5	2.5	1.0
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1176	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

Krejcie, R.V. and Morgan, D. (1970). *Determining* sample size for research activities. *Journal of educational and psychological measurement.* Vol. 30, No. 3, P. 608.