
**A COMPARISON OF EXTENSION METHODS USED BY
DIFFERENT AGRICULTURAL EXTENSION SERVICE
PROVIDERS IN NYANDARUA COUNTY, KENYA**



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ABSTRACT

This Bachelor's thesis was commissioned by The World Agroforestry Centre and it was written for one of its projects, The East Africa Dairy Development Project. The project aims at improving farmers' dairy production, market access and generally increasing knowledge among farmers.

Four objectives were chosen for this thesis: (1.) to obtain information about extension methods from farmers and extension providers to recommend the use of new extension methods or how to modify the three methods, (2.) to compare the effectiveness of three extension methods, (3.) to identify farmers' innovations and describe how the innovations are disseminated among the farmers, and (4.) to recommend the most effective extension method to disseminate research findings and innovations to the farmers.


This research includes both qualitative and quantitative research methods. The main method to acquire data was two sets of questionnaires, one given to the farmers and the other one to the extension providers. The data was obtained from two towns, Muki and Ol'kalou, in Kenya in January 2012.

The review of the literature explains the concept of extension and extension methods. It focuses on three extension methods: farmer-to-farmer, demonstrations and dissemination facilitator. It also gives a description of the study areas and introduction to organizations and farmer groups involved in the questionnaires.

The farmers stated farmer-to-farmer as the most effective extension method of these three. The extension providers said that demonstrations is the most effective method. According to the survey, there are five variables that affect which extension method is stated to be the most effective one by farmers.

Keywords extension, extension method, farmer-to-farmer, demonstrations, dissemination facilitator

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TIIVISTELMÄ

Tämän opinnäytetyön toimeksiantajana toimi The World Agroforestry Centre. Opinnäytetyö kirjoitettiin yhdelle heidän projekteistaan, The East Africa Dairy Development –projektille. Projektin tavoitteena on parantaa maanviljelijöiden maidontuotantoa ja edistää pääsyä markkinoille sekä yleisesti nostaa maanviljelijöiden tietoutta.

Opinnäytetyön tavoitteita oli neljä: (1.) saada tietoa maanviljelijöiltä ja neuvontaa tarjoavilta henkilöiltä, jonka perusteella tehdään suosituksia uusista neuvontamenetelmistä tai miten kolmea menetelmää pitäisi muuttaa, (2.) vertailla kolmen menetelmän tehokkuutta, (3.) tunnistaa maanviljelijöiden innovaatioita ja kuvailla, miten innovaatioita levitetään maanviljelijöiden kesken, sekä (4.) suositella tehokkain neuvontamenetelmä, jolla tutkimustietoa ja innovaatioita levitetään maanviljelijöille.


Tutkimus on sekä laadullinen että määrällinen. Päättökäytännönä käytettiin kahta kyselylomaketta. Toinen räätälöitiin maanviljelijöille ja toinen neuvontaa tarjoaville henkilöille. Aineisto kerättiin kahdesta kaupungista, Mukista ja Ol'kalousta, Keniasta tammikuussa 2012.

Teoriaosuudessa käsitellään neuvontaa ja neuvontamenetelmiä. Työssä keskitytään kolmeen neuvontamenetelmään: maanviljelijältä maanviljelijälle, esittelyyn sekä levitys fasilitaattoriin. Teoriaosuudessa käsitellään myös tutkimusalueita ja esitellään organisaatiot ja maanviljelijäryhmät, joille kysely kohdistettiin.

Maanviljelijöiden mukaan maanviljelijältä maanviljelijälle on tehokkain neuvontamenetelmä näistä kolmesta menetelmästä. Neuvontaa tarjoavien henkilöiden mukaan tehokkain menetelmä on esittely. Kyselyn mukaan viisi tekijää vaikuttavat maanviljelijöiden mielipiteeseen, minkä neuvontamenetelmän he valitsivat tehokkaimmaksi.

Avainsanat neuvonta, neuvontamenetelmä, maanviljelijältä maanviljelijälle, esittely, levitys fasilitaattori

Sivut 56 s. + liitteet 10 s.



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Appendix 1 Questionnaire to the farmers

Appendix 2 Questionnaire to the extension providers



ABBREVIATIONS USED IN THE THESIS

ABS TCM LTD	Africa Breeders Services Total Cattle Management Limited
CEPS	Community Extension Providers
DLPO	District Livestock Production Officer
DMG	Dairy Management Group
EADD	East Africa Dairy Development
FFD	Future Focus Development
GDP	Gross Domestic Product
ICRAF	World Agroforestry Centre
ICT	Information and Communication Technology
IDRC	International Development Research Centre
ILRI	International Livestock Research Institute
MFCS	Mukifarmers Co-operative Society
MoLD	Ministry of Livestock Development
NGO	Non Governmental Organization
SPSS	Statistical Package for the Social Sciences
TNS	TechnoServe
USAID	United States Agency for International Development

1 INTRODUCTION

The Republic of Kenya (Kenya) is located in East Africa with the Equator cutting the country into half (Figure 1). The Indian Ocean is situated south-east of Kenya, with its bordering countries being Somalia in the north-east, Ethiopia in the north, South Sudan in the north-west, Uganda in the west and Tanzania in the south (Figure 2). Lake Victoria, the largest lake in Africa, lies south-west of Kenya (International Lake Environment Committee n.d.). (The World Factbook n.d.a.)



Figure 1 Kenya is situated in East Africa (The World Factbook n.d.).



Figure 2 Kenya and the location of its bordering countries: Somalia, Ethiopia, South Sudan, Uganda and Tanzania (The World Factbook n.d.).

There are about 41.1 million people living in Kenya of which about 3.4 million are occupying the capital, Nairobi. Kenya is home to many cultural backgrounds given that 42 tribes live in the country (KenyaInformationGuide.com 2011). The largest tribes include Kikuyu (22 percent), Luhya (14 percent) and Luo (13 percent). Approximately 45 percent of Kenyans are Protestant and 33 percent are Roman Catholic. Kenya's official languages are English and Kiswahili, however, each tribe has its own language.

Kenya gained its independence from the United Kingdom on December 12th, 1963. Kenya's current president is Mr. Mwai Kibaki (since 2002). The country's GDP per capita is 1 600 US Dollars; to compare, Finland's corresponding number is 35 400 US Dollars (The World Factbook n.d.b). "GDP is the total market value of all final goods and services produces in a country in a given year, equal to the total consumer, investment and government spending, plus the value of exports, minus the value of imports" (Investorwords.com 2011). Most Kenyans work in agriculture (75 percent) with the rest (25 percent) in industry and services. (The World Factbook n.d.a.)

2 THE WORLD AGROFORESTRY CENTRE (ICRAF)

2.1 Introduction

The World Agroforestry Centre (ICRAF) is a nonprofit organization which was established in 1978 by John Bene of Canada's International Development Research Centre (IDRC) (World Agroforestry Centre 2011a). ICRAF is committed to produce and put into effect the best existing information to inspire agricultural growth, increase farmers' wages and preserve the environment. ICRAF works in three different continents: Africa, Asia and South America with its headquarters located in Nairobi, Kenya. (World Agroforestry Centre 2011b, 2011c.)

The abbreviation ICRAF stands for International Centre for Research in Agroforestry which is even nowadays the organization's legal name. However, in 2002 ICRAF got a new brand name, the World Agroforestry Centre which is now commonly used. (World Agroforestry Centre 2011a.)

The Centre belongs to Consultative Group on International Agricultural Research (CGIAR) (World Agroforestry Centre 2011c). CGIAR is a global alliance for organizations that conduct research for sustainable development and receive funding for their work (Consultative Group on International Agricultural Research n.d.). Because of the alliance, CGIAR's development challenges are obeyed by ICRAF. These challenges are comprised with poverty mitigation which leads to increased health and food security, enhanced productivity with lesser environmental and social costs and flexibility due to climate change and other external issues. (World Agroforestry Centre 2011c.)

ICRAF receives its funding from about a 100 investors. The donors can be governments, private foundations, international organizations or regional development banks. Examples of investors include the European Union, Ministry of Foreign Affairs of Finland, Food and Agriculture Organization of the United Nations, World Bank, World Wildlife Fund, United Nations Development Programme and United Nations Environment Programme. (World Agroforestry Centre 2011d.)

ICRAF has about 500 permanent workers that are located within all their offices in Africa, South America and Asia. In addition to this number, the organization has staff on temporary basis and students on attachments that are not included in the number of 500. (Karanja, electronic mail 27.9.2012.)

2.2 Mission, vision and values

ICRAF's mission is to create science-based information about roles that trees play in agricultural sceneries and to use their research to progress policies and

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practices that help poor people and the environment. The Centre's vision is a rural transformation in the developing countries where the use of trees in agricultural sceneries is tactically increased by smallholder households to improve their nutrition, health, shelter, food security, wages, energy resources and environmental sustainability. ICRAF's values, however, include professionalism, shared respect and creativity. (Pye-Smith 2010, 2.)

2.3 Board of Trustees, Senior Leadership Team and the Director General

The World Agroforestry Centre has a Board of Trustees which is in charge of for instance guaranteeing the best interests of ICRAF and its stakeholders and assessing as well as managing the organization's performance. There are 10 members in the Board of Trustees and they meet twice a year, once in person and once by a teleconference. Extra teleconferences can be held if they are needed. (World Agroforestry Centre 2011e.)

Senior Leadership Team has four members and it is in charge of executing daily operations of the Centre together with the Director General (World Agroforestry Centre 2011e). The Director General is currently Dr. Tony Simons who began his duty on October 1st 2011. (Stapleton 2011.)

2.4 Extension methods used at ICRAF

Different kinds of extension methods are used in ICRAF in effort to improve people's livelihoods and landscapes. ICRAF's mostly used extension methods are dissemination facilitator, farmer trainer and demonstrations. These three methods are explained in Chapter 6. In addition, farmer trainer can also be called as farmer-to-farmer method that were both used in this thesis as they represent the same. (Karanja, interview 31.8.2011.)

3 THE EAST AFRICA DAIRY DEVELOPMENT PROJECT

3.1 Introduction

The East Africa Dairy Development Project (EADD) is an industry development project implemented in parts of Kenya, Uganda and Rwanda (Figure 3). Heifer International is a leading partner in the project. Other partners include ICRAF, TechnoServe (TNS), International Livestock Research Institute (ILRI) and Africa Breeders Services Total Cattle Management Limited (ABS TCM LTD). (East Africa Dairy Development n.d.)

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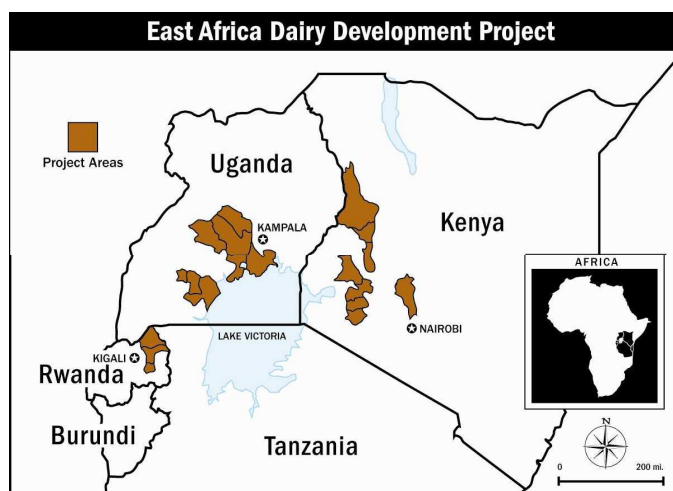


Figure 3 EADD project areas colored in brown in Kenya, Uganda and Rwanda (Heifer International n.d.).

EADD is funded by the Bill & Melinda Gates Foundation that gave the project a grant of 42.8 million US Dollars. The project was launched in January 2008 when the founder of Microsoft, Bill Gates, announced about the subject. (Heifer International n.d.)

When EADD was launched it was originally supposed to be a four-year project. However, the project received another grant of 8.5 million US Dollars from the Bill & Melinda Gates Foundation in July, 2012. The recent contribution is meant to maintain the activities of the project in Kenya, Uganda and Rwanda in addition to investigating the prospect of expanding EADD to Ethiopia and Tanzania between July 1st 2012 and June 30th 2013. (World Agroforestry Centre 2012.)

3.2 Project goals and intended benefit

EADD aims at doubling the household dairy income of 179 000 families or roughly one million people by the time the project has been ongoing for 10 years. This is achieved by improving farmers' dairy production, market access and increasing knowledge among farmers. The project intends to build 27 milk collections hubs, for example chilling plants that will store milk for it to be processed somewhere else. EADD also plans to form farmer business associations that will be the owners of the chilling plants. The associations are also scheduled to manage the plants according to the program. EADD makes effort to improve local cow breeds to produce more milk per cow per day. With this in mind, the farmers are also trained on animal nutrition and health which affects the milk quality. Training is also provided on other important and essential subjects in order the farmers be able to successfully produce, process and market their dairy products. (East Africa Dairy Development n.d.)

4 WHAT IS EXTENSION?

4.1 History of agricultural extension and advisory systems

Oxford and Cambridge universities in the United Kingdom firstly used extension as a term to explain adult education programs in 1867. These programs assisted in expanding the message of the universities outside of campus's borders and entering into the nearby communities. Extension as a term was officially adopted in the United States in the 1860's. Later on, research activities were included in 1887 with extension activities furthermore started in the 1890's.

Agricultural extension activities were officially called advisory services in the United Kingdom in the beginning of the 20th century. The majority of the European countries also used this same term. However, in the United States and Canada agricultural extension activities were called extension services.

The term that the donor agency used was commonly carried to the developing countries where the donor agencies played a part of building public agricultural extension institutions. For instance, in the 1960s and 1970s the United States Agency for International Development (USAID) was involved in setting up agricultural universities in addition to research and extension systems in many developing countries. Even nowadays, numerous agricultural extension systems still have the term extension in them. (Swanson & Rajalahti 2010, 1–2.)

4.2 The concept of extension

Extension as a concept has many definitions. It might be that every extension agent has his/her own interpretation for extension based on his experience and the position where he/she is working in extension. Because of this, extension does not have only one definition. However, all of the definitions have similarities. They all state that extension is an educational process which is applied to rural people which supports them, identifies and solves their problems. All of the definitions also highlight that extension is a procedure which happens over a long period of time, it is not just something that has one activity. (Oakley & Garforth 1985, 9–10.)

4.3 Four essential factors of the extension process

Furthermore, four different factors can be acknowledged in the procedure of extension. These factors should be the base for extension service and these factors should also be sought in the rural areas. Firstly could be mentioned knowledge and skills. Through extension farmers gain knowledge which they do not have, for example knowledge about pest control, how dung can be

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used as a fertilizer or why their cow is not coming in heat. This new information might force the farmer to learn new skills, for example technical skills of how to use new technology or farm management skills for keeping records of cow's milk production.

Secondly, through extension farmers get technical advice and information. This helps farmers to make decisions and allow them to get going. The information can be for example about credit or prices and markets. Technical advice may be about the production activities of the family farm and how to improve or sustain this production.

Thirdly, farmers require a form of organization through which they can show their interests, in addition, the organization also provides the farmers a way for taking joint action. Due to this, extension should assist the farmers to set up, structure and develop organizations through which dissemination of knowledge and skills can be done.

Fourthly, motivation and self-confidence is extremely important in order a farmer to be able to escape of his poverty. Extension agents need to encourage the farmers that they can change things and make decisions in addition to assisting them to take initiative. (Oakley & Garforth 1985, 10–13.)

4.4 Principles of extension

There are five key principles of extension and these principles should guide extension. The first principle is that “extension works with people, not for them” (Oakley & Garforth 1985, 13). As mentioned before, extension does things with rural people and this means that an extension agent should not make decisions on behalf of the farmers, the farmers should do it themselves. An extension agent should only provide completed information and all of the options that the farmer has. By doing this, the farmers obtain self-confidence.

The second principle mentioned by Oakley & Garforth (1985, 13) is that “extension is accountable to its clients”. Extension services and agents are accountable to their senior officers and to the government departments which decide on rural development policies. However, extension is a tool for the rural people, therefore, it has obligation to meet the needs of these people. As a result, extension programs are leant on people's needs, in addition to technical and national economic needs.

The third principle is that “extension is a two-way link” (Oakley & Garforth 1985, 14). Extension is a process where research findings and ideas find their way to the farmers. However, the process cannot be just this way, from the researchers to the farmers, it should also be the other way around, from the farmers to the researchers. Researchers should listen to the farmers for their ideas, suggestions or advice. This policy helps the researcher to understand

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the farmer and his surroundings and is in a better position to fill the farmers' needs.

Oakley & Garforth (1985, 15) suggest the fourth principle to be "extension cooperates with other rural development organizations". Extension is just one characteristic of numerous economic, social and political activities that look for improvements in rural society. Consequently, extension has to work with all other such organizations no matter if they happen to be governmental or non-governmental organizations.

The fifth principle of extension is that "extension works with different target groups" (Oakley & Garforth 1985, 16). Farmers in one area might have different problems, for example, one has more land than others and is ready to put new ideas into effect while another farmer who has less resources available, is likely to be more careful. Therefore, extension should recognize all different groups and plan the programs according to each target group. (Oakley & Garforth 1985, 13–16.)

4.5 The two types of extension

There are two types of extension, agricultural extension and non-agricultural extension. Rural economy's foundation is agriculture; therefore, it makes common sense that you will find agricultural extension as the most frequently used extension type in the rural areas. However, families need also other issues than agricultural activities to improve their lives. These are referred to as non-agricultural extension.

Technical advice relating to agriculture is presented by agricultural extension service. Farmers are also helped to maintain their agricultural production by providing the farmers inputs and services. Agricultural extension programs introduce the farmers a wide spectrum of topics for example from enhanced crop varieties and improved water management to pest control.

Non-agricultural extension includes all the other types of extension which are not directly associated with agriculture or livestock production. However, these aspects are still essential to families in rural areas. These consist of for instance home economics, health, nutrition, population education and community development. (Oakley & Garforth 1985, 21.)

4.6 What are extension methods?

Extension methods are the ways of communicating between the farmers and the extension agents. Through extension methods knowledge and skills are disseminated to the farmers. It is vital for the extension agent to completely be familiar with these methods since it is important for the agent to pick a certain method according to the situation. (Krishiworld n.d.)

Based on nature of contact, extension methods can be categorized into three different groups: mass communication methods, individual methods and group methods. Mass communication methods can make contact at the same time with numerous amounts of people. Mass communication methods include for example radio, television, video, posters, newspapers and leaflets. (Oakley & Garforth 1985, 45, 67.)

In individual methods the extension agent meets the farmer face-to-face, and gives him information and advice. In these methods the farmer gets the agent's full attention which will benefit the farmer. These methods are likely to be the most essential part in extension work. Some examples of individual methods are farm visits, office calls and letters. Although direct contact with the farmer is important, individual methods require a lot of time and resources, and they only make contact with limited number of people. (Oakley & Garforth 1985, 68, 72, 74–75.)

In group methods the agent meets the farmers in a group to conduct the extension work; therefore, he reaches more people than in individual methods. In group methods, the farmers can lean on each other for advice, and the group helps to form a supportive environment. However, forming a farmer group is a difficult procedure which requires a lot of time. In addition, extension agent has to consider many factors about farmer groups before starting the work, for example the group should consist of farmers with similar interests and problems which will help in reaching to the purpose. Examples of group methods are group meetings, demonstrations, field days and tours. (Oakley & Garforth 1985, 75–78, 82, 87–88.)

4.7 Informal extension

Farmers often listen and take advice from a friend, a relative or a neighbor who has traveled to some other regions to adopt new information or technology. This is called informal extension. It is information that is passed out mouth-to-mouth. Other forms of informal extension are retailers of a certain product or processors who make a contract with a farmer and supply the farmer with services like private extension. However, other informal extension providers are more objective than others. Retailers, for example, may lack objectiveness due to the fact that they try to promote certain products like chemicals. Processors, on the other hand, are more objective since they are the ones that buy the crop and guarantee adequate quality. (Tinsley 2004, 194–195.)

5 ADOPTING EXTENSION MESSAGES

5.1 The adoption process

Farmers' decisions on what to carry out in their farms are based on existing information. The adoption process is a procedure where farmers choose either to use or not to use new ideas in their farms. These new ideas might be for example new technology or innovations.

The adoption process usually has five different stages. The first stage is awareness or knowledge. In this stage the farmer gradually gets more knowledge, and therefore, starts to become aware of new ideas. The second stage is called interest or persuasion. Now the farmer is looking for more information and shaping up and changing his attitudes towards the new idea. The third stage is called evaluation or decision. In this stage, the farmer is gathering detailed information and making decisions about whether to try out the new idea or not. The fourth stage is called trial or implementation. The farmer is now testing the new idea on a small scale. The fifth stage is called adoption or confirmation. The farmer is deciding on preferably using the new idea than his old methods. In some cases there might be a sixth stage which is called reinforcement where the farmer is collecting even more information after which the farmer gets adoption to reconfirm that he has made the correct choice of applying the new idea. (Department of Agricultural Extension n.d., 114–115.)

However, the adoption process does not always go like explained above in the field. For instance, in some case testing the new idea on a small scale is simply impossible. Secondly, farmers might firstly have interest and then awareness. This applies when farmers are searching an answer to their particular problem. In this case, the stages of the adoption process might be problem, search for alternatives, select alternative, trial and adoption. (Department of Agricultural Extension n.d., 115; Lionberger & Gwin 1982, xv.)

5.2 What formulates the change in the adoption of new ideas?

What makes the change when farmers are trying to make a decision whether or not to apply a new idea or to make a change? What makes them change or not to change? There are numerous variables that affect in making a change. It also requires time. The variables also vary from person to person and from community to community. This is why these different things might be called as variables. These variables comprise of characteristics of individuals, for example the states that individuals are in, the types of assist that they receive from outsiders, what their friends and relatives are supposing that they will do, the educational strategies what they are exposed to and the importance they set on changes. (Lionberg & Gwin 1982, 5.)

It may be assumed that people have goals and they want to reach them. To reach them, they need information, supplies and services. Moreover, they need to make changes in behavior. The information, supplies, services and changes in behavior are called intervening variables. All of the variables, including the personal variables, like the characteristics of individuals, and the intervening variables must work together in order to reach the goals. These are the reasons why the process is very complicated. (Lionberg & Gwin 1982, 5–7.)

First of all, correct kind of communication plays a significant role in making changes. However, the process requires more than just communicating. Extension agent must bear in mind all the other variables as well.

Farmers are influenced by their surroundings. These influences might come from variables such as how was the childhood of the farmer, his parents' education level and, of course, their occupation. These are called personal variables. Moreover, situational variables also affect whether the farmer adopts the new idea or not. These are the characteristics of his farm, for instance, water and soil. Personal variables and situational variables are called Prior Conditions which means that they make a difference in the beginning of a farmer's adoption process. Intervening variables, however, take effect before the farmer or the whole family reaches its goals. (Lionberg & Gwin 1982, 6–7.)

Behavioral changes of a farmer usually develop into variable outcomes. These can be short-term, long-term or unintended variables. Also, government communication strategies or programs might affect the adoption process. (Lionberg & Gwin 1982, 8.)

Overall, the process of adoption is difficult. If the extension agent should fail to take into notice even one variable, adopting a new idea might be at risk. (Lionberg & Gwin 1982, 8.)

6 COMMON EXTENSION METHODS USED BY VARIOUS EXTENSION PROVIDERS

6.1 Dissemination facilitators

Dissemination facilitators are people who specialize in extension. They are meant to train and provide extension providers with information. Dissemination facilitators are usually employed by a project that is funded by someone. Originally, ICRAF and a few national agricultural research institutes started to employ dissemination facilitators in the late 1990s. Even nowadays, ICRAF employs numerous dissemination facilitators, which might be evi-

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dence that the dissemination facilitators are effective in their work. (Wambugu, Place & Franzel 2011, 106.)

6.2 Farmer trainers also called as farmer-to-farmer

The farmer-to-farmer extension method relies on group training of specific farmers who possess skills to become farmer trainers. The skills that the farmer trainers already have are improved by training and workshops that are done together with extension staff. Furthermore, extension agents provide the trainers with needed facilitation. Subsequently, the farmer trainers are persuaded to train farmers living next to them. It is expected that this procedure might create a situation where more and more farmers gain knowledge and skills through the farmer trainers. (Tanui 2001, 4.)

6.2.1 Steps for implementing the farmer trainer method

Farmer trainer extension method begins with the creation of awareness for the farmers and the extension staff. Next, the extension staff receives training on how to carry out the farmer selection. Farmer selection is a process where farmers are picked out by specific interests, knowledge and skills and who have a good status in the community. Therefore these selected farmers are in a good position to persuade other farmers to adopt extension messages. Once the farmer trainers have been selected, they will undergo training on different topics together with the extension staff. After the training, the farmer trainers are supported to build awareness between other farmers. The farmer trainers continue train the other farmers while the farmer trainer himself obtains training on subjects he finds complex. Planning and evaluation meetings are held with the farmer trainers and the extension staff. (Tanui 2001, 30–31.)

6.3 Demonstrations

Farmers are keen on seeing how a new idea works and how it might affect their crop production. Both of these can be done by a demonstration. An appropriate and practical demonstration is an important method in extension, especially among farmers who cannot read. This is because they have an opportunity to watch the differences between the new idea and the old one. The demonstration should be simple and it should illustrate concrete results to the farmers. In extension work, the agents use two different kinds of demonstrations. These are called method demonstration and result demonstration. Both of these require a great deal of thought, planning and competent implementation. (Food and Agriculture Organization of the United Nations n.d.)

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6.3.1 Method demonstration

Method demonstration, basically, show how to do something to the farmers. The farmers are shown step by step how to do something, for example how to sow fodder seeds (Figure 4) or operate a specific machine. The extension agent is most likely dealing with farmers, who are already familiar with the practice being illustrated. However, now they want to learn how to do it by themselves. (Food and Agriculture Organization of the United Nations n.d.)



Figure 4 An example of method demonstration. The community was demonstrated by extension staff on how to sow fodder seeds. (Jonna Luukkainen 24.6.2011.)

Major advantage of this method is that it allows the agent to communicate with the farmers and give details about simple farming methods to numerous people. In other words, the agent is growing the impact of his extension work. In addition, when the farmers have a chance to try it by themselves, the possibility of the demonstration helping them increases rather than in a situation where the farmers are given a lecture about the same subject. (Food and Agriculture Organization of the United Nations n.d.)

The key disadvantage of the method is if the demonstration is being observed by a large number of farmers, only some of the farmers get to see, hear and do. (Food and Agriculture Organization of the United Nations n.d.)

6.3.2 Result demonstration

In result demonstration, the agent shows the farmers that the new idea that is being demonstrated can work in local conditions. The difference is important in result demonstration, whether it is the difference between poor seed and selected seed, or using a fertilizer or not using it. The farmers tend not to believe the agent's words if he only says it to the farmers, that is why the old saying "seeing is believing" applies here. After the farmer sees the results, the agent builds confidence among the farmers and can encourage the farmers to

try it by themselves. (Food and Agriculture Organization of the United Nations n.d.)

The major disadvantage of the method is that it takes a long time to mature; hence it is a costly method. If a demonstration fails, due to for example lack of rain, it can have devastating consequences. (Food and Agriculture Organization of the United Nations n.d.)

7 DESCRIPTION OF THE STUDY AREAS

In Kenya, agriculture is the most important source of livelihood especially for people living in rural areas. Because of so many people's livelihoods are dependant of agriculture, sustainable growth in the sector is essential for improving the living standards of most Kenyans. Even though the agricultural sector is significant in Kenya, the farming in the country is mostly small-scale with average farm size being 0.2–3 hectares. Small-scale production in the country is relation to 75 percent of the total agricultural production. However, small-scale farming is not the only challenge in agriculture in Kenya. Farms are also lacking mechanization, chilling plants and refrigeration of the milk which leads to interrupted cold chains. Lack of chilling plants force to sell the milk untreated which is the way 91 percent of milk in Kenya is sold. When the milk is sold this way, it is sold through traditional sector players. They sell the raw milk to milk bars and kiosks which lack hygiene, standards for sale and testing tools to determine milk quality. Naturally, this exposes Kenyans to great health risks. Furthermore, farmers are not getting enough support from institutions and poor infrastructure creates its own trouble for farmers. (Agricultural Sector Development Strategy 2010–2020 2010, vii, 11; East Africa Dairy Development proposal 2007, 13.)

Directly, agriculture comprises of 26 percent of Kenya's GDP annually and an additional 25 percent indirectly. The agricultural sector is responsible for 65 percent of the country's exports and more than 18 percent of formal employment in the country. Moreover, more than 70 percent of informal employment comes from agriculture in the rural areas. (Agricultural Sector Development Strategy 2010–2020 2010, 1.)

It has been estimated that there are about 3.5 million cows in Kenya that produce milk. Small-scale farmers produce more than 80 percent of the milk in Kenya (Agricultural Sector Development Strategy 2010–2020 2010, 11–12). Milk production has been calculated approximately to be 5.1 billion litres in 2008. The average milk production per cow per day is five litres (Agricultural Sector Development Strategy 2010–2020 2010, 37). However, it is also said that the milk production per cow in Kenya is less than two liters. At present demand, it has been said that Kenya is self-contained in milk production. (Agricultural Sector Development Strategy 2010–2020 2010, 14; East Africa Dairy Development proposal 2007, 12.)

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7.1 Ol'kalou

Ol'kalou is a town situated in Nyandarua Central District in the Central Province (Figure 5) (Republic of Kenya 2008). Ol'kalou has a population of 47 795 and it covers an area of 371 square kilometers (Karanja, electronic mail 26.10.2012).

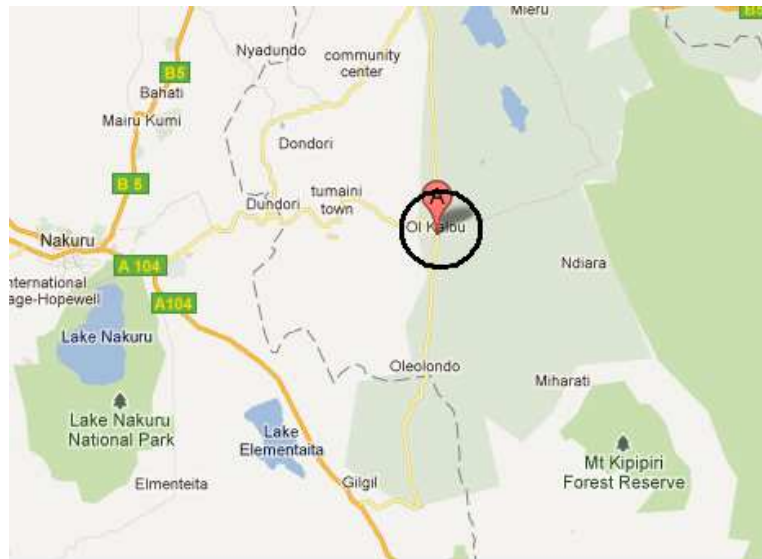


Figure 5 A map of Ol'kalou and its surroundings with the study area being circled. The nearest major town is Nakuru which is situated about 40 kilometers west of Ol'kalou. (Google Maps 2011.)

7.2 Muki

Muki is a village located in Nyandarua South District in the Central Province (Figure 6). Nyandarua South District has a population of approximately 87 397 in an area of 475.3 square kilometers. The major economic activities in the district are dairy, horticultural crops and maize farming. In Nyandarua South District, there are about 55 000 dairy cattle and 60 000 wool sheep in the area. Approximately, five dairy animals are owned per household. Each dairy cattle is estimated to produce 8.4 liters of milk per day. (Maiteri, electronic mail 28.11.2011.)

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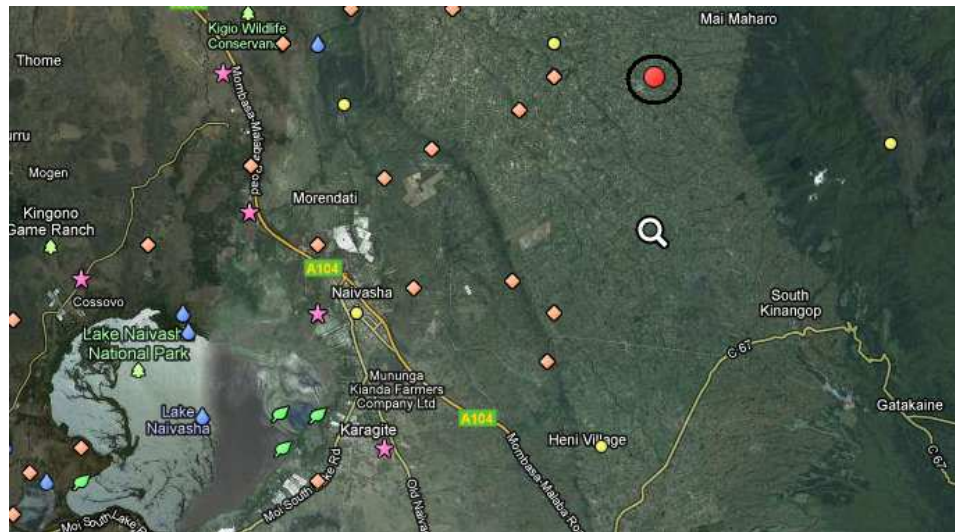


Figure 6 A map of Muki and its surroundings. The study area is circled on the map. The closest major town is Naivasha which is located about 25 kilometers south-west of Muki. (Mapcarta 2011.)

According to James Maiteri (interview 30.11.2011), the population of Muki is about 37 500. Maiteri also states that there are about 16 000 dairy cattle and 20 000 wool sheep in Muki.

8 INTRODUCTION OF THE ORGANIZATIONS AND DAIRY MANAGEMENT GROUPS INVOLVED IN THIS THESIS

8.1 Ol'kalou Dairy Limited

Ol'kalou Dairy Limited is a farmer owned organization that was established in 2005 under the facilitation of Heifer Project International. The organization is a milk marketing company collecting more than 28 000 kilograms of milk per day from more than 5 000 farmers located in 13 locations in Nyandarua County. Ol'kalou Dairy Ltd collects, chills, bulks and finds competitive market for farmers' milk within their district. The chilling of the milk takes place in a facility which is located in Ol'kalou town (Figure 7). The company works in districts such as Nyandarua Central District, Kipipiri District, Nyandarua West District, Gilgil District and Mirangine District. (Igate, electronic mail 11.11.2011.)

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Figure 7 Ol'kalou Dairy Limited has a facility situated in Ol'kalou town (Jonna Luukkainen 24.6.2011).

8.2 Dairy Management Groups in Ol'kalou

In Ol'kalou farmers are organized in small groups referred to as Dairy Management Groups (DMG). The first group is called Bosnia DMG which has 16 members. The average farm size within the group is four acres and the average number of cows is three. The farmers milk two cows at a time and they practice semi-zero grazing. A semi-zero grazing is a feeding system where free grazing and stall feeding is combined (Bebe, Udo, Rowlands & Thorpe 2003, 212). (Igathe, electronic mail 11.11.2011; Igathe, interview 11.1.2012.)

Another group in Ol'kalou is called Milimani DMG which has 21 members. The average farm size is 0.5 acres and the average number of cows is three. Like Bosnia DMG, Milimani DMG also practices semi-zero grazing. (Igathe 11.1.2012.)

These two DMGs were chosen by Mr. Peterson Igathe. He chose the groups because of four reasons. Firstly, both of the groups were easily accessible with a car, secondly, the groups are gender balanced, they both have female and male members. Thirdly, there are youth and elderly people in both of the groups. Finally, the groups had undergone trainings and responded well. (Karanja, electronic mail 26.10.2012.)

8.3 Mukifarmers Co-operative Society Limited

Mukifarmers Co-operative Society Limited (MFCS) is a smallholder dairy farmers' co-operative society located in Muki. MFCS was founded in 1989 by

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29 members for the purposes of milk collection and marketing. The membership number has now increased to 7 500 with 3 800 active members.

MFCS together with private investors have built a milk processing plant with a capacity of 80 000 liters in 16 hours. However, the members of MFCS are only able to produce 37 000 liters of milk per day.

MFCS gives its members support to produce milk by providing them with agro veterinary and artificial insemination services, extension and training on dairy production, milk handling and milk quality improvement. Furthermore, MFCS offers its members financial advances ahead of milk payments and loan facilities. In the areas where MFCS is unable to perform such services, respective service providers are contracted to offer these services. (Maiteri, electronic mail 28.11.2011.)

8.4 Dairy Management Groups in Muki

The first DMG in Muki is called Raitha and it has 24 members in the group. The average number of cows within the group is four. Each member owns four acres of land on average. Some members practice semi-zero grazing and some free grazing.

The second DMG is called Kiambaa and it has 16 members in the group. The average number of cows within the group is also four. Moreover, members own four acres of land on average. Like within the Raitha group, Kiambaa members also practice semi-zero grazing and free grazing.

These two DMGs were picked by Dr. James Maiteri from Mukifarmers Co-operative Society Ltd. Dr. Maiteri chose these DMGs to fill in the questionnaire because they had shown more interest in zero grazing system. (Maiteri, electronic mail 24.10.2012.)

8.5 The Ministry of Livestock Development

The Ministry of Livestock Development (MoLD) was established in 2008. The Ministry promotes, regulates and facilitates livestock production for socio-economic development and industrialization. MoLD has two departments, Veterinary Services and Livestock Production (Ministry of Livestock Development 2011a). (Ministry of Livestock Development 2011b.)

The Ministry's vision is "to be the Regional Leader in facilitation and delivery of efficient and effective services for a sustainable and prosperous livestock sub-sectors" (Ministry of Livestock Development 2011c). What comes to MoLD's mission, it is "to create a favorable legal framework for the sustainable development of the livestock industry; and to provide support ser-

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VICES that increase productivity, value addition and market access for the sub-sector products” (Ministry of Livestock Development 2011c).

MoLD has several core functions for which it concentrates its efforts. Examples of these functions are developing and managing programs, supplying extension services and making them easier and supervising along with preserving the natural resources. (Ministry of Livestock Development 2011d.)

8.6 Private business providers and agro-vets

In Ol’kalou, there are two agro-vets that collaborate with Ol’kalou Dairy Ltd. These are called Agro-vet Centre Ol’kalou and Ol’kalou Dairy Agro-vet. (Igate, electronic mail 11.11.2011.)

Agro-vet Centre was established in 2010 and it is located in Ol’kalou town. The agro-vet deals with agrochemicals and vet medicines. They have two employees working in the shop. (Kariuki 11.1.2012.)

Ol’kalou Dairy Agro-vet started its business in 2008 and it is owned by approximately 5 000 farmers. The store has two employees, an agro-vet accountant and a store keeper. The agro-vet deals with farm inputs such as animal feeds, mineral bricks, drugs, silage polythene papers and fertilizers. The products are sold through check-off system and cash. The farmers are given an opportunity to buy products with credit, and later on the amount is deducted from the figure the farmer is supposed to get in exchange for the milk. The store has an average total sale of 40 000 Kenyan shillings (approximately 373 Euros). (Igate 11.1.2012.)

The private business provider in Ol’kalou started doing business in 2006. He offers artificial insemination services to farmers through check-off, fodder conservation, silage making, calf rearing and advice for food nutrition to animals. (Ouko 9.1.2012.)

Also in Muki, two agro-vets were interviewed. The first one was established in 2009 and it is situated close to Muki town, along the Ol’kalou Highway. The Agro-vet has two employees, one is working as a vet who carries out treatments and the other one is the store attendant who sells animals’ feeds and de-wormers. (Kamau 10.1.2012.)

The second agro-vet is a part of Mukifarmers Co-operative Society and it is situated downstairs of the Society’s premises. It handles agrochemicals and vet medicines. (Maiteri 10.1.2012.)

8.7 Non Governmental Organization working in Muki

Future Focus Development (FFD) is an indigenous, non-profit, faith-based organization that deals with development, training, research and consultancy. It was registered by the Government of Kenya's NGO Coordination Board in 2007. However, FFD started operating in 2006 by volunteering. At that time, the organization trained women groups, church groups and youth in the villages. FFD's office is located in Naivasha town which is about 100 kilometers north from Nairobi. (Future Focus Development n.d.)

9 METHODOLOGY OF STUDY

9.1 Method of data collection

Two sets of questionnaires were used to collect data and information from farmers and extension providers. One questionnaire was tailored to the farmers and the other one to the extension providers.

9.2 Objectives of the thesis

The following objectives were selected for this thesis:

- To obtain information from farmers and extension providers about extension methods to recommend the use of new extension methods or how to modify the three methods.
- Compare the effectiveness of the three methods used by ICRAF and other extension service providers.
- Identify and describe appropriate farmers' innovations and describe how these innovations are disseminated among themselves.
- Recommend the most effective extension method to disseminate research findings and innovations to farmers.

9.3 Research questions

Two research questions were identified. Which of the three extension methods is the most productive one? What are the advantages and disadvantages of each method?

9.4 Survey strategy

From The Ministry of Livestock, five people were given the questionnaire: the District Livestock Production Officer (DLPO), two people from Muki office and two people from Ol'kalou office.

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In Ol'kalou, eight extension providers and two Dairy Management Groups (DMG) were handed the questionnaire. The extension providers include the Extension Manager from Ol'kalou Dairy, two agro-vet extension providers, four Community Extension Providers (CEPS) and one private extension provider.

In Muki, nine extension providers and two DMGs were set to answer to the questionnaire. The extension providers consist of the Extension Manager from MukiFarmers Co-operative Society Ltd, two agro-vet extension providers, one farmer trainer, three CEPS, one private extension provider and one person from a NGO working in the region (Future Focus Development).

Furthermore, four people from EADD extension staff were sent the questionnaire through e-mail. These comprise of Ms. Josephine Kirui who is the Senior Dissemination Facilitator, Mr. Patrick Mudavadi, Mrs. Esther Karanja and Ms. Sylvia Wafuna. Mr. Mudavadi, Ms. Karanja and Ms. Wafuna are all Dissemination Facilitators.

The survey contains both quantitative and qualitative research methods. Quantitative method is mostly used to obtain background information of the interviewees and qualitative method is mostly used to acquire other data.

The questionnaires were filled in by farmers in Muki on January 5th, 2012 and in Ol'kalou on January 9th, 2012 and on January 12th, 2012. The extension providers answered to the questionnaire between January 6th, 2012 and January 12th, 2012.

In each of the villages, there was a person present who knew the local language and who helped to go through the questionnaire question by question with the farmers (Figure 8). In Ol'kalou, this person was Mr. Peterson Igate, and in Muki, Dr. James Maiteri. Therefore, each question was translated to the communities by using their own language in case someone does not know English well. After the community was translated the question, they were given directions how to fill in if unclear. Next, they were given time to write their answer. Afterwards, the farmers were translated the next question, and so on.

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Figure 8 Mr. Peterson Igathe translating and giving directions to the farmers how to fill in the questionnaire in Ol'kalou (Jonna Luukkainen 12.1.2012).

What comes to the extension providers, most people were called and invited to come and fill in the questionnaire either separately or in small groups. Thus, they were handed the questionnaire and everyone filled it independently. Although, some extension providers did not have time to arrive at the spot, therefore the questionnaire was sent to them by a matatu, which is Kenya's public transport. Also, the questionnaire was left to be filled in by a few extension providers, and then later to be picked up or sent by e-mail.

9.5 Methods of data analysis

The data was mostly analyzed with a computer program called Statistical Package for the Social Sciences (SPSS). However, a few graphs were made with Microsoft Office Excel.

Firstly, all the data was inserted to Microsoft Office Excel program. Then, the answers were coded by using numbers to indicate each different answer. However, the open questions were analyzed differently. A percentage or a frequency was taken out of the interviewees that mentioned the same matter in each question. Or, a table was prepared of the answers.

9.6 The reliability and validity of the research

The researcher should always check the reliability and validity of his research. The reliability indicates the ability of the research method to give results that were intended or what the research was supposed to find out. The validity points to ability of the research to assess essential and right things.

The reliability of the research is strengthened by creating the questionnaires carefully. The validity is supported by if the researcher knows the commissioning organization well before generating the questions to the questionnaire. This way, the researcher guarantees that he knows exactly what extension methods are used, what happens in the field and how the farmers are doing relating to the project. For this research, the advantage was that the researcher had already conducted an internship in the commissioning organization therefore was fully aware of the mentioned things. Moreover, the questions in the questionnaires were approved in the commissioning organization and they had an opportunity to change the questions, add or remove them.

10 RESEARCH FINDINGS

All together, the questionnaires received 70 replies out of 103 which equals to about 68 percent. Farmers' and extension providers' answers were separated to make them more clear.

10.1 Farmers

Out of all 77 farmers, 52 answered to the questionnaire (approximately 68 percent). Question D8 of the farmers' questionnaire was eliminated in the analysis due to a misunderstanding between the researcher and the farmers.

Respondents came from two different towns: Muki and Ol'kalou. Within both of the towns, interviews were done in two different villages. In Muki, the villages were Kahuru and Mkungi, and in Ol'kalou, Huhoini and Milimani. Therefore, in Muki, 28 people, and in Ol'kalou, 24 people replied to the questionnaire.

It is noticeable that more than half of the respondents were farmer-husbands (Figure 9). Furthermore, 38 percent of the respondents were farmer-wives. Less than two percent were either farmer-daughters or farmer-sons.

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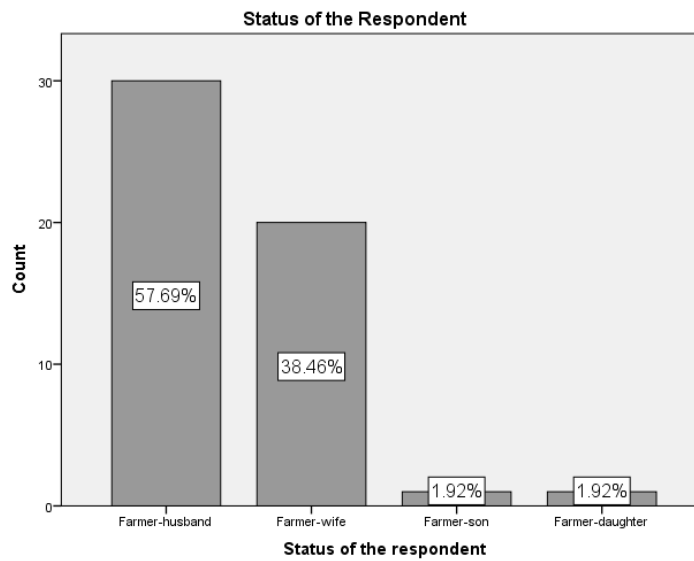


Figure 9 Status of the respondents (N=52).

Approximately 56 percent of the respondents were male and 44 percent were female (Figure 10).

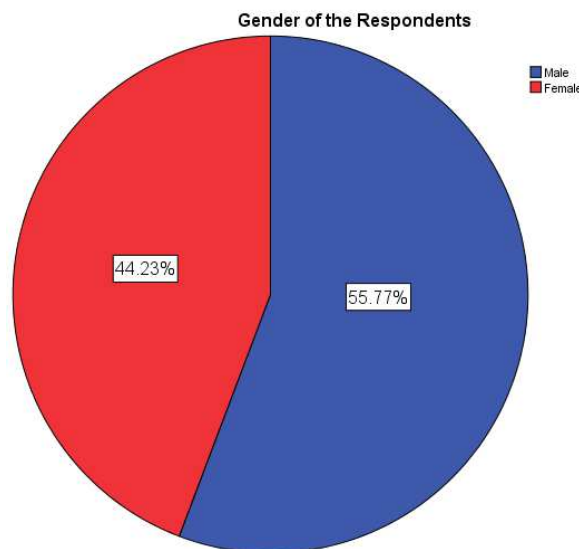


Figure 10 Gender of respondents (N=52).

Approximately 88 percent of the respondents' households were male headed and only 12 percent were female headed (Figure 11).

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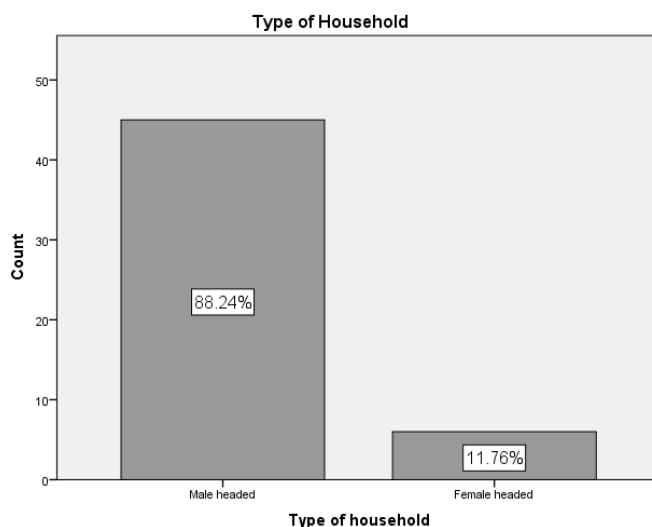


Figure 11 Type of household (N=51).

The mean age of the farmers was 40.83 years with the age ranging from 25 years to 77 years. On average, the farmers had attended school for 10.22 years. The least educated had been to school for one year and the most for 15 years.

The mean number of the respondents being farmers was 10.66 years with the number ranging from two years to 45 years. On average, the respondents were in possession of 4.07 acres of land of which they owned 3.17 acres and 0.89 acres were rented. The mean number of the time renting the land was 1.61 years and on average, the monthly rent of the land was approximately 5 902 Kenyan shillings. Furthermore, the average distance to the nearest road with pavement was 2.52 kilometers with the distance ranging from one meter to six kilometers.

81 percent of the respondents thought that they do not have adequate access to water (Figure 12). 19 percent thought that they have adequate access to water.

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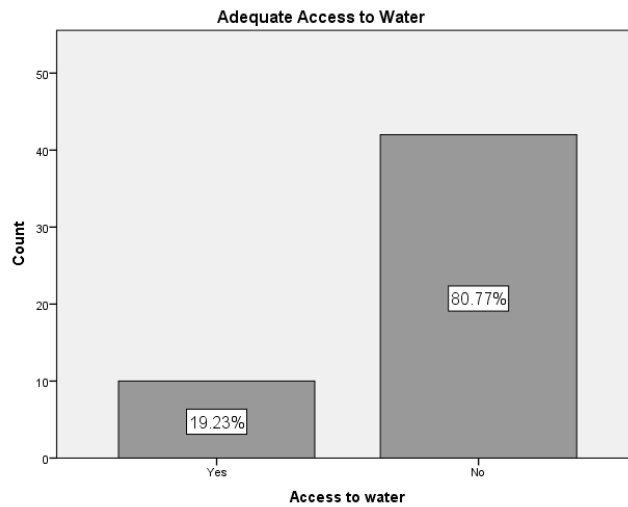


Figure 12 Respondents' opinion whether or not they have adequate access to water (N=52).

Furthermore, farmers' main source of water was asked in the questionnaire. 30 percent of respondents used rain water, 26 percent used a river, 20 percent used a well, 10 percent used a bore hole, eight percent used a dam, four percent used tap water and two percent used a hose pipe (Figure 13). The mean distance to the main source of water was 0.99 kilometers. The shortest distance among the respondents was zero meters and the longest three and a half kilometers to the main source of water.

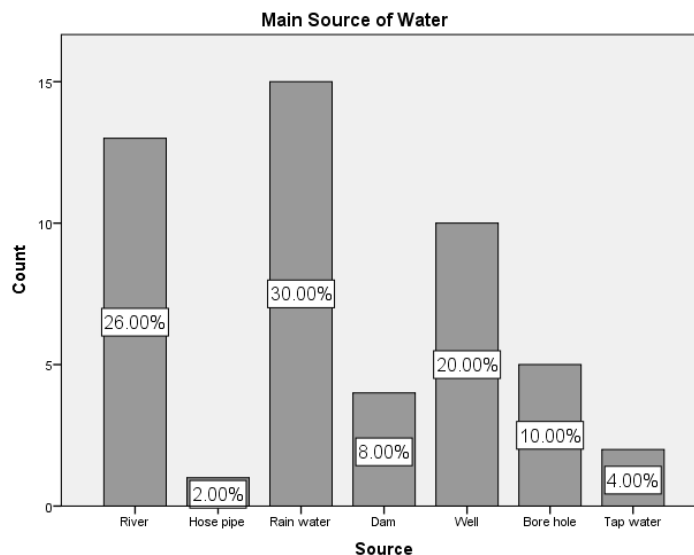


Figure 13 Respondents' main source of water (N=50).

The farmers were asked to list three main crops that they are growing. Figure 14 shows the frequencies of each crop that the farmers listed. The most grown

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crops were maize and potatoes with each a frequency of 41. This tells that 80 percent of the farmers were growing maize and potatoes.

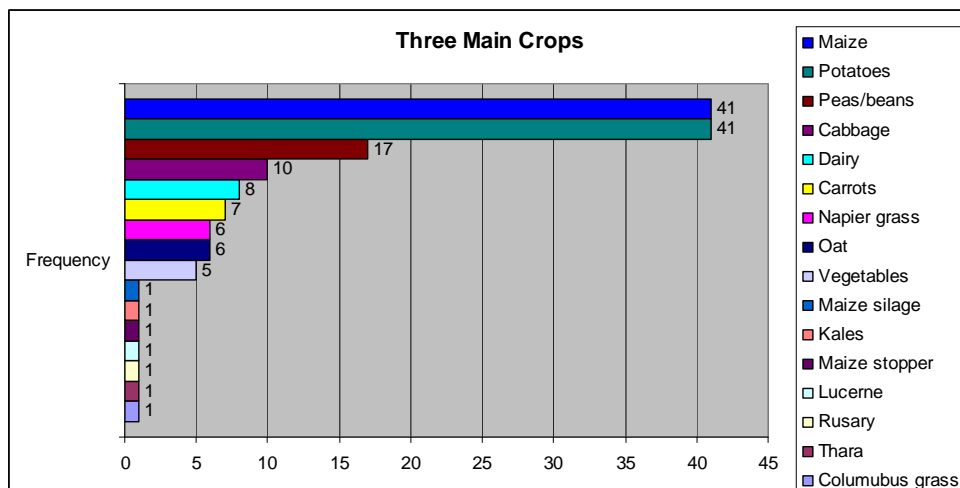


Figure 14 Farmers were asked to list three main crops that they are growing (N=51).

On average, the respondents owned 2.37 dairy cows with the number ranging from zero to eight. Moreover, the mean number of owning heifers was 0.85 with the number ranging from zero to four. The farmers owned 0.29 bulls on average with the number ranging from zero to three. The respondents owned 0.88 calves on average with the number ranging from zero to four. On average, the total number of cow units was approximately 3.40 with the number ranging from one to 12.08. The cow units were calculated the way that one cow unit equaled to one cow or a bull, 0.67 cow units equaled to one heifer and 0.2 cow units equaled to one calf.

Approximately 83 percent of the respondents said yes to preserving fodder crops for dry season feeding (Figure 15). Hay bale was the most common form of preserving the fodder, since 50 percent of the farmers used it. The second most common form was silage, which was used by approximately 39 percent of the farmers. Furthermore, about 21 percent also kept fodder in the store. Moreover, everyone who preserved with silage used natural fermentation.

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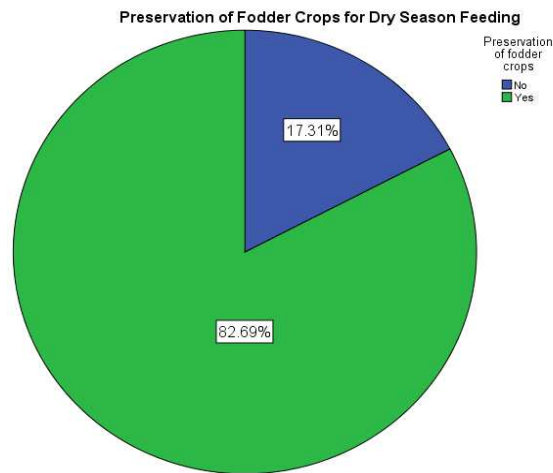


Figure 15 Preservation of fodder crops for dry season feeding (N=52).

The first member among the farmers, who started in EADD, started participating in 2006. The most recent members joined the activities in November 2011. Moreover, over half of the farmers found out about EADD through extension staff (Figure 16). 24 percent found out about EADD through a relation.

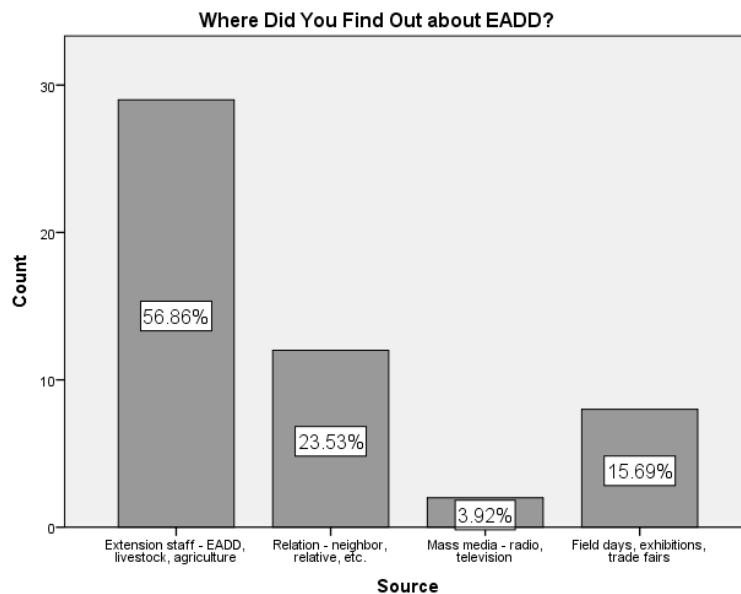


Figure 16 The sources from where the farmers found out about EADD activities (N=51).

Figure 17 shows the frequencies of the reasons why farmers got involved in EADD. 41 farmers stated that the reason was to improve dairy productivity which equals to about 80 percent.

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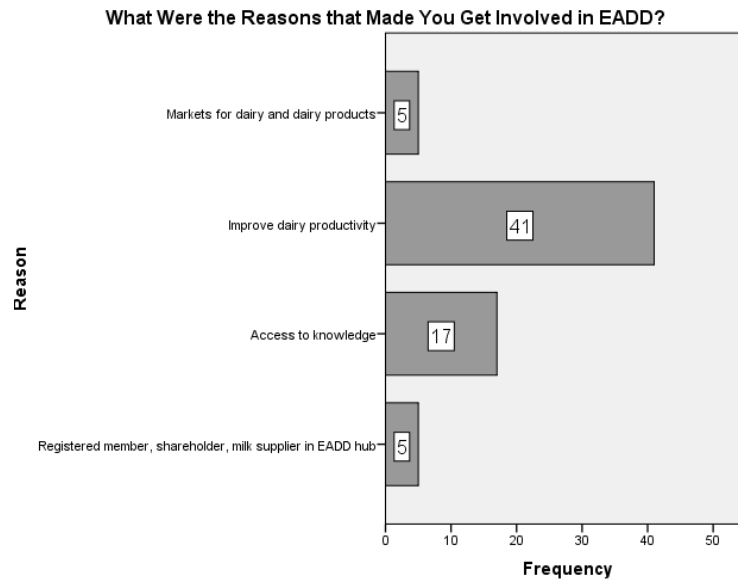


Figure 17 What were the reasons that made you get involved in EADD (N=51).

About 69 percent of the farmers were familiar with all of the three extension methods, dissemination facilitator, farmer trainer and demonstrations (Figure 18). The rest did not know either one of them or two of them. Almost six percent stated that they are not familiar with the three extension methods.

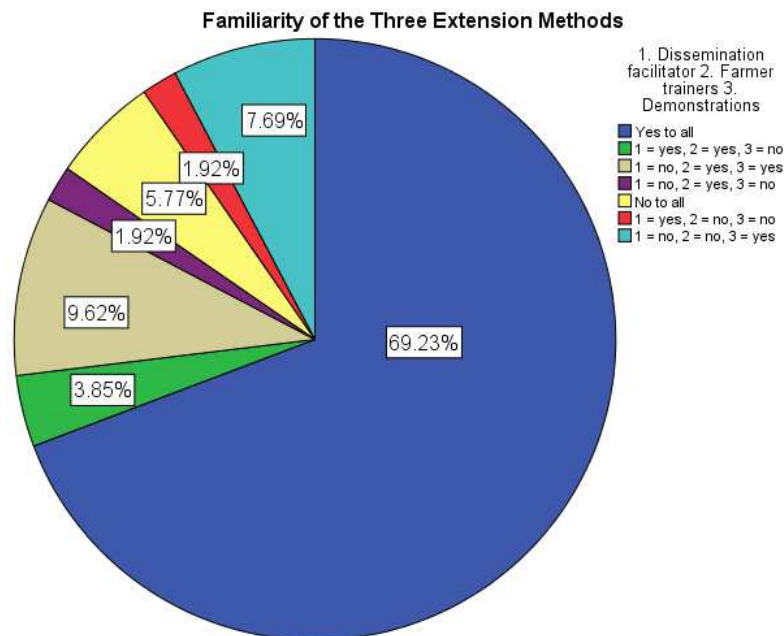


Figure 18 Familiarity of the three extension methods among the farmers (N=52).

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About 42 percent of the farmers thought that farmer-to-farmer (farmer trainer) is the most productive extension method of the three (Figure 19). However, only farmers who stated to know all the three methods in the previous question were acknowledged. 31 percent said that dissemination facilitator is the most productive method, and 26 percent stated the most productive method to be farm demonstrations.

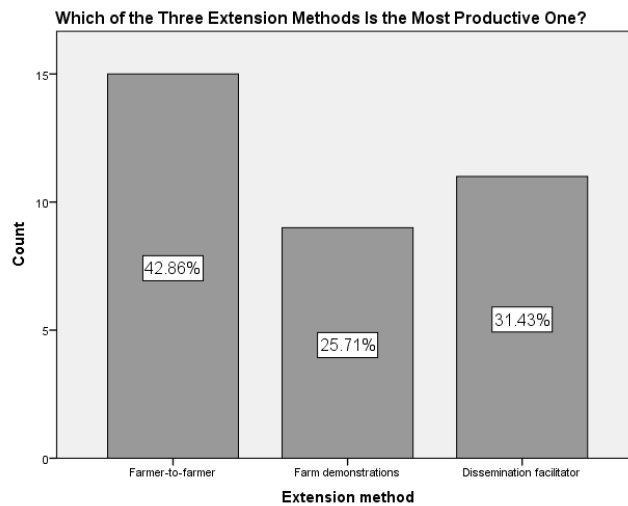


Figure 19 The most productive extension method of the three according to the farmers (N=36).

Figure 20 shows the constraints that farmers were experiencing from fully implementing the production technologies being promoted by EADD. Farmers were given the freedom of listing more than one constraint. Lack of capital was the biggest constraint with a frequency of 44 which tells that 90 percent of the farmers listed lack of money as a constraint.

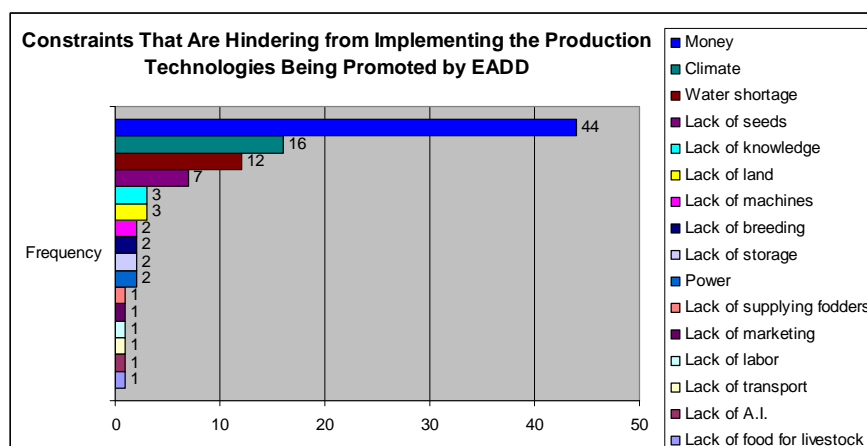


Figure 20 Constraints that are hindering from implementing the production technologies being promoted by EADD (N=49).

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48 percent of the farmers use income that has been generated from the dairy activity to education of children (Figure 21). 36 percent stated that the income goes to feeding family. 14 percent buys better breed of livestock and two percent improve their living standards.

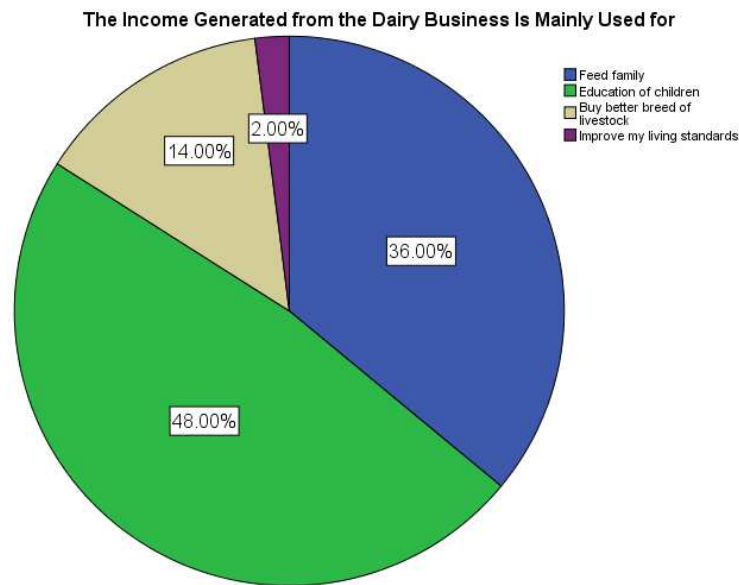


Figure 21 The income generated from the dairy activity is mainly used for (N=50).

All the innovations and new technology according to the farmers are shown in figure 22. Farmers were given the freedom of listing more than one innovation or technology. Most of these innovations were obtained through trainings by extension staff. However, a few of the farmers were harvesting water with plastic and using a small machine for cutting grass.

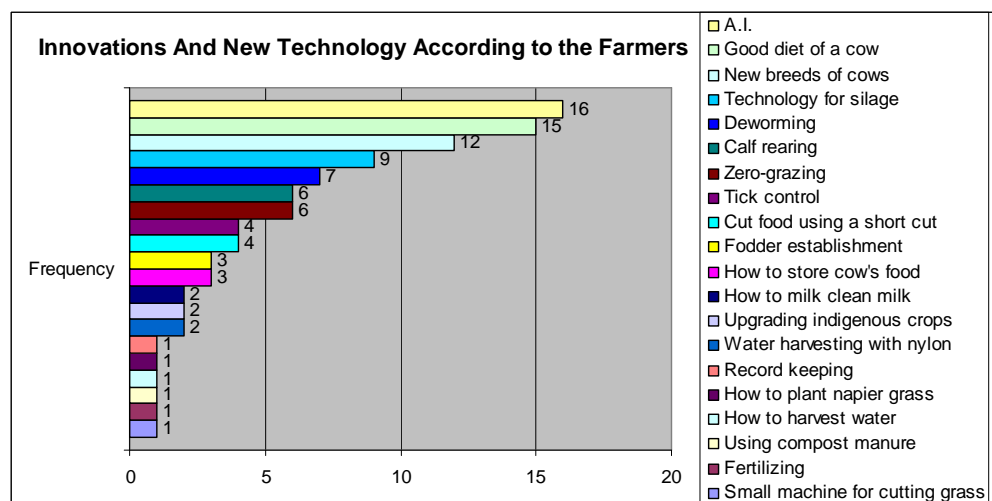


Figure 22 Innovations and new technology according to the farmers (N=48).

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Almost 87 percent of the farmers heard about another farmer developing innovations from EADD staff (Figure 23). Almost 10 percent said that they had heard about innovations from a neighbor. Less than four percent stated that they had learned about innovations from a relative.

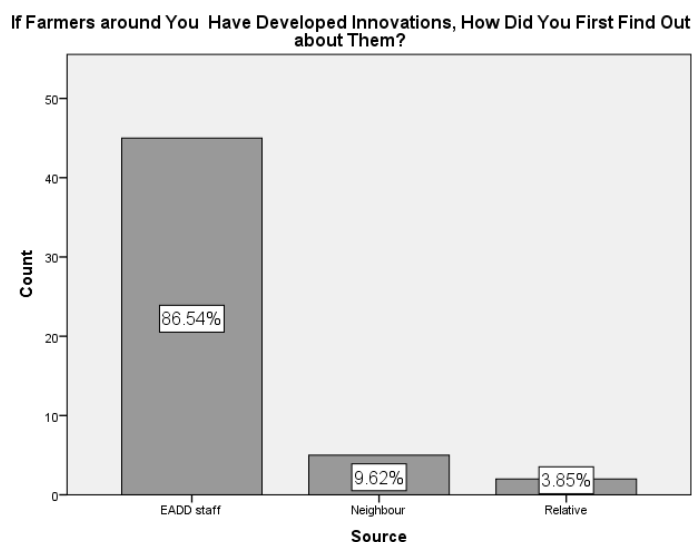


Figure 23 Distribution of innovations (N=52).

When asking the farmers what they would consider as the major production technologies (extension methods) for their dairy business, they ranked 10 different sources according to their importance (Table 1). However, the highest frequency of farmers ranking the first place went clearly to dissemination facilitator, and the second place to own knowledge.

Table 1 Ranking of major production technologies (extension methods) according to their importance.

Source	Rank
Farmer trainer	1
Dissemination facilitator	2
Farm demonstration	3
Training workshop / seminar	4
Own knowledge	5
Milk processors	6
Radio and TV	7
Ministry of Livestock Development	7
Agro-vet stockist	9
Newspapers / extension bulletins	10

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According to this questionnaire, age affects which of the three extension method the respondent stated to be the most productive method. Out of all the 40 year-olds and above, 67 percent stated that farmer-to-farmer method is the most productive method (Figure 24). Farmer-to-farmer was not that popular among respondents aged between 30 to 39 years old because only 15 percent of them stated farmer-to-farmer as the most productive method.

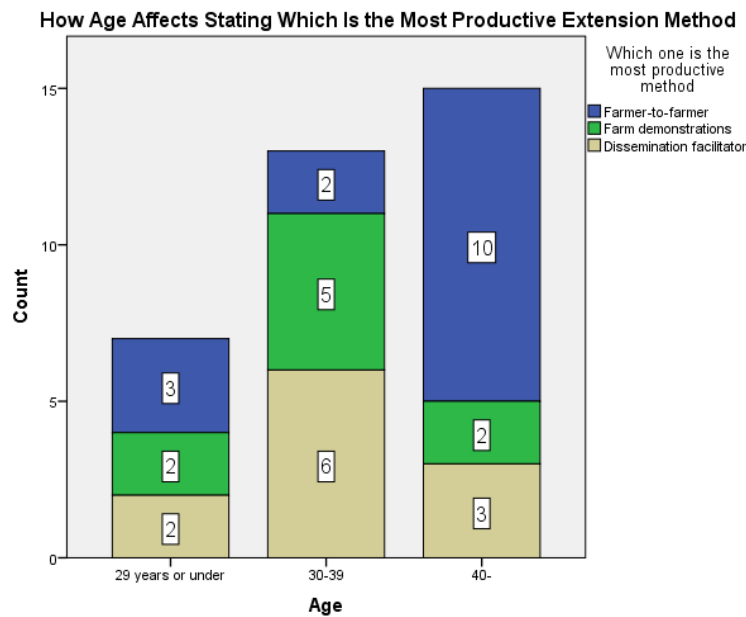


Figure 24 How the age of the respondent affects stating which of the three extension methods is the most productive one (N=36).

Figure 25 shows how gender affects stating which the most productive extension method is. 60 percent of farmers who said farmer-to-farmer to be the most productive method were female. 67 percent of the ones that stated farm demonstrations as the most productive method were male. Furthermore, 64 percent of farmers who said dissemination facilitator is the most productive method were also male.

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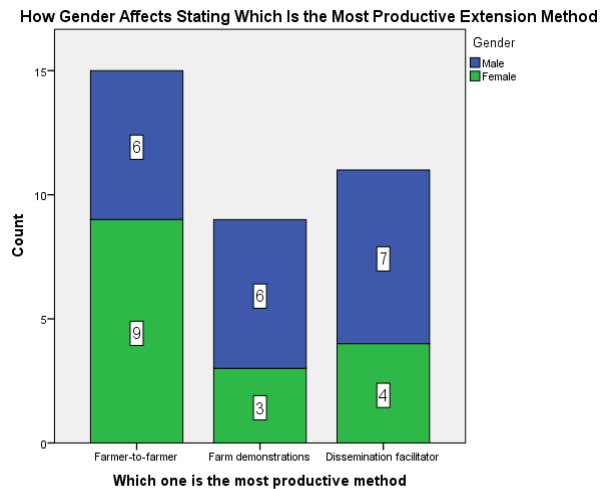


Figure 25 How gender affects stating which is the most productive extension method (N=36).

Figure 26 demonstrates how the respondents' distance to the nearest pavement road has an effect on stating which the most productive extension method is. Out of all the respondents whose distance to the nearest pavement road was less than one kilometer, zero picked farm demonstrations as the most productive method. This might be because of the short distance to the pavement road of these farmers thus they can easily travel to demonstrations organized near the road. The farmers who live further away from the pavement road prefer that the demonstrations are conducted near their homes. Furthermore, 55 percent of the farmers, whose distance is over four kilometers, picked farmer-to-farmer as the most productive method.

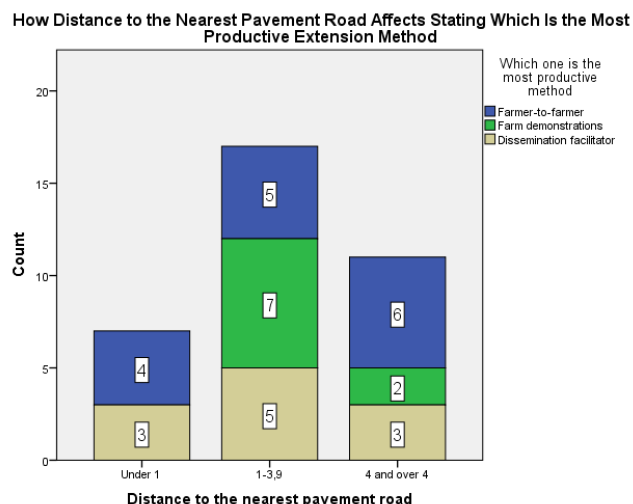


Figure 26 How distance to the nearest pavement road affects stating which is the most productive extension method (N=36).

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Figure 27 demonstrates how cow units affect stating which the most productive extension method is. Out of the farmers who had six or more than six cow units, 80 percent said that farmer-to-farmer is the most productive extension method.

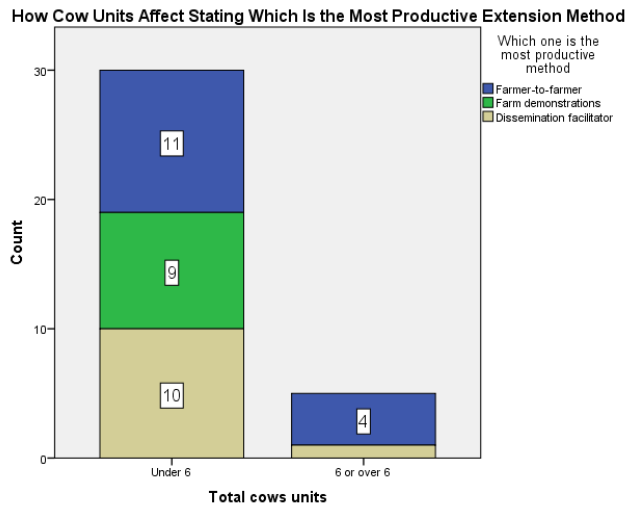


Figure 27 How cow units affect stating which is the most productive extension method (N=36).

Figure 28 shows how the source of hearing about developed innovations affects stating which is the most productive extension method. All of the farmers, who heard about the innovations through a neighbor, stated that farmer-to-farmer is the most productive method.

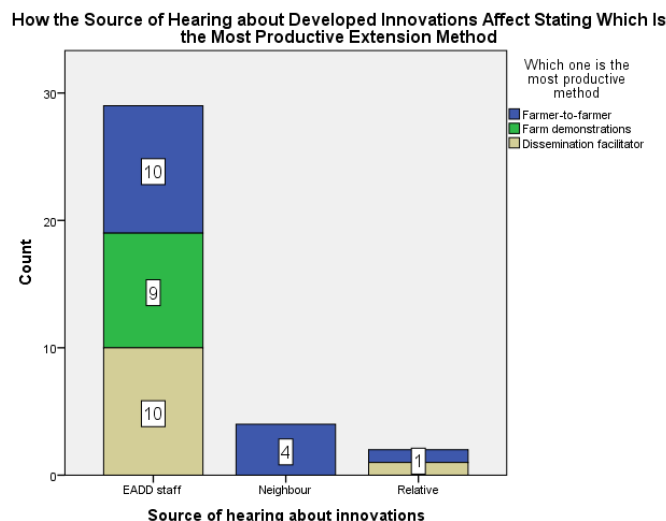


Figure 28 How the source of hearing about developed innovations affects stating which is the most productive extension method (N=36).

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65 percent of farmers who owned two to eight acres of land were male (Figure 29). However, all of the farmers who owned more than eight acres were female. The researcher speculates that this might be because females tend to do almost all of the work in the farms and at home while men are either at work or relaxing with their friends.

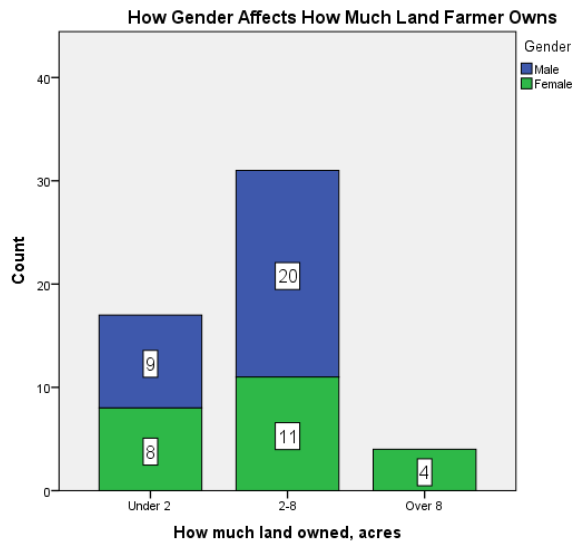


Figure 29 How gender affects how much land farmer owns (N=36).

Figure 30 reveals that 68 percent of farmers that rent land were male. Moreover, 73 percent of farmers who rent two to eight acres of land were male.

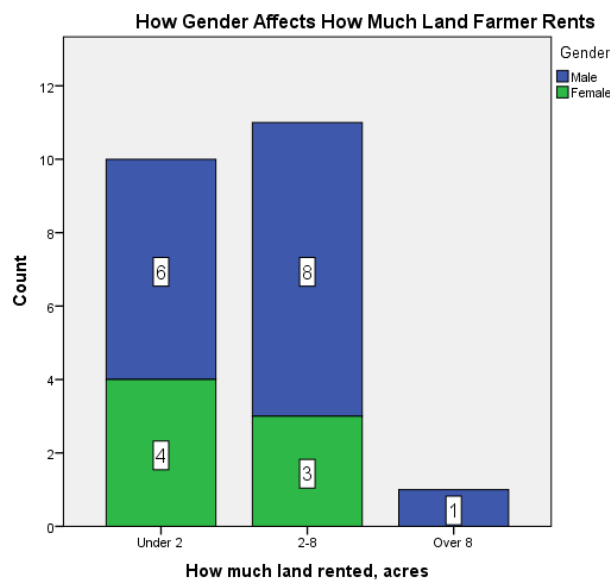


Figure 30 How gender affects how much land farmer rents (N=36).

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Figure 31 shows how gender affects how much land farmer possesses in total. This number includes both, land owned and land rented. Farmers, who possessed less than two acres of land, were 75 percent female. However, out of the farmers who possessed more than eight acres of land were 80 percent female. Subsequently, out of the farmers who possessed land between two to eight acres, were 67 percent male.

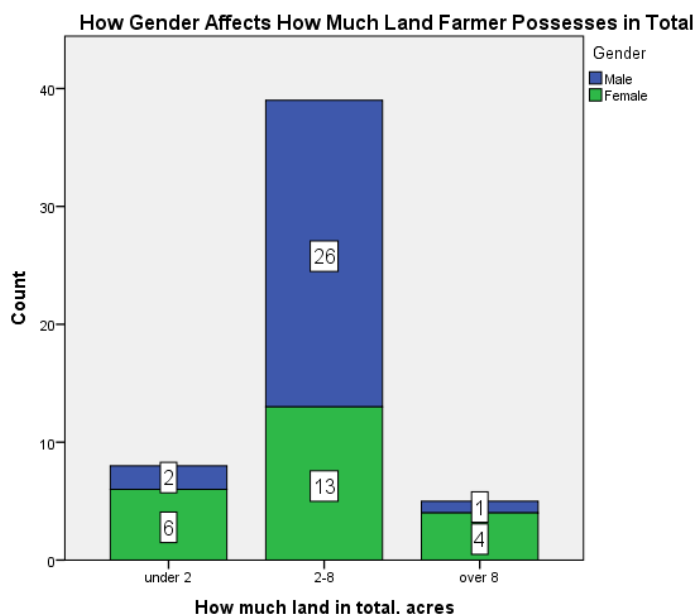


Figure 31 How gender affects how much land farmer possesses in total (N=36).

One might assume that gender affects how farmers used the extra income generated from the dairy business. However, according to this research, this assumption is not valid. Both females and males used the extra income for feeding family, education of children, buying better breed of livestock and improving their living standards.

10.2 Extension providers

Out of all 26 extension providers 18 answered the questionnaire (approximately 69 percent).

50 percent of the extension providers that answered the questionnaire came from Ol'kalou (Figure 32). Approximately 39 percent came from Muki and about 11 percent were working for The World Agroforestry Centre. The respondents mean age was 43.2 years with the youngest being 26 years and the oldest 62 years old.

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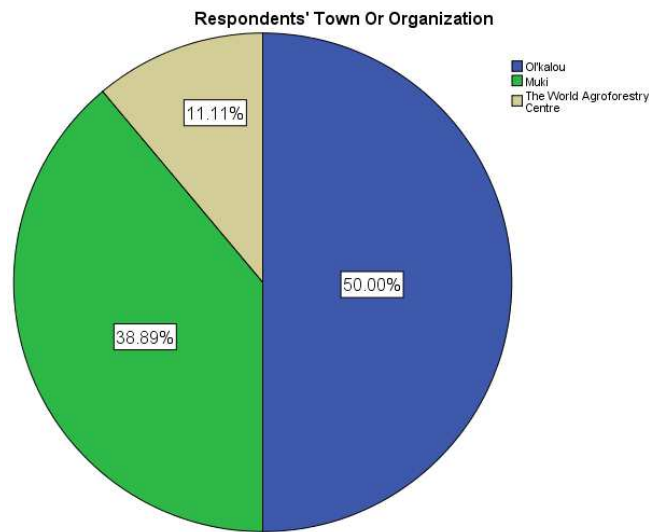


Figure 32 Respondents' town or organization (N=18).

About 89 percent of the respondents were male and only 11 percent were female (Figure 33).

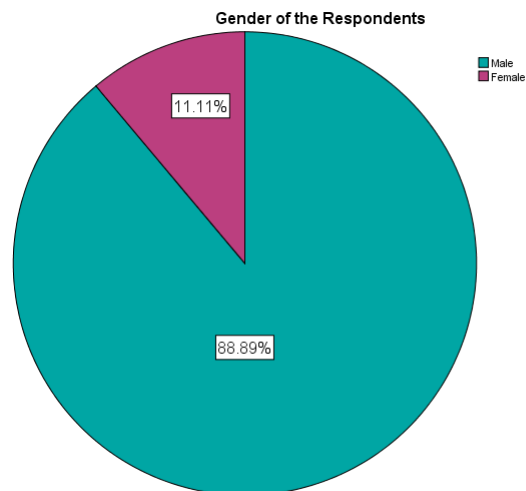


Figure 33 Gender of the respondents (N=18).

50 percent of the extension providers had a certificate and 31 percent of them held a diploma (Figure 34). 13 percent had a degree or master's degree. In addition to these, they had undergone also other professional training and additional courses. In figure 34, the least educated level is on the left and the highest educated is on the right. The extension providers were given the freedom of choosing as many options as applicable. Moreover, the mean number of work experience in the field of study was 16.22 years with the work experience ranging from one year to 35 years. Furthermore, they had worked in

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their present position 4.33 years on average, with the number ranging from one year to 20 years.

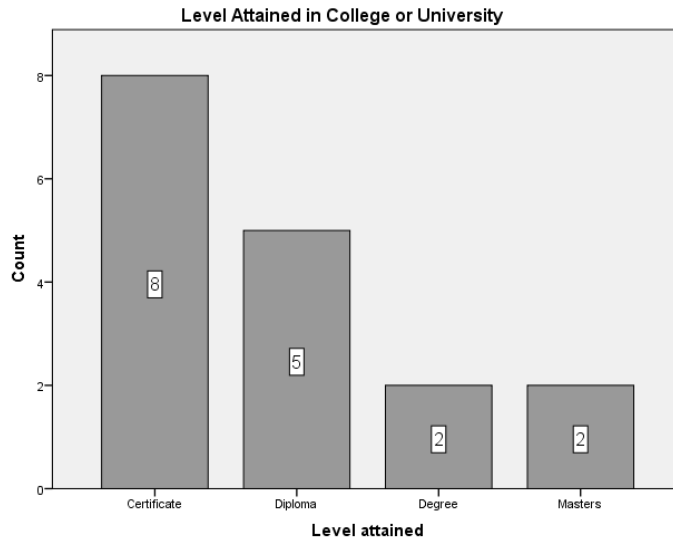


Figure 34 Level attained in college or university (N=16).

94 percent of the extension providers were familiar with all of the three extension methods (Figure 35). Only one individual (six percent) was familiar with none of them.

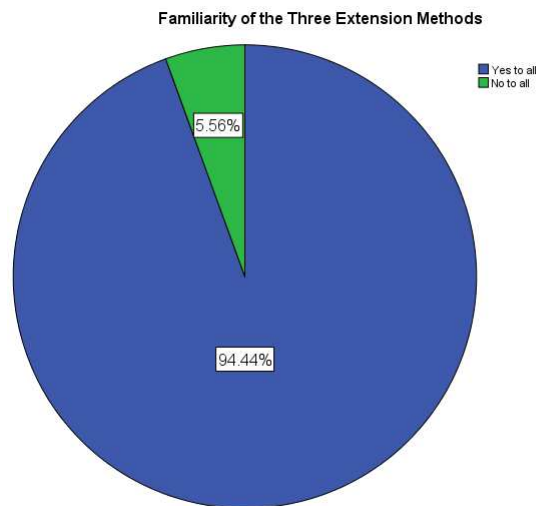


Figure 35 Familiarity of the three extension methods among extension providers (N=18).

When asking the extension providers whether or not the three extension methods are successful even nowadays or if they think the extension should be approached differently, approximately 76 percent stated that they are suc-

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cessful even today. However, some of these mentioned that some additions should be made within the extension methods, for example the use of computer for instance in record keeping is important. Another extension provider stated that these three methods are not enough. He is suggesting adding for example seminars.

24 percent said that the three extension methods should be changed. One extension provider reasoned that nowadays the extension workers are becoming fewer and fewer. Another respondent thought that vernacular radio programs have become very effective and they might overtake these three extension methods.

All advantages and disadvantages of the three extension methods are compiled in table 2. Many of the extension providers stated that dissemination facilitators are expensive. This is due to the fact that they are paid salaries. Many also mentioned that as dissemination facilitators are trained professionals, they might use technical terms that farmers do not understand which naturally causes problems. This might be due to the fact that dissemination facilitators are usually more educated than farmers. Some also pointed out that if the dissemination facilitator does not keep up with new information and technologies, he might end up giving outdated information to farmers. Thus, dissemination facilitators must always keep up with the latest information so he does not confuse the farmers.

The extension providers highlighted that a farmer trainer is not a technical professional, thus he might adopt matters wrongly. For example, if a farmer trainer has adopted wrongly how to use a specific machine and then teaches the wrong method to farmers, everyone has adopted the message wrongly. Therefore, the wrong method is fast repeated and then it is difficult to correct. The underlying problem might be that the farmer trainer is not committed enough and therefore does not care enough that he is giving out wrong information. Some extension providers also declared that farmer trainers are discouraged since they do not get paid from their work. If they were given salaries, farmer trainers might commit themselves more efficiently thus reducing giving out wrong information.

What comes to demonstrations, the extension providers emphasized that demonstrations is an expensive extension method. This is because farmer needs to pay for the demonstration materials himself and labor that is needed for the demonstration needs to be paid. Demonstration also takes a lot of time to prepare thus it is not time efficient since not many farmers can learn fully to the smallest detail in one session. The demonstrator needs to give detailed information step by step which cannot be heard by a large group of people. Only a few will hear the whole speech and get to try the matter being demonstrated by themselves. This is why the groups should be kept quite small. Therefore at least all the farmers have a chance of adopting the message.

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Table 2 Advantages and disadvantages of dissemination facilitator, farmer trainer, and demonstrations.

Dissemination facilitator		Farmer trainer		Demonstrations	
Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages
Cohesive and close contact between farmers and facilitators	Use of technical terms may lead farmers not to understand	Farmers understand one another so they can also learn from each other	Lack of experience between farmers	Many farmers learn together thus building closeness with demonstrators	Lack of technical skills by demonstrators
Large group of farmers are tackled at the same time	Expensive	Easy to recognize interested farmers	It is not time efficient	Farmers are able to justify what they have been trained on	Time consuming
Can identify research gaps	Tiresome because of traveling so much	It is easy to identify farmers' problems	Farmer trainer needs to be committed to his work so he will not end up giving wrong information	Not much education is needed	Demonstrations need a lot of money and time to prepare
Encourages creativity and innovation	Limited by scope and time	Farmer trainer encourages other farmers	There is competition hence a farmer may refuse to listen to his fellow farmer to avoid competition	They are result oriented and hence the farmers gain a lot of confidence in what they are doing	Farmers must have capital
Strengthens partnership with other partners	May not reach to very remote areas	Farmers get to know new techniques	If wrongly adopted the same errors are fast replicated	"Seeing is believing"	If wrongly adopted/demonstrated the impact may be hard to correct
Dissemination facilitator forms the foundation to extension work	It needs experienced person who is able to bring the group together	Farmers take other farmers as colleagues so it is easy to take up the technology	Not much exposed	Demonstrations help many farmers adopt the technology	Lack of demonstration material
Covers a large area	Their education level is too high composed to the farmers	Farmer trainer has tried the skills and adopted, therefore he has confidence	One can be a professional of only one line of work	Can bring change easily in people's lives	Labor is much needed
Farmers can exchange ideas about dairy farming	Sometimes his information is old, he needs to keep up with new things	It improves on better methods as it creates competition among farmers themselves therefore improving social economic activities in the area	They do not charge their services, so they are discouraged	Other farmers are able to learn and adopt	Unwilling farmers do not take care of the demo plots
They have a wide experience	It is not time efficient	They are available	It is expensive as farmer trainer needs to move from one place/farm to another	Effective as a learning method	Farmers have to buy the materials needed which is expensive

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			other		
Information given is technically proven and correct	Most of the time they are not available	They have a lot of experience of the area	There is no room for alternative method as one is only taught in one way	Practical	It can only accommodate a few individuals as one has to explain and elaborate every detail in each step
They identify local problems and address the right authorities urgently	They operate in area for a very short period and mostly their work ends with their exit	They adopt new technologies fast	Perception by the trainees	If well maintained can last for long	Uptake varies due to the place of the demonstration
They are able to trigger the market even where there is no demand	May have personal weaknesses negatively affecting extension messages	One can see what he has been taught	He trains only with what he knows and what he has in the farm	It involves the farmers	Farmers have to move, walk or travel far distances to see the demonstration site
It is cheap as there are no materials needed	The rate of adoption is low	They are able to mobilize farmers	Not many competent farmers available for the training of farmers	Easy to understand and emulate	The plots can be destroyed by natural calamities
Has quick results	Tedious	Cost effective like volunteers	The farmer might spend so much money which might not be recovered from his project		Uptake beyond the demo plot
Facilitator can do well if funded well	He can only do what he can and cover what he can	Farmer trainer is practical and action-oriented	Farmers may lack some technical information as opposed to a technical facilitator		
Facilitator is available all the time to the farmer	Dissemination facilitator needs transport	It is cheap	Farmers are too busy to attend trainings		
	He/she can be terminated before finishing his project	Scaling up is faster	Non-willingness of the farmers to become farmer trainers		
		Farmers share information with their neighbors	Creativity may be discouraged or not promoted		
			Covers only a small area		

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The extension providers were asked to describe a good combination of two to three extension methods. 75 percent of the respondents mentioned on farm demonstrations and 44 percent mentioned farmer trainer. Dissemination facilitator was also stated 44 percent among all the replies. Farm visits was another popular extension method because 38 percent of the respondents mentioned it. Therefore, according to this questionnaire, on farm demonstrations, farmer trainer and dissemination facilitator provide a good combination of extension methods.

Similar results were found in the question, where extension providers were asked to mention extension methods that are necessary for the extension to be successful. 80 percent of the respondents mentioned demonstrations, 40 percent mentioned farmer trainer and 33 percent stated dissemination facilitator. Moreover, 27 percent also mentioned farm visits. However, some respondents reminded that follow-up and fast dissemination are also vital for the extension to be successful. Furthermore, one respondent stated that the appropriate extension methods need to be chosen according to farming systems, agro ecology and social-cultural considerations.

The extension providers were asked to rank the three extension methods according to how frequently they use the methods. Farmer trainer was the most frequently used method with the respondents ranking it number one eight times. Demonstrations were ranked in the second place with the respondents ranking it number one four times. Dissemination facilitator came third and it was ranked number one five times.

The extension providers were asked to rank the three extension methods also according to which is the most effective method. Demonstrations were ranked in the first place with eight mentioning of it being number one. Farmer trainer received the second place with extension providers mentioning it six times as the number one. Dissemination facilitator came last and it was mentioned once as the number one.

The extension providers were requested to rank nine extension methods for their effectiveness in eventual adoption of new technologies by farmers (Table 3). On farm demonstrations were ranked in the first place, Farm visits came second and farmer trainer came third. It is also noticeable that the distribution of frequency of ranking a method as number one was mostly placed to one of the top three methods.

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Table 3 Ranking of extension methods for their effectiveness in eventual adoption of new technologies by farmers

Extension method	Rank	Frequency of No. 1
On farm demonstrations	1	8
Farm visits	2	3
Farmer trainer	3	4
Dissemination facilitator	4	0
Participatory training	4	1
Workshop/seminar	6	0
Bulletins/newspapers	7	0
Electronics/media	8	0
Administration barazas	9	0

The extension providers were asked to list innovations and new technology by farmers (Table 4 and 5). To mention some innovations, farmers have learned to mix fodder shrubs in the same plot as opposed to using just one species, farmers can now also construct zero grazing units and stores for feeding material. Farmers have also realized that by making cuts in the silage and placing it above the ground can save the silage from spoiling in wet regions.

What comes to new technology, farmers are using biogas to light their houses and to cook food. One farmer has also found a way to harvest water and save money. He has constructed water tanks underground by using plastic bags. This way he has saved about 85 000 Kenyan shillings as opposed to buying plastic water tank from Kentank. Another farmer learned how he can build a house using thatched grass and use the house as a bee apiary to collect honey.

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Table 4 Innovations for dissemination facilitator, farmer trainer and demonstrations.

Innovations for dissemination facilitator	Innovations for farmer trainer	Innovation for demonstrations
Urea treatment of crop residue	Fodder conservation	Creation of competition among the farmers for those who have done well
Development of simple machine for drilling carrot seeds	Use of locally available materials	Use of alternative locally available supplements rather than manufactured ones
Milk hygiene	Construction of feed stores, zero grazing units and fodder establishment	Easy machines for example chuff cutters which help to cut the forage to the animals
Disease control	Calf rearing, for example feeding using porridge	Establishment of fodder trees
AI (good breeding programs)	Farm planning	Pasture management
Feeding management/conservation	Use of timber frames combined with prhy timber to make water trooughs for zero-grazed cows (cheaper)	Improved silage making above of the ground in wet regions by use of cuts in the silage
By use of brochures with pictures farmers are able to follow instructions and improve	Farmers learned from each other how to make mobile feeding so it can be moved from one paddock to another by using gunny bags	Different farm outputs are displayed in the warehouses and manured creating a place where other farmers can learn
Silage making to be used during dry season		Machete fixed between two poles to ease chopping of the fodder and making it more efficient
Mixing fodder shrubs of different species on the same plot as opposed to pure stands		
Through the formed groups the farmers can now access loans and buy good breed of cows		

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Table 5 New technologies for dissemination facilitator, farmer trainer and demonstrations.

New technologies for dissemination facilitator	New technologies for farmer trainer	New technologies for demonstrations
New methods of farming	Artificial insemination	Use of modern ways to control and test mastitis in dairy cattle
Computers for data collections	Vaccinations for livestock	Use of milking machines
Silage making (fodder conservation)	Keeping of dairy records of the cows	Making a silage and hay which enables farmers to produce milk throughout the year
On farm livestock feeds production, preservation and home-made rations	Water harvesting by the use of shallow water pans	Feed formulation using on farm produced materials for example maize
Use of mobile phones & SMSs to make communicating easier	Numbering animals by ear tags	Making a tube silage
High quality fodders	Use of electronic media	Farmers learned how to plant fodder crops from demonstration plots established at farmer trainers farms
Use of brush cutters and chuff cutters for cutting animal fodder into small pieces	Using hay box for making a hay bale instead of using an expensive bailing machine	High quality fodders
Breeding though imported semen	Calf feeding and rearing	Dairy cattle de-worming
Use of vernacular radio stations	Production of fodder seeds and seedlings for sale to other farmers as a business/service	Water conservation
Hay making	Establishment of zero grazing units to improve feed management	Lucern establishment
Improved feeding systems	Some farmers have produced CDs which can be bought	Availability of brochures showing every step on the farm
Biogas technology for lighting and cooking	Printing of reading materials for farmers to read during their free time	Construction of a thatched grass house for use as a bee apiary to get honey
	Making simple and affordable water harvesting method - farmer learned from other farmers how to make a simplified water harvesting underground tanks which basic requirement is to dig a pit and cover it with polythene bags. A tank that can host over 15 000 liters of water only cost 15 000 Kenyan shillings while buying the same from Kentank will cost around 100 000 Kenyan shillings	Employing some personnel to move around advertising on the date of demonstration and what they are demonstrating that day as well as its benefits

11 DISCUSSION AND RECOMMENDATIONS

According to the questionnaires, farmers' and extension providers' opinion of what is the most effective extension method of farmer-to-farmer, demonstrations and dissemination facilitator differ from each other. The farmers stated that farmer-to-farmer is the most effective method of these three. However, the extension providers thought that demonstrations is the most effective method. Subsequently, according to the survey, it may be impossible to state only one extension method to be the most effective method. This is why because according to this research, there are five variables affecting the opinion about which of the three methods is the most effective one.

Because of what is stated above, the researcher cannot recommend one extension method to be used in dissemination of research findings and innovations to farmers. However, extension staff may find good clues about picking an appropriate extension method for each farmer group by reading what is said about variables affecting which extension method is stated to be the most effective one.

According to the survey, age affects which of the three extension method farmers said to be the most productive. The survey suggests that if a farmer is 40 years old or older, most likely he prefers farmer-to-farmer method. Farmers aged from 30 to 39 most likely prefer either dissemination facilitator or demonstrations. Furthermore, farmers younger than 20 years old could prefer any of the three methods.

The survey is also implying that gender also has a saying about which of the three extension methods the farmer states is the most productive one. Females are most likely to say that farmer-to-farmer is the most productive method. Moreover, farmers who declare demonstrations or dissemination facilitator as the most productive method of these three are likely to be males.

Perhaps unexpectedly, the distance between the farmer's home and the nearest pavement road also affects farmer's opinion about which is the most productive extension method. Farmers, whose above mentioned distance is less than one kilometer, are unlikely to pick demonstrations as the most productive method. Moreover, a farmer whose distance between home and the nearest pavement road is more than four kilometers is expected to pick farmer-to-farmer as the most productive method.

The survey is also proposing that cow units affect the farmer's opinion about which is the most productive method. A farmer who has more than six cow units probably picks farmer-to-farmer as the most productive extension method.

According to the survey, the source of hearing about innovations developed by other farmers also affect which extension method the farmer is likely to

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pick as the most productive method. Farmer, who heard about the innovations from a neighbor, is likely to state that farmer-to-farmer is the most productive method.

According to the questionnaire, females are likely to own bigger pieces of land than males. Males are likely to own land between two to eight acres and males are also the ones who are expected to rent land. Females are most likely to be in possession of land which is less than two acres. On contrast, females are also expected to be in possession of pieces of land which are more than eight acres.

To conclude, extension staff could pick farmer-to-farmer method for farmer groups where most of the members

- are 40 year-olds and above
- are female
- have more than six cow units

and

- the distance from their homes to the nearest pavement road is more than four kilometers
- if they have heard about innovations from a neighbor.

If most of the members are within the age group between 30 to 39 years old and male, the extension staff may pick dissemination facilitator as the extension method to be used.

The reason why the farmers stated that farmer-to-farmer is the most productive method could be simple. The farmer trainer is a fellow farmer hence it might be that the farmer trainer and other farmers understand each other better than for example farmers and a dissemination facilitator. The dissemination facilitator is likely to be more educated and live his life in a different environment than the farmer. Therefore, it might be said that the farmer trainer and the other farmers are one the same wavelength with each other.

The explanation of why the extension providers said that demonstrations is the most effective method could be that they find it so practical. They state that demonstrations are simple and very easy to understand therefore many farmers adopt extension messages through demonstrations. Even in table 3 the extension providers ranked demonstrations as the first method according to the effectiveness for eventual adoption of new technologies by farmers. This is also an indication that the rate of adoption is probably the highest in demonstrations among farmers. These might be the reasons why the extension providers picked demonstration as the most effective extension method.

Four out of 17 extension providers brought up that the three extension methods should be changed because the world has changed. In addition, many of the extension providers who stated that the three extension methods are still

successful even nowadays said that the extension methods should still be added something, for instance computer use. Altogether, this is significant evidence that something needs to be done to the three extension methods. This can be achieved by adding trainings to the farmers on for example computer use and information and communication technology (ICT). This might help the farmers to come to the 21st century where for example cell phones are in everyday use. It would also assist the farmers in managing their farms better by for instance recordkeeping.

The results of the research may well be utilized by EADD. The research gave relevant information about the variables which affect the opinion about which is the most productive method among farmers. It also helped identify innovations invented by the farmers and new technology that has been introduced in the farms since EADD started its activities. The study also revealed advantages and disadvantages of each of the three extension methods. The research also cleared how land is owned and rented based on gender among the farmers.

12 EVALUATION OF THE THESIS PROCESS

Overall, the thesis process was a real learning experience, not only because of the thesis but also for Kenyan culture. Searching for sources for the review of the literature ended up being quite difficult. There are numerous sources on the Internet; however, books were also needed to be used. ICRAF library provided the books, however, when there was need for more information that was the most difficult part. There were no books in the local library relating to this field, and actually, in order to get in to the library, was a complicated process here in Kenya.

Getting sources from the Internet was also quite a task. The Internet speeds here are really slow, and the computer might load one single page for over 15 minutes. The speed is faster in the Internet cafés but using them is quite risky, especially, if someone wants to connect their flash disk into the computer at the Internet café. They are riddled with computer viruses and one might end up losing some files from the flash disk.

Getting replies to e-mails required a lot of patience. Sometimes it took almost two months to get a reply even though reminders were sent through e-mail and SMS. What comes to getting some of the filled questionnaires through e-mail, it ended up taking really long. Somehow, a date was never set until which the respondents were supposed to send the filled questionnaire. This cost the researcher months until the commentator of the thesis stepped in and told to stop waiting and start analyzing the results. If a date was set, it would have saved the researcher a lot of time.

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Testing of the questionnaires was never done. This was due to the fact that the villages where the questionnaires were filled are really remote and impossible to reach alone. It would have required someone to go with, and overall, the process would have required money that the researcher did not have. However, it should have been done, since one of the questions in the farmers' questionnaire had to be eliminated because the respondents did not understand what was supposed to be answered to the question. However, this mistake was supposed to be corrected because the researcher intended to go through the questions one by one with the person who translated the questions to the farmers when the questionnaires were filled. However, the person was hours late and the time the person arrived it was already time to go meet the DMGs. Therefore, there was no time to go through the questions.

Overall, the most challenging part of the thesis process was analyzing the data with SPSS. The researcher had never used the program before therefore, had to learn how to use it first. However, with the help of one person in particular, the process was done quickly. Although it was the most challenging part of the thesis, it was also the most rewarding part as well. However, the researcher learned that groups, for example age groups should be developed directly to the questionnaire. That way, the data can be analyzed more easily because the groups already exist and one does not have to create them.

Communicating with the supervisor of the thesis was quite difficult through e-mail. If questions were needed to be answered, sometimes it took days, weeks or even months to get the answer from Finland. Generally, it is hard to communicate with someone with e-mails on matters like a thesis. It would have been more effective and efficient to ask questions face-to-face.

Despite the difficulties, the survey was successful. Even though it could not recommend one extension method to be used in disseminating research findings and innovations to farmers, it concluded that this might even be an impossible job.

A representative of the commissioning organization, Mrs. Esther Karanja said that the thesis successfully compares the most commonly used extension methods in Ol'kalou and Muki District. Therefore, the thesis is an easy reference for researchers who are interested in using the most effective extension methods to quickly disseminate information to farmers. Mrs. Karanja stated that the results of the research are useful to any researcher who is interested in knowing the most important extension methods used in the area where the research was conducted. She also declared that the survey clearly states the advantages and disadvantages of the three extension methods which are useful to the researchers when they are considering an appropriate extension method to be used in disseminating various technologies to the farmers.

13 SUCCESS STORIES

Through the following success stories everyone can read how EADD/ICRAF has made a difference in people's lives. This might be a proof that development projects are sometimes successful, and they have the power to increase people's living standards and livelihoods. (Karanja, electronic mail 27.9.2012.)

13.1 Stephan Muturi

Stephan Muturi is a farmer in Ndunyu Njeru in South Kinangop District of Nyandarua County. Before becoming a farmer, Stephan was a junior civil servant and after that, a motor vehicle spares attendant where on average he earned about 10 000 Kenyan shillings (equivalent to about 100 Euros) per month. He switched to farming in 1997 and now he owns 10 acres of land of which seven acres is cultivated. He has three dairy cows and two heifers. He has also planted a variety of forages for feeding his livestock. These include Lucerne, purple vetch, sweet potato vines and Napier grass.

Stephan gets about 35 liters of milk per day. The income earned from his dairy business adds up to about 21 000 Kenyan shillings (about 210 Euros) per month which is double the amount he used to earn from being a motor vehicle spares attendant. Moreover, he has a grass cutter that he leases out to other farmers at 300 Kenyan shillings (about three Euros) per hour to harvest Lucerne and grass for making hay. He also earns extra income from training other farmers. He trains about 200 farmers per month. He charges about 100 Kenyan shillings (about one Euro) per farmer per session earning him additional 20 000 Kenyan shillings (about 200 Euros) per month. The farmers who had undergone his training have improved their dairy production from an average of five to 10 liters per day. The farmers plan to improve the amount and the quality of the milk which they hope to achieve by improving the feeding and breeding.

With the income Stephan gets, he has constructed a water pan, purchased a grass cutter and constructed a zero-grazing unit for his dairy cows. The profits have also helped to provide for his family and educate his seven children.

Stephan also uses many innovations, for example the water pan he has built. It stores water when it rains, and then he can use the water in the dry seasons for irrigation and for drinking water for his cows. The water pan cost him about 15 000 Kenyan shillings (about 150 Euros) which is much cheaper than buying a plastic water tank with about 100 000 Kenyan shillings (1 000 Euros). Stephan's innovations have attracted neighboring DMGs to copy the technologies. Stephan has even helped five other farmers to build similar water harvesting system to their farms. (Karanja, electronic mail 27.9.2012.)

13.2 Lucy Wanjiku

Lucy is a 50 year-old small-scale farmer who is married and has five children. In her five-acre land in Lari, Kiambu County, she keeps three dairy cows and two heifers. On the same piece of land, she grows subsistence crops and tea as a cash crop. The home stead, tea bushes and food crops take almost four acres, therefore leaving just an acre for grazing and fodder production. Lucy and her husband learned about the benefits of the fodder shrubs from ICRAF and has been a successful dairy farmer.

Lucy and her husband have a fodder shrub nursery where they propagate Calliandra and Tricandra seedlings for sale. They have now invested the profits in a water storage tank costing 25 000 Kenyan shillings (approximately 250 Euros). The water is now helping to produce more seedlings during the dry seasons, supplying drinking water for the livestock and the water is also used for domestic consumption. The family used to fetch water from a river which was about two kilometers away. Therefore, time is saved for the family and it is now spent on other productive economic and social activities. Lucy and her husband have also been extending the knowledge to the neighbors and beyond. However, even with limited production and marketing capabilities the propagation of the fodder shrubs remains as a major enterprise for the family. (Karanja, electronic mail 27.9.2012.)

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Appendix 1

QUESTIONNAIRE TO THE FARMERS

QUESTIONNAIRE TO THE FARMERS

This questionnaire has been developed to get data for a bachelor's thesis which is written by a Finnish student studying Sustainable Development in HAMK University of Applied Sciences in Finland. Your answers will be of a great value to the student. The student thanks you for your replies. Asante sana!

A: BACKGROUND INFORMATION

Date: _____

Please record the following identification information.

A.1.	Name of respondent	
A.2.	District	
A.3.	EADD hub	
A.4.	Division	
A.5.	Village	

B: DEMOGRAPHICS

S/N	Characteristic	Respondent
B.1.	Status of the respondent: 1 = Farmer- husband, 2 = farmer-wife, 3 = farmer-son, 4 =farmer- daughter, 5 = farm worker, 6 = Other, specify	[]
B.2.	Gender: 1 = male, 2 = female	[]
B.3.	Type of household: 1 = male headed, 2 = female headed	[]
B.4.	Age of respondent (Years)	[]
B.5.	Total number of years of schooling (Years)	[]
B.6.	For how long have you been a farmer? (Years)	[]
B.7.	How much land do you own? (Acres)	[]
B.8.	How much land do you rent? (Acres)	[]
B.9.	For how long have you rented it? 1 = Months, 2 = Years. Please specify	[]
B.10	How much rent do you pay for the land (per acre)? (Ksh.)	[]
B.11	What is the distance to the nearest road? 1 = meters 2 = km. Please specify	[]
B.12	Do you have adequate access to water? (Yes / No)	[]
B.13	What is your main source of water?	[]
B.14	What is the distance to the main source of water (km, meters)	[]
B.15	What is your main farming enterprise(s)? (e.g. food crops, cash crops, poultry, dairy, etc.)	[]
B.16	What are the three (3) main crops you are growing? Please rank in order of importance. The most important crop is _____ The 2 nd important crop is _____ The 3 rd important crop is _____	[] [] []
B.17	Do you keep cattle? (Yes / No)	[]
B.18	If yes, how many? (1 = dairy cows, 2 = heifers, 3 = bulls, 4 = calves)	[]

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C: CROP PRODUCTION AND ACREAGE

C.1. Please indicate the acreage of each crop in your farm.

Food Crops	Acreage	Cash Crops	Acreage	Pastures and Fodder crops	Acreage
1 Maize	[]	15 Tea	[]	23 Desmodium	[]
2 Beans	[]	16 Coffee	[]	24 Fallow and natural pasture	[]
3 Sorghum/finger	[]	17 Sugar cane (sugar)	[]	25 Napier grass	[]
4 Bananas	[]	18 Sugar cane (juice)	[]	26 Planted pasture i.e. Rhodes	[]
5 Kales (sukuma wiki)	[]	19 Sim sim	[]	27 Thatch grass	[]
6 Sweet potatoes	[]	20 Ground nuts	[]	28 Lucerne	[]
7 Cow peas	[]	21 Fruit/tree crops	[]	30 Fodder trees	[]
8 Cassava	[]	22 Other	[]	Calliandra	[]
9 Onions/tomatoes	[]		[]	Sesbania sesban	[]
10 Pigeon peas	[]		[]	Leucaena	[]
11 Cabbage/carrots	[]		[]	Glicicidia	[]
12 Paw paw	[]		[]	31 Other	[]
13 Local vegetables	[]		[]		[]
14 other	[]		[]		[]

C.2. Do you preserve fodder crops for dry season feeding? Y N

C.3. If yes, do you use these following forms of preserving? If you preserve in other ways, please specify.

Hay bale: Y N

Silage: Y N

If yes, what kind of silage: with preservative/acid or natural fermentation? (please circle)

Others, specify _____

D: EXTENSION ACTIVITIES

	Question	Respondent
D.1.	When did you start participating in EADD activities?	[]
D.2.	From where did you first find out about EADD / extension practices in your area? 1 = Extension staff (EADD/Livestock/Agriculture) 2 = Relation – neighbor, relative, etc. 3 = Mass media – radio, television 4 = Print media – newspapers, bulletins, fliers, etc. 5 = Field days, exhibitions, trade fairs 6 = Other, specify _____	[]
D.3.	What were the reasons that made you get involved in EADD / extension practices? 1 = Registered member /shareholder / milk supplier in EADD hub 2 = Access to knowledge 3 = Improve dairy productivity 4 = Markets for dairy and dairy products – milk, cattle	[]

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5 = Field days, tours and exchange visits	
6 = Other, specify _____	

D.4. Who are your major extension providers in dairy milk production, and how often do they visit your farm?

Name of extension provider	Frequency of farm visit			
	Weekly	Fortnightly	Monthly	Occasionally

D.5. If you had the opportunity to choose one extension provider with whom you would like to cooperate or get advise from, whom would you choose and why?

D.6. Are you familiar with the following extension methods by extension providers in your area?

- Dissemination facilitators approach / methodology Y N
- Farmer trainers (farmer-to-farmer) Y N
- Farm demonstrations approach Y N

D.7. If yes, which particular method has helped you most improve your dairy business (what is the most useful method)?

D.8. Please indicate your dairy business improvements, for example increase in dairy milk production.

	Without Project	With Project
Increase in number of milk cows		
Dairy business improvement		
Dairy business income		
Increase in milk production		

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D.9. What are the constraints that may be hindering you from implementing fully the production technologies being promoted by EADD in your area?

D.10. What would you consider as the major sources of production technologies (innovation) for your dairy business?

Source	Rank in order of importance (1-10)
• Own knowledge	<input type="checkbox"/>
• Farmer trainers.....	<input type="checkbox"/>
• Agro-vet stockist.....	<input type="checkbox"/>
• Dissemination facilitators.....	<input type="checkbox"/>
• Farm demonstrators.....	<input type="checkbox"/>
• Training workshop / seminar.....	<input type="checkbox"/>
• Newspapers / extension bulletins.....	<input type="checkbox"/>
• Milk processors / breeders.....	<input type="checkbox"/>
• Radio / TV and other electronic media.....	<input type="checkbox"/>
• Ministry of livestock extension staff	<input type="checkbox"/>

D.11. The income generated from the dairy activity is used mainly for: (choose one)

- Education of children.....
- Paying medical bills
- Feed family.....
- Improve water supply / sanitation.....
- Construct permanent house.....
- Buy better breed of livestock
- Others.....

E: INNOVATIONS AND NEW TECHNOLOGY

E.1. What innovations have you gotten and what new technology has come to your farm since EADD started? Please describe your innovations and new technology.

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E.2. If farmers around you have developed innovations, how did you first find out about these innovations?

- a) EADD staff
- b) Neighbor
- c) Relative
- d) Other, specify _____

F: FREE COMMENTS

F.1. You may give your free comments about the questionnaire or more information about the subject of study.

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Appendix 2

QUESTIONNAIRE TO THE EXTENSION PROVIDERS

QUESTIONNAIRE TO THE EXTENSION PROVIDERS

This questionnaire has been developed to get data for a bachelor's thesis which is written by a Finnish student studying Sustainable Development in HAMK University of Applied Sciences in Finland. Your answers will be of a great value to the student. You may comment (or explain your answer) each question to the back of the answering sheet (or give your comments in the e-mail as you send it back to the student). The student thanks you for your replies. Asante sana!

A: BACKGROUND INFORMATION Date: _____

A.1. Name? _____ Age? _____

Gender? Female / Male (circle the appropriate option)

A.2. What is your education background?

Name of your high school: _____

Name of your college/university: _____

Level attained: Degree / Masters / Diploma / Certificate (circle the appropriate option; you may circle more than one if appropriate)

Other professional training: _____

A.3. Who is your employer, what is your job description and what is your job title/position?

A.4. How many years of work experience do you have in this field?

A.5. How long have you worked in your present position?

B: EXTENSION METHODS

B.1. Are you familiar with the following extension methods?

1. Dissemination facilitator	<input type="checkbox"/> Y	<input type="checkbox"/> N
2. Farmer trainer	<input type="checkbox"/> Y	<input type="checkbox"/> N
3. Demonstrations	<input type="checkbox"/> Y	<input type="checkbox"/> N

1

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B.2. If you answered "yes" to the previous question, please place a number 1 in front of the extension method you use most frequently out of these three extension methods. Place a number 3 in front of the extension method you use less frequently.

- ___ Dissemination facilitator
- ___ Farmer trainer
- ___ Demonstrations

B.3. Please place a number 1 in front of the extension method you think is the most effective one. Place a number 3 in front of the extension method which you think is the less effective.

- ___ Dissemination facilitator
- ___ Farmer trainer
- ___ Demonstrations

Please justify your choices. _____

B.4. In your opinion, are these three mentioned extension methods known to be successful even nowadays or do you think the world has changed over time and people should adopt new ways of approaching extension as opposed to approaching it in the past? If yes, please give an example of a situation which needs a different kind of dissemination method.

B.5. According to your experience, please give advantages and disadvantages of each of the following extension methods.

Dissemination facilitator:

Advantages: _____

Disadvantages: _____

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Farmer trainer:

Advantages: _____

Disadvantages: _____

Demonstrations:

Advantages: _____

Disadvantages: _____

B.6. Please rank the following methods for their effectiveness in eventual adoption of new technologies by farmers.

<u>Method</u>	<u>Rank 1-9</u>
1) On farm demonstrations.....	<input type="checkbox"/>
2) Participatory training.....	<input type="checkbox"/>
3) Farm visits.....	<input type="checkbox"/>
4) Workshop / seminars.....	<input type="checkbox"/>
5) Administration barazas.....	<input type="checkbox"/>
6) Bulletins / Newspapers	<input type="checkbox"/>
7) Electronics / Media	<input type="checkbox"/>
8) Farmer trainers (farmer-to-farmer).....	<input type="checkbox"/>
9) Dissemination facilitators.....	<input type="checkbox"/>

B.7. According to your experience, can you please describe a good combination of two to three different extension methods?

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B.8. According to your experience, what extension methods are necessary for the extension to be successful?

C: FARMER INNOVATION

C.1. Innovation as a word tends to indicate that farmers improve on the basic extension messages to make them more user-friendly. In the case of the three extension methods mentioned below, please list what you consider as a farmer innovation which was created by using the appropriate extension method and that has made the extension message more adoptable to the farmers.

Dissemination facilitator:

Farmer innovations: _____

Farmer trainer:

Farmer innovations: _____

Demonstrations:

Farmer innovations: _____

D: NEW TECHNOLOGY

D.1. Unlike an innovation, new technology is not recently invented; it has been introduced in some other parts of the world even though there is not any of it available in your village. According to your experience, what new technologies have farmers adopted by using the three extension methods mentioned below.

Dissemination facilitator:

New technologies: _____

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Farmer trainer:

New technologies: _____

Demonstrations:

New technologies: _____

E: FREE COMMENTS

E.1. You may give your free comments about the questionnaire or additional information about the subject.

