

**USING PARTICIPATORY VIDEO MATERIALS FOR LEARNING AND  
DISSEMINATING PUSH-PULL TECHNOLOGY AMONG SMALLHOLDER  
FARMERS IN SELECTED DISTRICTS IN WESTERN KENYA**

**BY**

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## DECLARATION

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## **DEDICATION**

I dedicate this work to my parents Patrick Olumola and Doreen Nakhumwa for their endless love, support and encouragement throughout my life.

### **ABSTRACT**

Push-Pull Technology (PPT) has been promoted as innovative and effective agriculture technology of addressing yield losses in the maize fields of resource-poor famers due to Striga weeds and Stem borers' infestation in western Kenya. Being a knowledge

intensive technology, learning and uptake of push-pull technology among the smallholder farmers has been relatively slow. Farmers need to have considerable knowledge level for them to learn and adopt it. The purpose of the study was to investigate effectiveness of using participatory video materials in learning and disseminating push-pull technology among farmers. The study sought to compare farmers` knowledge level before and after exposure to print and video content; investigate the social-cultural factors that influence farmers` learning abilities; establish ways of sharing and disseminating video material to reach more farmers. To achieve these objectives, 240 push-pull farmers were sampled purposively and randomly from Bungoma, Kisumu West, Vihiga and Suba Districts. The study adopted a quasi-experimental research design to compare knowledge levels from three treatment groups including: farmers exposed to print materials; farmers exposed to participatory video and farmers exposed to both print and participatory video. Qualitative and quantitative data was collected using structured questionnaires, interview schedules, focused group discussion and document review. Data computation and analysis were done using Statistical Package for Social Sciences (SPSS). One-way ANOVA analysis depicted significant high knowledge and understanding of push-pull technology compared to the treatment that received print material only. The researcher concludes that participatory video is an effective too for farmers in learning knowledge-intensive technologies such as push-pull technology and therefore confirm the findings of notable researchers in this field, that video is a good instruction medium for teaching varying agricultural subjects among children, youth and the elderly. The researcher recommends that production of educational video targeting local population should have farmers participate in the production process, as this is likely to encourage farmers` to embrace the end product, particularly because most of them share social-economic and cultural backgrounds hence increasing chances of learning and adopting improved technologies.

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DG	Digital Green
FAO	Food Agriculture Organization
FFS	Farmer Field School
GoK	Government of Kenya
HIV/AIDS	Human Immunodeficiency Virus Infection / Acquired
ICIPE	International Centre of Insect Physiology and Ecology
ICT	Information Communication Technology
IFPRI	International Food Policy Research Institution
	Immunodeficiency Syndrome
IPM	Integrated Pest Management
KARI	Kenya Agriculture Research Institute
KALRO	Kenya Agricultural and Livestock Research Organization
KBC	Kenya Broadcasting Cooperation
NGOs	Non-Governmental Organizations

PPT	Push-Pull Technology ( <a href="http://www.push-pull.net">www.push-pull.net</a> )
PV	Participatory Video
SPSS	Statistical Package for Social Sciences

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background Information

Implementing scientific research findings as practical solutions is a challenging task. One of the challenges is providing end user with access to information and uptake of new technologies through effective dissemination pathways that are crucial in optimizing the adoption process especially of 'knowledge-based' innovations ( Padel 2001). Being a knowledge intensive technology, the potential uptake of PPT would be limited, especially among the smallholder farmers, if appropriate dissemination pathways are not used to ensure its effective transfer.

Access to technology information is important in achieving agricultural sustainability among the resource-poor smallholder farmers in Kenya. Majority of farmers from developing nations have not been properly reached by agricultural extension services and lack access to technology information (Ehien, Oladele, Ogunfiditimi, 2004).

Several information dissemination pathways have been adopted by several agricultural research organizations to enhance technology dissemination and adoption among smallholder farmers. (Khanetal., 2008a; Amudavietal.,2009a,b) reports on the extensive use of Farmer Field Schools (FFS), Field Days (FD), Farmer Teachers (FT),radio programmes, public gatherings (Chief Barazas) ,print media, and other technologies.

Despite extensive use of these improved innovations`/ technology dissemination pathways, uptake of knowledge of new innovations have been relatively low (Damisa & Igonoh, 2007). Agricultural stakeholders are in constant search for information in order to

increase production and generate income. However, acquiring such information requires appropriate communication mechanisms from the sources to the primary consumers of that information.

In this study, the researcher explores the effectiveness of using videos showing local people in their local fields speaking local languages to communicate Push-Pull Technology (PPT). Participatory video (PV) offer a great opportunity for smallholder farmers to record their knowledge and experiences in agriculture.

A 2010 study by Van Mele et al., establish that 78% of development organizations, including non-government organizations (NGOs), research institute and universities use video to train farmers. Until recently, however, video training in rural areas required a generator, a DVD player, projector and other audio-visual equipment. Farmers often had to meet in central areas to watch them. These characteristics pose serious limitations to those who live in the countryside with poor roads and where there is no electricity. In the past few years, small battery-powered pocket projectors such as pico projectors have been developed and tested to mitigate these difficulties.

According to a World Bank (2004) report, indigenous knowledge and local initiatives are usually documented and disseminated by outsiders who make their own interpretation in the process while sidelining the views and contributions of the locals themselves . Ramirez and Stuart (1994) reported that farmers must control their own learning and be able to access information according to specific needs, times and means. Hence, this study seeks to investigate the effectiveness of using participatory video in learning PPT.

## What is Push-Pull Technology?

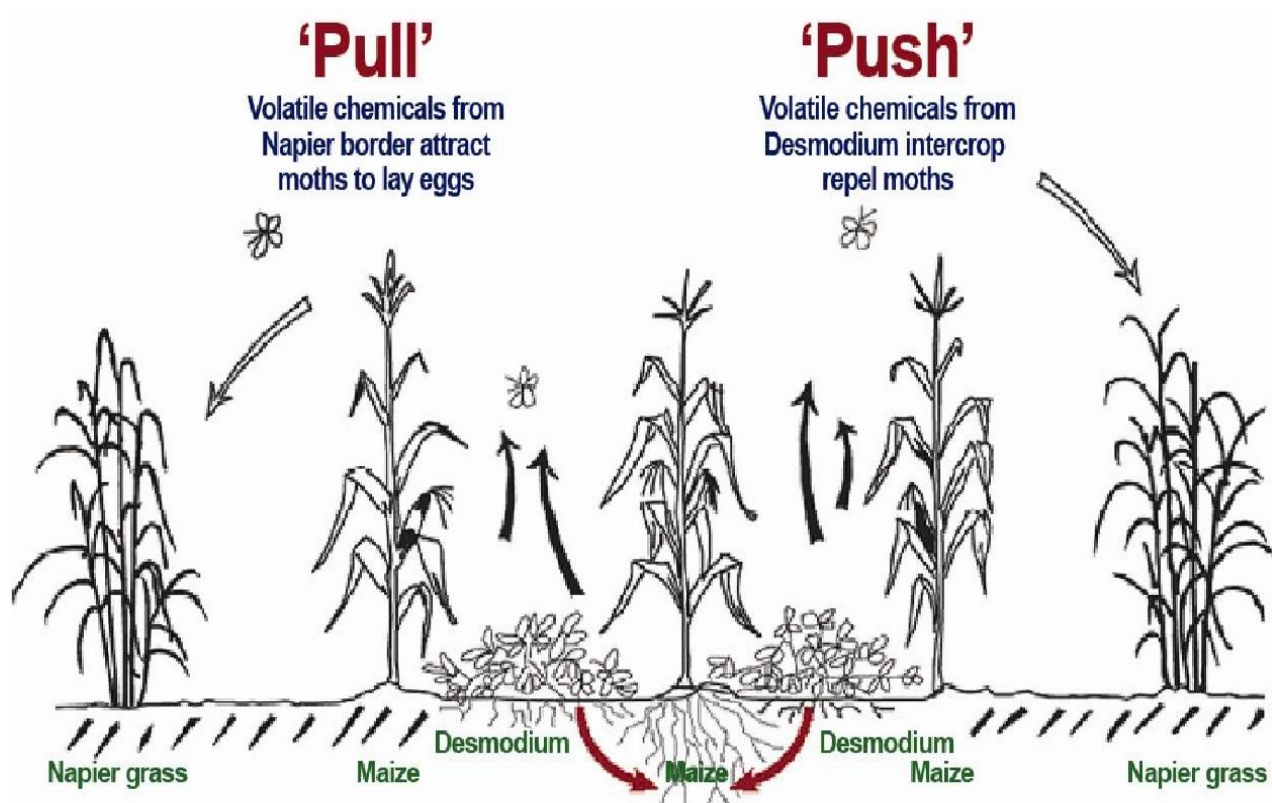


Figure 1: A pictorial demonstration of how push-pull technology works.

Source: [www.icipe.int](http://www.icipe.int)



**Figure 2: A woman holding a Stemborer infested maize.**

Source: [www.icipe.int](http://www.icipe.int)



**Figure 3: A well maintained push-pull plot.**



Source: [www.icipe.int](http://www.icipe.int)

In 1997, research scientists from the International Center of Insect Physiology and Ecology (icipe), the Rothamsted Research Institute, UK and the Kenya Agricultural and Livestock Research Organization (KALRO) formerly known as Kenya Agricultural Research Institute (KARI) developed a habitat management strategy for controlling the effects of parasitic *Striga hermonthica* and stem borers infestation on cereal crops such as maize, sorghum and millet while improving soil fertility of degraded soils.

PPT is a novel cropping system that integrates pest, weed and soil management with sustainable yield increases in cereal-based farming systems. It controls cereals-stem borer pests by attracting them to a trap plant like Napier grass, which prevents the pests from completing their life cycle (the 'pull'). A repellent intercrop - the forage legume silver leaf (*Desmodium uncinatum*), planted between lines of maize, drives the pests away from the crop (the 'push') (Khan et al., 2001; Cook et al., 2007). Chemicals released by the intercrop roots also control the parasitic weed *Striga hermonthica* by inducing abortive germination, providing very effective control of this noxious weed.

The *Desmodium uncinatum* provides the “**Push**” while Napier grass provides the “**Pull**” -- hence 'Push-Pull Technology.'

Push-Pull Technology uses behavior-modifying stimuli to manipulate the distribution and abundance of stem borers and beneficial insects for management of stem borer pests (Figure 1 above). It is based on in-depth understanding of chemical ecology, agrobiodiversity, plant-plant and insect-plant interactions, and involves intercropping a cereal crop with a repellent intercrop such as desmodium (push), with an attractive trap plant

such as Napier grass (pull) planted as a border crop around this intercrop. Gravid stemborer females are repelled from the main crop and are simultaneously attracted to the trap crop. Napier grass produces a significant higher levels of attractive volatile compounds (green leaf volatiles), the strong cues attracts Stemborers to Napier grass. There is also an increase of approximately 100-fold in the total amounts of these compounds produced in the first hour of nightfall by Napier grass (scotophase), the period at which stemborer moths seek host plants for oviposition, causing the differential oviposition preference. However, many of the stemborer larvae, about 80%, do not survive as Napier grass tissues produce sticky sap in response to feeding by the larvae which traps them causing their mortality. Legumes in the *Desmodium* genus (silver leaf, *D. uncinatum* and green leaf, *D. intortum*), on the other hand produce repellent volatile chemicals that push away the stemborer moths. These include (E)- $\beta$ -ocimene and (E)-4,8-dimethyl-1,3,7-nonatriene, semi chemicals produced during damage to plants by herbivorous insects and are responsible for the repellence of desmodium to stem borers.

The companion plants provide high-value animal fodder, which farmers can sell or feed to stall-fed dairy animals. The intercrop plants also help to improve soil health by enhancing fertility and preventing degradation.

The technology improves gender equity, diversifies farmers' income sources, and is appropriate and economic as it is based on locally available plants, not expensive external seasonal inputs. As such, it fits well with traditional mixed cropping systems in Africa. As of July 2013, PPT has been adopted by about 75, 257smallholder farmers in East Africa whose cereal yields have tripled on average.

## 1.2 Benefits of adopting the Push-pull strategy

- Increase maize yields by 25–30% in the areas where only stem borers are a problem but more than 100% where both stemborer and striga are problems
- Increase supply of cattle feed from Napier grass and desmodium
- Fix nitrogen into your farm by desmodium legume, so you save on fertilizer costs
- Protect soil from erosion as desmodium acts as a cover crop
- Retain soil moisture in your plot because desmodium acts as a mulch
- Get money from sale of desmodium seed at an attractive price
- Make more money from increased milk production and sales
- Save on farm labour as you do not have to manually remove striga weed from the farm
- Protect maize from strong winds when surrounded by Napier grass

The following are testimonies from smallholder farmers who have adopted PPT:

*“I have struggled, but push–pull has improved my life. I sell maize, I sell milk, I pay school fees and even after that I have enough for the family to eat.”*

**Annette Taaka, farmer, Busia , Uganda**

*“The push–pull technology is truly changing the lives of women farmers, particularly the vulnerable.”*

**Agatha Anselmo Murugahu Farmer, Tarime District, Tanzania**

*“The push–pull technology has indeed changed our lives as far as food security is concerned.”*

**Peter Waboya Chairman, Bungoma Umbrella Farmer Field School Network, Kenya**

*“Thousands of people in our village are food-secure now because of this technology, which is changing our lives in many ways. We think most small-scale farmers in Africa can benefit from this technology. God willing, this may be a green revolution in Africa.”*

**Nactical Kutayi, a facilitator, Epwopi FFS, Ebukanga, Vihiga**

PPT is knowledge-intensive technology whose potential benefit depends entirely on timely adoption. Like most advanced agricultural technologies, speedy learning and adoption is desirable because increase in production in the early years of a project has greater impact on the rate of return on capital investment than in later years. It also determines the overall survival of farms since widespread diffusion and adoption of new technology is likely not only to lower output prices but also put upward pressure on input prices (Fuglie and Kascak, 2001; Carletto et al., 2007).

Extensive studies by Fuglie and Kascak (2001), Burton et al. (2003), Dadi et al. (2004), Abdulai and Huffman (2005), D’Emden et al. (2006), and Carletto et al. (2007) indicate a number of factors that determine the rates of adopting an innovation. In particular, access to information is critical in speeding up the adoption process of a ‘knowledge-based’ innovation such as PPT.

Productivity growth achievable by smallholder farmers from accessing and utilizing information on new agricultural technologies like 'Push-Pull' has not been fully realized ( Alene and Manyong 2006). Adesina and Baidu-Forson (1995) attribute this to weaknesses in agricultural extension service provision and poor infrastructure for information access by smallholder farmers. Amudavi et al., (2009) note that small-scale farmers prefer to get new information from fellow farmers because they share similar characteristics in many respects, including level of education, membership to local groups, similar sources of income, etc. However, in efforts to promote dissemination and adoption of PPT by the smallholder farmers, researchers at the International Center of Insect Physiology and Ecology (ICIPE) use a range of methods, including field days, farmer teachers, mass media (radio–Tembeana Majira), public gatherings (chiefs' Barazas), printed matter, and farmer field schools (Khan et al., 2008a; Amudavi et al., 2009a,b).

Extensive research on communication and information provision for rural development and small-scale agriculture are well documented (Morris et al. 2005). However, this has been mainly focused on top-down dissemination of information i.e. from research centers and extension personnel to farmers as sources and receivers respectively. Roling (1996) and Rivera (2001) record that low learning and adoption rates of agricultural innovations are a result of linearity in our ways of thinking and promoting top-down communication approaches for development.

For a long time, most organizations adhered to a top-down approach in providing agriculture extension services. Extension was seen as a linear function of disseminating knowledge developed in research stations to farmers'. Roling (1982) notes that the top-

down model in agricultural extension is inadequate because scientists cannot teach farmers without learning from them and about them. Quite often, researchers and extension systems view farmers as end-users who must be persuaded or otherwise will be led into adopting research outputs (technologies), rather than as partners in the process (Hakiza et al., 2004; Van Mele et al., 2005).

Today a large number of people have entered into the theater of agricultural activities and rural development in anticipated and unanticipated ways, and as the intricacies of farming activities increase day by day.

Social learning is becoming an important element for innovation and technology dissemination to give more farmers access to the most relevant and available agricultural technologies (Leeuwis & Vanden Ban, 2004).

A number of participatory communication approaches have been implemented to promote community development and technology dissemination among smallholder farmers. They include farmer field schools, farmer teachers, field days, drama and participatory video (Khan, 2008).

In order to share information, knowledge, trust, and commitment in development projects, people's participation is very important. As Paulo Freire (1983, p.76) alludes, participatory communication stresses the importance of cultural identity of local communities, and democratization and participation at all levels be it international, national, local or even individual level.

### **1.3 Statement of the Problem**

Production of cereals by poor smallholder farmers in western Kenya is constrained by Striga weeds, Stem borers, low soil fertility, water stress, degraded soils among other

biotic and a biotic factors. Approximately 540,000 acres in Western Kenya region has been infested with parasitic Striga weeds and this has caused significant yield losses of up to 180,000 tons(85-100 percent) approximated at Ksh.1.8billion annually (Woomer and Savala, 2008).

Despite the huge potential of PPT for controlling Striga weeds and Stemborers, there has been relatively low uptake of this technology among smallholder farmers, especially in Striga-prone areas.PPT is knowledge intensive and requires practicing farmers to have a considerable education level so that they can learn and adopt it. However, the challenge is that the majority of farmers are illiterate; thereby making it difficult for them to learnt his knowledge-intensive technology.

The International Center of Insect Physiology and Ecology(ICIPE)has used several technology dissemination pathway sin an effort to empower the farmers with knowledge and skills of eliminating Striga weeds and Stemborers as a result improve soil fertility in order to increase yield size. The methods include farmer teachers(FT),farmer-to-farmer communication , farmer field schools(FFS), printed materials (books, pamphlets ,posters ,brochures),radio programmes (Tembe and Majira ),field days, and drama activities(Khanetal.2008a;Amudavietal.2009a,b).However ,research has shown that a majority of farmers prefer acquiring agricultural information from fellow farmers, through farmer-to-farmer communication.

Therefore, this study seeks to determine the adoption rate of push-pull technology for improved and integrated cereal and livestock production among farmers in ..... It also attempts to develop strategies that promote good adoption of agricultural technology by enhancing learning, adoption and dissemination /knowledge sharing among farmers through participatory video, among other measures.

#### **1.4 Aim of the study**

To determine the effectiveness of using Participatory Video in uptake and learning Push-Pull Technology (PPT) among smallholder farmers in Striga and Stemborers infested areas in Western Kenya.

#### **1.5 Objectives of the study**

The objectives of the study were to:

- i. Establish social-cultural factors that influence learning and uptake of new technologies.
- ii. Compare farmers` knowledge level of push-pull technology before and after going through print media and participatory video content on push-pull technology.
- iii. Investigate advantages and disadvantages of using PV and print materials in learning and suggest ways of improving the use of videos for learning.
- iv. Establish key video elements and how they impact on learning
- v. Determine best practices for sharing and distributing video content to reach many push-pull farmers.

#### **1.6 Research Questions**

- i. What are the socio-cultural factors that influence learning of push-pull technology?



- ii. What is the difference in knowledge levels of farmers before and after receiving PV and printed materials?
- iii. What are the advantages and disadvantages of using video and print media for learning improved agriculture innovations and ways to improve the use of video for teaching and learning PPT?
- iv. What are the key elements of participatory video materials and how they impact on farmers learning process?
- v. How best can farmers improve sharing and distribution of videos materials to a wider farmers?

### **1.7 Limitation of the study**

Several issues may have limited this study. Factors such as geography, culture (language), and drastic climate changes may have affected the learning process and dissemination of push-pull technology materials to the target group of smallholder farmers. Personal bias may have affected interviews. Finally, many of the questions on the questionnaires dealt with perception of the farmers, and may contain respondent bias.

The researcher attempted to avoid these issues by the following practices:

- Awareness of and attentiveness to potential bias
- Use of trained assistants to help with the interviews and to provide inputs and perceptions

- Triangulation through research design and data sources, such as interviewing various extension players, including individual farmer groups and government and non-governmental extension personnel
- Establishing a record trail of data obtained use of local language, and
- Attention to both who is being interviewed and who is not

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

This study is important because it recognizes the crucial role that video can play in enhancing learning and dissemination of improved agricultural technologies (e.g. push-pull) among small-holder farmers. The study highlights the role that farmer groups play in technology development processes and how the group's participation enhances farmers understanding of this technology. The findings of this study are important since it determines future expansion and implementation of the project to include other small-holder farmers in sub-Saharan African countries facing serious challenges from Striga weeds and Stemborers infestation.

Development organizations working with smallholder farmers will also benefit from this study's recommendations. To this end, the study provides a video production model that could be adopted by the organizations that wish to use video in their development projects. Significantly, this study will ensure that PPT is adopted by one million farmers from sub-Saharan Africa to adopt PPT as part of the project's vision 2020. Video is an attractive media and one that is able to reach a large population to achieve this goal. This will significantly empower more farmers with the knowledge to manage Striga weeds and Stemborers and improve soil fertility. As a result, this will boost food security in the country, reduce poverty levels and improve nutrition among children.

## 1.9 Operational Definition of Terms

### **Participatory Video (PV):**

Lunch & Lunch (2006) describe PV as a set of techniques to involve a group or community in shaping and creating their own films. The idea behind this is that making a video is easy and accessible, and is a great way of bringing people together to explore issues, voices, concerns or simply to be creative and tell stories. PV is a highly effective tool to engage and mobilize marginalized people and to help them implement their own forms of sustainable development based on local needs.

### **Print materials:**

Refers to posters, pamphlets, textbooks, brochures, newsletters ,systematic guides or manuals used in the dissemination of push- pull technology information.

**Push-Pull Technology (PPT)** is a habitat management technology for controlling Striga and Stemborers in maize. With this technology, the maize is intercropped with a Stemborers moth repellent fodder legume, Desmodium push with an attract ant trap plant, such as Napier grass — pull planted around this intercrop (Chamberlain, Khan, Pickett, Toshova, Wadhams, 2006).

**Dissemination:** Defined by WEDC (2001) as circulating or spreading information from the source to end-users through various channels.

**Scale up:** The spread of more quality technology benefit stomore people over a wider geographical area more quickly, more equitably and in a longer-lasting manner (IIRR, 2000).

**Striga:** A parasitic weed with purple flowers that invades farms growing cereals. It injures plants by attaching itself to the roots and feeding upon and damaging the host, reducing yield by 30 to 80 percent. In Luo (*a dominant tribe in Nyanza region*) it is called “Kayongo” while Luhyas (*a dominant tribe in Western region*) it is called Luyongo (Woomer and Savala, 2008).

## **CHAPTER TWO**

### **THEORETICAL FRAMEWORK AND LITERATURE REVIEW**

“If a picture speaks a thousand words, then a video must speak a million!”

**Troy Olson, Digital advertising**

#### **2.1 Introduction**

A number of improved agricultural innovations/ technologies have been developed and documented to help improve agricultural production (Morris et al., 2005). Efforts have also been initiated in devising suitable dissemination methods to ensure that information and knowledge of improved technologies up scales to majority of farmers to enhance agricultural sustainability. Take PPT for instance, developed by Research Scientists from ICIPE and partners, is effective in controlling Stem borers and Striga weeds which have contribute to poor cereals harvest in several parts of Western and Nyanza regions in Kenya (Kanampiu et al., 2002; Khan et al., 2008).

Extensive research has been done on the use of Participatory Video in various disciplines including agriculture, social, and political development. And in most of these studies the results have been positive.

Hence, in this chapter, the researcher reviews and analyses extensive literature including; the history of PV, elements of a good video for training, how PV is revolutionizing traditional extension services, among other key topic. This review will also try to look at how effective is the use of printed materials in diffusing same technologies to the local farmers.

## 2.2 Theoretical Framework

*“Ideas confine a man to certain social groups and social groups confine a man to certain ideas. Aiming at a group is better than aiming at an individual more easily changes many ideas”*

*-Josephine Klein*

### 2.2.1 Diffusion of Innovation

Diffusion is a process that focuses on the penetration of a social system by some kind of new knowledge or an introduced technological innovation. Diffusion of innovation describes the social process of communication of new ideas among members of a community over time and adopted according to various features of both the technology and the users (Rodgers, 1995)

Robinson, 2009 defines diffusion of innovation as a process by which an innovation scales-up within members of a social system via proper communication channels while innovation is an idea, behavior, or object that is perceived as new by an individual or other unit of adoption.

The theory offers three valuable explanations into the whole process of social change with regard to uptake of new innovations.

- i. What qualities make an innovation spread successfully?
- ii. The importance of peer-peer (farmer-farmer) communication and farmer groups and networks.
- iii. Understanding the needs and concerns of the local people or farmer groups.

Rodgers defines four major elements in the diffusion of innovation. They include; a) *the innovation*, b) *communication channels*, c) *time*, d) *the social system (farmer groups)*.

The information flows through networks. The nature of networks and the roles opinion leaders (successful farmers`) determine the likelihood that the innovation will be adopted. Innovation diffusion research has attempted to explain the variables that influence how and why users learn and adopt a new technology, such as PPT. Farmer teacher among other successful adopters of improved technologies wield a lot of influence on audience via their personal contact, but additional intermediaries called change agents and gatekeepers are also included in the process of diffusion. According to Rogers (1995), diffusion (dissemination) effect is greater in a social system with a higher degree of interconnectedness such as in well-organized FFS. More importantly, Rodger`s acknowledges communication channels as the heart of diffusion of innovation theory in order to realize successful learning and adoption of any new agricultural technologies among small farmers.

“The essence of any diffusion process is exchange of information through which an individual communicates an idea to one or several others”  
(Rodgers, 1995:18).

In general mass media such as video, print media are considered the best channels to create awareness about improved agricultural innovations, whereas interpersonal channels are crucial for persuasion and ultimate adoption. Rodgers` theory of diffusion emphasizes interpersonal communication and social networking more than any other areas of communication research (Rodger and Signal 1996). “Diffusion theory states that individuals who are isolated or on the periphery of local social networks....are less likely

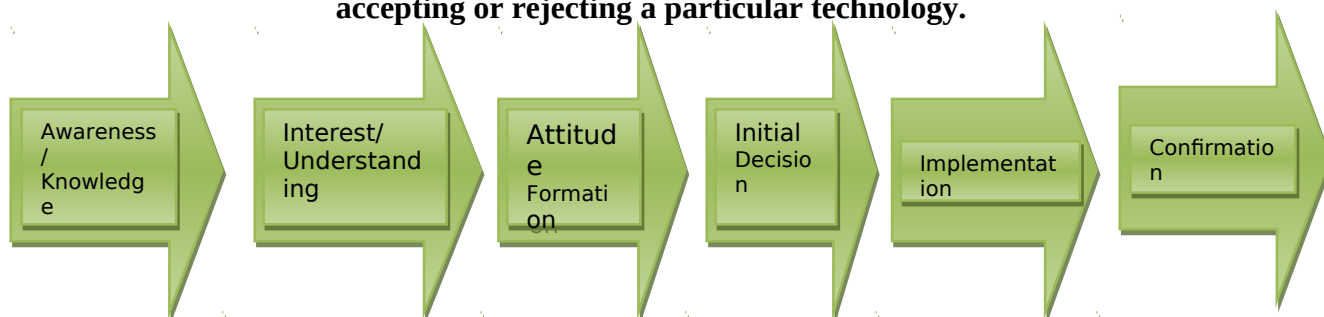
to hear about an innovation, will hear about it much later, and will not have as much opportunity for social comparison” (Kincaid 2000:218).

According to Rodgers, effective communication between individuals in a social network is more effective when there exists a strong homophily-“the degree to which one or several individuals who interact are similar in certain attributes, such as beliefs, social status, education and the like” (Rodgers 1995:19). Therefore, in this context, effective dissemination and learning of PPT among smallholder farmers highly depends on how strong participants share homophily and the types of mass media used in the learning process.

### 2.2.3 The process of adoption and rejection of a technology

An individual`s decision about rejection or acceptance of a particular technology is not drastic, but instead it goes through several steps. Contrary to what Ryan and Gross (1943) proposed, most scholars today recognize a similar set of stages that begins with awareness of the innovation and ultimately results in its adoption or rejection (Rogers, 2003).

**Figure 4: Illustrates the stage through which an individual goes through before accepting or rejecting a particular technology.**





The sequence of stages that an individual passes through during the process of adapting or rejecting of an innovation Adapted from Rogers (2003):

**Awareness/knowledge** - Obviously, an innovation will not be adopted if nobody is aware of its existence. Hence, awareness, or knowledge of the innovation, is the first stage of the adoption process. From a strategic point of view, for an innovation to be known extensively, there is need for proper communication channels through which such knowledge intensive technologies can be communicated to the target audience.

**Interest/Understanding**-Individual's perception towards the innovation is key. If the individual has not developed interest in the technology it will be very difficult for such an innovation to be adopted. Hassinger, 1959 notes that even if an individual is exposed to an innovation, it will have little effect unless the innovation is perceived to be relevant to the needs of that individual. If there is interest in a certain technology, then the individual will work towards learning and understanding that particular technology.

Thus, this implies that promoters of a given innovation should pay careful attention to ensure proper communicated/packaging of the technology in a way that is easily understood by the target audiences.

**Attitude formation**-Once an individual is aware of the existence of a particular innovation coupled with basic understanding of how it works, they will begin to weigh the relative advantages and disadvantages of using the innovation in their context, and begin to develop either favorable or unfavorable attitude towards that innovation. This attitude formation may consist of thinking hypothetically about what would happen if the innovation were applied to their situation. It also often entails seeking the opinions of one's peers.

**Initial decision-**The attitude formation stage eventually leads to an initial decision about whether to adopt, or at least try the innovation. Most individuals do not adopt an innovation without first trying it on a limited basis (Rogers, 2003). This trial is often an important part of the ultimate decision to adopt or reject an innovation. Although some innovations are not conducive to a trial basis, those that are tend to be adopted more readily. A decision not to adopt an innovation need not be a principle decision; rather, it may just be a subsidence in further pursuit of the innovation as interest declines.

**Implementation-**This stage is when the innovation is actually put in to use. Researchers of the diffusion of innovation also now recognize that there can be considerable “re-invention” at this stage, as individuals or organizations adapt a given innovation to their particular set of circumstances.

Sometimes a given innovation may go through a substantial evolution and divergence as it is implemented in different contexts. It is even thought that a high degree of such re-invention leads to faster adoption and greater sustainability of the innovation to, because it indicated a high degree of flexibility for the innovation be adapted to different circumstances (Rogers, 2003).

**Confirmation-**Empirical evidence is accumulated that reinforces or counters the decision to implement an innovation. A decision to discontinue use of an innovation after initially deciding to implement it is not uncommon. Leuthold (1967) found in the farming context that discontinuing innovations was just as frequent as adopting new innovation can occur when an individual or organization becomes disenchanted with the results of implementation, or can occur as a replacement in order to adopt a better idea that supersedes it.

Why do certain innovations spread more quickly than others? And why do others fail to scale-up? Everett Rogers (2003) and other diffusion scholars recognize five qualities that determine the success of an innovation.

**Relative Advantage-** This is the degree to which an innovation is perceived as better than the idea it supersedes by a particular group of users, measured in terms that matter to those users, like economic advantage, social prestige, convenience, or satisfaction. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is likely to be.

The cost and social status motivation aspects of innovations are elements of relative advantage. For instance, while innovators, early adopters, and early majority are more status-motivated for adopting innovations, the late majority and laggards perceive status as less significant. When faculty members face the new demands placed on them, they will adopt technology (Casmar, 2001). If farmers see that technology has value in their instruction, then they will use it (Finley, 2003). To increase the rate of adopting innovations and to make relative advantage more effective, direct or indirect financial payment incentives may be used to support the individuals of a social system in adopting an innovation. Incentives are part of support and motivation factors. Another motivation factor in the diffusion process is the compatibility attribute.

**Compatibility with existing values and practices-** Rogers (2003) defines compatibility as the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. A lack of compatibility in modern dairy technology with individual needs may negatively affect the individual's technology use (McKenzie, 2001). In her literature review, Hoerup (2001) describes that each innovation

influences teachers' opinions, beliefs, values, and views about teaching. If an innovation is compatible with an individual's needs, then uncertainty will decrease and the rate of adoption of the innovation will increase. Thus, even naming the innovation is an important part of compatibility.

**Simplicity and ease of use-** This is the degree to which an innovation is perceived as difficult to understand and use. New ideas that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings.

**Trial ability-** According to Rogers (2003), trial ability is the degree to which an innovation may be experimented with on a limited basis. Trial ability is positively correlated with the rate of adoption. The more an innovation is tried, the faster its adoption is. As discussed in the implementation stage of the innovation-decision process, reinvention may occur during the trial of the innovation. Then, the innovation may be changed or modified by the potential adopter. Increased reinvention may create faster adoption of the innovation. For the adoption of an innovation, another important factor is the vicarious trial, which is especially helpful for later adopters. However, Rogers stated that earlier adopters see the trialability attribute of innovations as more important than later adopters.

**Observable results-** Rogers (2003) defined observable results as the degree to which the results of an innovation are visible to others. Role modeling (or peer observation) is the key motivational factor in the adoption and diffusion of technology (Parisot, 1997). Similar to relative advantage, compatibility, and trialability, observable result also is positively correlated with the rate of adoption of an innovation. Rogers (2003) defines communication as a process in which participants create and share information with one

another in order to reach a mutual understanding. This communication occurs through channels between sources. Rogers (2003), states that a source is an individual or an institution that originates a message. A channel is the means by which a message gets from the source to the receiver. Rogers states that diffusion is a specific kind of communication and includes these communication elements: an innovation, two individuals or other units of adoption, and a communication channel. Mass media and interpersonal communication are two communication channels. While mass media channels include a mass medium such as TV, radio, or newspaper, interpersonal channels consist of a two-way communication between two or more individuals. On the other hand, diffusion is a very social process that involves interpersonal communication relationship (Rogers, 2003). Thus, interpersonal channels are more able to create or change strong attitudes held by an individual. In interpersonal channels, the communication may have a characteristic of homophily, that is, the degree to which two or more individuals who interact are similar in certain attributes, such as beliefs, education, socioeconomic status, and the like. However, the diffusion of innovations requires at least some degree of heterophily, which is the degree to which two or more individuals who interact are different in certain attributes (Rogers, 2003).

Communication channels also can be categorized as localize channels and cosmopolite channels that communicate between an individual of the social system and outside sources. While interpersonal channels can be local or cosmopolite, almost all mass media channels are cosmopolite. Because of these communication channels' characteristics, mass media channels and cosmopolite channels are more significant at the knowledge stage and localite channels and interpersonal channels are more important at the persuasion stage of the innovation-decision process (Rogers, 2003).

According to Everett Rodgers, these five qualities determine between 49-87% of the variation in the adoption of new products.

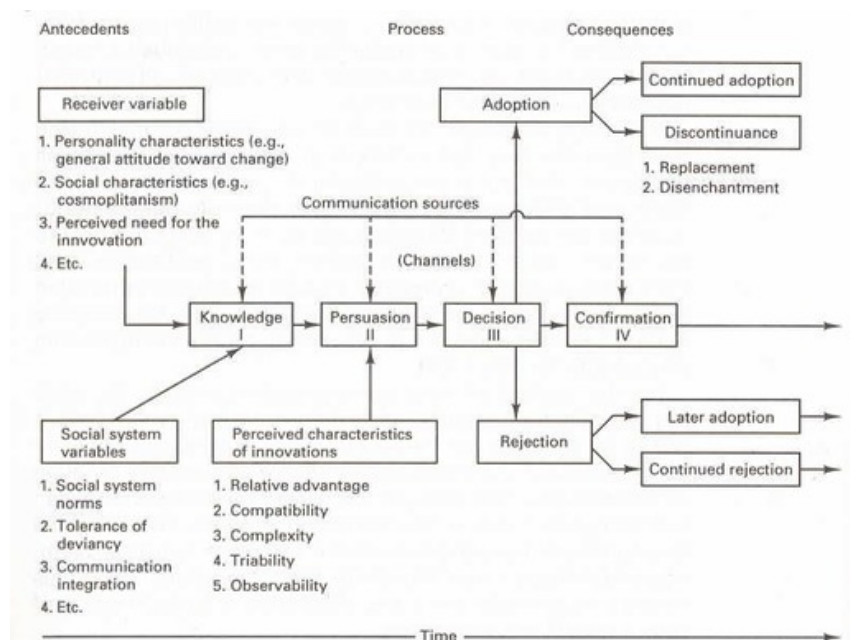


Figure 5. Conceptual framework illustrating diffusion of innovation model **Source: Rodger, 1995**

### 2.3 History of Participatory Video – The Fogo Process

In basic understanding, Participatory Video is a set of techniques to involve a group or community in shaping and creating their own films (Lunch & Lunch 2006).

In a detailed fashion, Mengi (2000) describes participatory video as a scriptless video production process, directed by a group of local people, moving forward in iterative cycles of shooting-reviewing, and aiming at creating video narratives that communicate what those who participate in the process really want to communicate, in a way that they think is appropriate.

The concept of Participatory Video can be traced from the late 1960s in Fogo Island, Eastern coast of Newfoundland, Canada in a series of events that were dubbed “Fogo processes” (Riano1994, MediaDevelopment1989).

As the story is told, in1967, Fogo Island had only 5,000 people. Poverty was at its peak, with not much communication between the communities that occupied the Island. The Island represented the type of isolation and lack of information or organization that Snowden wanted to show as alternate indicators of poverty in the province. For over 300 years, the occupants of the Island fully depended on fishing as their only source of livelihood, unfortunately that wasn't enough to sustain them for long. By this time, inshore fishing had been dropping thus poverty rates were escalating. This forced 60 percent of them to form welfare associations.

Then Snowden and other scientists decided that for the Islanders to survive it was necessary to form co-operatives to bring people together to share their problems and protect their cultures. To achieve this, Snowden and his colleagues, in consultation with the communities, introduced the use of film so that people could tell their stories and also share their problems with others. The film was introduced so that the people could know that they share common problems and therefore could develop common solutions to the problems (Singhal, 2003).

The community members interviewed clearly identified a number of island issues: the inability to organize, the need for communication, their sentiment felt towards the idea of resettlement, and the anger that the government seemed to be making decisions about their future with no community consultation process. Snowden decided to show the films to the people of Fogo and 35 separate screenings were held with the total number of viewers reaching 3,000. This became an important part of the process. It was realized that people

were not comfortable discussing issues with each other face-to-face. However, people were quite comfortable telling their views on camera which was then taken to other community to watch After watching the films, the Islanders started to appreciate that all the communities were experiencing the same problems; they became more aware of these problems and what needed to be done to solve them.

Events in Fogo process led to the adoption of participatory video methodology to other disciplines around the world including; Africa, Asia, Europe etc. From the non-participatory video has been applied in various projects around the globe. Today participatory communication is practiced in many developmental activities in greater magnitude than any time before (Mohapatra, 2007).

Participatory Video is a very flexible communication medium that has been practiced extensively for the purpose of educating, training, entertaining, situational analysis and advertising in most developing nations in Asia, Latin, America and Africa (White, 2003; Omotayo and Isiaka, 2006). PV processes mainly concerns with documenting and developing local innovation capacity by locals and for the locals by engaging them in the whole process of video production.

In most instances of Participatory Video production, ready-made scripts are not used, but instead emphasis is placed on handling over the camera and editing. Literally, local peoples lead the whole process (Johansson et al., 1999, White, 2003). Moreover, the local people learn the skills of using the equipment (camcorders, computers and DVD players), thinking through the storyboard (a series of visual frames that presents the story) and creating their own scripts (the story as spoken word) to make their own films, implicitly using their own voices that will be featured in the film.



Ultimately, the element of participation of the local people in the whole process develops their self-consciousness and empowers them through skills and knowledge acquisition and group development (Shaw and Robertson, 1997). The audio-visual elements in participatory video approach can be used to mediate communication between the local people and other ‘unreachable’ like stakeholders, policymakers and implementing partners.

#### **2.4 Participatory Video Making Process**

In essence, the process of making participatory video is extremely simple and the equipment needed is increasingly available and affordable. Through this approach, people have been provided a grassroots platform to document their own knowledge and experiences and to express wants and hopes from their own perspectives.

In the handbook, *‘Insight into participatory video’*, Nick and Lurch (2006) describe the process of a typical participatory video approach as follows:

- The local people rapidly learn how to use video cameras through name games and exercises through the guidance of experts and researchers.
- The facilitators help the local groups to identify and analyse important issues in their community to plan how to show them on video.
- The video messages are directed and filmed by the local groups. The filming process is done in the local languages to enhance easy understanding of the communication.

- The footage is then shown to the community in a daily sequence through community screening and this sets in motion dynamic exchange of ideas and perceptions from the local people.
- Completed films can be used to promote awareness and exchange among different target groups. Through community screening, the locals are able to be informed about certain agricultural technologies and they can get to know what other farmers in other regions undertake and apply the same improved agriculture innovations.

## 2.5 Models of Participatory Video

### Digital Green ([www.digitalgreen.org](http://www.digitalgreen.org))

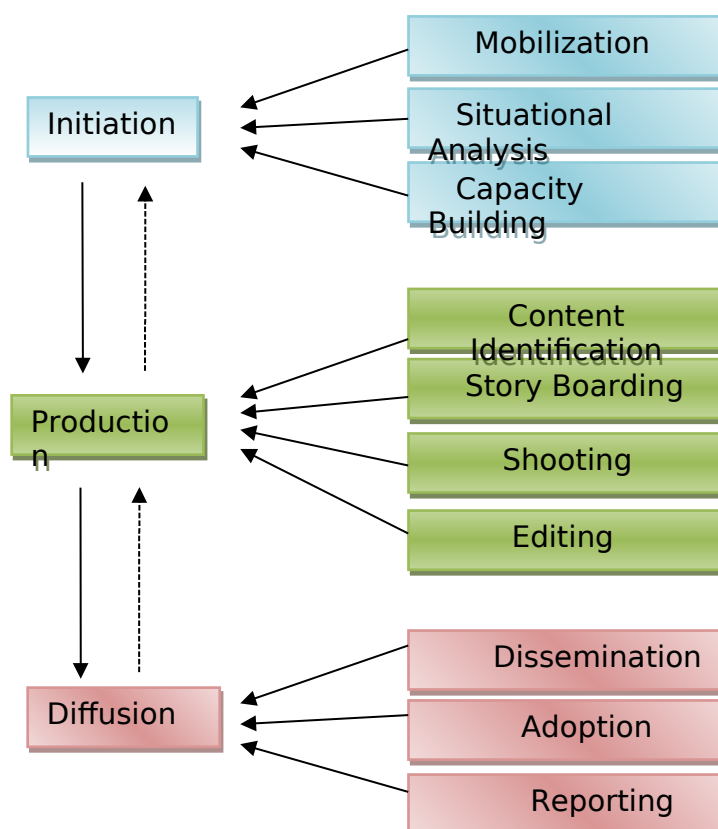


Figure 6: Illustrates the Digital Green Video Model.

Source: [www.digitalgreen.org](http://www.digitalgreen.org)

Digital Green (DG) is a research project in India that is mandated to improve the social, economic and environmental sustainability of smallholder farmers' livelihood. To achieve this, Digital Green focuses on production and dissemination of agricultural innovation and information via video and mediated instructions. The videos are produced by farmers, for farmers and of farmers. Unlike other systems or project that rely on ICT to deliver technology information to farmers, DG, works with people-based extension

systems and aims to amplify their effectiveness in learning and adopting new technology information among resource-poor farmers.

For effective technology dissemination, DG works with already existing people-based extension systems such as FFS, CBOs and farmer teachers/facilitators in order to amplify their effectiveness.

Despite the fact that video provides a point of focus, it is people and social dynamics that ultimately makes DG work. The thrill of appearing “on television” motivates farmers and homophily is exploited to minimize the distance between the researcher and the farmers. Research has shown Digital Green to be ten-times more effective per dollar spent.

The Digital Green model of participatory video emphasizes on the following elements:

- 1) A participatory process on content production
- 2) A locally generated digital video database
- 3) Human-mediated instruction for dissemination and training
- 4) Regimented sequencing to initiate a new community. Unlike some systems that expect information or communication technology alone to deliver useful knowledge to marginal farmers.

## **2.6 Participatory process on content production**

One of the most important aspects of DG is the inclusion of local farmers in video content. This is a critical, basing on the fact that other farmers in the area are more likely to adopt a practice when they can see that is already being implemented by their peers. In addition, the appeal of appearing in a video is motivation enough for some farmers to adopt a new practice.

The video materials contain different types of content, including testimonials from farmers already implementing a new practice and what might be considered entertainment (e.g., groups of village children singing, drama) however, the majority of the video produced is instructional in nature. Instructional videos are recordings of demonstrations that are made when an extension agent is teaching a farmer a new technique.

Classically, DG videos prominently feature either an experienced farmer showcasing the benefits of a particular agriculture technology, or a new farmer attempting a technique on her field for the first time. Most video recordings involve three people: a facilitator/teacher, a farmer, and a content producer who doubles as the camera operator.

The content producer mainly enforces the following: (a) a brief verbal overview of the process; (b) an itemization of the required resources and associated costs; (c) step by-step instructions in the field, usually with the farmer and, sometimes, also the teacher actually implementing the technique; (d) a showcasing of the uses and benefits; and (e) interactions with farmers to address common questions and concerns. At times advanced lesson planning is necessary especially having a storyboard for content producers so that they are prepared for recording, but much of the actual recording in the field is, at once, ad hoc and chronologically true to the way extension agents interact with farmers.

These content producers can be experienced farmers, field staff, university scientists, NGO experts, and volunteers from the local community, with the most common producers of content being NGO extension agents. Extension agents perform their regular extension duties, mostly field assessments or demonstrations, and capture these interactions with farmers on video. In this way, an extension agent can produce one or two clippings per field visit with minimal additional effort.

Occasionally, farmers themselves also contribute insight or innovative techniques during recordings. However, we should not over-romanticize this possibility in the majority of cases, the expertise does lie, in fact, with the extension agent, and the primary value of the farmer's participation is to demonstrate willingness to learn.

The NGO's extension agents are already attuned to the needs and local variations in what information should be provided to the farmer, so by hitching the recording process to an existing extension system, appropriate content is naturally generated.

Advancement in technology have made it possible for development organizations and farmer groups to create quality videos using inexpensive camcorders; external microphones and tripods help to improve the quality of the audio and video production.

## **2.7 Locally Generated Video Database**

Once the raw footage have been recorded, DG requires at least one video editor-a person with basic computer literacy and have some rudimentary understanding of the nature of the content, and be capable of being trained in the basics of video postproduction.

The video editors check for the accuracy, clarity, and completeness of the content. Where content is missing, they coordinate with content producers in the field to help gather missing footage. A minimum amount of titling and metadata, such as tags for language and thematic category, is added for indexing into a database. The Editors also sign off on the format and quality of the final product.

The videos are digitized on a PC and edited, using simple non-linear, open-source editing software. Once the videos are ready, they are mailed as DVDs or directly uploaded, if adequate bandwidth is available, on to a searchable Internet database that makes the content available for public use under a Creative Commons license

## **2.8 Mediated Instruction for Dissemination and Training**

The principal means of distributing videos from the Digital Green database to farming communities is by physically mailing or couriering DVDs. Villages are provided a minimum of one TV and one DVD player each and battery backup equipment if necessary.

In each farming community, local mediators are hired on a part-time basis (in our study, by GREEN Foundation). These mediators are residents of the same communities in which they share DG content; this reduces the logistical challenges of regular visits to a village and provides local access to agricultural knowledge from a familiar source. In each village, the mediators conduct a minimum of three screenings per week during suitable evening hours. They transport DG equipment to different segments of their

communities, maintain attendance records, and track the interest and adoption of the promoted techniques. These mediators are additionally supported by a full-time extension system (in our study, NGO) that provides mechanisms for feedback and audit for a cluster of villages. The mediators are given a performance-based honorarium of up to Rs. 1,500 (US\$30) per month, which is calculated from a mutually agreed set of target metrics that take into account the local population of farmers and the agro-ecological conditions of the season.

Villages usually do not have a public forum at which farmers regularly gather, so location and timing of the screenings is a major concern. Farmers are often only willing to take a short diversion of between one to two hours from their daily routine in the evening. In addition, political and socioeconomic differences within village communities rarely permit all the farmers to gather in one place at one time. The night screening typically involve small groups of 20 to 30 farmers who are willing to come to gather at a common site within a short distance from their homes. Several small groups are formed within a single village to screen content on a regular basis, based on the availability and interests of group members. Since the screening locations preferred by each small group may differ, multiple screenings are scheduled each week on a rotational basis. Actual locations are selected by local extension agents and mediators, who typically choose accessible sites—bus stands, temples, schoolhouses, *panchayat* (administrative) offices, storefronts, individual homes, and on the streets.

Extension agents use the DG system as a tool to support their regular duties and require some training in its optimal use. Since extension agents often come from various backgrounds, videos are used to train and standardize their own interactions with farmers as well. In addition, the extension staff is shown how to integrate the DG system into its



existing operations. Training introduces staff to the system, available content, and facilitation techniques. Mediation itself and training in mediation are critical elements; both roughly follow guidelines of established pedagogy for mediated instruction

### **2.8.1 Regimented sequencing to initiate a new community**

Farmers' acceptance of new agricultural practices does not occur over a single video screening. So, communities are approached in a particular manner and order: First, a village gathering is organized in a central location to showcase highlights of the services that will be provided; interested farmers are identified; new content is recorded, with extension staff introducing a particular practice to the identified farmers in the field; informal screenings of content of peer farmers are held; small groups of interested farmers are then formed with a regular schedule of content screenings (as described in the previous subsection); finally, community participation is encouraged through peer pressure to learn, adopt, and innovate better agricultural processes.

Small groups that will regularly participate in the recording and screening of DG content are also founded within existing formal structures, such as local farmer cooperatives and self-help groups (SHGs), or are initiated by the DG system itself.

While the DG Web site provides functionality to search and browse the video database, the DVDs used by the village facilitators only provide a basic navigational menu that lists the titles of the 10 to 15 videos on a single disc. Still, the order in which the content is presented is important, so mediators are trained to begin by showcasing practices that are known to provide immediate results for farmers. Local extension agents also assist in determining the sequence of the content to be shown. We try to present material that was recently recorded, as featured farmers are especially interested to see themselves "on

TV.” Because such recordings happen in season, the timeliness of the promoted practices also aligns with the issues that farmers face in the field.

DG video development process follows the following three steps; **Initiation, Production and Diffusion**. Within these main stages there are also sub-steps explained as follows:

**Initiation Stage:** there will be mobilization of farmers groups and other self-help groups and their sources required, situational analysis; here a survey of the location is carried out to develop individual profiles of the villages based on few socio-economic parameters and village are selected through a randomized selection process. The target groups of farmers (FFS) with the help of the researcher will select one of them who will be their farmer teacher and custodian (optional) of the video toolkit. The appointed farmer teachers will then be taught on how to operate the video and computer technologies, scripting, shooting/recording, video editing, and their dissemination to the community.

**Production:** The local farmers will participate on choosing topics or lessons on PPT that they intended record. The knowledge or information will then be put on a storyboard so that farmers will be guided on the clips to include in their production. Note that the local farmers will be in total control of the whole process: They decide on the language, the video clips to shoot, and what to remove and add during the editing process. Afterwards, the contents of video recording that were done through a participatory approach involving all the farmers will then be checked by the researcher for verification purposes prior to dissemination.

**Diffusion:** this is last stage prescribed by DG. This is a very important exercise in the researcher notes the feedback from the other farmers with regard to the lessons documented by PPT farmers from different regions on the activities operations and most

importantly the benefits of Push-Pull Technology. The placement of the farmers in PPT participatory video is based on the assumption that by watching the clips from other PPT farmers, non-PPT farmers in the area are more likely to adopt the technology that is already being implemented by the neighbors.

During the process of dissemination, communities will be sharing their local knowledge and techniques that they use in farming processes, by doing that, farmers will be able to share experiences, problems, and strengths with regard to agricultural technologies thus creating an opportunity of expanding the dissemination and adoption of 'push-pull' technologies to farmers getting poor harvest and low income that come as a result of Striga.

To disseminate the video recordings efficiently and effectively, the trained farmer teachers together with other members in the FFS organize for a Television or a small projector-pico or with a DVD player or a laptop to facilitate screening for others to watch. The screening exercise will be done at the convenience of the farmers particularly during social gatherings, Chiefs Barazas, farmer field days, agricultural shows, conferences, or even homes.

Participatory video will also take advantage of globalization and the available technologies like the internet so that upon uploading the video recordings on PPT on the internet (YouTube) then more and more people will be able to appreciate the value of PPT to the farmers, thus motivating other non-push pull farmers in other regions to adopt it. Other projects that have adopted models of producing and training videos.

**Insight Share Model (<http://agroinsight.com/resources.php>)**

This model aims to develop deep local ownership of the participatory video making process, by working with individual and groups to build long-term local capacity for ongoing Participatory Video activities. Insight Share trainers work directly with target groups drawn from the target community and/or from partner organizations, to train and empower them to become Participatory Video facilitators themselves within the framework of a 3 stage capacity building process:

- I. Training for representatives from partner organizations and their constituents
- II. The application of PV with local community groups;
- III. Ongoing support from PV experts.

It utilizes a well-researched script with a voice over narrator and a selection of farmer interviews. Videos are preferably made with graduates from farmer field schools (FFS). Underlying principles of technologies are explained and illustrated by local examples, using good quality close ups, simple graphics or analogy whenever needed. Collective action is shown as much as possible accessible to all participants, irrespective of literacy or background, participatory video (PV) is a tool that has the power to mobilize a community whilst simultaneously documenting the dynamic process of community research, analysis and change. The videos provide a channel through which local knowledge and experience can be shared with other communities, as well as with scientists, decision and policy makers on a local, national and global level.

When video is placed in the hands of the concerned population acts as a catalyst and a mirror, initiating a process of community-led analysis, reflection and change. Regular community screening opens up an exchange of ideas and opinions within the community

and encourages more people to get involved. Adopting a participatory, all inclusive methodology in research fosters an open and trusting relation between facilitators/researchers and participants and gives a clear signal that they are in control and that their knowledge matters.

Insight Share trains researchers and or/local people recruited from target groups in the community to act as facilitators. Similar to Digital Green, Insight Share trains and supports groups to use the videos to capture their views. Those who commission the research can decide on using standard questions for video interviews which match those written in questionnaires.

Insight Share participatory video research projects follow the following key principles: Engagement, Empowerment, Clarification, Amplification, Catalyzing, Being inclusive and Flexible, Accessibility, Equipping people with skills and positive Attitudes, Disseminating Good Practice, Surprises and Building Bridges.

**Table 1. Comparison of Digital Green and Insight Share Model**

<b>Theme</b>	<b>Digital Green</b> <a href="http://www.digitalgreen.org">http://www.digitalgreen.org</a>	<b>Insight Share</b> <a href="http://www.insightshare.org">http://www.insightshare.org</a>
Script development	Initial ideas prioritised by DG team, based on interaction with and feedback from local NGO partners Storyboard developed with farmers in local language The same storyboard is used in multiple sites and dialogues are adjusted, so many videos are made on the same subject with little variations	Following the zooming in, zooming-out approach (Van Mele, 2006), topics are identified based on farmers' learning needs and experiences of working with farmers in multiple sites and countries Script written with regional focus in mind and with separate input and feedback mechanisms for scientists, service providers and farmers
Concept	Either an extension worker explains 'how to do' to a farmer; some farmers working with partner NGOs come forward as they are thrilled to appear on TV	Empowered farmer groups (through FFS or other ways) are targeted as key resource to collaborate in production and review
Format	Training format, no voice over, trainer and farmer talk throughout	Structured, with voice over and farmer interviews; attention to discovery learning
Gender Focus	27% of videos feature women Focus is on technologies, not on their gender implications	Targeted and balanced in terms of farmer interviews, also with regard to generation differences Gender implications of technologies are presented
Farmers film themselves	Either video professionals, trained NGO staff or community resource people	no
Attention to quality of the video	To a limited extent	yes
Professional Video Support	Limited	Yes, during training
Length of modules	4-15 min average 9 min	6-19 min average 11 min
Script Available	no	yes
Translation	no	Involving national scientists and local media professionals
Subtitles	no	no

### **Documentary Video vs. Participatory Video**

There are two main types of video content produced for agriculture communications. They can be categorized as education/documentary video and Participatory video materials.

### **Educational video films/documentary videos**

These are video content that have been produced by various specialists in the field of agriculture and directed by film experts. They are basically top-down video films produced elsewhere e.g. in environmentally controlled environment (at the experimental farms/site), with high tech plants and or animals by a specialized (video) team concentrating on specific topic- e.g. maize farming- looking after maize. The video specialists make the production and submit it to the producers who in most cases are agricultural scientists and the scientist will distribute it to extension officers who are expected to project the video to farmers with an objective of teaching them on that selected topic.

Popular film/videos programmes produced and screened on the local television are listed include:

- i. Zero grazing (Kenya Broadcasting Corporation TV)
- ii. A School without walls
- iii. Runoff – a foe or a friend
- iv. A sun will still rise
- v. Safari Njema (Kenya Broadcasting Corporation TV)

- vi. Mkulima (Kenya Broadcasting Corporation TV)
- vii. Maziwa Safi (Kenya Broadcasting Corporation TV)
- viii. UfugajiwaNdizi (Kenya Broadcasting Corporation TV)
- ix. Shamba Shape-up (Citizen TV)
- x. Smart Farm (Citizen TV)

Some of these programmes, e.g. *Maziwa Safi* and *Ufugajiwa Ndizi*, were being televised weekly by the national broadcaster KBC TV and produced by KARI. *Shamba Shape Up* is a more recent agriculture segment televised on Citizen TV every Saturday and Sunday.

**Table 2: Comparison of Documentary Video and Participatory Video**



<b>Question</b>	<b>Documentary video (DV)</b>	<b>Participatory video (PV)</b>
Who shoots the video?	Documentary maker/director (individual author/directors)	People and video participating together (collective author/directors)
Who writes the scripts?	Documentary maker	No script or jointly formulated script
Who decides on content?	Documentary maker	People
Who constitutes the audience?	Undetermined audience (mass)	Determined audience, direct addressing of the audience
Is feedback expected?	Not necessarily, the audience may think about it.	Yes, definitely; people are empowered to act
Processor products?	Product oriented	Process and or product oriented
What is the paradigm behind?	Monism objectivity	Pluralism, subjectivity

**Source: Author**

**Table 3: Major features of scripted and script less styles of video**

Feature of style	Scripted video	Script less Video
Topic	Selected by NGO expert or research scientist	Selected by NGO expert, research scientist and local

		farmers
Content Identification	Identified by NGO expert or research scientist	Identified by NGO expert, research scientist and local farmers
Script Development	Script is developed by the Research Team (RT) and Farmers` Video Team (FVT); draft script is discussed with the participants before shooting	No script is used; participants narrate their stories spontaneously in front of the camera
Camcorder Operation	Video camcorder is handled by the research team including field staff/consultants	Video camcorder is handled and managed by the farmers
Selection of Rough video clips	Clips are selected at the studio based on the script	Video clips are selected in the field during weekly sessions
Draft Editing	Editing is done by professionals at studio	Editing is done by professionals together with farmers` video team during weekly screening
Validation and Final Editing	Draft video is shown to farmers to validate the message(s)	Draft video is shown to farmers to validate the message(s)
Video screening	Organized by the RT and FVT	Organized by the RT and FVT

Source: Author

## 2.9 Video for Learning

Studies conducted on the use of video as a tool for instruction and training have rated it very useful and that it increases training quality, especially in reaching less educated audiences (Van Mele, 2011). Videos, especially those produced in the local language, transcend the literacy barriers. In a 2011 study, Van Mele et al found that 78% of his respondents who are members of development organizations, research institutes and NGOs rated videos “quite to very useful” in reaching less educated audiences. Using video in training and as a medium of instruction also reduced the technological support requirement for farmers (Gandhi et al., 2007).

Lie & Mandler 2009, notes that the visual element in videos can be very persuasive and therefore the knowledge intensive improved technologies, hard to be described in words can easily be understood through video. For instance, in Malawi, video was used to demonstrate the cleanliness and low rates of breakage of parboiled rice they sell (Gandhi et al., 2007). Detailed agricultural information technologies can be summarized into short video segments that farmers can easily follow through without losing attentiveness, thus enhancing training efficiency (Lie & Mandler., 2009).

With costs of these technologies drastically reducing as new technologies advances, the benefits of using video as a tool for training can easily be harnessed even with the resource-poor smallholder farmers (Coldevin, 2003). The possibilities of having actors and drama in the video training materials, which are attractive to farmers enhance learners' capacities (David & Asamoah, 2011). Video can also be very flexible, in the sense that it can be screened anywhere at any time (Coldevin, 2003).

Other advantages of using video as a tool for training and learning are: - content can be produced and distributed very easily to the target groups in a very short time.

- i. Availability-as a form of multi-media, video can be created, distributed in a very short time to the target group.
- ii. Video combines both visual and audio feature, therefore when produced in local languages, video can be a very effective communication tool especially to the illiterate farmers.
- iii. Video can emphasize meaning by showing relevant information in close-up.

- iv. Consistency- the information in the film is uniform it can be recorded in master copy and still maintain it quality.

Participatory video brings together farmers as actors and lead in the process of technology dissemination. As noted by Lunch & Lunch (2006), participatory video brings together to create their own video materials to share experiences and knowledge with the rest of the people with no other person coming in to tell them what do.

## **2.10 Elements of Participatory Video**

### **Quality**

Ideally, videos should entice multiple organizations to use them in multiple settings, facilitated or not, depending on the local context (Van Mele et al., 2010a). Well-made videos can serve farmer organizations, extension services, radio broadcasters, and can be modified for use on mobile phones or in any other way. In terms of efficiency and scope to disseminate, it makes much more sense to translate one quality video into ten languages, rather than to completely reproduce the same video (or minor variations) in each single language.

### **Length/Runtime**

What is the suitable length of training video? According to Van Mele (2010), there is no golden rule as to the ideal length of a training video. It depends on the complexity of the topic being discussed. In recognition of people`s limited information processing capabilities, Van Mele (2011) notes, video should be between 5 and 15 minutes in length. This is close to what (Rikin Gandhi, 2010) proposes, eight-12 minutes. However, the length of a video can be extended depending on the complexity of the topic and amount

of information to be captured. Africa Rice extended its video to 19 minutes because of the complexity of the topic. The preferred length may also be cultured-bound. For example, Africa farmers are more accepting of longer videos compared with their peers in Asia (Van Mele, 2011).

### **Localization**

Hoffmann (2003:15) says “Communication is always communication. If you do not have relevant information it is not the question if you use Internet or pamphlets. If you do not speak the “language of the people” it doesn’t matter if you use email or radio announcements”

An online survey conducted by Agro Insight on use of video in Agricultural training in developing countries, with 500 respondents, 85% of the respondents believe that video must be available in local languages in order to be effective (Van Mele, 2011)

Although the importance of local language is obvious, videos do not have to be made directly in the local language, as this would imply an incredible duplication of efforts when scaling up. Digital Green uses storyboards as blue prints to produce many variations on the same topic, whereby only the dialogues differ. As the videos are made in the local language and there are no scripts, the outreach potential of a single video is limited to its initial language/context in which it has been produced. Without a script, translation becomes impossible and service providers who do not speak that local language only have the visuals (not the audio) to judge for its relevance in other contexts.

Drawing on the experience of bringing Asian videos into Africa, and recently also vice versa, English and French versions can be used as a first step to gauge for local interest before deciding on translating any video (Van Mele et al., 2010b). Appealing to many

organizations, the Bangladeshi rice seed health videos were quickly translated into Mandinka. Without understanding the language spoken, the visuals were already convincing farmers that the subject was of great interest to them. Subsequent local language versions boosted local dissemination and use of the videos. Across Africa, many NGOs, development agencies, farmer organizations, national research and extension staff, as well as radio journalists and TV broadcasters became involved in the translation and national dissemination of the rice videos. By 2010, the rice videos had been translated into 37 African languages. The translation exercise in itself can offer a good opportunity for professionals from different backgrounds to work together.

Lack of local context causes “impedance mismatches” between audience and producers that hinder knowledge acquisition (Wang et al., 2005).

Chowdhury, Van Mele and Hauser (2011) found that farmers were more likely to be convinced by videos featuring actors similar to themselves in a dialect and accent, culture, education and agricultural expertise. In their study, an experienced female farmer who appeared in a Bangladesh rice video enhanced the perceived reliability of training materials. Farmer audiences were more likely to adopt the recommended technology after seeing video showing peers using it (Gadhi et al., 2007). Farmers' interaction and participation in video production and dissemination have been shown to be an effective localization method in many studies (Zossou et al., 2009a; Gandhi et al., 2007; Shanthi & Thiagarajan, 2011)

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### **Pico Projectors**

Until recently, the shortage of electricity and limited access to the internet and other modern technology have limited the adaptation of modern training devices such as computers and TV to present digital content in rural areas (Jain, Birnholtz, Cutrell & Balakrishnan, 2011). The low information and communication technology proficiency of rural training facilitators dictates simple and easy-to-use training devices. Because videos are screened in multiple locations that do not have electricity, low-cost battery-operated device are a must.

Recently, a small battery-operated video projector called the “pico” has been tested in rural areas. Smaller than a normal projector (the 3Mpro 150 version is 1 by 2.4 by 5.1 inches and weighs 5.6 ounces) (PCMag, 2010), it is bright, battery powered, portable, durable and affordable” (OMPT, 2010). In two trials in India, a pico projector was connected to a camera phone to present training materials stored on a cell phone (Jain et al., 2011; Mathur, Ramachandran, Cutrell & Balakrishnan, 2011). Some types of pico projectors have an internal memory or an SD card slot, so they do not need to be connected to a computer or DVD player. Pico projector images are suitable for viewing by groups of 15-20 people (Mathur et al., 2011).

The projectors however have two major disadvantages. First, because of its relatively low luminosity, video must be shown in a darkened room. Second, it requires an external

speaker because its audio capacity is not sufficient to be heard by a group of 15-20 farmers (Mathur et al., 2011).

### **2.11 Participatory Video in Agriculture**

Video is a tool that enhances participation as well creating a final product that can be watched by other people who understands the language of the video (Mc Causland, 2006:30).

The advantages of using participatory video have been felt decades and decades back. The late Martha Stuart was one of the pioneer researchers in the areas of PV, with a special focus on how PV can be used as a tool for social change and, in several other respects. She recognized the development potential of small video formats due to its flexibility and portability compared to other traditional media's (Singhal et al, 2008).With latest revolutions witnessed in video and computer technologies, different video formats have been developed that caters for the different technology platforms and output mediums being used. The recorded participatory videos can then be transported to other communities for watching.

Unlike other traditional technology dissemination techniques, participatory video involves interaction, dialogue, sharing, consensual decision making and action-taking. White (2003) reckons that the most important outcome of a participatory communication is the presence of the local people indecision-making, project design and implementation as well as evaluation. The ability of PV to bond local people gives the primary stakeholders a platform to share their problems and experiences, elements that are important in any developmental project. According to Lunch et al, 2006, video is a highly flexible and immediate medium of communication that entails direct human dimensions i.e. face to face contact.



The use of PV has drastically changed the mode of communication from the traditional one-way, top-down model to the contemporary of bottom-up, horizontal approach among agricultural technicians to farmers and social groupings designed to bring together both groups in a two-way sharing of information among communication equals (Servaes, 2003:19). Most communication approaches assume a top-down or center-periphery approach, where top or center decide the courses of the development actions, and down or periphery accepts what is being driven and directed from the top or center. In this way the primary stakeholders of the technology project (farmers) are commonly treated as passive recipients and hence, beneficiaries of the technology and debts of the so-called development experts who are generally from outside the areas of project intervention. For that reason, the use of PV helps in breaking ice that exists between the farmers and the technology disseminators by creating a level ground where each of them share knowledge and experiences on the adoption of the technology.

The most effective communication strategy is one that comes directly from the project recipients and from the work itself (Ibid).

On cost-benefit analysis, the use participatory video has been said to be relatively cheaper and effective as compared to traditional methods like printed materials (debatable). The proponents of PV say that its overall costs is cheaper because; first, the costs of video cameras, computers and Television sets have significantly reduced, making it affordable and accessible to many people including farmers. In addition, video being portable makes it easily transferable from one location to another thus enhancing wide dissemination of the agricultural technologies to other communities. On the other hand, despite its extensive use, print materials have been criticized for not being efficient dissemination of agricultural technologies. This is because it doesn't favor majority of the rural farmers

who are either semi-literate or completely illiterate since farmers find it difficult to read and understand the technical intensive knowledge on such technologies, thus applying it also becomes a big problem to them.

Participatory video is based on visual and verbal communication, as such, it has a great potential to add to indigenous means of communication and documentation that are so primarily visual. Video can enable under-represented and non-literates to use their own visual languages and oral traditions to retrieve debate and record their own knowledge (Oxfam; 1998).

In the course of the using participatory video, other skills can be explored such as writing, management, self-initiation, organizational, teamwork and integrity. Through this farmers are able to increase their capacity to understand the technology and express themselves in both written and oral form. To add on, by interacting with both video and other computer technologies, farmers are also likely to gain the basics on the technical know-how thus bridging digital divide among semi-literate and illiterate farmers. All this are useful skills useful for the daily lives and they increase their employability (USAID, 2006). With access to the internet, participatory video on PPT can be uploaded on [www.youtube.com](http://www.youtube.com) where anybody in the world can access it. Globalization (the network-enabled exchange of ideas and technology across great geographic distances) can produce a positive impact (Fukuyama, 1999). When farmers express themselves through the media, in the case of PV, makes the participants more critical and they realize that they have a place in the society, that they are citizens, and that they can be heard.

The following are some examples of significant where participatory video (PV) has been effectively applied:

1. Research, training and development
2. Advocacy policy dialogue/debate and influencing
3. Facilitate intra and inter community debates on key/sensitive issues
4. Networking sharing and exchange of information (video letter)
5. Building evidence for project/policy evaluation, legal claims in courts, public hearing on human rights violation or lobbying institution that monitor human rights violations.
6. Capacity building and empowerment: training, therapy, personal empowerment to do things you would have done before;
7. Keeping personal video journals or diaries.

### **2.12 Participatory Video in Extension Services**

FAO recommends one extension officer to every 400 farmers. However, according to the Association for International Agriculture and Rural Development (IARD), Kenya has one extension officer for every 1,500. This means that there are few qualified extension officers in Kenya and it is not possible for them to be everywhere at once. They are expensive to train and maintain, and it costs money to travel from village to village. Technology is, however, changing this equation. If well implemented, video can provide impressive results as far as learning and disseminating information on improved technologies is concern. Research from Digital Green, a research organization that uses a low-cost video in India, has found video to be 10 times more effective per dollar spent on a cost-per-adoption basis than traditional extension services alone. Like other new media, Video has greatly revolutionized communications between farmers and research

institutions, thereby making communication more efficient. For instance, between 1975 and 1986, in Peru, the food agriculture organisation (FAO) of the United Nations supported a farmer-training project that reached more than 150,000 smallholder farmers. These projects among others demonstrate the potential of participatory video in promoting and revolutionizing provision of extension services.

Earlier, however, video cameras and other related accessories were cost prohibitive. These costs however have fallen dramatically in that last two decades. In 1996 FAO conducted a study that suggested audio-visual training activities would cost one-third to one-fifth of classical extension training. The use of low-cost videos complements the work of agriculture extension officers and enables them to achieve their goals and increase impact. What's more exciting is that using locally created, low-cost video is still in a fairly nascent stage to Munyua (2000) and Asian Development Bank (ADB) (2003), ICT therefore is thought to achieve information transfer more effectively than other communication methods, in extension and has played a major role in diffusing information to rural communities and show great unexpected potential. The potential applications of ICTs in extension are almost limitless and should be adopted in agricultural services delivery.

### **2.13 Agricultural Extension Services**

There is a general consensus that extension services, provided they are well designed and implemented, promote agricultural productivity providing farmers with information that helps them to optimize their use of limited resources (Evenson and Mwabu 1998; Bindlish and Evenson 1993). Nevertheless, agricultural extension services are faced with challenges of providing relevant agricultural extension and training programmes to meet farmer-needs in a changing agricultural environment. Globally extension services are

facing challenges emanating from the changing social and natural environments as well as from within the extension organisations themselves (Leeuwis 2004 and van den Ban). These authors discuss challenges related to ensuring food security for a growing world population; reducing poverty and promoting agricultural practices that ensure sustainable natural resource management. Other challenges include upcoming new agricultural technologies and new clientele – the elderly and orphans managing farm household due to HIV/AIDS effects on the household structure (Du Guerny 2002).

The Government of Kenya has a long history in providing agricultural extension services, dating back to the colonial period. The extension service in Kenya has operated under two major systems. The first is the government extension system. Under this system several extension models and approaches have been tried, including the model farmer approach, the integrated agricultural rural development approach, farm management, training and visit (T&V), the farming systems approach and the farmer field schools. These methods have produced varying levels of achievements (Muyanga and Jayne 2006). The second type of extension system is the commodity-based systems run by government parastatals, out-grower companies, and cooperatives. The commodity-based extension deals mainly, but not exclusively with commercial crops such as coffee, tea, pyrethrum and sisal, the system is motivated by profits. The system integrates all aspects of producing and marketing a particular commercial crop ranging from research, advice, input supply to farmers, to organizing local and exports marketing.

The extension services in Kenya, like in many other developing countries, are particularly constrained by insufficient human and financial resources occasioned by the SAPs in the 1980s. Budgetary allocations for extension services have declined from 6 percent of the overall annual government budget in the two decades after independence to less than 2

percent currently. About 20,000 government extension workers would ideally be needed to respond to farmers' needs countrywide, but only 7,000 are currently employed (Republic of Kenya 2005a). Apart from financial constraints agricultural extension is currently facing challenges related to providing services to HIV/AIDS-affected households. Traditional extension programmes aimed at male household heads are not likely to reach orphan- and female-headed households or even the elderly. Leeuwis and Van den Ban (2004:11) recommend that for agricultural extension services to support farmers in dealing with these challenges they will have to be “reinvented as a professional practice; that is, it will have to significantly adapt its mission, rationale, mode of operation, management and organisational structure”.

#### **2.14 Smallholder Farmers` Participation in Extension Services**

World Bank, 1996 defines participation as a process through which stakeholders' influence and share control over development initiatives and decisions and resources that affects them. Stakeholder may include the farmers, donors and staff from implementing organization.

Farmers tend to learn most of the agricultural knowledge from fellow farmers. Farmers, who they share characteristics in many respects such as level of education, membership to local groups, similar sources of income (Amudavi, Khan, Wanyama, Midega, Pittchar, Hassanali & Picket, 2009a; Garforth, 1998). This has heightened the interest to use of farmers in up-scaling and out-scaling new technologies to reach as many farmers as possible (Erbaugh, Donnermeyer, & Amujal, 2007; Noordin, Amadou, Bashir, & Nyasimi, 2001).

An evaluation by the World Bank (1996) established that, putting responsibility in the hands of farmers to determine agriculture extension programs can make services more

responsive to local needs, more accountable, more effective and more sustainable for example farmers` participation is essential in formation and dissemination of Push-Pull Technology which requires farmers to invest effort and resources in technology that are knowledge intensive.

For instance, in Indonesia, on-farm trails with substantial farmer involvement have proved the best means to ascertain and demonstrate the potential benefits of Integrated Pest Management (IPM) technology, World Bank report 1996.

As per a 2001 report, The International Food Policy Research Institute (IFPRI) documented that when farmers are made influential and responsible beneficiaries rather than the passive clients of the extension services sustainability both for the benefit of the investment in the technology and of the services it may substantially be improved.

If properly designed and implemented, participatory method have the capacity to increase farmers` ownership of the technology promoted by extension management especially where the methods are developed at least in part by the immediate beneficiaries themselves and are based on technology have been seen to be working.

### **2.15 Dissemination of Improved Agriculture Technology Information**

Affordable and timely access to accurate, understandable and relevant agricultural technologies information, is important for achieving sustainable agricultural productivity (Lee, 2005).Therefore, farmers` access to this information and its effective dissemination is greatly meaningful to economic development (Wang &Chen, 2009).

While trying to produce enough to feed their families and little surplus for income, smallholder farmers are faced with numerous a biotic and biotic challenges such as soil fertility, drought and famine, water stress, pest and disease infestations etc. (Ejeta, 2007).

With limited and ineffective government extension services in sub-Saharan Africa, smallholder farmers often rely on informal channels of information exchange and knowledge sharing to address these challenges (Katungi, Svetlana & Smale, 2008).

The most common channels for acquiring agricultural information are; print media (leaflets, brochures' posters, books, newspaper etc.), extension officers, farmer groups and field schools, fellow farmers, exhibitions, radio programs, TV etc. (Ozowa, 1997). However, the choice of a particular pathway mostly depends on the needs ( Demiryurek, Erdem, Ceyhan, Atasever & Uysal, 2008; Maria, Anne & Germán, 2008).

Some are more accessible and affordable than other. For instance, many of the resource-poor farmers are able to access cheap if not free extension services provided by the ministry of agriculture. Numerous researches on appropriate technology dissemination pathways have indicated that farmers tend to learn about agricultural technologies from fellow farmers (i.e. farmer-to-farmer approach) because farmers share characteristics in many respects such as education levels, cultures, membership to local groups, similar sources of income (Amudavi, Khan, Wanyama, Midega, Pittchar, Hassanali& Picket, 2009a; Garforth, 1998).However, no single technology dissemination channel is effective by itself. Whether from farmer-to-farmer or from agriculture extension officer to farmer (and vice versa), will continue to be important (Black, 2000).

According to Bohmann (2003), the selection of a medium depends mainly on the message and the target groups. Therefore, each medium has a specific technical feature that makes it more or less suitable for specific objectives; target groups, the situation and most importantly the kind of message one wants to communicate.



With the understanding that majority of the smallholder farmers are either illiterate or semi-literate, print media would not be the most suitable source of information. More especially if one is communicating information about a knowledge intensive technology such as push-pull technology. For such kind of audience, it is important that one uses most appropriate communication medium to effectively communicate this information.

The use of video materials for transferring knowledge and information to the grassroots people has increased due to the recent technological revolution. Advancement in technologies industry has come with huge benefits its users. For instance the cost of such items has relatively reduced making it affordable and accessible to many people.

Compared to other sources of agriculture information, video has a comparative advantage as it combines both audio and visual effect thereby effectively communicates the information to the target group. It's important to note that pictorial information will stick longer in the mind than text only. Furthermore video materials are able to reach a wider audience than at the same time in a cost effective and efficient manner ( VeMele, 2007).

Despite the huge potential of video application in transforming learning and dissemination of improved agriculture technologies, most application of video adopt a top-down approach where farmers passive audience as they are not involved in the creation of the content. The scenario here is that, scientists and other experts in agriculture sit in a laboratory come up with findings and solutions that they think would work for the farmers.

As noted by Knowls (1997), adults will only learn things that they deem relevant to them and has proof of benefiting their lives. Therefore, it is important to include the

beneficiaries of a technology in all its stages of development. This will make them feel they own the process and that it's to their own benefit.

### **2.16 Farmer-to-Farmer Learning Approach**

In the recent years, there has been a growing interest to use farmers in up scaling and out scaling new technologies to many farmers to improve productivity (Erbaugh, 2007; Wambugu, 2006). This has been necessitated by the fact that there is a big yield gap between what is possible and what is actually achieved on farmers' fields, mainly due to lack extension services, institutional and cultural constraints, and farmers' long adaptability to traditional practices (Alene & Manyong, 2006). The use of farmers as extension agents contributes to strategies for overcoming barriers to access, utilization of information, understanding client information needs, and designing effective information delivery systems (Amudavi et al., 2009b). Technology diffusion theory stresses the importance of decentralized communication channels, through which knowledge and information are communicated via informal networks, as essential elements for behavior change (Rogers, 1983). Farmer-to-Farmer dissemination of new technologies such as PPT form part of the decentralized communication channels.

Farmer-to-Farmer involves farmers and other rural people participating as the principal agents of change to increase the effectiveness of meeting farmers' knowledge and information needs and to improve sustainability of services or technologies. According to FARM-Africa 2003, this approach enables farmers to play a more active role in decision making and planning; builds local capacity to manage and control services; allows area-specific service delivery; and facilitates equity in delivery by targeting poor farmers.

Efforts to integrate Farmer-to-Farmer dissemination of technologies into public service delivery systems have been tried, though in very few cases. Examples of such efforts include Farmer Field Schools (FFS) within Integrated Pest Management (IPM) programmes in Indonesia and the Philippines ( Killough, 2003). Most efforts on application of farmer-led approaches have been on a relatively small-scale and that there is limited experience and capacity in scaling-up (ibid). Qamar (2002) identified two major constraints to scaling-up of such approaches; the intensity of human resource inputs required both by extension staff and farmers in problem solving, management and decision-making, and also the need for encouraging a change among traditional development organizations towards accepting that farmers may have much to offer in agricultural technology development and dissemination processes.

Farmer-to-Farmer dissemination of technologies, work best in areas where two or three well proven technical innovations can be quickly introduced and have the potential of making impact; they are applicable in commercial and/or market-oriented agricultural production environments; and they work in overtly commercial agricultural contexts where extension services are integrated with the sale of inputs or with other technical and marketing services ( Hawkesworth & Perez, 2003; Killough 2003; Van Asten, Kaaria, Fermont, & Delve, 2009). Therefore, in order to overcome these challenges and exploit the opportunities, new and innovative approaches need to be developed and embraced by farmers.

### **2.17 Group Learning**

In most traditional research and extension linkage system, development and transfer of high yield agriculture technologies tends to be largely based on a vertical one-way communication model with information flowing from research laboratories to farmers

through extension officers. In many of these linear models, problem definition tended skewed toward research interests than to farmer perceived problems and therefore farmers end-up not playing an active role in technology development and transfer. At the end there is no motivation to farmers to adopt such practices.

With continued decline of free extension services from the respective government ministries to smallholder farmers, discussions on alternative approaches have been going on to be able to come up with an approach that not only delivers technology information to farmers in an effective and efficient fashion, but also one that will help farmers organize themselves in groups to effectively share experiences and knowledge about farming.

The farmer field school (FFS) method is a farmer-driven, learning-by-doing intervention which uses discovery learning and adult education principles to improve farmers` knowledge and expertise in agriculture and strengthen decision-making capacity.

FFS is a new concept of farmers` training to promote learning and diffusion of knowledge to the farming community that was developed in the 1980`s by FAO in Indonesia before adopted in Africa in the 1990`s (Pontius et al. 2002). However doubts have been raised as to whether the approach will succeed in Africa, particularly with regard to the expected diffusion of knowledge from trained farmers to non-participants, which are essential in achieving large scale impact of FFS (Rola et al. 2002; Feder et al. 2004).

Studies on diffusion of innovation have indicated that diffusion is a complex process that depends on multidimensional and interrelated factors (Rogers 2003; Roeling 1988; Palis et al. 2002; Fuglie and Kascak 2001). Seemingly, interpersonal networks are the

predominant methods through which farmers' access and diffuse knowledge (Rola et al. 2002; Birkhaeuser et al. 1991; Tripp et al. 2005).

Unlike the traditional linear technology transfer approach, FFS approach, subscribes to an all-inclusion learning approach where farmers, extension officer, researchers and other stakeholders consult at all level to come up with technology information that is beneficial to farmers.

It is recommended that FFS comprise of 20-25 members and is led by a facilitator who is basically a technically competent person who leads the group members through hands-on exercises. Facilitators can either be a graduate from the FFS or an extension officer.

The main features of FFS, according to Anandajayasekeram et al., (2001) are:

- Field is primary resource
- Participatory discovery learning process where farmer participation is enhanced.
- Hands-on experience sharing i.e. experience forms and the basis for learning
- Capacity building and empowerment
- Stakeholder ownership on the process, content and knowledge derived.
- Covers entire production cycle or key steps in the management practices of the crop livestock systems.
- Can handle multiple technologies and support services simultaneously.
- It is group-based, with in-built flexibility.

- Curriculum is dictated by the specific production system, and priority problems and the local conditions of the farmer groups.

If properly implemented, enhances farmer to farmer extension of technologies and information.

When implementing the various agricultural programs, agricultural stakeholders are always focused on covering large geographical areas to remain politically visible and get nation-wide impact. Thus a typical placement strategy is to introduce one FFS in every village and therefore maximize the number of “FFS villages” in a country for a given budget. Consequently, the proportion of trained farmers in a given area is small. The alternative strategy is to concentrate on fewer villages, which may be selected due to their history of pest infestation among other biotic causes. In this case, the project budget would be spent to train a critical mass of farmers (in several FFS) including follow-up training. Both approaches can be expected to have implications for the diffusion of knowledge.

In this strategy, trained farmers who are adopters of improved agriculture technologies may have a stronger influence on non-adopters as compared to a village where only a few farmers attended a FFS. This influence could then result in higher adoption through farmer-to-farmer communication. Hence learning and knowledge diffusion highly depends on participatory extension strategy.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter describes the methods used to help understand and investigate the effectiveness of using participatory video method in learning and disseminating technology information among smallholder farmers.

It covers the research design, the population and subjects, sampling procedures, data collection instruments, study variables, data analysis and means for ensuring validity and reliability.

The goal of the study was to examine the effectiveness of participatory video method in learning and disseminating technology information among smallholder farmers in selected regions in western

#### **3.2 Description of Study area**

Smallholder farmers, many of who practice subsistent agriculture, primarily occupy Western Kenya. The area receives reliable, bimodal rainfall between 1200 to 2000mm annually. However, the dominance of Striga weeds, highly weathered, nutrient-depleted soils and poor farming methods have continued to cause low cereals production in the

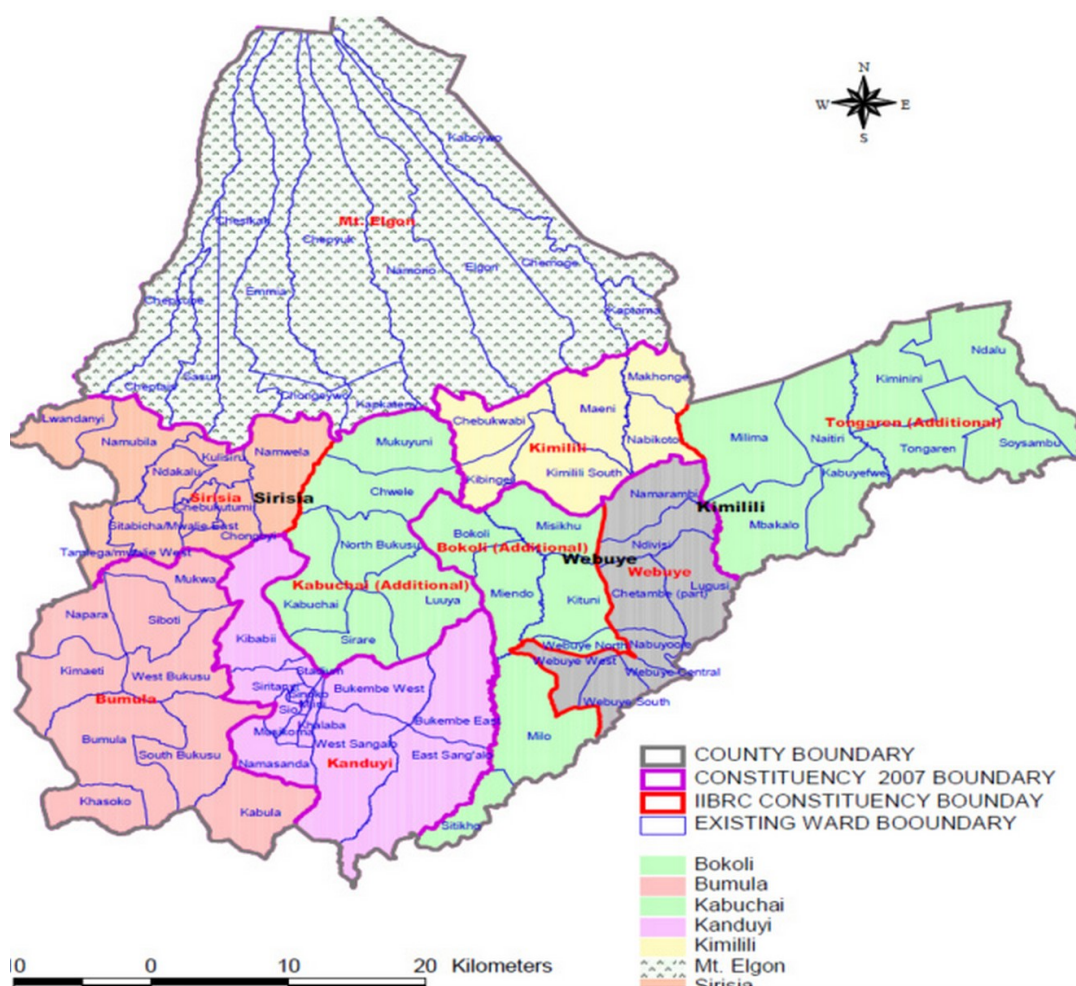
region which have resulted to increased poverty, low income, malnutrition among children etc.

The average farm size is only 1.5 ha but ranges in size from about 0.3 to 6ha from different areas in the region. This means that a majority of the farmers practice small-scale farming .Vihiga District has a population of 554, 622 in a surface area of 531 km<sup>2</sup> with 1,045 people per km<sup>2</sup>, Bungoma District has a population of 1,630,934 in a surface area of 3,593 km<sup>2</sup> with 454 people per km<sup>2</sup>, Suba District has a population of 958,791 in a surface area of 2,586 km<sup>2</sup> with 371 people per km<sup>2</sup> while Kisumu District has a population of 968,909 in a surface area of 2,086 km<sup>2</sup> with 465 people per km<sup>2</sup> (Kenya National Bureau of Statistic, 2010).



### 3.2.1 Bungoma District

Figure 7: shows a map of Bungoma District



Source: Kenyan, 2012

Is a district in western Kenya and situated on the slopes and footpath of Mt. Elgon boarding Republic of Uganda to the west and lies between latitude 0 25.3` and 0 53.2` North and Longitude 34 21.4` and 35 04` East.

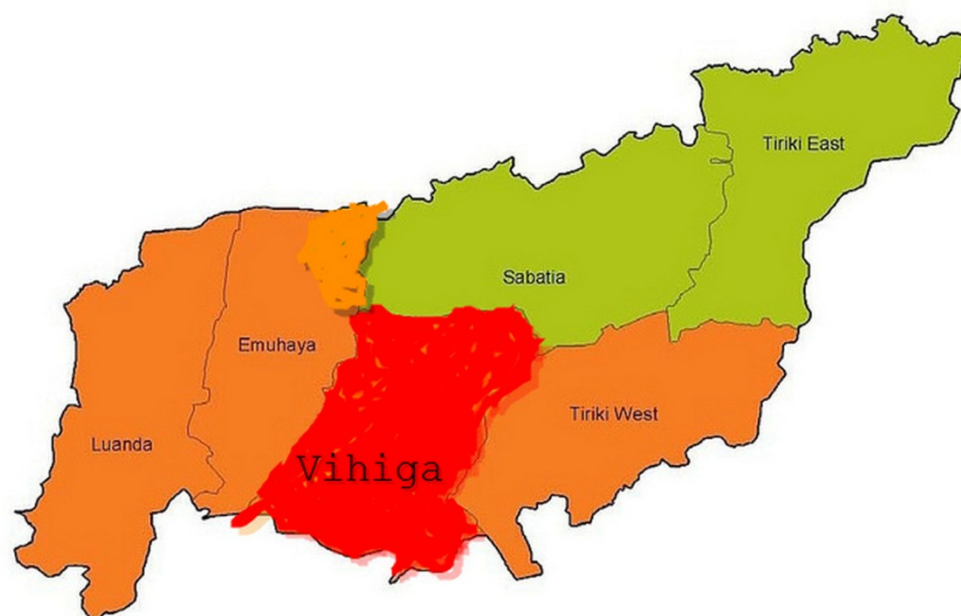
Bungoma district occupy land size of about 2, 068.5km<sup>2</sup>. An estimated 1, 838 km<sup>2</sup> (183.800ha) of land is Agricultural land that supports crops and livestock production.

The district enjoys generally abundant and well-distributed annual average rainfall. The region enjoys two rain patterns; with the long rains covering March to July while short rain start in August to October.

According to recent statistic, Bungoma has a population of 1,630,934 people in a surface area of 3,593 Km<sup>2</sup> with 454 people per km<sup>2</sup>. There are heavier populations in the urban areas near major factories and shopping centers in Malakisi, Tongareni, Kimilili, Sirisia, Nzoia Sugar Company, Webuye and Bungoma Town.

### **3.2.2 Vihiga District**

**Figure 8: Shows a map of Vihiga District. Source: Kenyani, 2012**

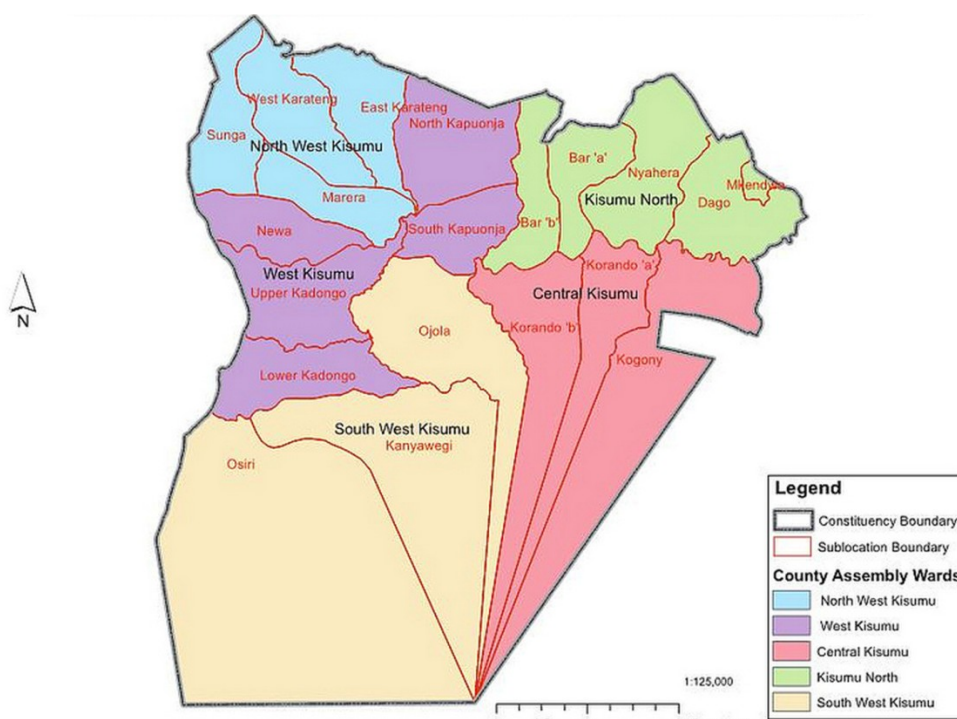


Vihiga County is in western Kenya. Vihiga has four constituencies including; Luhya community largely occupies Emuhaya, Sabatia, Vihiga and Hamisi with a population density of 1,045 people per sq. km. Vihiga. It is a predominantly a high potential agriculture area covering approximately 530.9 sq km. Population is growing relatively fast in this county. For instance, in 1999 the estimate population was 498,883 persons (GOK, 2001 b). Reports from GoK indicate that there are approximately 554,622 people of whom 47% are male and 53% are females. With regard to age distribution, 44.2% are between 0-14 years, 49.4% are between 15-64 years and 6.1% are 65 years and above. The increase in population has continued to increase stress on the already small pieces of land with majority of the farmers owning as little as 0.5-1 hectares of land.

Vihiga has a hilly terrain. Agriculture is the main economic activity and the crops planted include tea, maize, millet, bananas, avocados, papaya, and sweet potatoes and cassava. Livestock rearing is also practiced in the county.

### 3.2.3 Kisumu West District

**Figure 9: shows a map of Kisumu West District. Source: IEBC, 2012**



Kisumu west district is in Kisumu County formerly Nyanza province. It covers an area of about 2,085 sq km. There are 5 local authorities in Kisumu county; they include; Municipal council of Kisumu county, county council of Kisumu, Nyando, Muhoroni and Ahero.

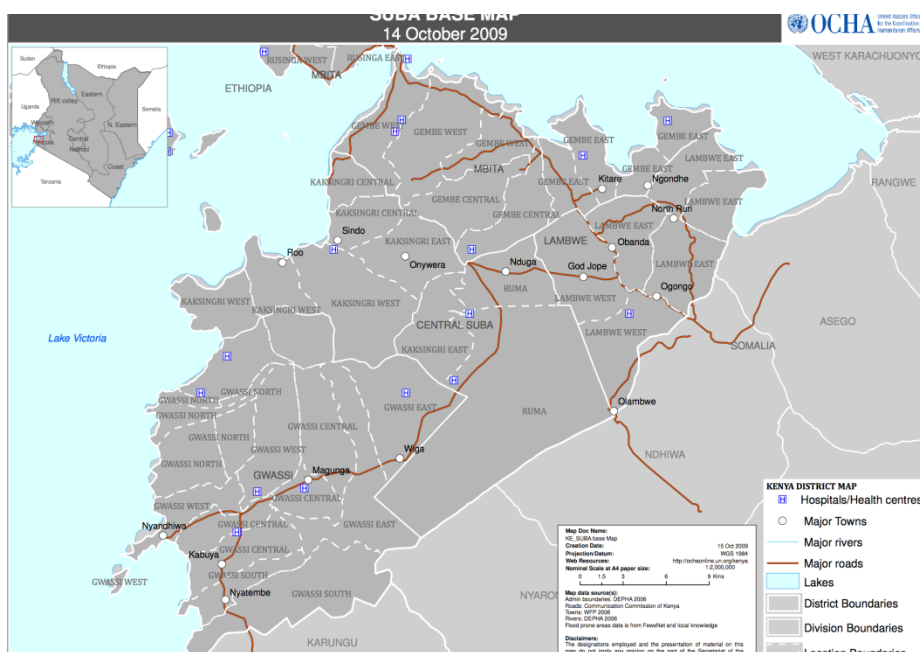
A part from fish farming, Agriculture is also a common economic activity in this region, mostly concentrating on sugar cane farming and rice irrigation. However, majority of the people practice subsistence farming and mainly on cereal (maize, millet and sorghum)

production. The presence of L. Victoria in the region has also boosted agriculture productivity considering the inconsistent rainfall patterns in the region.

Kisumu covers an area of 2,085 sq km and receives annual rainfall of 1200mm and 1300mm with temperatures of between 20-35 degrees. Currently, the population is at 968,909 with 48.9% being male while 51.1% are women. Population density is 465 people per sq km. Poverty rates are 45%.

### 3.2.4 Suba District

**Figure 10: Shows a map of Suba District. Source: Albert Kenyani, 2012**



It is located in the former Nyanza province with an area of 3,183.3 sq km. 95% of the occupants is from Dholuo speaking community. There are 7 local authorizes in Homabay county and they include; town council of Mbita Point, Oyugis, Kendu Bay, Suba, Rachuonyo, Homabay, Municipal Council of Homabay.

Fish farming and agriculture are the main economic activities in Homabay County. Subsistence farming is practiced extensively with crops such as maize, sorghum, groundnuts, millet, sorghum and sweet potatoes.

Currently there are approximately 963, 794 people, 48% are male and 52% being females. The population density is 303 people per sq. km.

### **3.3 Research Design**

A mixed quasi-experimental research design was adopted in the study. Quasi-experimental designs are designed to maximize on internal validity (cause and effect conclusion) in a study. The advantage of quasi-experimental research design is that participants are not assigned variables randomly, which might have effects on the findings.

### **3.4 Population and Subjects**

The study population consisted of smallholder farmers who have already implemented PPT in their farms. Farmers were drawn from four districts namely; Bungoma, Vihiga, Kisumu West and Suba districts. The farmers` were drawn from selected FFS from their respective districts. For instance in Bungoma, participants were drawn from Simana FFS (GPS Location: N 00 35`34`.2" E 0.34 34`27.5") Epwopi FFS in Vihiga (GPS Locaton: N 00 05`32.5" E 0.34 35`38.4"), Ladpufa FFS in Suba and Yenga FFS in Kisumu West (GPS Location: S 00 02` 47.8" E 0.34 38` 21.9")

### **3.5 Sampling**

Purposive sampling was used to select districts and farmer field school (FFS) with predominant use of PPT as a control measure for Stemborers and Striga weed. Purposive sampling ensures that certain important segments of the target population are represented

and also allows selection of rich information that provides a great deal of insight into the issues of central importance to the research (Patton 1990).

Participants were drawn from a pre-existing list of registered smallholder farmers in FFS who have already adopted push-pull technology in Bungoma, Vihiga, Suba and Kisumu Districts. A Random sampling technique was used in selecting smallholder farmers from the four Districts. A multi-stage sampling method was adopted. Bungoma, Vihiga, Kisumu and Suba Districts were selected purposively basing of several reasons including the following:

- i. That there is very high infestation rate of Striga weeds in the areas
- ii. That a high numbers of smallholder farmers owning small pieces of land.
- iii. There is a huge presence of push-pull farmers who are already using the technology.

240 participants were randomly selected from a host of push-pull farmers from four districts. From the foregoing explanation, the farmers were randomly distributed into three treatment groups i.e. PV content only; PV + Print and Print materials only.

The farmers' were interviewed to test the following:

- a) Their understanding and retention capacity of the science of push-pull technology after exposure to PV and printed media content.
- b) Their readiness to share knowledge with the rest of farmers in a farmer-to-farmer approach.

c) Changes in farming techniques and practices

Other parameters to be evaluated will be the levels of understanding and application of PPT knowledge, the levels of adoption, and technology diffusion to other farmers, and the demand created to learn push-pull using video.

### **3.6 Treatments Groups**

*Treatment I:* Farmers were exposed to participatory video content of PPT only

*Treatment II:* Farmers were exposed to both participatory video and print media content on push-pull technology

*Treatment III:* Farmers were exposed to PPT print materials only

The researcher did a blind experiment to ensure participants do not know their groups as a way of preventing “Heathrow effect”-the tendency of subjects to act differently when they know they are being studied, especially if they think they have been singled out from some experimental treatment.

In phase one, a group of experienced push-pull farmers from Bungoma, Vihiga, and Kisumu and Suba districts participated in the development of video lesson materials for PPT using a participatory approach. Farmers together with their farmer teachers went through on-farm training on using the handheld cameras, develop storyboards, shooting and editing the videos. The videos were captured during the long and short rain seasons in different farmers` fields.

### **3.7 Push-Pull Technology video lessons produced**

i. *Understanding Striga weed biology*



This 11 min video is produced by farmers from Yenga FFS in Kisumu West. The farmer explains his knowledge of Striga weed biology and how it affects the maize or cereals crops causing yield losses. The language used is English.

*ii. Land Preparation and layout of push-pull fields*

A 10 min video produced by farmers from Simana FFS in Bungoma. The video shows Mr. Peter Waboya, the chairman of Simana FFS demonstrating how to prepare a push-pull plot. The language used is Kiswahili.

*iii. Weeding of Desmodium and Napier grass*

This 7 min video shows a group of experienced Push-Pull farmers from Ladpufa FFS in Suba District explaining how to weed desmodium and Napier grass on a push-pull plot.

*iv. Harvesting and utilization of Napier and Desmodium as fodder for livestock*

This is an 8 min video produced by Push-Pull farmers from Simana FFS in Bungoma. Mr. Wafula demonstrating how to harvest desmodium and Napier grass in a Push-Pull plot and how the desmodium is mixed with Napier grass a fed to the animal.

### **3.8 Criteria of selecting PPT lessons**

- I. The lessons constitute the key elements of understanding Push-pull Technology
- II. The lessons can be taught and demonstrated practically and achievable in one season
- III. The farmers have experience with the topics
- IV. Farmers (learners) can easily apply and be tested on their knowledge

### **3.9 Pilot Testing of Instruments**

The researcher pilot-tested the data collection instruments in February 2012 in Matulo, Webuye District in order to determine their reliability in terms of clarity of the questions and ease of understanding. This enabled the researcher to detect any possible errors and review the instruments appropriately to ensure internal consistency among the items.

According to Kumar (1996), pilot testing should neither be carried out with the actual study population nor in the same actual study areas. Hence, the researcher, with the help of a farmer facilitator and an agriculture extension officer conducted the pilot testing by interviewing a selected group of practicing push-pull smallholder farmers. 25 respondents were interviewed during pilot testing.

### **3.10 Data Collection**

In line with the qualitative inductive approach, the study started with preliminary data collection that allowed for the development of data collection instruments that included; structured questionnaires and direct observation. The researcher also used semi-structured interviews with key respondents especially during the preliminary phase to help guide the inquiry, identify the hypothesis and help collect rich data.

A consultative approach comprised of the researcher, push-pull extension officers and farmer teachers was adopted in designing data collection instruments. The questionnaires and interview schedules were significant for collecting basic information including; socio-economic characteristics such as; age, education level, language preference, gender, sources of agricultural information, household size and farming experience. Focus group discussions were also used to complement data collected through questionnaires.

The questionnaire was pre-tested before actualization. 15 practicing push-pull farmers from Matulo village in Webuye district participated in the pre-testing exercise. This helped the researcher in analyzing the completeness of questionnaires for collecting required data. The researcher with the help of farmer teachers and field officers administered the final set of questionnaires.

A Multi-stage approach was adopted during data collection. Primary data was collected through participant observation with the researcher joining the respondents at their villages to experience their day to day farming activities and experiences to learn PPT and while collecting data at the same time.

### **3.10.1 Interviews**

Firstly, the researcher introduced and discussed the purpose and the important benefits of the study. After setting preferable dates and dividing participants into the treatment groups, participants were interviewed using structured questionnaire in a face-to-face interview.

Before the interviewed, the researcher assured the participants that the information and discussions would be held in the strictest confidentiality. They were requested to be open when answering questions and be free to ask questions where they did not understand. Equally, not answer any questions that they do not want to answer.

The participants (controls and treatments) were placed in different rooms to avoid making contact and exchanging information.

There was no time limitation imposed to the participants and those who were interviewed and finished first were requested to wait for the others interviewees but not mix with them.

### **3.10.2 Focus Groups**

The Participatory video materials were also evaluated using focus groups. The Focus groups allow participants to react to and discuss material, providing insights that may not be obtained through other data assessment methods (Nordstrom, Wilson, Kelsey, Marezki, & Pitts, 2000; Sevier, 1989). In this study, focus groups were to determine how the videos were received by the smallholder farmers and what improvements should be made. Participants in the focused groups were randomly selected. Each focused group had 8-10 members including a mix of male and females of different ages. Each discussion focused on eight topics related to the Push-Pull Technology Instructional Videos: content, length, instructional clarity, language level, relevancy, likes, dislikes, and recommended changes. Two focused groups were done each lasting approximately 45 min.

The focus group discussions were audio-taped to facilitate data analysis. Audiotapes were transcribed and reviewed to identify similar topics.

### **3.10.3 Validity**

Mugenda and Mugenda 1999, define validity is the extent to which a researcher can draw accurate and meaningful inferences based on the results obtained from an instrument. The validity of qualitative data is measured by trustworthiness, dependability and credibility.

Validity was assured by undertaking:

- Triangulation;
- Following a consultative approach during the development of data collection instruments.

- Comparing observations to the literature;
- Training farmer teachers;
- Assuring anonymity of respondents;
- Using random sampling where possible;
- Pre-testing the questionnaires- a pilot study was carried out in Matulo village, Bungoma District with 15 push-pull farmers to ascertain the validity and reliability of data instruments. This helped the researcher to establish the accuracy of the instruments when conducting the actual study.

### **3.11 Reliability**

This is the extent to which an instrument is consistent in measuring or in which a particular technique will always yield the same results (Babie 1986). Reliability can be compared to precision.

Error that affects reliability can come from various sources. The respondents may have been tired or ill, or not be in the mood to talk to the researcher. On the questionnaires, there may have been ambiguous questions or an enumerator may not have understood what information the researcher was attempting to obtain. The questionnaires administered during raining season and this could have influenced the farmers` responses. Other errors could be due to incorrect data entry (Dedrick, 1997, Foundations of educational research, unpublished manuscript, University of South Florida).

### **3.12 Data Analysis**

Quantitative data from the questionnaires were entered into the Statistical Package for the Social Sciences v.18 (SPSS) software (George & Mallery, 2001) and analyzed. Descriptive analyses of the data were a major outcome. One-way ANOVA analysis technique was used to measure farmers` knowledge levels at pre-test and post-test among the treatment groups. Correlation techniques and measures of association such as correlation coefficients (Pearson`s product moment) and multiple linear regressions were used to examine and predict relationships among the study variables. The logistic regression model was also used to deal with binary responses. Comparisons of groups were made using contingency tables and cross-tabulations, and tested for significance with tests such as chi-square.

Qualitative data was analyzed by hand by reducing them to workable categories. The researcher then sought to discover themes, patterns, associations, explanations and general statements about the relationships among categories of data (Marshall & Rossman, 1999).

Another tool that was used for data collection was GIS (geographic information systems). GIS is basically a software package that combines maps and database information in a single analytical tool. With GIS, the researcher was able to map the dairy-goat groups. Further information on Meru such as agro-ecological zone, altitude, markets; forests, rivers and roads were added to this information to determine how they were all related.

## **CHAPTER FOUR**

### **DATA PRESENTATION, ANALYSIS AND INTERPRETATION**

#### 4.1 Introduction

In chapter 3, the researcher discussed the methods used in the study. This chapter focuses in data presentation, analysis and interpretation.

#### 4.2 Demographic and social economic characteristics

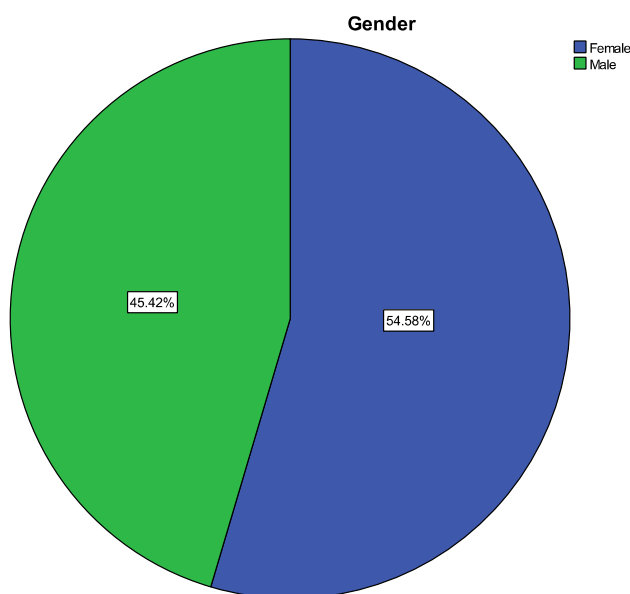
This section gives a broad look at the social economic characteristic of the farmers. They include; Gender, Age, Education level, Language, Marital status, income level, house hold size, size of land, farming experience.

##### 4.2.1 Gender

**Table 4: Distribution of respondents according to gender**

<b>Age</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Cumulative Percentage</b>
Male	109	45.4	45.4
Female	131	54.6	100
<b>Total</b>	<b>240</b>	<b>100</b>	

N=240, SD=0.49894, M=1.5458, Range=1.0, Minimum=1.0, Maximum=2.0



**Figure 11: A pie chart showing distribution of farmers by gender**

A descriptive analysis of distribution of respondents on the basis of their gender revealed that 109 (45.42%) of the respondents were males while a high of 131 (54.58%) were females.

Gender is an important variable that affects learning and adoption of new technology; since female headed home differ in terms of access to assets, Education and other critical aspects of technology adoption. Research indicates that male-headed homes have higher access to resources and information hence they have a greater capacity to adopt technologies. (Kaliba et al., 2000)

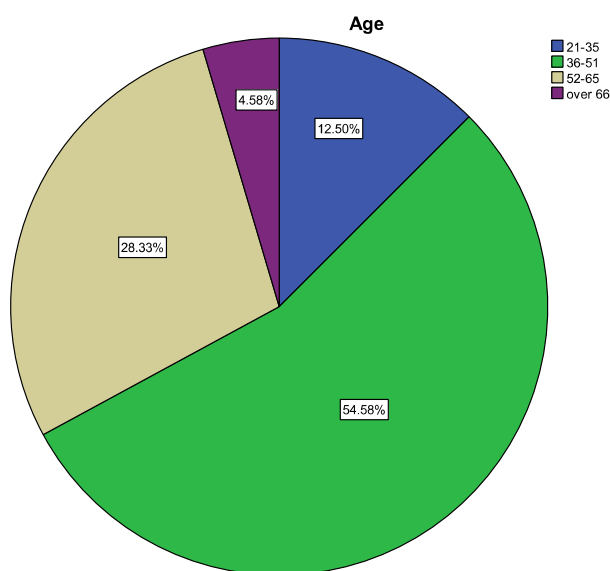
Above results revealed a majority of the respondents from the four districts were female. These results are in line with Matata et al, (2001) who reported that women dominate small-scale farming in Africa.

#### **4.2.2 Age**



**Table 5 : Frequency distribution of age of the respondents**

Age	Frequency	Percentage	Cumulative Percentage
21-35	30	12.5	12.5
36-51	131	54.6	67.1
52-65	68	28.3	95.4
66 +	11	4.6	100
<b>Total</b>	<b>240</b>	<b>100</b>	

**Figure 12: A pie chart showing distribution of respondent by age**

A descriptive analysis on the distribution of age of the respondents was done as shown in the table 5 above. 12.5% of the respondents were between 21-35 years; 28.3% were between 52-65 years; 54.6% were between 36-51 years while as little as 4.6% had 66 years and above. This implies that majority (67.1%) of the farmers were below 51 years and therefore are able to learn the knowledge intensive improved agriculture technologies

such as PPT much faster than elderly farmers. However, in some technologies, older farmers have a high potential of learning new technologies considering their wealth of experience.

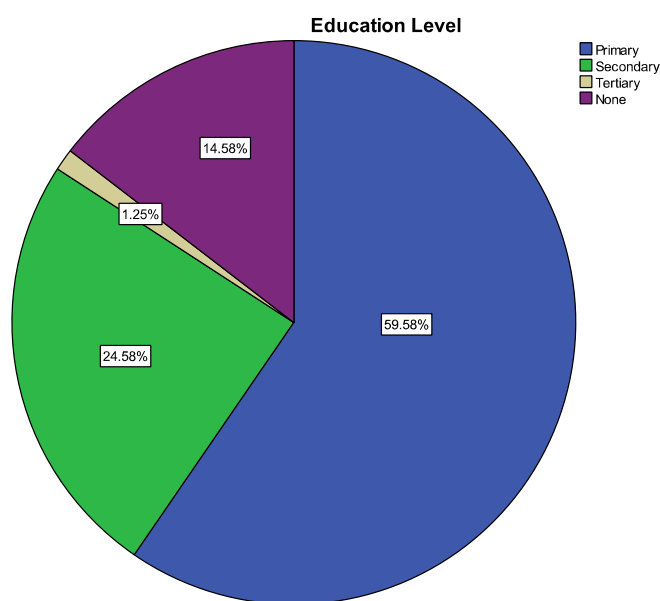
According to Porcari (2010), the older generation is unfamiliar with the latest communication technologies and in many cases; their children are far more familiar with social networking and other recent advances in Internet use. Major cultural changes are needed so that they can take advantage of these tools to enhance their networking, advocacy and other opportunities to have impact.

Age is described as a composite of the effects of farming experience and planning horizon and can either be positive or negative (A strat et al. 2004). In some technologies, older farmers have a high potential of learning new technologies considering their wealth of farming

### 4.2.3 Education Levels

**Table 6 : Frequency distribution of farmers` education level**

Education	Frequency	Percentage	Cumulative Percentage
Primary	143	59.6	59.6
Secondary	59	24.6	84.2
Tertiary	3	1.3	85.4
None	35	14.6	100
<b>Total</b>	<b>240</b>	<b>109</b>	



**Figure 13: A pie chart showing distribution of farmers by education levels**

Education is used as a proxy for farmers` ability to acquire and effectively use information ( Gervais et al., 2007). An educated farmer is more likely to learn and understand the technology better. The analysis of education level of the household heads

in the study areas indicated that out of a total of 240 farmers; 143 (59.6%) had primary level education, 59 (24.6%) had attained secondary school education level, only 3 (1.3%) had attained college education, 35 (14.6%) had no formal education.

The descriptive analysis indicates that majority of farmers 84.2 % had some formal education. This is an advantage for learning and dissemination of farm innovations as education is a key factor in the learning and adoption of modern farm practices (Obinne, 1991). In other words, the high level of education among the respondents the more they are able to learn and retain the knowledge intensive agricultural technologies.

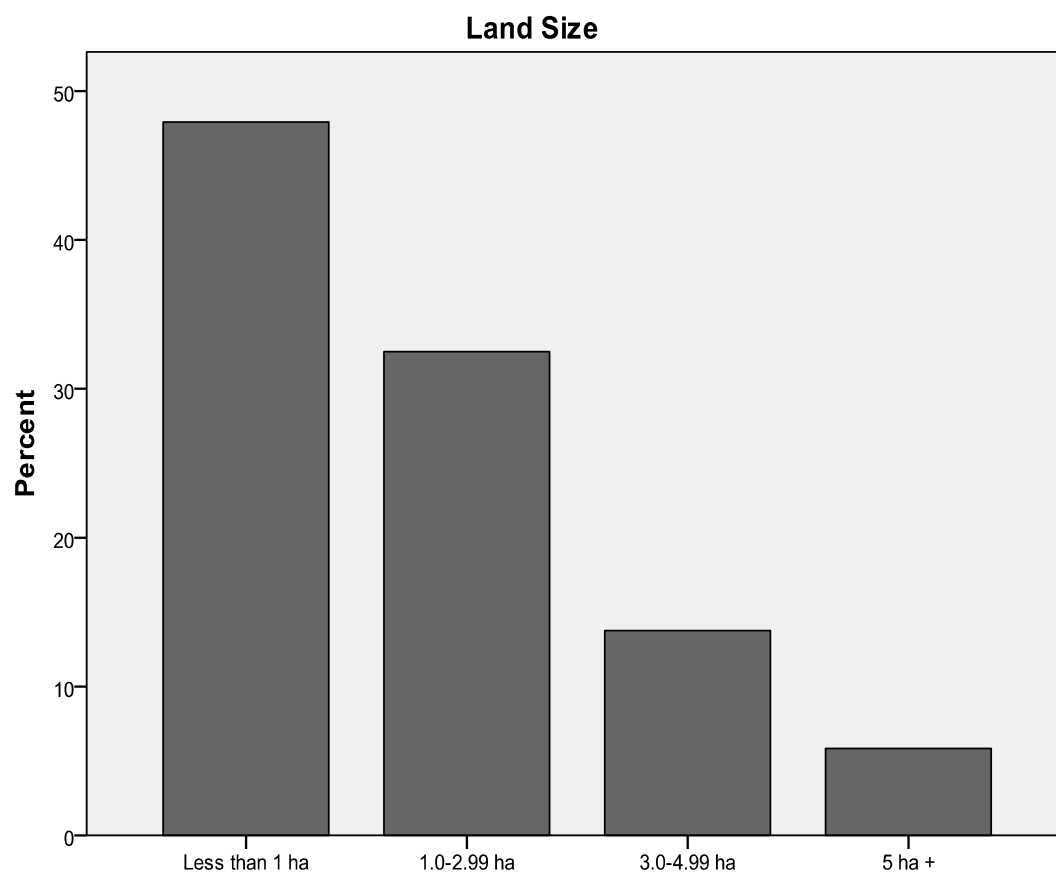
#### **4.2.4 Land Sizes**

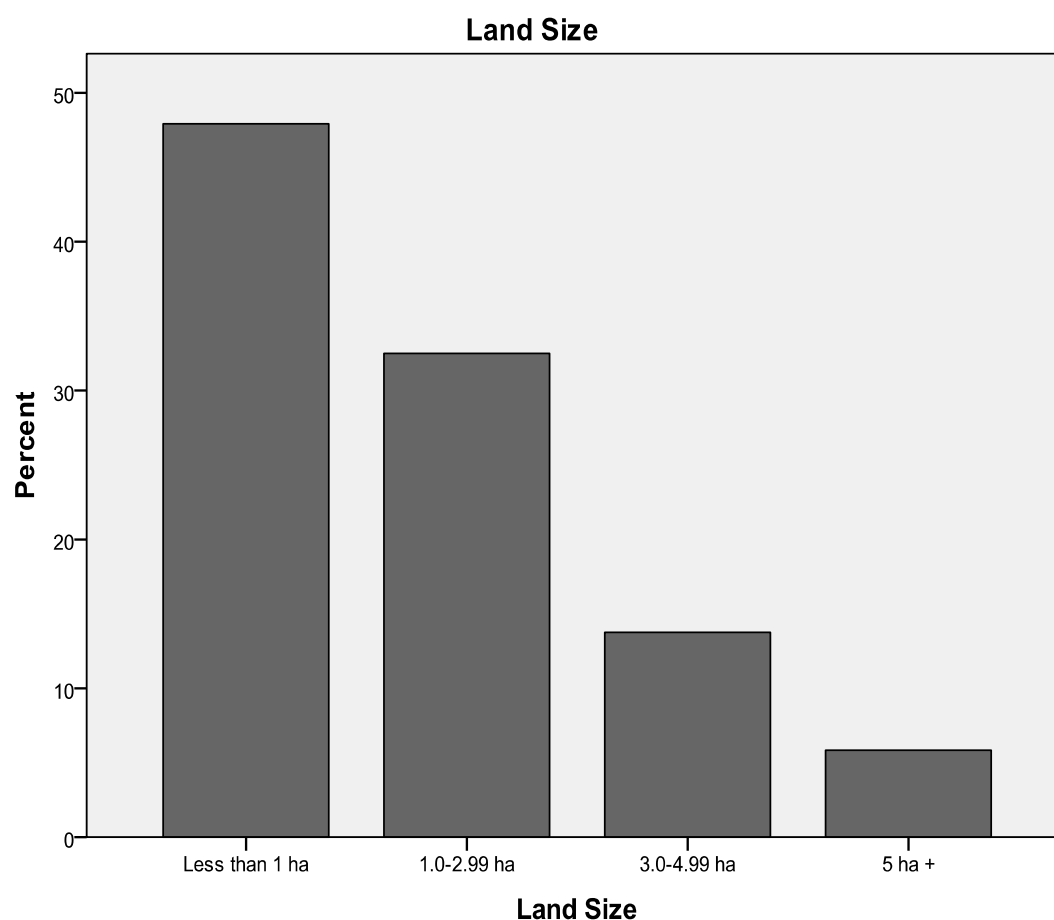
An analysis of the respondents' farm sizes showed that 47.9% owned less than 1 ha, 32.5% owned 1.0 - 2.99 acres, 13.8% owned 3.0-4.99 acres while 5.8% of the farmers owned more than 5.0 acres of land. The results of the descriptive analysis are indicated in Table 7 below. The results correspond with Idowu Oladele (2008), who found that farm sizes are not up to 10 acres are the most common amongst farmers in sub-Saharan Africa. This may be due to the subsistence nature of production among farmers.

**Table7 : Frequency distribution of farm sizes of the respondent**

Farm Size (ha)	Frequency	Percentage	Cumulative Percentage
Less than 1	115	47.9	47.9
1.0-2.99	78	32.5	80.4
3.0-4.99	33	13.8	94.2
More than 5.0ha	14	5.8	100
<b>Total</b>	<b>240</b>	<b>100</b>	

Figure 14: A bar chart showing distribution of farmers by size of land





#### 4.2.5 Farming Experience

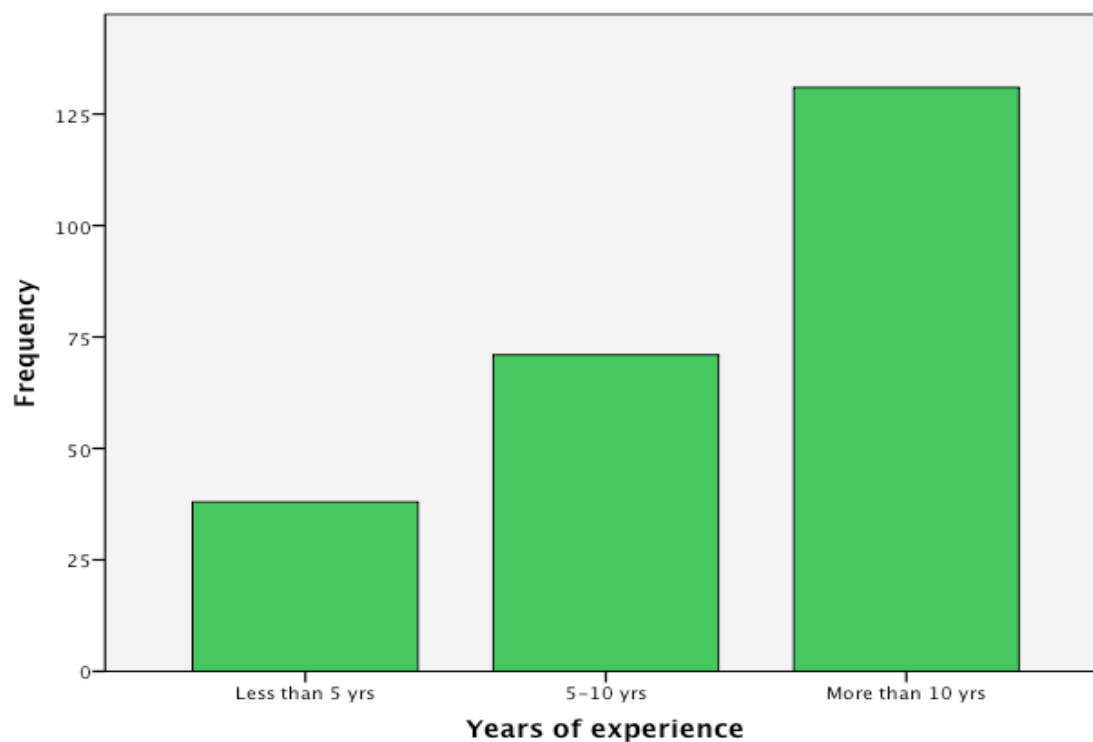
A descriptive analysis was done to describe the farming experience (years) of the respondents in agriculture and the results are shown in Table 13 below. The results indicated that 15.8% of the farmers had less than 5 years in farming, 29.6% had done farming between 5-10 years while 54.6% had more than 10 years' experience in agriculture. Long farming experience is an advantage for improving productivity, since it encourages rapid adoption of farm innovations (Obinne, 1991).

**Table 8: Frequency distribution of respondents according to their farming experience**

Farming Experience	Frequency	Percentage	Cumulative Percentage
Less than 5 yrs.	38	15.8	15.8
5-10 yrs.	71	29.6	29.6
More than 10 yrs.	131	54.6	100
Total	240	100	

Mean=2.3875, R=2.0, Std=0.74587, Mode= 3.0

**Figure 15: A bar chart showing distribution of respondents according to farming period**



#### 4.2.6 Language Preference

The results of a descriptive analysis of the respondents' language preference revealed that 5.4% preferred English, Kiswahili was preferred by 22.1%, Luhya was preferred by 35% while 37.5% preferred Dholuo language. Language plays a very a big role in farmers' education especially when teaching knowledge intensive technologies such as push-pull

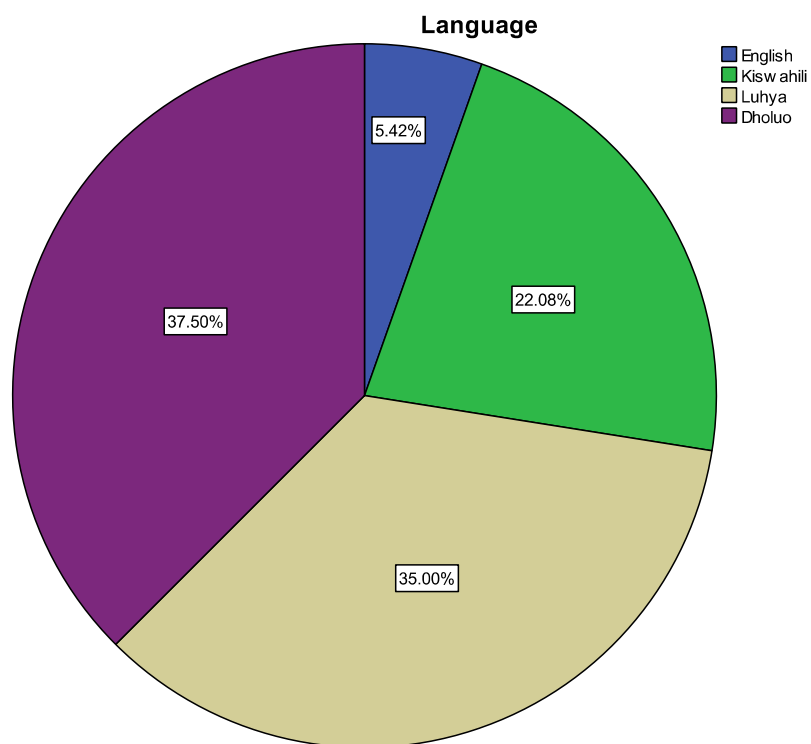


technology. It is through language that learners read, comprehend, and effectively understand during teaching and learning process. UNESCO (2003) notes that it is an obvious yet not generally recognized truth that learning in a language that is not one's own provides a double set of challenges to the learners.

**Table 9 : Frequency distribution of respondents according to their language preference**

<b>Language</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Cumulative Percentage</b>
English	13	5.4	5.4
Kiswahili	53	22.1	27.5
Luhya	84	35.0	63.5
Dholuo	90	37.5	100
Other	0	0	0
<b>Total</b>	<b>240</b>	<b>100</b>	

**Figure 16: A pie chart showing language preference among the respondents**



### **Household Size**

A majority of farmers 106 (44.2%) registered that they had a family size of 5-8 persons followed by 71 (29.6%) with a family size ranging between 3 and 5 persons. Only 5 of the respondents noted they had more than 12 persons in their family.

Large family sizes are typical in Kenya and indeed Africa in general. The implication of this finding is that large families increase pressure in the land and indeed the reason for continued dissemination of improved agricultural technologies.

Household Size	Frequency	Percentage	Cumulative Percentage
Less than 2	6	2.5	2.5
3-5	71	29.6	32.1
6-8	106	44.2	76.3
9-11	52	21.7	97.9
12+	5	2.1	100
<b>Total</b>	<b>240</b>	<b>100</b>	

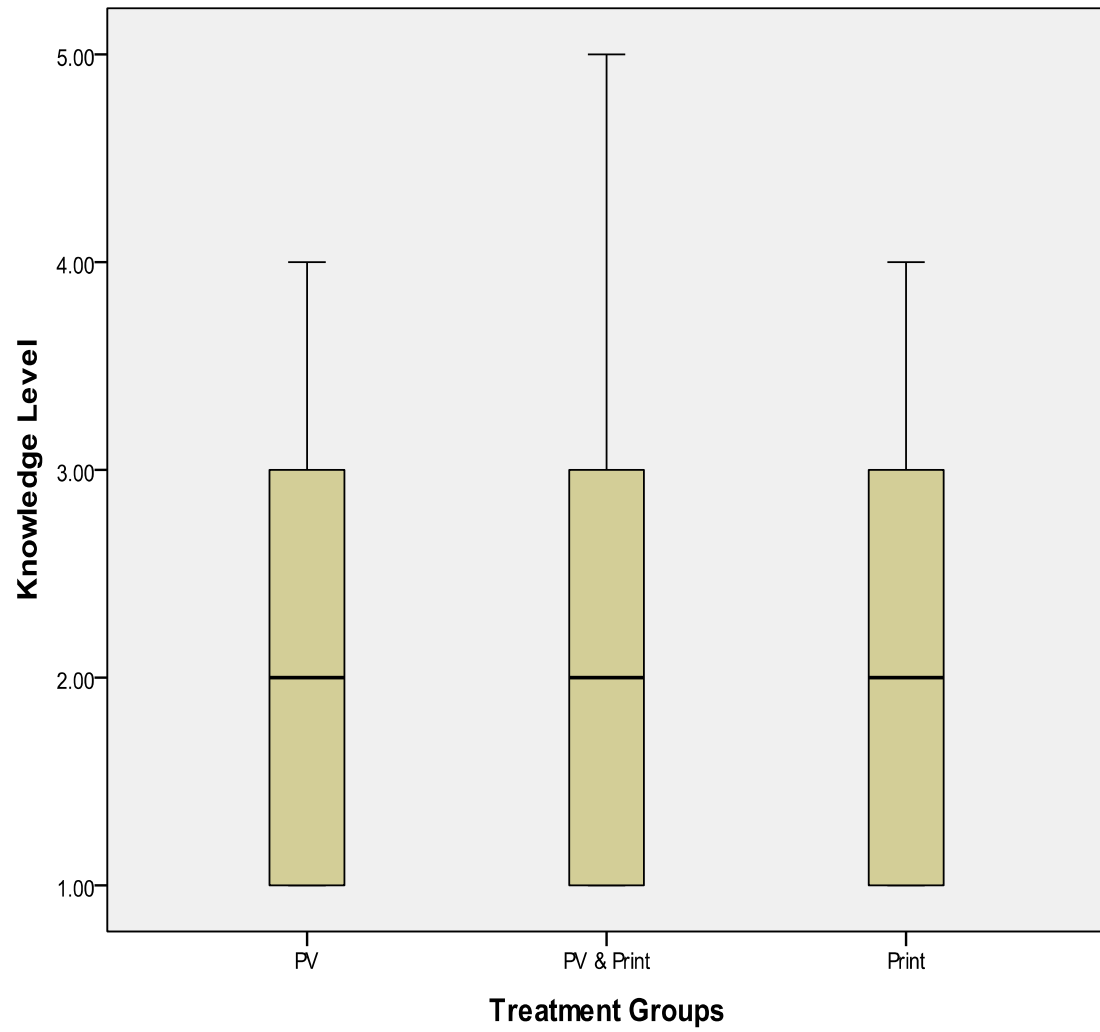
**Table 10: Frequency distribution of farmers` according to household sizes in the study areas** n=240, mean=3.0458, Range=4.0, Min=1.00, Max=4.00, SD=0.90210

**Source: Field data 2012**

#### **4.3 Knowledge levels at pre-exposure (Pre-test)**

Knowledge levels across all the tree treatments were analyzed using one-way ANOVA test (between experimental groups). The box plot in Figure 19 shows that all three treatment groups were approximately balanced around the median of each group. The results shown in Table 6 suggest that before exposure to video and print materials, the knowledge levels of farmers in the three treatment groups was significantly different ( $F = 0.085$ ,  $p < .005$ ). An LSD post hoc test showed that the PV, PV+ Print and Print scores at pre-test were (M=1.9875, SD=0.93381), (M=2.0375, SD=0.93381) and (M=1.9875, SD=0.87863) respectively. Besides differences in education levels and period farmers have been using the technology, these differences could be caused by the differing effectiveness of previous traditional technology dissemination pathways such as farmer-to-farmer, farmer field schools etc.

**Figure 17: The box plot of knowledge levels of each of the treatments (pre-test)**



Results of an ANOVA testing the difference in knowledge score among the treatment groups at pre-test

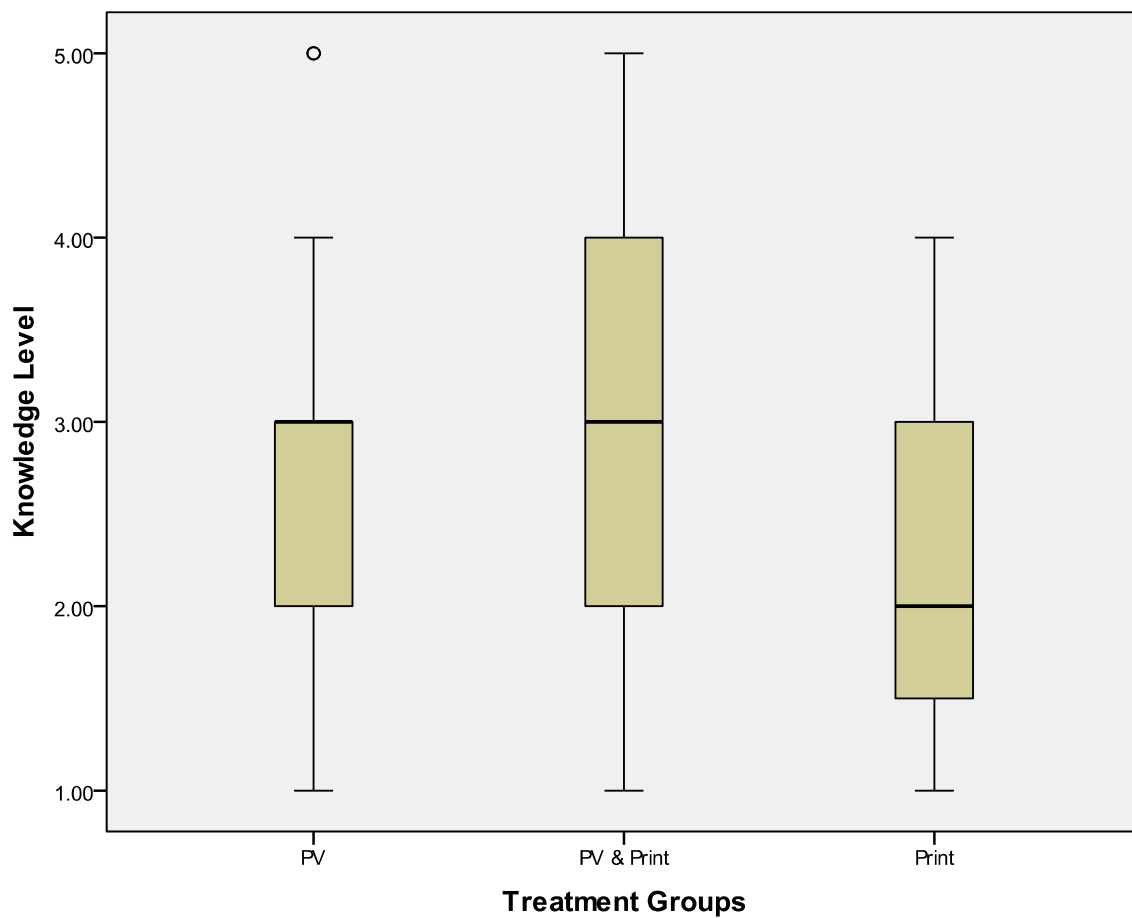
**Table 11: shows farmers` the knowledge level at pre-test across the three treatment groups**

<i>Experiments</i>	<i>Number</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>D.F</i>
PV	80	1.9875	0.83429	2
PV + Print	80	2.0375	0.93381	2
Print	80	1.9875	0.87863	2

LSD *post hoc* test confirm a significant pair wise mean difference between participatory video and print material treatments.  $P < 0.05$

#### **4.4 Knowledge levels at post exposure (post-test)**

Farmers' post-test knowledge level (post-test) across the three treatment groups' also were analyzed using a one-way ANOVA test (between treatment groups). The box plot in Figure 4 shows that the distribution of knowledge levels in all three treatment groups shifted to the top part of the inter-quartile range at post-test (the full score was 3=Good). The post-test knowledge level of the participatory video + print materials was almost the same (Table 10) as the post-test knowledge level of participatory video only treatment group, but higher than that of the print only group. A ceiling effect in knowledge scores may be occurring here.



**Figure 18: The box plot of knowledge level of each of the treatments (post-test)**

Results of an ANOVA testing the change in knowledge scores at post-exposure (post-test)

**Table 12: shows farmers` the knowledge level at post-test across the three treatment groups**

<i>Experiments</i>	<i>Number</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>D.F</i>
PV	80	2.6500	0.96914	2
PV + Print	80	3.0750	1.16679	2
Print	80	2.1625	0.8633	2

#### **4.5 Comparing change of knowledge levels of respondents at pre-exposure and post-exposure**

Smallholder farmers' pre and post knowledge levels within each experimental group were analyzed by using three separate t-tests (within treatment group tests) (see Table 12). Results indicate that post-test knowledge level was significantly higher than pre-test knowledge levels. Smallholder farmers issued with PV+ print materials, had significantly higher knowledge difference (0.24) compared to farmers exposed to PV only (0.14) in knowledge levels between pre-test and post-test, while those in the print materials only treatment group had the smallest (0.01).

**Table 13: Shows the significant knowledge differences across the three treatment groups**

<b>Treatment groups</b>	<b>N</b>	<b>DF</b>	<b>Post Test – Pre Test (SD)</b>	<b>t-value</b>	<b>Sig</b>
PV	80	79	1.01850-0.84194 = 0.76266	14.367	.000
PV + Print	80	79	1.00757-0.88590 = 0.79715	15.147	.000
Print	80	79	0.90148-0.90148 = 0.05029	3.193	.002

#### 4.5.1 Summary of farmers` knowledge level

The above results clearly show that farmer exposed to different treatments (participatory video and print material) have registered a certain level of knowledge and understanding PPT. Results on table 18 clearly shows the t-value of respondents` knowledge levels is relatively higher at post-exposure compared to pre-exposure. Notably also is that knowledge levels increases significantly when the respondents are exposed to push-pull technology information via participatory video compared to those exposed to print materials who recorded no changes in knowledge levels. The results clearly show that the treatment that was exposed to both print material and participatory video information recorded a significant higher knowledge of push-pull technology supported by  $t=15.147$  compared to  $t=14.367$  of treatment that was exposed to PPT information via participatory video only.

Hence it can be concluded that participatory video is a good instructional medium for PPT compared to using print media material only. The findings were in accordance with the findings obtained by Kadian and Gupta (2006) who stated that compared to “lecture only”, “audio only” and “literature only” educational methods, the Video Compact Disc (VCD) found to be most effective for imparting knowledge related to dairy calf management practices. Jayakumar (1992) and Selvaraj (1997) pointed out that video



presentation had produced remarkable impact on gain in knowledge of the technology disseminated.

#### **4.5.2 Sources of Agricultural Information**

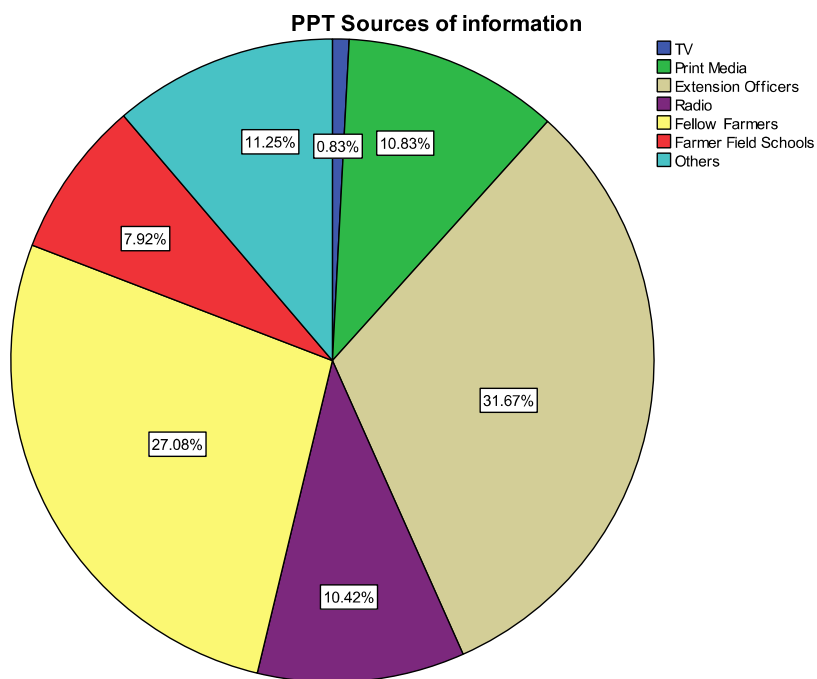
Farmers always depend on several information sources for their agriculture activities and needs. These sources include; Television, Radio, Print materials, fellow farmers, field schools, social gathering (Baraza), and field days. As discussed earlier in Chapter 2 (Literature Review), different sources have different impact with regard to their effectiveness in disseminating particular agriculture information. Equally, studies have showed that farmers have preference to certain technology dissemination pathways.

A descriptive analysis (Tab 13) on the sources used by farmers to learn push-pull technology showed majority of farmers 76 (31.3%) learnt PPT through extension officers, followed closely by those who received the knowledge through fellow farmers 65 (26.7%). 26 (10.7%) noted that they learnt using print material, TV was used by the least number of people 2 (8%).

**Table 14: Sources from which farmers learnt push-pull technology**

<b>Source of Agriculture</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Information</b>	<b>(f)</b>	<b>(%)</b>
TV	2	8
Print Materials	26	10.7
Extension Officers	76	31.3
Radio	25	10.3
Fellow Farmers	65	26.7
Farmer Field School	19	7.8
Others <i>-(barazas, field</i>	27	11.1
<i>days)</i>		
<b>Total</b>	<b>240</b>	<b>100</b>

N=240, Mean=4.2083, Range=6.0, Min=1.00, Max=7.00, SD=1.54647

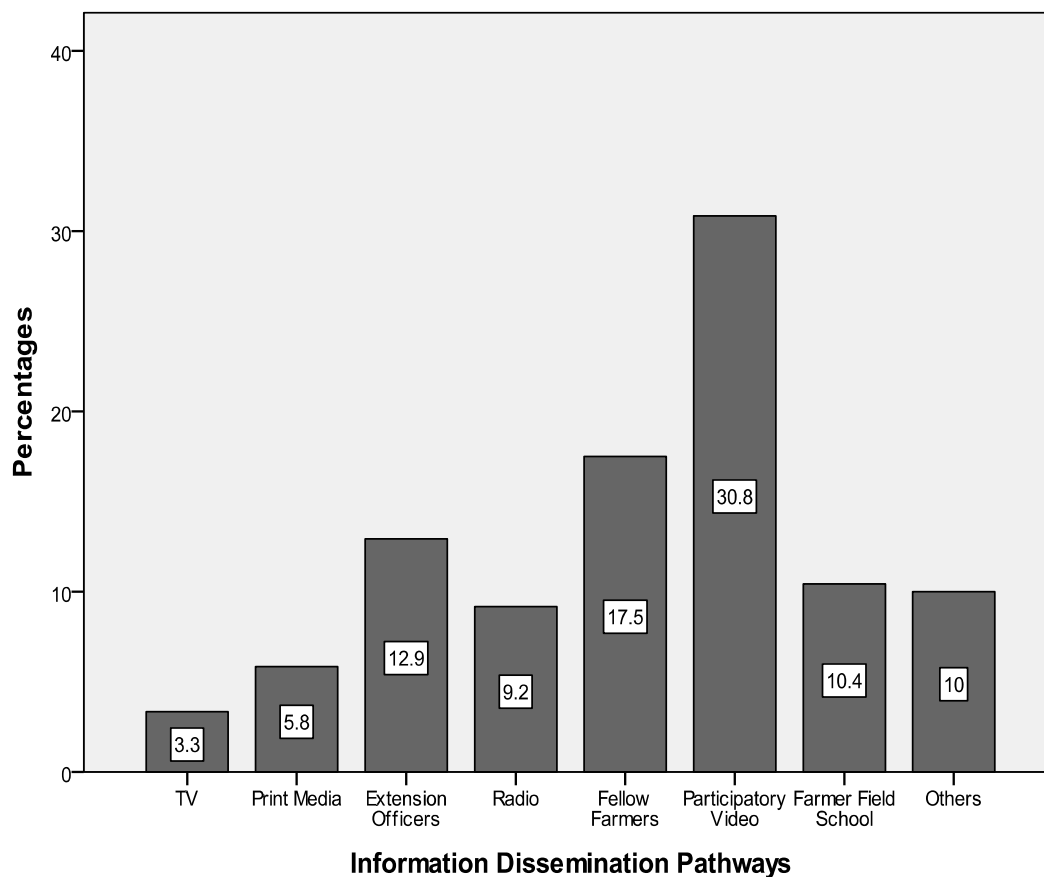


**Figure 19: A pie chart showing information sources used by farmers to learn PPT**

#### **4.6 Technology dissemination pathways**

The study also sought to establish the dissemination pathways preferred by farmers for disseminating agricultural information. The results indicated that majority 30.5% of the respondents rated PV as the most appropriate, followed by farmer-to-farmer 23% and extension officers 12.8%. Print materials, TV and Radio were rated 5.8%, 3.3%, and 9.1% respectively.

This implies that participatory video is the most appropriate dissemination pathway for agriculture information. This is because video combines both visual and audio capabilities and therefore appropriate for the semi-literate resource-poor farmers.



**Figure 20: Ranking farmers` preference of agriculture information dissemination pathways**

#### Ownership of TV & Video Player

Only 31.3% of the respondents recorded owning a TV and a majority of 68.8% does not have a television of their own. Equally a few (25.4%) respondents registered owning a video player.

A descriptive analysis of farmers` access and use of print media as source of information indicate that most farmers 46.3% read print media occasionally, 17.9% were regular readers, 23.8%, rarely while 12.1% noted that they never use print materials.

Majority of the farmers` (90.8%) noted that they have shared improved technology information with other people including; fellow farmers, neighbors, relatives and friends. 9.2% said that they had not shared such information with anybody else.

**Table 15: Perceived advantages of using participatory video and print materials**

<b>Participatory Video</b>	<b>Print Materials</b>
i. Training can be done in distant places	i. It gives confidence to the farmers
ii. Visual and sound elements	ii. Gives practical examples
iii. Enables farmers participation	iii. Relatively cheap when used for training farmer groups
iv. Can be stored as reference material	iv. Can be translated into other languages
v. It is attractive because of the visual elements	v. Good teaching skills
vi. Incorporates peoples` culture and local languages	vi. Provides detailed information
vii. Can be used to train many people	vii. Good information presentation including; pictorials and diagrams
viii. Its cost effective	viii. Expensive to print copies of the materials

**Table 16: Perceived disadvantages of using participatory video and print materials**

<b>Participatory Video</b>	<b>Print Materials</b>
i. Low interaction	i. Push-Pull curriculum book was too voluminous
ii. The equipment can be relatively costly	ii. Print materials were not enough for every farmer
iii. Disadvantageous for visually impaired	iii. Language barrier especially for illiterate farmers
iv. Most of the actors were males	iv. Low interaction
v. Poor sound quality	
vi. No translation to local languages	
vii. Laptop used for screening was too small	

#### 4.7 Evaluating PPT Participatory Video lessons

**Table 17 : Respondent`s evaluation based on video elements**

Themes	Not Good (f)	Good (f)	Very Good (f)
Clarity of content	3	32	125
Overall sound quality	20	79	61
Duration of video	4	33	126
Farmers` participation	2	42	116
Language used	4	41	115

##### 4.7.1 Clarity of Message

In general, the quality of the videos and message was good and this attracted the farmers to continue watching hence good for learning new technology. Most of the respondents (125) who received video content measured “Very Good” the clarity of video content which definitely had a positive impact on learning and understanding push-pull technology.

However, some of the farmers noted that some sections in some of the video materials was not shot steadily as there was a lot of camera movements that tend to distract the viewers from watching the videos.

##### 4.7.2 Overall Sound Quality

Sound quality was good and the respondents including the elderly always found the video lessons audible. However, 20 (8.3%) measured sound quality as “Not Good”. This is

probably due to low frequency wireless microphone used; also there was background noise in some of the videos. The laptop used for screening did not have good sound output, which made it difficult for people with hearing impairment to understand what was being taught.

#### **4.7.3 Farmers` Participation**

Majority of the farmers were happy with farmers' participation in the video content. However, there were concerns about number of women appearing in the videos, with suggestions being, more women should be included in the video materials.

Most of the farmers who watched participatory video materials were happy to see their fellow farmers in the videos sharing their experiences and knowledge about push-pull technology.

Farmers were clearly encouraged by the testimonies given by farmers in the videos and by seeing other farmers carrying out the practices on their farms.

*“I have seen my neighbor in one of the films. I would like to appear in the video one day” said Sifuna, a push-pull farmer from Bungoma’*

*What I hear I forget, what I see, I remember, what I do I learn (A peasant proverb)*

Studies have shown that a farmer is most likely to learn and adopt a new technology when a fellow farmer teaches him/her about the benefits of the technology. And a better way to do this is through film/video, which harness the power of audio and visual capabilities to communicate the message effectively to the beneficiaries.

Producing video films with local characters is also important because farmers will automatically associate themselves with the characters and have that concentration and



value what they are doing

#### **4.7.4 Language use**

Video lessons were done in English and Kiswahili languages. Most of the respondents were able to understand the videos especially those that were done in Kiswahili since most of them are native speakers of Kiswahili language. A relatively high number of respondents (especially the elderly) said they could not understand most of what was being said in the lessons done in English however they could still follow the actions in the footage and get to understand what was being taught.

This study has showed that if the language of instruction is foreign, the quality and message from the images should be clear enough to enhance effective understanding of the message. Therefore if the story is well edited and the pictures are clear people will be able to follow what is portrayed with limited problems.

When asked about their language preference, a majority of the respondents said they would prefer the next video lessons should be done in either their mother tongue (Luhya or Dholuo) or Kiswahili. This means that language use is a key element in any kind of informal instruction especially when elderly people are involved.

#### **4.7.5 Duration**

On average, PPT training video materials were 7-10 minutes long. An average human being has a relatively short concentration period that is sufficient for him/her to understand and retain what they have read or watched. Therefore, it is important to create very short and precise video lessons than lengthy ones.

A majority of the respondents were satisfied with the lengths of the video lessons, saying that they were able to follow through the lessons and understand the content clearly.

#### 4.8 Evaluating PPT Videos

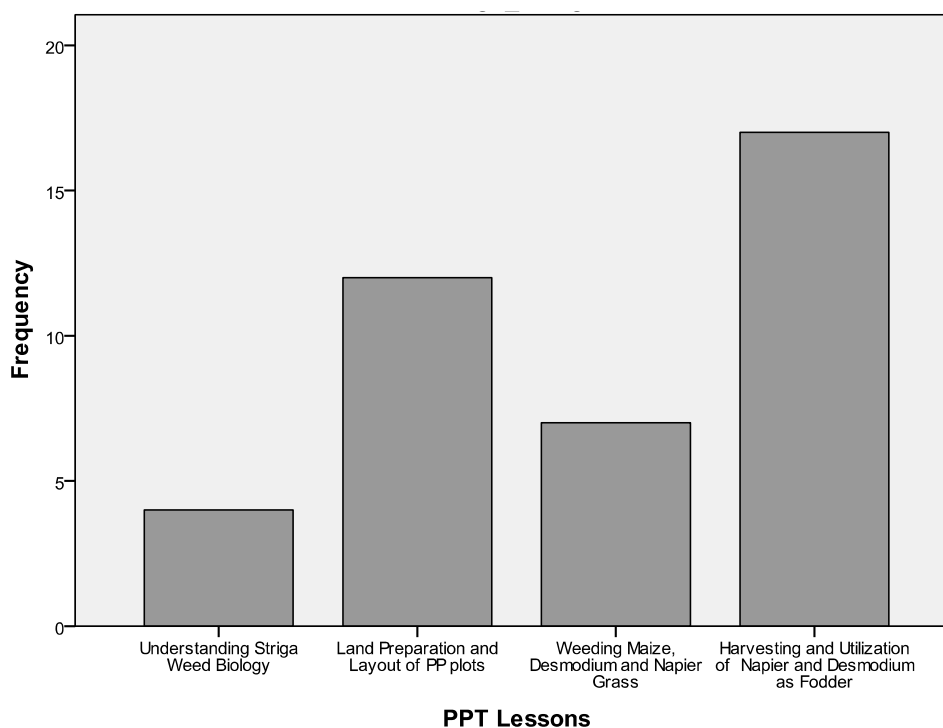
Results from the descriptive analysis of the respondents on the most understood push-pull technology video lesson showed 33.8% selected *Harvesting and utilization of Napier grass and desmodium*; 31.9% selected *land preparation and layout of push-pull plots* video lesson as most effective. 23.8% chose *weeding maize, desmodium as most understood* while 10.6% chose *understanding Striga weed biology video lesson as most effective and understood*. The findings are from 160 respondents from two treatments i.e. farmers exposed to PV and farmers exposed to both PV + Print Materials.

**Table 18: Shows Respondents` ranking of the selected PPT video lessons**

S/No	Push-Pull Technology Video Lesson	Frequency (f)	Percentage (%)	Cumulative Percentage (%)
1	Understanding Striga weed biology	17	10.6	10.6
2	Land preparation and layout of push-pull plots	51	31.9	42.5
3	Weeding maize, Desmodium and Napier grass	38	23.8	66.3
4	Harvesting and utilization of	54	33.8	100

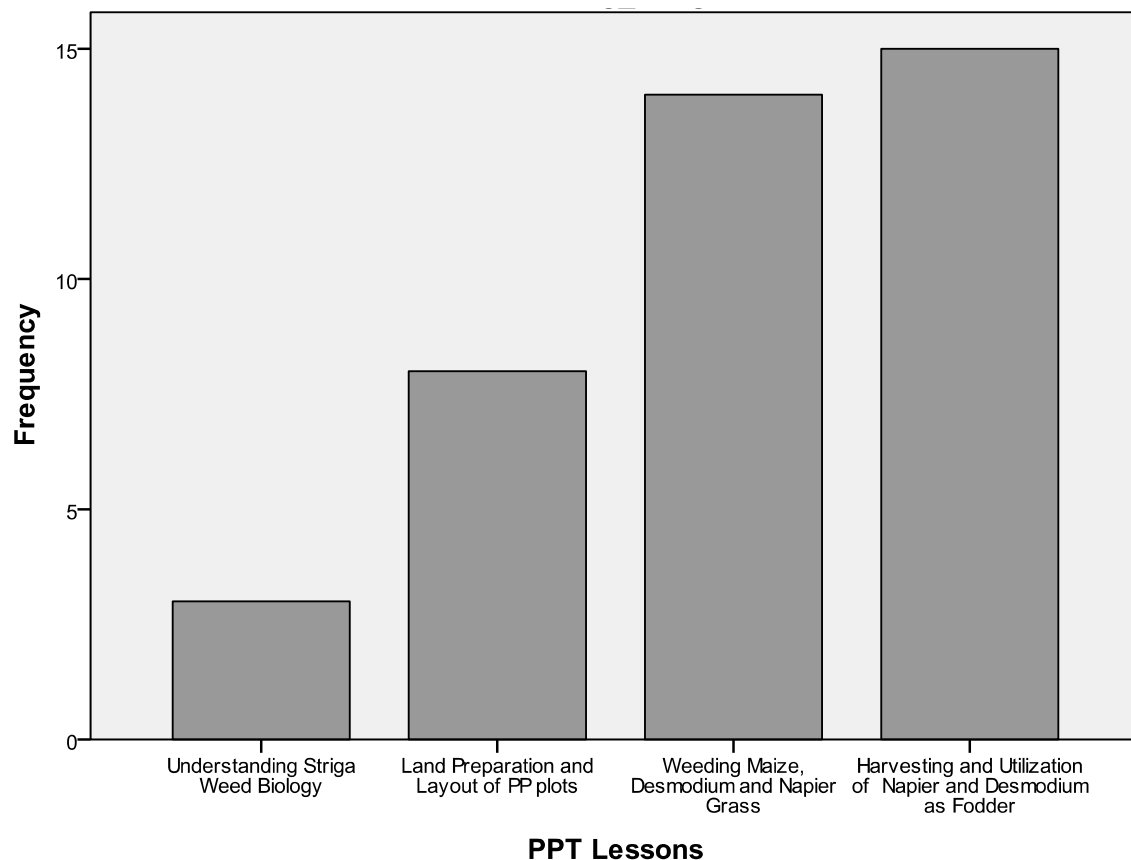
	Napier and Desmodium as fodder			
<b>TOTAL</b>		<b>160</b>	<b>100</b>	

**Figure 21: Shows farmers` ranking of the selected video lessons basing on their effectiveness to learning selected lessons of PPT in Bungoma district.**



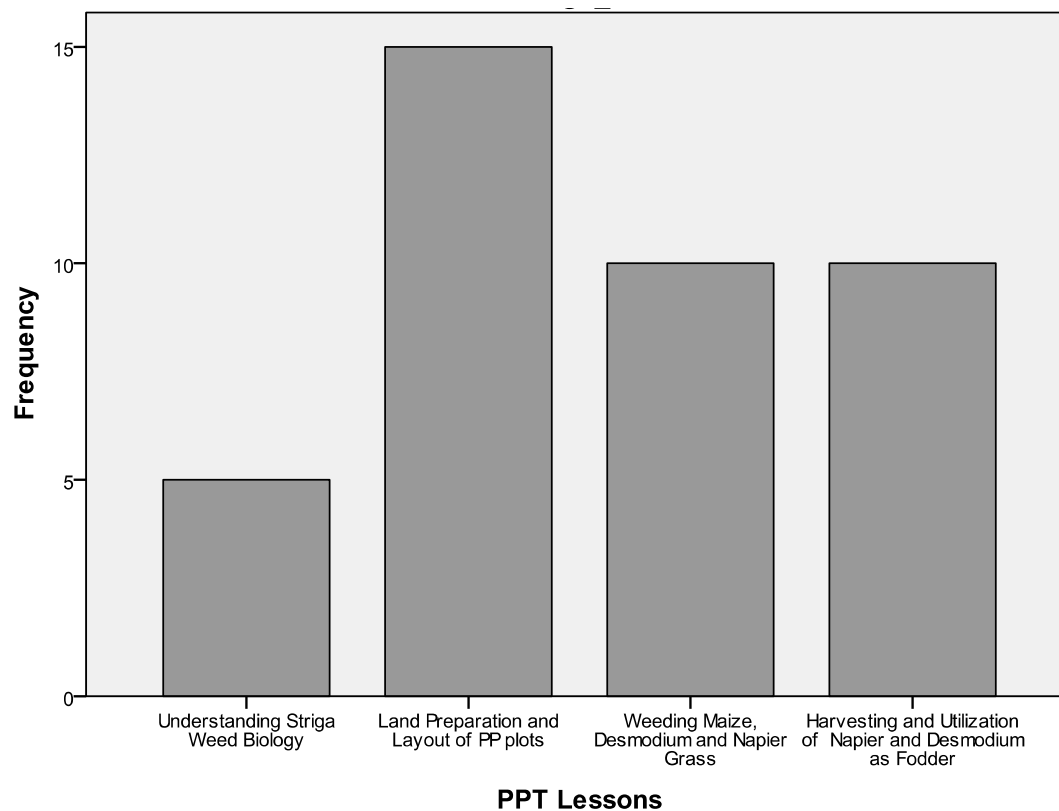
Results from descriptive analysis indicates out of the 40 farmers exposed to participatory video lesson from Bungoma, a majority of the farmers 30% ranked *Land preparation and layout of PPT plot* as most effective for learning PPT, 42.5% selected *Harvesting and utilization of Napier and Desmodium as fodder*, while *Understanding Striga weed biology* 10% and *weeding maize Desmodium and Napier grass* 17.5% respondents.

**Figure 22: Shows farmers` ranking of the selected video lessons basing on their effectiveness to learning selected lessons of PPT in Vihiga district.**



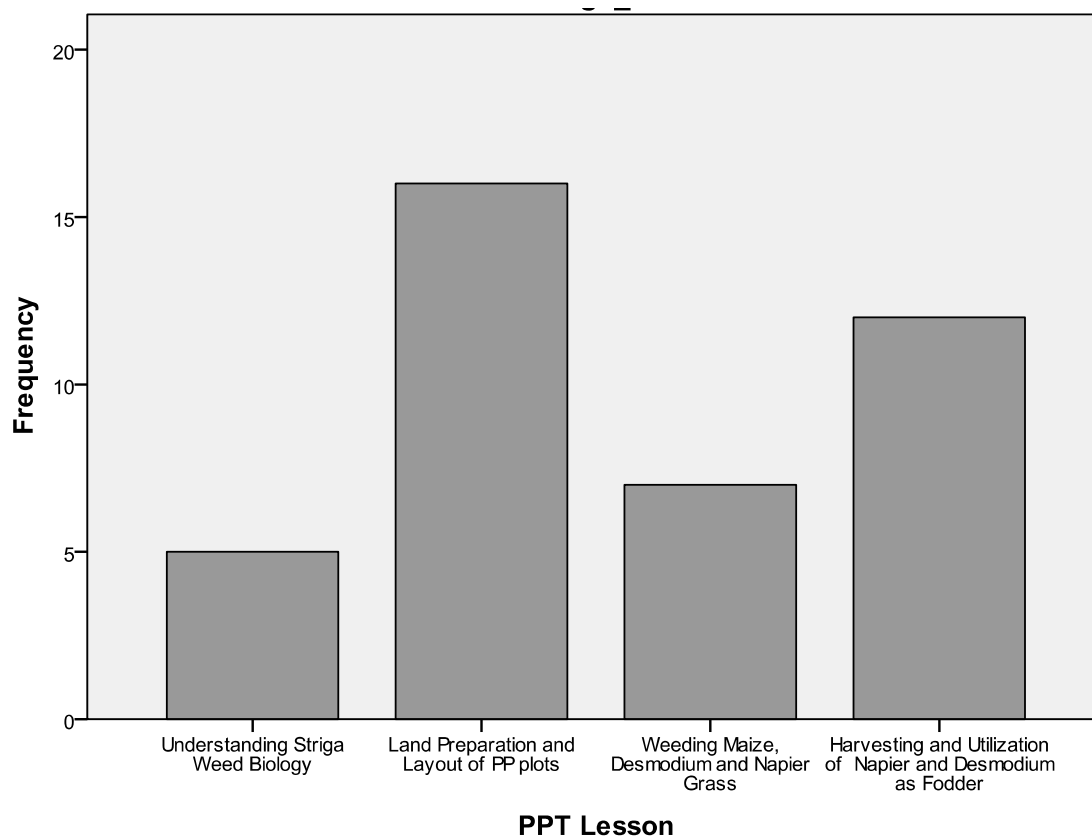
A descriptive analysis of the respondents exposed to participatory video lessons in Vihiga district. Out of 40 respondents, 7.5% ranked *understanding Striga weed biology*, 20% of the respondents' selected *Land preparation and layout of push-pull plots*, 35% selected *Weeding maize, Desmodium and Napier grass lesson* while 3.7% preferred *Harvesting and utilization of Napier and Desmodium as fodder lesson*.

**Figure 23: Shows farmers` ranking of the video lessons basing on their effectiveness to learning selected lessons of push-pull technology in Kisumu West district.**



A descriptive analysis of the respondents exposed to participatory video lessons in Kisumu West district. Out of 40 respondents, 12.5% ranked *understanding Striga weed biology*, 37.5% of the respondents' selected *Land preparation and layout of push-pull plots*, 25% selected *Weeding maize, desmodium and Napier grass lesson* while 25% preferred *Harvesting and utilization of Napier and desmodium as fodder lesson*

**Figure 24: Shows farmers` rankings of the video lessons basing on their effectiveness to learning selected lessons of push-pull technology in Suba district.**



Results from descriptive analysis indicates out of the 30 farmers exposed to participatory video lesson from Bungoma, 40% preferred *Land preparation and layout of PPT plot* as most effective for learning PPT, 30% selected *Harvesting and utilization of Napier and Desmodium as fodder*, 12.5% selected *Understanding Striga weed biology* while 17.5% of the respondents preferred *weeding maize Desmodium and Napier grass*.

In general, 54 (33.8%) of respondents ranked “*Harvesting and Utilization of Napier Grass and Desmodium as Fodder*” video lesson received highest approval ratings with majority of the respondents saying they learnt a lot from it.

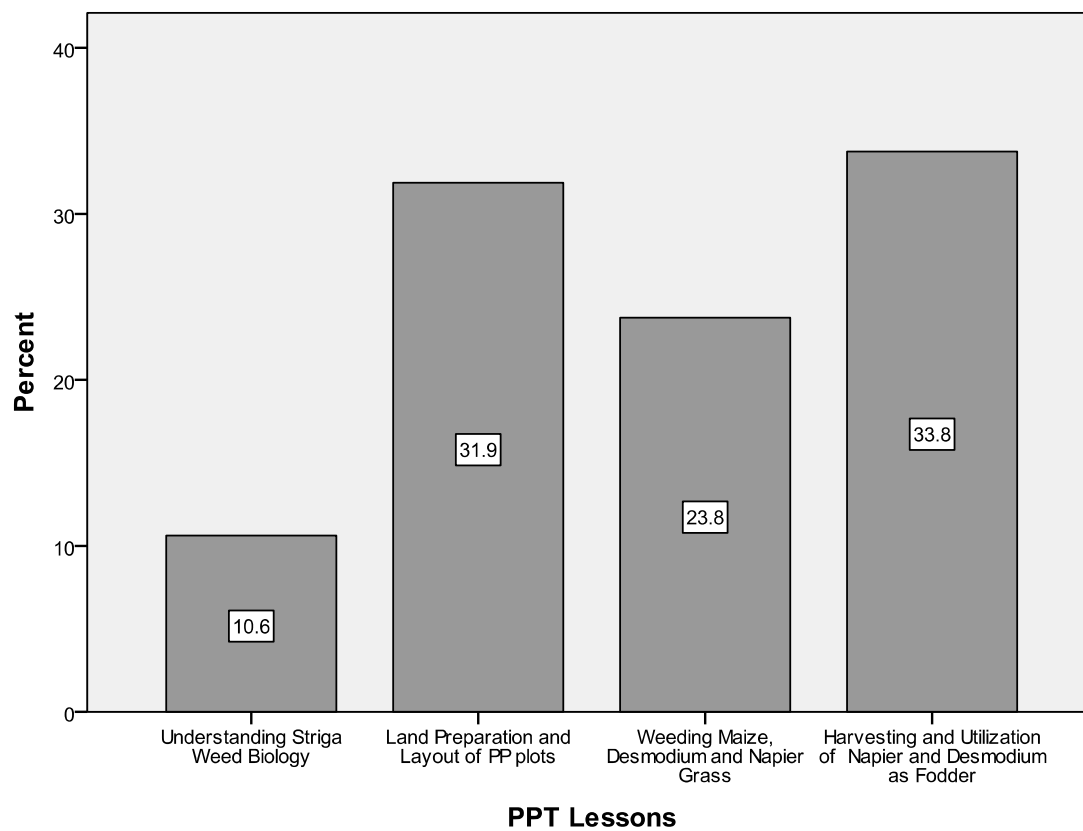
Part of the reasons why farmers chose the video include clarity of the message, good sound quality and use of understandable language. Most of the farmers gave very good rating to the quality of video content; this perhaps indicates that quality of the videos is key in the learning of technology information. Farmers were also encouraged see that farmers in other regions were also practicing PPT and yielding a lot of harvest and the testimonies given by farmers in the videos and by seeing other farmers carrying out the practices on their farms. Most of the respondents highly appreciated the clarity of the technical messages and language used which suggests a positive outcome of involving farmers in the video development process.

The least understood PPT topic was “*Understanding Striga Weed Biology*” with only 17 (10.6%) approval ratings. Part of the concern here was the language of instruction. The video was mostly done in English while most of the farmers preferred either Kiswahili or mother tongue (Luhya or Luo). Equally, the topic itself is knowledge intensive as it talks about how Striga behaves and depletes nutrients from main crop. There is also use of many biological terms such as *Striga hermonthica* that’s a bit difficult to understand.

Land preparation and layout of push-pull plot and Weeding maize, desmodium and Napier grass video contents received 31.9% and 23.8% approval ratings respectively



**Figure 25: Shows overall rankings of the four PPT videos based on farmers` preference.**



#### **4.9 Suggestions on how to improve PPT video training materials**

The following is a summary of the suggestions given to farmers about ways to improve the use of video as tool for learning push-pull technology.

- i. Increase farmers` participation in the video development process particularly the women
- ii. Localizing video content by incorporating local cultures and languages, to enhance farmers` learning capacity of these knowledge intensive technologies
- iii. Invest in high quality production equipment such HD cameras, wireless microphones, speakers etc. to improve on sound and picture quality.
- iv. Increase video screenings in farmers` group meetings such as field days, field schools, public gatherings etc.
- v. Produce video lessons of the remaining topics in the PPT curriculum
- vi. Train more farmer teachers on how to use video cameras to capture and document farmers` experiences in using PPT.
- vii. Increase the number of cameras and related computer technologies to enable increased participation of farmers in video production.
- viii. “Include interviews from different farmers` sharing their experience and testimonies on the benefits of adopting PPT. This will encourage farmers especially non-adopters to adopt PPT in their farms” Nactical KutaiSufu (a farmer teacher, Epwopi FFS, Vihiga District)

#### **4.10 Dissemination of Video Content**

The following are the suggestion from the farmers on ways of increasing access to the video material:

- Organizing daytime screenings within farmer groups such as; farmer field schools where are large number of farmers sitting together to learn about push-pull technology.
- “Producing several copies of the video lessons on video CDs and DVD, which can then be distributed to individual farmers or farmer groups” said Jackline Wanambisi, a smallholder farmer from Kituni Village in Webuye Division in Bungoma.
- Produce a drama video on push-pull technology with local participation
- Kelvin Ka`agola from Yenga village in Kisumu suggests the development of an online library to store all the video contents and which can be access from any location by the farmers. However this will require that farmers have good ICT including a strong Internet.
- Handing the videos to agriculture extension officers to distribute them to the farmers since they have a wider contact base of the farmers.
- Screening the video materials in video viewing kiosks before showing a football match. This will help disseminate information to youths who are mostly football fans.

#### **4.11 Summary from focus group discussions**

Table 22 below summaries key responses and opinions by participants in the focus group discussions. Generally, the researcher established that farmers found the video lessons enjoyable and of an appropriate runtime (length). They found it was a good instruction media for learning Push-Pull Technology. Most focus group participants could easily understand the words used in the video, even if they did not speak English, Luhya, dholuo or Kiswahili as their native language.

**Table 19: Provides a summary of responses and reactions from focus group discussion.**

<b>Theme</b>	<b>Question</b>	<b>Evaluation</b>	<b>Response</b>
<b>Content</b>	What did you learn from the video?	Striga weed biology	“Presentation was not very clear. Simple language should be used to explain such complex topics”
		Preparing a push-pull field	“Now I can prepare my push-pull plot well”
		Weeding desmodium and Napier grass	“I didn’t know that I had to weed desmodium twice”
		Harvesting desmodium for fodder crops	“I learnt a lot on how to mix desmodium with Napier grass and feed my cattle”
<b>Length</b>	Did you think the video was too long? Too short?	Good length	“Generally the length was good. However, I think some one or two videos were short”
<b>Instructions</b>	Were the instructions easy to understand?	Clear Instruction	“Instructions were very clear”
<b>Language</b>	Were the words easy to understand?	Some difficulty with language	“I could understand most of the information but some concepts were a bit complex to understand”
<b>Relevance</b>	Did the video apply to your work?	Apply to push-pull	“Lessons were very relevant as it is what I practice everyday”
<b>Likes</b>	What did you like about it?	Farmers` participation	“I would also like to appear in the video so that I can share my knowledge of push-pull technology”
<b>Dislikes</b>	What didn't you like about it?	Audio was a challenge	“The wind was too much in certain sections of the video and this interfered with quality of audio of the presenter”
<b>Recommended Changes</b>	What would you change about the video?	Youth participation	“Most of the people talking in the video were elder. Youth should be encouraged to participate in the production and sharing of knowledge”

## CHAPTER FIVE

## **SUMMARY OF STUDYING FINDINGS, CONCLUSION AND RECOMMENDATIONS**

### **5.1 Introduction**

This chapter presents a summary of the study and highlights the main findings and conclusions drawn from the study. The study focuses on investigating the effectiveness of using participatory video methods in learning improved agricultural technologies particularly, Push-Pull Technology among smallholder farmers. The study compares participatory video methods with print media, farmer field schools (FFS), and using extension officers in enhancing learning of improved agriculture technologies. The study also compares the change in knowledge level of the respondents when they are exposed to either print media material or video content on push-pull technology.

This study investigated the effectiveness of using participatory video materials as a tool to complement or a possible replacement of the traditional technology dissemination methods such as farmer teachers, extension officers, print media etc., to improve the knowledge and uptake of PPT among smallholder farmers most of whom have relatively same education levels, gender, farming experience and sizes of land. The farmers were drawn from Bungoma, Vihiga, and Kisumu West and Suba districts in Western region of Kenya. To achieve this, the research was conducted with 240 smallholder farmers, with a random sample of 60 farmers already practicing PPT from each of the four districts. Participants from the districts were divided into three treatment groups i.e. those issued PV materials only (treatment one); issued PV + print materials (treatment two) and issued print materials only (treatment three). This chapter therefore, presents the conclusions drawn from the findings, and recommendations to improve learning and dissemination of

push-pull technology among farmers. The chapter also contains suggested areas for further research.

## **5.2 Recommendations**

Based on the findings in the study, the researcher recommends the following:

In addition to using print media, farmer teachers, radio, farmer field school, public gathering etc. to get information on new/improved technologies, researchers, innovators and other agriculture stakeholders should adopt video to complement traditional pathways in amplifying the information to target audience. Factoring in the socio-cultural differences and other social dynamics of particular groups of people, disseminators can combine video and print media to intensify the message to the target population. This approach takes advantage of each of the method to achieve effective learning by the target group.

The technical people involved in production of locally-generated educational video materials should have basic technical skills in handling and operating cameras and related accessories such as computers, tripod, microphones lights etc. These personnel should be trained on various video production processes (*pre-production, production and post-production*) how to handle and ensure safety of the equipment and also how to do minor repairs and routine maintenance.

The technical team which includes a farmer teacher, facilitator and or extension officer should provide a storage bank for all the footage being created. Depending on capacity and resources available, the technical team can store the videos on an online platform to where farmers can access or produce several copies of the video in CD/DVD which can then be issued to the farmers or screened during farmer field schools meetings. Video

promotes intensive learning and understanding of new/improved agriculture technology information especially to farmers who cannot read and write. Videos should be screened repeatedly during farmers` group meetings to increase their understanding of the technology.

Completed videos should also be played at video cafes before a football match starts. Most young people frequent to such video cafes to watch football hence this provides a good opportunity to communicate new/improved technologies information to the young people most of whom are not involved in agricultural activities.

Participatory videos can be very effective if watched in groups, for instance at farmer field schools where a group of farmers can watch and have a discussion about the film at the end of screening session. This will also help fill in the void of “lack of feedback” form the videos. Farmers, especially the slow learners get a chance to ask questions and seek clarification on topics that they did not understand. Participants who were issued video materials complained there was no one to respond to their questions relating to the training topics. Information processing theory proposes that learning together can create and recreate human communities so that learning occurs in relationship with others (Boyatzis, Cowen & Kolb, 1995)

While choosing farmer teachers and facilitators for the local video projects, farmers` should appoint/choose people who possess basic technical skills of using the video camera and its accessories and computers and also be responsible to ensure safety of the equipment on behalf of the group. Facilitators who have good technical skills are able to train other farmers on how to operate the production equipment.



Videos meant for grassroots should be done in a participatory approach, with the locals taking the lead in every production processes. This is to ensure ownership and acceptability of the product; the videos should be localized and culturally acceptable by using local languages and incorporating their experiences and knowledge and ways of doing things. Video is a powerful instruction media for low literacy people. As indicated in numerous researches, smallholder farmers are either illiterate or semi-literate and therefore they have little interest and time to attend seminars or read publications but find the pull of film/video irresistible. In fact, for most people, watching videos is a leisure activity, thus educational videos can be positioned for great impact.

We have learned that the power of the video or visual communication is the human aspect. This means, adoption of improved technologies has a human face especially regarding the success stories. Documenting people`s success stories through video is a powerful and moving process that influence big change in the community, For instance recording a farmer talking about the benefits of implementing push-pull technology and how his/her yields have increased is an attraction to many farmers who share same homophily i.e. background, language, education, economic status alike, as they tend to connect with the successful farmer through this aspect and would easily want to learn and adopt that particular technology.

Demographic information indicated that majority of PPT farmers were 50 + years and they were the majority sharing their experience on camera. To attract young people into agriculture, more of them should be involved in hands-on video production processes either in technical work or appearing in the videos. In this study, the researcher noted disappointment of some of the participants as why there were very few young people

involved. Therefore, the researcher recommends that youth should play a key role in video production as this will attract more young people into agricultural activities.

### **5.3 Conclusions**

In general this study has demonstrated that the choice of media for disseminating new/improved technologies will greatly determine learning capabilities of the recipients of information. While most smallholder farmers utilize several technology dissemination pathways to get information on PPT, it is evident that some pathways are relatively more effective in delivering such knowledge intensive information to farmers.

In this study, the findings indicate that participatory video is a very effective medium to intensify uptake of PPT among farmers compared to other traditional mediums such as print media, agriculture extension officers, farmer field schools, radio, field days among others methods.

However, the study indicates that two or more pathways can be combined, taking advantages while capitalizing on the disadvantages of each other to enhance uptake of new/improved technology. For instance, when participatory video and print media are strategically combined, farmers` have a higher uptake of PPT knowledge compared as opposed to utilizing only one pathway. For example, participatory video have the advantage of being educative and entertaining at the same time. Farmers who cannot read/write get an opportunity to watch and listen to how certain agricultural practices are done by their fellow farmers. On the other hand, the print material (PPT Curriculum) provides farmers with detailed information about PPT and can be used as a reference tool for intensive discussions and learning.

The results also suggests that several socio-cultural factors such as gender, education levels, language, income levels, age, size of land and farming experience influence learning and uptake of new/improved technologies. For example, educated farmers are more likely to learn and understand technology better than uneducated farmers. The choice of technology dissemination pathway is also determined by farmers' education level. While educated farmers (with post-secondary education), prefer getting information from printed media, it is worth noting that majority of them use traditional methods such as: field schools, field days and farmer teachers. However these results from a given region would not necessarily translate to similar findings with farmers in other regions. For instance, a video that has been done in *Dholuo*- the dominant language in Nyanza region, would not have the same preference when screened in Bungoma County which is predominantly speaks *Luhya*. Therefore it is important to understand the "one-size fits all" approach is not appropriate in learning and uptake of PPT. Research organizations and development groups must understand the socio-economic and other demographic factors within a given region before implementing a particular information dissemination pathway.

Disseminators of new/improved agricultural technologies such as PPT should focus on understanding the farmers' social structures, farming experiences, education levels, information requirements etc. in order to determine best ways of disseminating this knowledge intensive technologies for intensive uptake. Suggestions have been made that disseminator of such information should consider targeting small and specific segments of the population other than focusing on relatively large geographical areas when up scaling such information (Gloy et al., 2000)

#### 5.4 Recommendation for further research

Extensive research should focus to compare effectiveness of documentary videos produced by a professional versus participatory video produced by the local people in learning and transfer of information and knowledge about new/improved technologies.

Further research should be done to establish whether PPT instructional video will improve knowledge levels and PPT by farmers who have integrated PPT in sorghum and millet plots.

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## APPENDICES

### Appendix 1: Questionnaire

I am Sammy Olumola a postgraduate student carrying out research on effectiveness of using participatory video materials in learning and adoption of Push-Pull Technology among smallholder farmers in Western Kenya. I kindly request you to provide responses to the questions stated below.

The information will be treated with utmost confidentiality. Thank you.

#### SECTION I: DEMOGRAPHIC CHARACTERISTICS

1. Name of respondent: \_\_\_\_\_ Mobile Phone:  
\_\_\_\_\_

2. Area of residence:

(a) County: \_\_\_\_\_ (b) Division: \_\_\_\_\_

(c) Location: \_\_\_\_\_ (d) Village: \_\_\_\_\_

3. Gender:  Female  Male (please tick as appropriate)

4. Age group of the respondent: (Please enter year of birth): [     ]

5. Which language do you understand properly? (select only one)

English  Kiswahili  Luhya  Dholuo  others,  
specify \_\_\_\_\_

6. Marital status (please tick one)

Single     Married     Widowed     Divorced

7. What is the highest level of education you have attained? (Please Tick only one)

None     Primary     Secondary     College     University

8. Employment of the respondent (current status)

Employed     Not-employed     Self-employed     others (specify)

\_\_\_\_\_

9. What is your annual income category in Kenya Shillings (Ksh.)

Less than KES 99                       KES 100 – KES 199

KES 200 – KES 299                       KES 300 – KES 399

KES 400 – KES 499                       KES. 500 and above

10. What is your source of labor?

Family labor

casual labor

Regular labour

family and casual labor

Family and Casual labour

11. What is the size of your land?

Less than 1ha.

1.0-2.99 ha.

3.0-4.99 ha

5ha +

**SECTION II: FARMING EXPERIENCE AND KNOWLEDGE OF 'PUSH-PULL' TECHNOLOGY**

12. How long have you been farming?

Less than 2 years

3-5 years

6-8 years

9 years and more

13. Available land for Agriculture?

a) What is the size of farm land owned?: \_\_\_\_\_ Acres

b) What size of farm land rented?: \_\_\_\_\_ Acres

14. How would you rate the following problems on your farm? (0=No Problem and 4=Very serious Problem)

	No problem	Minor problem	Moderate problem	Serious problem	Very serious problem
Striga infestation	0[ ]	1[ ]	2[ ]	3[ ]	4[ ]

Stemborers infestation	0[ ]	1[ ]	2[ ]	3[ ]	4[ ]
Lower soil fertility	0[ ]	1[ ]	2[ ]	3[ ]	4[ ]
Lack of fodder	0[ ]	1[ ]	2[ ]	3[ ]	4[ ]
Low maize yield	0[ ]	1[ ]	2[ ]	3[ ]	4[ ]
Dry weather	0[ ]	1[ ]	2[ ]	3[ ]	4[ ]
Soil erosion	0[ ]	1[ ]	2[ ]	3[ ]	4[ ]
Flooding	0[ ]	1[ ]	2[ ]	3[ ]	4[ ]

15. Please rate how the farmer responds to questions in the table below on the basic aspect about push-pull technology. The correct answers are enclosed in box brackets. Use the answer score sheet provided to tick the category that best represents the farmers understanding of the constrains and knowledge of the PPT.

Knowledge level of push-pull technology in addressing Striga and Stemborers constraints	
	If Yes, what is the farmer`s knowledge level? (Use the key below to score and tick the level where the answer falls).

	<b>Yes</b>	<b>No</b>	1	2	3
<p>How Stemborers get into your maize or sorghum crop?</p> <p>[The months lay eggs on maize/sorghum plant, the eggs hatch into larvae that eat the leaves and burrow into the stem as it grows]</p>					
<p>How Stemborers cause damage on maize or sorghum crop?</p> <p>[Extensive damage o the leaves and tunnelling of the maize stem resulting to death hearts and they also eat the food the maize could use to fill the grains]</p>					
<p>The lifecycle of Stemborers.</p> <p>[The adult moth lays eggs on plants that hatch into larva after 5-7 days. The larva feeds on plants and turn into pupa for 7-14 days. Pupa develops into moth which matures and lifecycle continues]</p>					
<p>Signs of a maize or sorghum crop that is damaged by Stemborer?</p> <p>[Feeding marks/holes on the maize/sorghum leaves caused by larvae or dead heart caused by Stemborer larvae feeding/tunnelling into the</p>					

maize/sorghum stems]					
<p>How Striga weed affects your maize/sorghum crop?</p> <p>[The Striga weed attaches itself to the roots of the maize/sorghum plant and it takes the food from the maize/sorghum plant thereby stunting and killing it completely]</p>					
<p>Signs of a maize or sorghum crop that is damaged by Striga weed?</p> <p>[Stunted growth of maize/sorghum crop which hardly grows more than 1 foot tall and eventual death]</p>					
<p>How push-pull technology works in controlling Striga and Stemborers?</p> <p>[Cropping strategy where Desmodium is planted between the rows of maize or sorghum and Napier grass around the maize or sorghum plot. Desmodium produces chemical substances which cause Striga weeds to germinate but does not attach to the roots of the Stemborers months to lay eggs on it but don't survive when hatched to larvae. Thereby saving the crop from Striga and Stemborers damage]</p>					
How to establish a push-pull plot?					

<p>[Planting Desmodium between the rows of maize/sorghum and 3 rows of Napier grass around the maize plot. A footpath/space of 75 cm is left between the outer row of Desmodium and inner row of Napier grass]</p>					
<p>How to plant Desmodium seeds in a ‘Push-Pull’ plot?</p> <p>[by drilling using a strong pointed stick, make a furrow 1-2 cm deep in the middle of the roots of maize roots]</p>					
<p>The role of Desmodium in the ‘Push-Pull’ plot?</p> <p>[It is used to produce a smell that Stemborers moths do not like and are pushed away from maize crop. It also improves soil fertility and stops Striga weed from attaching itself to the maize roots]</p>					
<p>The role of Napier grass in the ‘Push-Pull’ plot?</p> <p>[It`s more attractive to Stemborers months and pulls them away from maize to lay eggs on it and it does not allow their larvae to develop into adults. It`s a trap crop]</p>					
<p>How to plant Napier grass in a ‘Push-Pull’ plot?</p> <p>[3 rows are planted in a border around the maize</p>					



crop using a spacing of 75 by75cm]					
<p>How to weed a Push-Pull plot for the first time?</p> <p>[It's carried out when the maize is 3 weeks old. Hand weeding is recommended to avoid uprooting of Desmodium]</p>					
<p>Harvesting and utilization of Napier and Desmodium fodder?</p> <p>[Napier: Harvest Napier when its 3 months old or 1-1.5m high. Harvesting starts with the inner row nearest to sorghum/maize. Leave a stem eight of 4 inches from the ground at harvesting to encourage re-growth. Feed livestock with freshly harvested and chopped Napier grass]</p> <p>[Desmodium: Harvesting of Desmodium can be fro fodder or seed. When harvesting for fodder, cut the vines and leaves stubble of 6 cm above the ground for re-growth. Chop the harvested Desmodium and mix with Napier in a ration of 3:1 mix well and feed your livestock]</p>					
<p>Other benefits of adopting 'push-pull' in your farm apart from controlling Striga and Stemborers?</p> <p>[Increase maize yield, Fodder for cattle, Nitrogen fixation, prevention of soil erosion,</p>					

moisture retention in the soil, income from the scale of milk, Maize protected from strong winds by Napier grass and saving on farm labour]					
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Key: KNOWLEDGE LEVEL [ ] Low [ ] Average [ ] Good [ ] V. Good [ ] Excellent

### SECTION III: INFORMATION DISSEMINATION PATHWAYS

16. Rank the following the extension methods in order of their effectiveness in learning and disseminating agricultural information in your area?

- i. [ ] Television
- ii. [ ] Print materials (leaflets, magazines, posters etc.)
- iii. [ ] Extension Officers
- iv. [ ] Radio
- v. [ ] Fellow Farmer
- vi. [ ] Field days
- vii. [ ] Farmer schools

17. Do you own a video player?

[ ] Yes

[ ] No

18. Do you own television set?

[ ] Yes

[ ] No

If No, where do go to watch TV?

- i.  Neighbor
- ii.  Friend
- iii.  Relatives
- iv.  Market place
- v.  Farmer Field school

If yes, how often do you watch your TV?

- i.  Daily
- ii.  once per week
- iii.  once/twice per week
- iv.  once per month
- v.  Never

19. Do you have access to PPT print material?

- i.  Yes
- ii.  No

If yes, how often do you read them?

- i.  Regularly
- ii.  Occasionally

iii.  Rarely

iv.  Never

20. Do you belong to a farmer group?

Tick one

Yes

No

If yes, what is the size of your group? .....

If no, why haven't you joined a farmer group?

i.  Fear group setup/by-laws

ii.  Too much commitment

iii.  Not allowed to join

iv.  Lack of knowledge

v.  There are no such people

vi.  Don't have time

vii.  Don't have enough money

viii.  Don't need to

21. How often does your group meet?

i.  Weekly or more frequently

- ii.  Bi-weekly (every 2 weeks)
- iii.  Monthly
- iv.  Bi-monthly (every 2 months)
- v.  Less than 6 times a year

22. Does your group tell other farmers about new information and technologies?

Yes

No

23. Have you trained and told other farmers about new technologies or information in the past 5 years?

Yes

No

If yes, to whom did you share the information?

- i.  Neighbor
- ii.  Friend
- iii.  Relative
- iv.  Farmer from other location
- v.  Others

If yes, approximate how many farmers?

- i.  Few 1-5

ii.  some 6-10

iii.  Many >11

**SECTION IV: EVALUATING PARTICIPATORY VIDEO MATERIALS**

24. Which video lesson(s) was the most effective in teaching and learning PPT?

Understanding Striga weed biology (*how it parasitizes host plants and explain how its seeds survives for long in the soil*)

Land preparation and layout of push-pull plots

Weeding maize, Desmodium and Napier grass

Harvesting and utilization of Napier and Desmodium as fodder for livestock

Explain

why?.....

i. What did you learn from the videos?

ii. Which other PPT lessons/topic would you like produced?

iii. How best can we improve the training video in future?

iv. Give suggestions as to how we can enhance community access to the PPT video materials?

25. Rate the following thematic elements in the video materials?

<b>Video</b>	<b>Fair</b>	<b>Good</b>	<b>Very Good</b>
Overall visual quality			

Sound quality			
Language use			
Length of the video			
Farmers participation			
Easiness of using the videos			
Instructions			

## Appendix II: Image

### Screen Shot of Farmers` guide on planting a Push-Pull Field



Fig. 5. How to make desmodium furrows

- Mix the desmodium with superphosphate fertilisers (about one handful of seed and two handfuls of fertiliser).
- One kilogramme (1 kg) of desmodium seed is needed for 1 acre of land.
- If you cannot afford fertiliser, just mix desmodium seed with fine sand. Sow it into the furrows you made and cover with light amount of soil (Fig. 5).
- Desmodium should also be drilled on both sides of the outer rows of maize at an inter-row spacing of 37.5 cm.
- Plant desmodium with the rains for maximum germination.

#### Step 3 . Weeding

##### Weeding and Crop Management

- Early weeding is very important for the successful establishment of a push-pull plot.
- Carry out the first weeding when maize is 3 weeks old and second weeding when maize is 5 weeks old.
- It is important to distinguish between desmodium and weed (Figs 6 and 7).



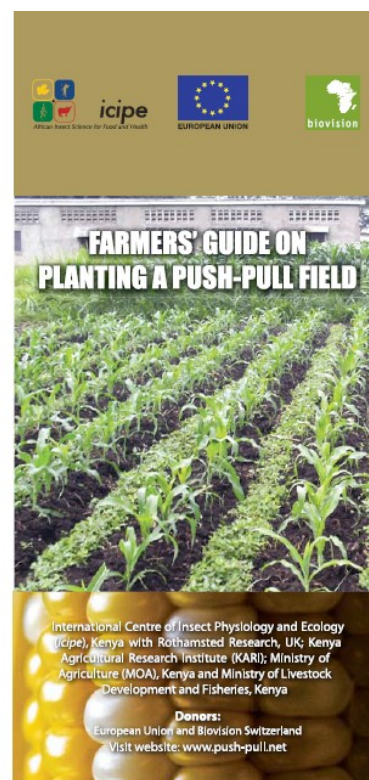
Fig. 6. Three and five-week-old desmodium seedlings



Fig. 7. Hand weeding of desmodium seedlings planted in between maize plants

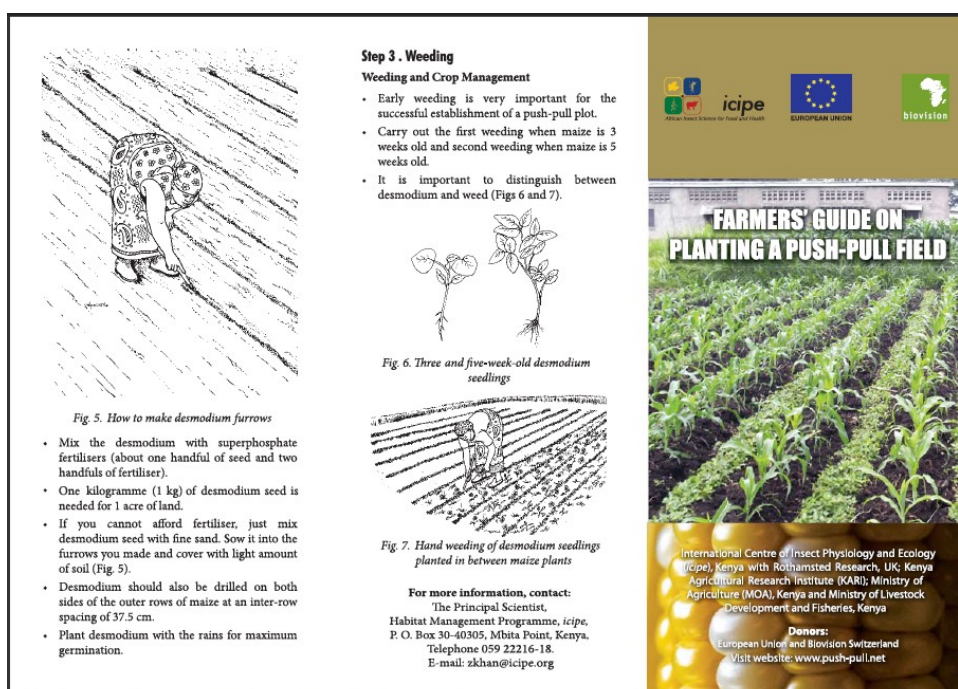
#### For more information, contact:

The Principal Scientist,  
Habitat Management Programme, *icipe*,  
P. O. Box 30-40305, Mbita Point, Kenya.  
Telephone 059 22216-18.  
E-mail: zkhan@icipe.org



Source: [www.push-pull.net](http://www.push-pull.net)

## Appendix III: Image



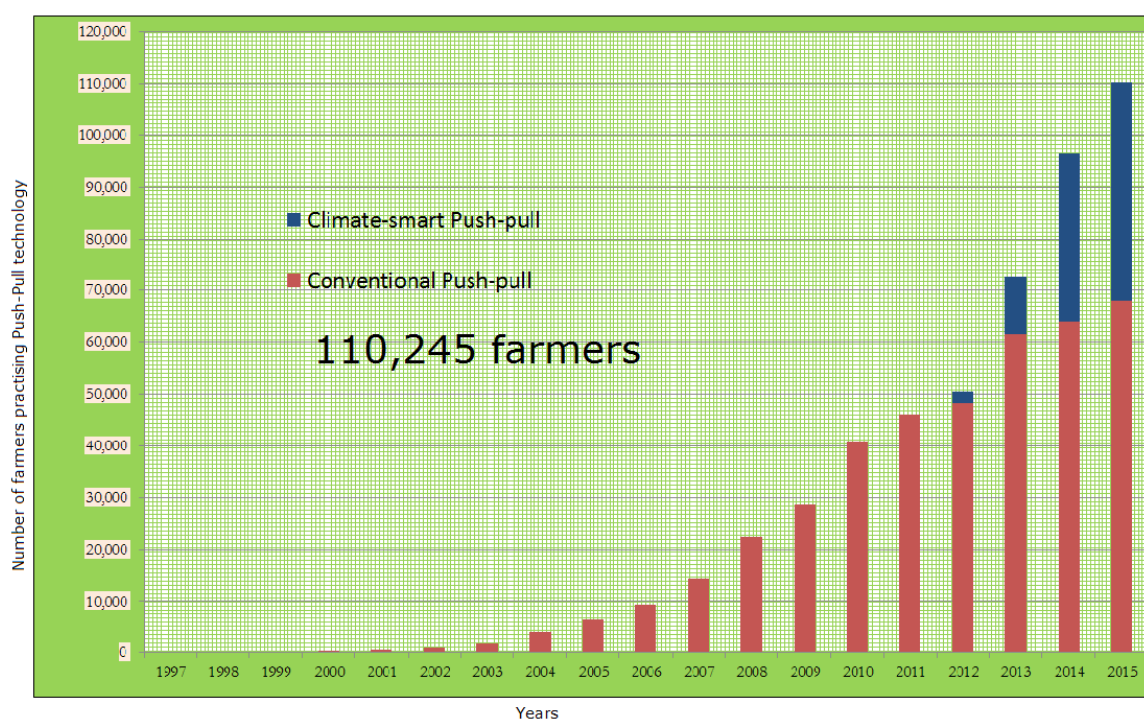
Source:

[http://www.push-pull.net/farmers\\_guide\\_2012.pdf](http://www.push-pull.net/farmers_guide_2012.pdf)



## Appendix IV: Graph

A screen shot of oligarch indicating total number of smallholder farmers who have Push-Pull Technology as at June, 2015.



Source: [www.push-pull.net](http://www.push-pull.net)

**Appendix V: Image**

Researcher Sammy Olumola assisting a farmer to hold a hand camera during Epwopi FFS meeting in Vihiga. PHOTO/ Joseph Bisong



**Appendix VI :Image**

Nactical Sufu, facilitator at Epwopi FFS being interviewed by a farmer in Ebukanga Village, Vihiga District. PHOTO/ Sammy Olumola

**Appendix VII : Image**

Farmers from Simana FFS in Bungoma district, during an on-farm practical video shooting session. PHOTO/ Sammy Olumola



**Appendix VIII: Image**

Farmers in Simana FFS, Bungoma in a celebrating mood after receiving video a cameras, a tripod stand, projector donated by icipe. PHOTO/ Sammy Olumola