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Farmers' knowledge, attitude, and perception of video-mediated learning vis-à-vis Farmer Field School on Striga weed management in Western Kenya

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ABSTRACT

Farmer education and perceptions have been neglected in extension science. Knowledge, attitude and perceptions on technologies are key and first steps in adoption process. While Video Mediated Learning (VML) is a new communication approach currently being promoted as alternative pathway to foster knowledge sharing, Farmer Field Schools (FFS) remain one of the most active traditional extension approach used in Kenya. Since farmer receptivity to messages depends on the extension approach used, this study sought to provide evidence and superiority on effectiveness of VML through evaluation of knowledge, attitude and perceptions.

The study was conducted at Rachuonyo Sub-County, where a sample of 120 maize farmers was selected through Systematic random sampling. These farmers were put into three experimental groups namely; G1-Video Mediated Learning, G2-Farmer Field School and G3-a combination of video and FFS where they were trained on striga weed management. G1 watched video clips on striga control technologies, G2 learnt such technologies under FFS settings and G3 was subjected to both video clips and FFS on the same topic. Primary data on farmers' access to extension services, knowledge in terms of awareness and *how-to knowledge*, attitude in terms of their opinions, approval, viability of the VML and perceptions in terms of understanding, quality and relevance of messages disseminated were gathered using pre-tested, semi-structured questionnaires. The results showed that 47.5% of the respondent accessed extension services. On knowledge, 77% of G1, 57.5% of G2 and 89% of G3 participants were aware and displayed knowledge on striga weed management. As regard to attitude, 72.5% of G1 and 55% G2 participants found video and FFS as viable tools and approved their use in extension work. Lastly, on perception, 84% of G1, 66% of G2 and 95% of G3 participants viewed messages as relevant and clear. From these results, there was an average difference of about 18% between video participants and FFS participants who had knowledge, found VML a viable tool and perceived messages disseminated as relevant. Video mediated learning was therefore greatly perceived to be a viable tool with its messages highly appreciated as compared to FFS. Hence, need for extension service providers to intensify the use of video mediated learning as it is viewed as a viable and effective tool in information delivery.

Keywords: *Striga, Video Mediated Learning, Knowledge, Attitude, Perception, and Farmer Field Schools, Kenya*

1. INTRODUCTION

Since independence, agricultural sector has remained a prime driver of Kenyan economy. Currently, the sector contributes greatly to socio-well beings of people through food production and employment (Aker, 2010). Despite its significant share on the overall economy, the sector is facing serious challenges such as unfavorable weather conditions, pest and diseases, weeds, poor farming methods and weak agricultural institutions which are responsible for disseminating relevant information on improved technologies (Toyama et al, 2009,GoK, 2009). For instance, farms in western Kenya are infested by *Striga hermontheca*, a parasitic weed which is considered as a major threat in cereal production (Evans et al, 2011). The weed is estimated to cause up to 100% losses in grain yield (Khan et al, 2008); hence addressing this situation is an urgent need.

According to (Bowonder and Yadav, 2005), access to information by rural farmers is paramount in achieving increased productivity. In Kenya and other developing nations, agricultural extension sub-sector has been identified as key in fostering knowledge and information (Shaik et al, 2014). Currently, Kenya has two categories of extension service providers (ESPs) namely; public and private sectors. The ESPs have established extension strategies that include Training & Visit (T&V), Participatory Rural Appraisal (PRA) and Farmer Field Schools (FFS) among others to strengthen the extension activities (NASEP, 2012). In addition, a number of communication pathways such as face to face interactions, audio, visual and print media have been developed over time to promote spread of extension messages (Amudavi et al, 2009). All these developments are in the line with the fact that productivity can be increased through better delivery of extension services (GoK, 2010).

Farmer Field School, in particular, has adopted principles of experiential learning (Kolb, 1984). This approach has been found to be effective in conveying complicated agricultural information (Bentley et al, 2014) and enhances farmers' capacity to innovate local sustainable practices through individual and communicative learning (Van de Fliert et al, 2007). At the same time, it faces a number of criticisms especially on how it can be validated to reach out to more farmers quickly irrespective of personality differences. For instance, only poor-resource farmers tend to participate in FFS activities as wealthier farmers perceive such move as a waste of time (Davis et al, 2010). In addition, there is little evidence that FFS messages spread beyond the participants and quality of learning deteriorates especially when scientific words are used (Witt et al, 2008).

To bridge the above gaps, agricultural extension is seeking for best alternative approach which promotes learning and motivates farmers to continue engage in extension activities. One promising approach is the use of video mediated learning (VML) which is believed to be a powerful communication platform for delivering agricultural messages (Gandhi et al, 2009). According to (Bentley et al, 2015), the use of video in extension science is becoming common. VLM combines both visual and verbal communication methods and it appears to be a suitable communication approach for agricultural messages (Chowdbury et al, 2010). Farmer to farmer video focuses on farmers within their local context (Gandhi et al, 2009; Van Mele et al, 2010). Further, past study by (Van Mele, 2011) has shown that videos have an added advantage during training because a larger number of farmers can be reached at once. They also enhance the work of agricultural experts (Gandhi et al, 2009; Okry et al., 2014) and trigger farmers to remember topics taught (Karubanga et al, 2016). However, their use within rural areas is affected by low level of accessibility and inadequate access to source of power (Zossou et al, 2009).

While FFS and now VML are being used in extension work, little research has been conducted to assess farmers' knowledge, attitude, and perceptions on these extension approaches (Donus et al, 2013). Past studies have shown that lack of adequate knowledge; negative attitude and relatively low perceptions of modern technologies were the most impeding factors for scaling up adoption (Musemakweri, 2007). According to (Ndambiri et al, 2014), high farmers' perceptions of

the modern agricultural interventions prompt the adoption process. Therefore, a gap in knowledge exists between farmers' knowledge, attitude and perceptions on technologies disseminated by both FFS and VML and their capability for continued involvement in extension activities.

The current study gathered information to gain farmers perspectives regarding their experiences with FFS and VML as expressed in their own words. Primarily, this study was based on belief that by establishing the approach which promotes high level of understanding and comprehension, access to extension services by farmers would be enhanced.

2. MATERIALS AND METHODS

2.1 Site Description

The study was carried out at Rachuonyo South Sub-County in Western Kenya (Figure 1). Farming is the main occupation of the people in the area. However, they also engage in lumbering, mining and transportation of goods and services as the area is served with tarmac road (County Government of Homa-Bay, 2013). The main food crops grown include maize, beans, sweet potatoes; sorghum and vegetables (Nyasimi, 2014). Over 80% of the potential farmers produce maize as food crop (County Government of Homa-Bay, 2013). Farmers have small land sizes averaging at two acres per households. The soil is deep, well-drained and relatively fertile (Sikei et al, 2009). Livestock rearing is combined with crop production.

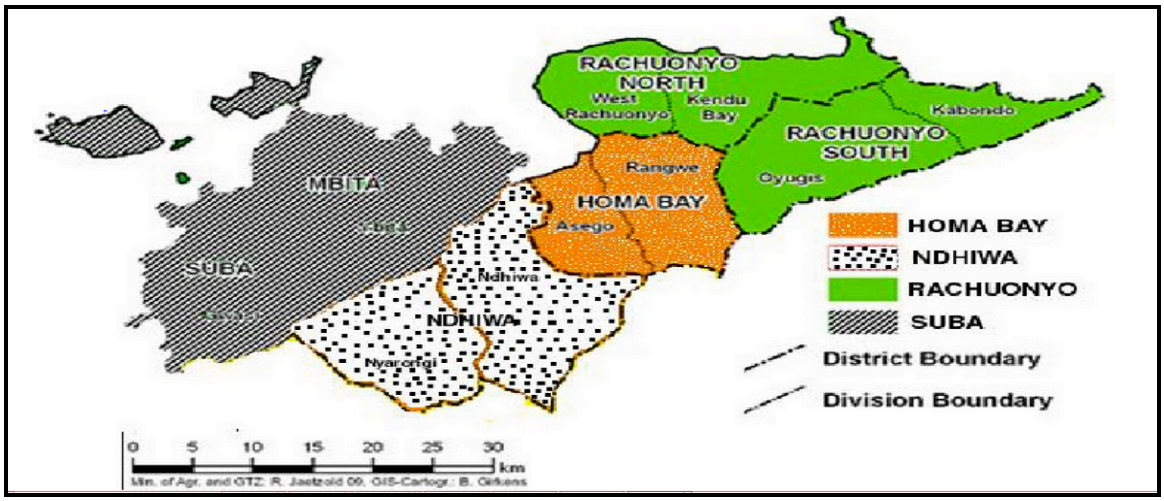

Figure 1. *Map of Homa-Bay County Showing Rachuonyo Sub-County*
Source: Homa-Bay County Integrated Development Plan (2013-2017)

2.2 Sample Selection and Grouping of Farmers

To achieve the main objective of the study, a multistage sampling procedure was employed to divide the sub-county into smaller admintrative units. Afterwards, a list of registered maize farmers who work closely with Oyugis Integrated Project (OIP), a local NGO that works to uplift the livelihood of people within the sub-county by providing agricultural, medical and social services was drawn. From the list, a total of 120 maize farmers were obtained using systematic random sampling technique. With the help of extension officers three experimental farmer groups were established (Table 2.1).

Table 2.1*: Training methods and Farmer groups*

Training method	Cluster	Training procedure	Some topics covered
G1-Video mediated learning	Ringa	1. Video screening 2. Farmer group discussion	Striga biology, micro-dosing, push pull manure application etc
G2-Farmer Field School (control group)	Kodera	1.Facilitation/Learning 2. Farmer discussion 3. Field demonstrations	Striga biology, manure application, push-pull crop rotation etc
G3-A combination of Video and FFS	Mirondo	1.Video watching 2. Facilitation and discussion 3. Field demonstrations	Striga biology, push-pull Manure application, crop Rotation, Micro-dosing

To enhance equal distribution, each group had forty (40) farmers. The learning sites were situated at different points, about 12 to 15 Kilometers far away from one another to avoid exchange of ideas. Farmers' experiences with video watching and FFS demonstrations were presented. The DVD was obtained from Access Agriculture and contained a multiple of ten video clips on striga control technologies (http://www.accessagriculture.org).

2.2.1 Video Mediated Learning (G1)

Participants of G1 assembled in the screening room, where a brief explanation of the project was given prior to actual screening. A computer Laptop bearing videos, electric cables, and screen and sound systems were installed in a room. Participants started off by watching video clips on striga biology to know its life cycle for proper control (Photo1). Other topics covered included: Integrated approach against striga, which combines manure application, hand pulling, fertilizer application among others, Composting to beat striga which gives tips on making compost manure from crop residues, Micro-dosing which involves application of smaller amounts of fertilizer to the base of the plant. The entire training took two hours.

Photo 1: *Farmers watching video clips on striga control technologies*

2.2.2 Farmer Field Schools (G2)

Participants in this category received trainings under the shade (Photo2). The extension officers first presented the theory underlying the striga weed management under topics as in G1.This was closely followed by field demonstrations where technologies such as push-pull, intercropping were practically shown in farmers' field. Other striga control tecnologies presented included crop rotation, fertlizer application,weeding, uprooting and compost manure application.

Photo 2: Farmers attending FFS lessons and demonstrations

2.2.3 G3-Combined Video mediated learning and Farmer Field Schools

G3-participants watched a series of ten video clips, each clip of about 5-12 minutes on striga control technologies, the same as discussed in G1 (Photo 3). Afterwards, they were taken through a series of FFS lectures on striga weed management which was closely followed by field demonstrations on technologies such as push-pull, intercropping and manure application (as discussed in G2).

Photo 3: *Farmers attending FFS lectures (a), demonstrations (b) and (c) watching video clips on striga control technologies*

2.3 Questionnaire Design and Administration

Six months later, a household survey was conducted where primary data was collected by the use of semi-structured questionnaires. The questionnaire had two sections; A and B. Section A covered areas on access to agricultural extension services, frequency of contacts with extension officers per season, and information sought on production practices to help understand the contribution of the earlier extension services deployed on adoption process. Section B covered participants' awareness on striga weed management to help evaluate their knowledge gap, farmers' attitude, opinions and the perceptual differences on new technologies.

To realize this, aspects such as awareness and *how-to knowledge* (mastery of the content) were measured to evaluate knowledge gap. On attitude, viability, excellence and approval of VML and FFS as tools for agricultural extension were evaluated. On perception, participants' experience in terms of coverage of the topic, clarity of the information and relevance of messages were

captured. Farmers' perception and attitude were determined through a 5- point rating scale as very useful, useful, slightly useful, slightly not useful, and not useful while tools as very good, good, neither good nor bad, bad and very bad. However, experience of G3 participants were captured in terms of relevance of messages, length of video, understandability of messages, coverage of the topic and quality of the video and rating done on a 3-point scale as very effective, effective and not effective. The collected data were subjected to descriptive statistics.

3. RESULTS AND DISCUSSION

3.1 Access to agricultural extension services.

We found that less than a half of the total respondents (47.5%) from all the groups were able to get access to the agricultural extension services (Table 3.1). On average, only 16% of FFS participants, 18% of video participants and 14% of a combination of video and FFS participants noted having been visited by extension officers. Out of this, about 7.5% of the farmers got these services from Ministry of Agriculture (County government), while majority (40.3%) obtained such services from private extension providers. However, their level of interaction with extension officers was limited. Only 42.1% of the farmers interacted with extension officers on quarterly basis, 19.4% on monthly basis, 31.1% of yearly basis and 7.4% on weekly basis. This implies that extension officers had no close contacts with maize farmers since majority were small scale farmers. In a related study by (Gandhi et al, 2009), it was found that extension officers usually restricted their interaction to the more resourced farmers in each village hence devote little time for poor resourced farmers.

***Table 3.1**: Access to agricultural extension services*

		G2-(FFS)	G1-(VML)	G3-(VML+FFS)	**Total(%)**
Variables		%	%	%	**N=119**
Access to extension service (yes)	Ministry of Agriculture	2.5	3.4	1.6	**7.5**
	Private sector	13.4	15.1	11.8	**40.3**
Interaction levels	Weekly	3.6	1.9	1.9	**7.4**
	Monthly	8.8	7	3.6	**19.4**
	Quarterly	19.3	14	8.8	**42.1**
	Yearly	10.5	5.3	15.8	**31.1**
Information Sought	Agronomic techniques	15.8	10.5	8.8	**35.1**
	Improved seeds	7	5.3	8.8	**21.1**
	Pest & diseases	8.8	3.5	7	**19.3**
	Marketing	7	3.5	5.3	**15.8**
	Striga management	3.5	5.2	0	**8.7**

In terms of information sought, about 35% of the respondents needed information on new agronomic practices such better ways to cultivate land. This was closely followed by improved seeds and fertilizers (21.1%), pest and disease control (19.3%), access to markets (15.8 %) while only 8.7% of farmers needed information on striga management (Table 3.1). This clearly suggests that majority of the farmers did not have adequate knowledge and information on striga weed and its control as information on this aspect was rarely sought. Possession of knowledge and information about striga is the first step in its management. According to (Acheampong et al, 2013), an appropriate knowledge and information concerning new technologies stimulate farmers' ability to comprehend such technologies for sound decision making. This is due to the fact that knowledge influences acceptance of new ideas hence uptake of technologies developed over time to combat striga.

3.2 Farmers' knowledge, attitude and perceptions on Video Mediated Learning

A greater proportion of G1 participants (77.5%) were aware and had knowledge on striga control technologies after training (Figure 3.3). This implies that majority of farmers understood very well striga biology, its effects and control mechanisms as they could see and hear at the same time. Majority could narrate how small striga seeds were and also recall hand pulling, compost manure, micro-dosing and joining hands as a community in fighting striga. This shows that they were prompted to learn more and gained knowledge on the topic. Past study by (Karubanga et al, 2016), revealed that watching videos usually increases retention power of the participants to an extent of remembering most things learnt. Earlier findings by (Bentley et al, 2014) also indicated that many farmers were able to recall videos and remember topics learnt after video watching.

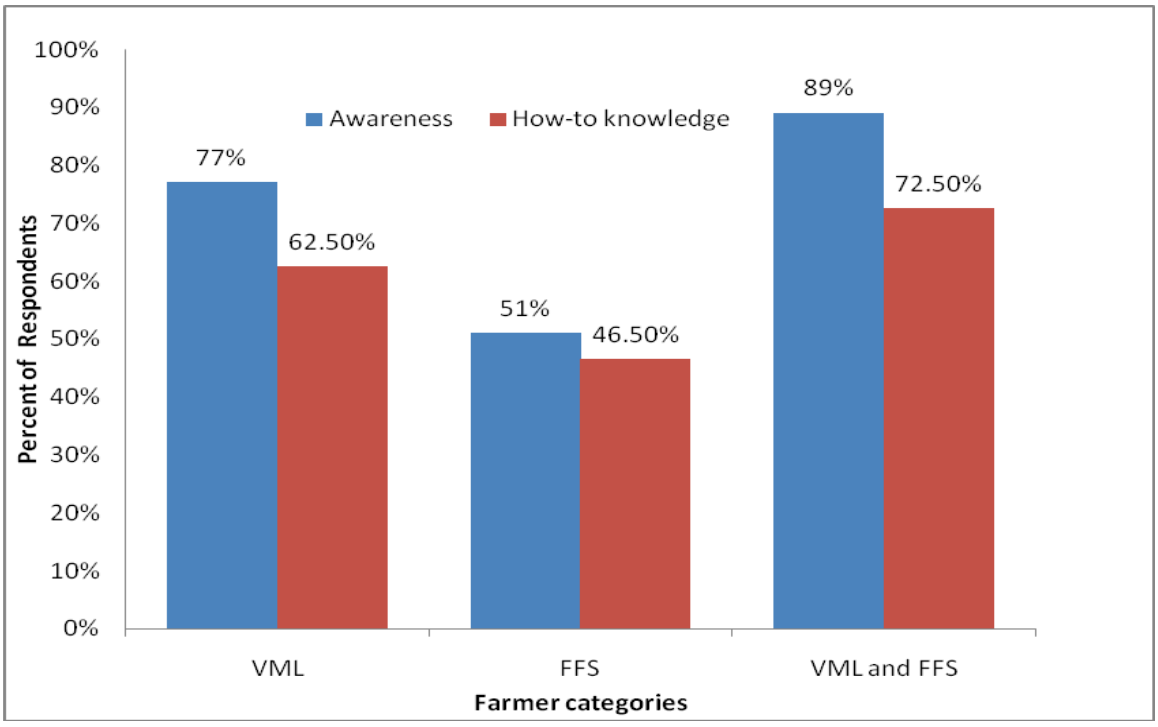

Figure 3.1: *Farmers knowledge on striga weed management after Video Mediated Learning and FFS trainings*

On attitude, about 72.5% of G1 participants found video mediated learning as a viable tool to communicate agricultural messages (Table 3.2). This clearly suggests that agricultural videos can be used to encourage farmers to learn and continue to participate in extension activities. In addition, they noted that video was an excellent approach for knowledge acquisition due to its ability to present information in simple formats. They saw how other farmers demonstrated and explained various striga control technologies on a camera and became intrinsically motivated to search for more information. This demonstrates the persuasive nature of agricultural videos in extension science. Further, it points that participants had a positive attitude towards video mediated learning. Past study by (Zossou et al, 2009) also found that 89% of the farmers who participated in video viewing considered video as an excellent communication tool during farmer training.

Moreover, over 60% of these participants approved the use of video to educate other farmers with similar messages in order to join hands in fighting striga within their farms. For improvement, they advocated for local language video versions. Reason behind this, was low level of education (Sikei et al, 2009) hence could not understand foreign languages very well.

Table 3.2: *Farmers attitude towards Video Mediated Learning and FFS extension approaches*

Aspects measured	Categories of farmers	Very Good %	Good %	Neither good nor bad %	Bad %	Very bad %
Viability	G1(VML) n=40	32.5	40	11.5	8.5	2.5
	G2(FFS) n=40	22.5	25	17.5	15	20
Excellence in knowledge	G1	37.5	42.5	15	3.4	1.7
	G2	17.5	32.5	19.5	14.5	8.5
Approval for other farmers	G1	22.5	42.5	11.5	5	2.5
	G2	12.5	32.5	22.5	20	12.5

In regard to perception, about 32.5% of the G1 participants found messages disseminated very useful, 40% of them found messages useful, while 11.5% found messages disseminated slightly useful (Table 3.3). This implies that a greater proportion of video participants positively perceived messages disseminated as relevant in their quest to improve maize production. Most of them cited video messages as very informative and clear. The images of fellow farmers and the use of sorghum stalks as alternative materials for compost manure preparation really caught their attention. They were amazed and excited to see better ways of farming using locally available resources. Some noted being entertained too apart from learning various striga control technologies. This finding augurs well with previous study by (Zossou et al, 2009) who revealed that farmer to farmer videos are rich in images and well enthused for farmer trainings.

***Table 3.3**: Farmers perception towards video and FFS messages*

Aspects measured	Categories of farmers	Very useful	Useful	Slightly useful	slightly not useful	Not useful
		%	%	%	%	%
Relevance of messages	G1(VML) n=40	32.5	40	11.5	8.5	2.5
	G2(FFS) n=40	25	32.5	8.5	14.5	19.5
Clarity of messages	G1	37.5	42.5	15	3.4	1.7
	G2	27.5	32.5	17.5	12.5	10
Coverage of topic	G1	40	42.5	11.5	5	2.5
	G2	22.5	35	15	17.5	5

3.3 Farmers' knowledge, attitude and perceptions of Farmer Field School

About 50% of G2 participants were aware and had knowledge on striga weed after training (Figure 3.3). This implies that nearly a half of the FFS participants understood the basic concepts of striga weed control. Most of them could specifically recall push-pull, uprooting and compost manure technologies in striga management. This was attributed to the fact that demonstrations were mostly done on push-pull and intercropping technologies. Other striga control technologies such as crop rotation and weeding were rarely mentioned as they were presented theoretically without field demonstrations. This observation demonstrates the power of learning by doing as farmers gain deeper experiences with the technologies tried in the field. In support to this, (Davis et al, 2010) revealed that learning through field experimentations usually motivate farmers to gain practical skills with technologies under test.

In regard to attitude, close to a half of G2 participants (47.5) found FFS as a viable approach to communicate agricultural information (Table 3.2). This implies that FFS was still an effective approach in delivering agricultural information among rural farmers. These participants had close contact with facilitators hence developed interest towards learning striga control technologies. However, farmers who did not find FFS a viable approach cited time as a major limiting factor. This was attributed to the fact that FFS training could go for relatively longer hours. Since most farmers were engaged in other production and social activities, trainings beyond three to five hours were rendered unattractive. In contrary, study by (Oladosu, 2006) revealed that FFS farmers complained about the duration of training as being too brief for meaningful knowledge transfer. Further, facilitation process was marred by the use of jargons as trainees were unable to translate every word into local language.

Nevertheless, about 25% of the G2 participants found messages disseminated as very useful, 32.5% of them useful and 8.5% slightly useful. This implies that close to a half of FFS participants' positively perceived messages as relevant in their quest to improve maize production. They appreciated having learnt many ways to combat striga weed which has caused huge yield losses within their farms.

On approval, only 45% of the G2 participants found FFS as an appropriate approach for communicating agricultural information. This means that FFS is still a reliable approach in extension despite emergence of Information Communication Technologies in the field of agriculture. They cited that personal interaction with extension officers usually motivate them to learn more and put into use the new ideas gained. The rest who did not recommend FFS to other

farmers cited that poor facilitation process especially the use of scientific terms as major constraints. To improve FFS, farmers asked for regular farm visits by facilitators in order to create close contact and sense of trust.

3.4 Farmers knowledge, attitude and perceptions on a combination of Video mediated and Farmer Field School

Majority of G3 participants (89%) were aware of striga weed and could recall various striga control technologies after training (Figure 3.3).This implies that video watching combined with in person-instructions from facilitators greatly encouraged farmers to learn very fast and gain better understanding of the messages disseminated. These farmers took advantages presented by the two pathways in order to acquire knowledge. For instance, FFS has an advantage of providing intensive learning (Murage et al, 2012), while video mediated learning has the advantage of sharing ideas informally using social networks within the community (Bentley et al, 2014). Therefore, they were able to capitalize on small group discussions and use social networks to gain better understanding of the striga control technologies disseminated.

As regard to perception, evaluation was done on topic coverage, relevance of the messages, understandability of the messages, quality of the video and video length. In terms of coverage of the topic, majority of the G3participants (90%) found video to be very effective tool, 7.5% of them found video to be fairly effective and 2.5% of them not effective. In regards to understandability of messages, 38% of the G3 participants found video to be very effective as, 12% of them effective and 50% found it not effective as shown in (Figure 3.4). The reason behind low understandability was the language (English) used to pass video massages during screening. Most farmers had low reception power for both English and Kiswahili languages, a factor attributed to low level of literacy in this area (Sikei et al, 2009).

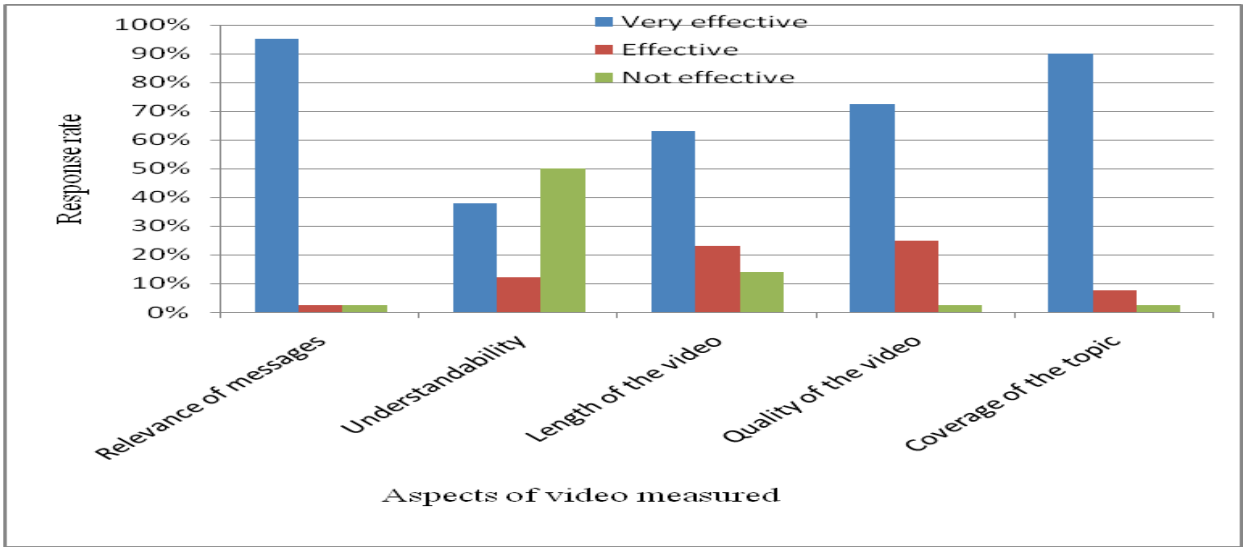

***Figure 3.4**: Farmers' perceptions on various aspects of Video Mediated Learning*

In terms of duration the video was shown, 63% of the G3 participants found video to be very effective, 23% of them found it effective and 14% of them found it as not effective. Relevance of the massages was measured at the same time and it was found that 58% of the G3 participants viewed messages as very relevant; 33% found messages relevant and only 9% found messages

not relevant. Lastly, 72.5% of G3 participants found video quality as very effective, 25% of them effective and 2.5% them not effective. This shows that video images were very clear and the background was appealing to most farmers. These findings imply that farmers viewed video mediated learning as an effective communication approach to promote sharing of agricultural ideas. In a related study by (Zossou et al, 2009), it was found that farmer to farmer videos are efficient way in reaching many farmers with relevant information.

3.5 Comparison between Video Mediated Learning and Farmer Field School approach

From the above results, there was a difference of 20% between G1 and G2 participants who gained knowledge on striga weed management after training process. This implies that video viewing enhances faster knowledge acquisition as compared to FFS lectures and demonstrations. As farmers see and hear, they internalize information and absorb much of what is being presented. This leads to building of lasting memories. A fact that was largely supported by (Rogers, 1983) which revealed that mass media (such as video) was more important at the knowledge stage of an innovation decision process. Furthermore, a study by (Rajula and Thiagarajan, 2011) on lecturing extension agents and multimedia found significant but small differences in knowledge gained between two groups ranging from 18.63% to 29.10%. They suggested that multimedia such as video when used on particular topics, can cope up with lecturing extension agents, especially when introducing concepts and sharing simple information. However, this contradicts earlier findings by (Karubanga et al, 2016), which found no significant difference in knowledge acquisition between video and FFS participants. When the two approaches are combined (VML and FFS), quantifying the actual impact and magnitude of individual extension method on knowledge, attitude and perceptions may be difficult (Murage et al, 2012).

On attitude, the study revealed a difference of 17.5% between video and FFS participants who found approaches as viable tools in extension work. This suggests that majority of the farmers had positive attitude toward VML. The VML approach can therefore be used to encourage farmers to learn and continue to participate in extension activities. In terms of perception, there was 18% difference between video and FFS participants who perceived messages disseminated as relevant. This implies that video messages were greatly appreciated. The source of information (whether from Video or FFS) therefore had a greater influence on farmers' perceptions towards messages being communicated. In this regard, (Mcbride et al, 1999) noted that information sources usually play a big role in influencing farmers' perceptions and attitudes towards new technologies.

4. CONCLUSION AND RECOMMENDATIONS

The focus of this study was to provide evidence whether video mediated learning could be alternative effective communication approach to FFS in extension science. The study was based on the idea that an extension approach which promotes high farmers' perceptions, positive attitude and greater knowledge acquisition would be effective as it meets farmers' information needs. Findings on knowledge revealed that video viewing enhances faster knowledge acquisition on new agricultural interventions. When video mediated learning and FFS approach are combined as in G3, farmers get an opportunity to utilize advantages of each approach for effective learning hence acquire knowledge relatively faster than the individual approaches.

On attitude, a greater proportion of G1 participants considered video as an excellent tool in extension as compared to their G2 counterparts on FFS. They appreciated images of fellow farmers and simple formats in which information was presented. With regard to perception, the study revealed that video mediated messages were greatly perceived as relevant and informative

as compared to FFS messages. When effectiveness of dissemination pathways is established by looking on perceived ability of such pathways to provide updated information to farmers, the study results have clearly shown that video mediated learning is an effective and alternative communication platform to FFS. Hence, there is a need for extension service providers to increase the use of video mediated learning in reaching and providing information to rural farmers.

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REFERENCES

Acheampong, P. P., Owusu, V., & Nurah, G. K. (2013). Farmers Preferences for Cassava Variety Traits: Empirical Evidence from Ghana. In *AAAE- Fourth International Conference, September 22-25, 2013, Hammamet, Tunisia* (No. 161633). African Association of Agricultural Economists (AAAE).

Aker, J. C. (2010). "Dial 'A' for Agriculture: Using Information and Communication Technologies for Agricultural Extension in Developing Countries." Tuft University, Economics Department.55pp

Amudavi, D.M., Khan, Wanyama, Miegada C., Pittchar J., Nyangau T., Hassanali A., and Pickett (2009): Assessment of Technical Efficiency of Farmer Teachers in the Uptake and Dissemination of Push–Pull Technology in Western Kenya. In: Crop Protection 28 (11): 987-996.

Bentley, J., VanMele, P., Harun-ar-Rashid, M., & Timothy, J.K. (2015). Distributing and Showing Farmer Learning Videosin Bangladesh. The Journal of Agricultural Education and Extension DOI:10.1080/1389224X.2015.1026365

Bentley, Jeffery, Paul Van Mele, Sidi Touré and Tom van Mourik (2014): Fighting striga and improving soil fertility with videos in Mali. Agro-Insight Report submitted to Swiss Agency for Development and Cooperation (SDC).

Bowonder, B., & Yadav, Y.(2005). Developing an ICT platform for enhancing agricultural productivity: the case study of EID Parry. *International Journal of Services Technology and Management*, *6*(3-5), 322-341.

Chowdbury, H.A., Odame, H.H. & Hauser, M., (2010). With or Without a Script ? Comparing Two Styles of Participatory Video on Enhancing Local Seed Innovation System in Bangladesh. *Journal of Agricultural Education and Extension*, 16(4), 355–371

County Government of Homa-Bay. (2013). *Homa-Bay County Integrated Development Plan for 2013-2017*. Available at: www.Homa-Bay.go.ke

Davis, K., Ephraim, N., Edward, K., Daniel, A., and Martins, O. (2010). Impact of Farmer Field Schools on Agricultural Productivity and Poverty in East Africa. Discussion Paper series 00992, June 2010. Available on IFPRI's website at http://www.ifpri.org/publications/results/taxonomy3A468.

Donus, B., Kwabena A., and Joseph A. K.(2013). Farmers' perceptions of the quality of extension services provided by non-governmental organisations in two municipalities in the Central Region of Ghana. Journal of Agricultural Systems 120 (2013) 20–26. Journal homepage: www.elsevier.com/locate/agsy

Evans, A Itoh Kazuyuki, Azuma Tetsushi and Takashige Ishii. (2011). Farmers' Perception and Constraints to the Adoption of Weed Control Options: the Case of Striga asiatica in Malawi Journal of Agricultural Science, Vol. 4, No. 5; 2012 page 41-50.

Gandhi, R., Rajesh, V., Toyama, K., & Vanaja, R. (2009). Digital Green: Participatory Video and Mediated Instruction for Agricultural Extension. Volume 5, Number 1, spring 2009: http://itidjournal.org/itid/article/view/322.

Government of Kenya, (2007). Kenya Vision 2030 - A Globally Competitive and Prosperous Kenya. , (October), pp.1–180.

Government of Kenya,GoK (2010). *Agricultural Sector Development Strategy 2010–2020*,

Karubanga G. , Kibwika P., Okry F, and Sseguya H. 2016. "Empowering farmers to learn and innovate through integration of video-mediated and face-to-face extension approaches:" The case of rice farmers in Uganda. Journal of Cogent Food & Agriculture 2: 1274944 Available at http://dx.doi.org/10.1080/23311932.2016.1274944

Khan, Z.R., Midega C., Njuguna E., Amudavi, Wanyama and Pickett J. (2008): Economic Performance of The Push-Pull Technology for Stem Borer andControl in Smallholder Farming Systems in western Kenya. In: Crop Protection 27(7): 1084-1097.

Kolb, D. (1984). *Experiential learning: Experience as a source of learning and development*, Upper Saddle River, New Jersey: Prentice Hall.)

Mary Nyasimi, D. A. (2014). Research Program on Climate Change, Agriculture and Food Security (CCAFS). *Working Paper*, Copenhagen, Denmark: CGIAR. Retrieved September 27, 2015, from Available:// ccafs.cgiar.org

Mcbride, W.D.,Daberkow S.and Chistesen L.A (1999): Attitudes about PrecisionAgriculture Innovations among US Corn Growers. Precision Agriculture 99: 2nd European Conference on precision agriculture. Stafford, J.V. (ed.): Precision Agriculture, ´05 Part 2: 927-936. Odense, Denmark.

Murage, A.W., G. Obare, J. Chianu, D.M. Amudavi, C.A.O. Midega, J.A. Pickett and Z.R. Khan (2012): The Effectiveness of Dissemination Pathways on Adoption of "Push-Pull" Technology in Western Kenya. In: *Quarterly Journal of International Agriculture* 51 (1): 51-71.

Musemakweri, J.(2007).Farmers' experiences and perceptions of theNAADS Agricultural Extension System/Programin Kabale district, Uganda. Retrospective Theses and Dissertations available at Digital Repository @ Iowa State University

National Agricultural Sector Extension Policy [NASEP]. (2012). *National agricultural sector extension policy. Government of Kenya, Agricultural Sector Coordination Unit (ASCU)* Nairobi, Kenya: Author. Retrieved from http://www.kilimo.go.ke/kilimo_docs/pdf/NASEP_SESSIONAL_Policy. pdf

Ndambiri, H., Ritho, C., and Mbogoh., S. (2014). An Evaluation of Farmers' Perception of and Adaptation to the Effects of Climate Change in Kenya. International Journal of Food and Agricultural Economics ISSN 2147-8988 Vol. 1 No. 1 pp. 75-96

Okry, F., Van Mele, P., & Houinsou, F. (2014). Forging new partnerships: Lessons from the dissemination of agricultural training videos in Benin. *The Journal of Agricultural Education and Extension, 20*, 27–47. doi:10.1080/1389224X.2013.783495.

Oladosu, I. O. (2006). Implications of farmers" attitude towards extension agents on future extension programme planning in Oyo state of Nigeria*. Journal of Social Science* 12(2): 115-118.

Rajula Shanthy, T., and R. Thiagarajan. (2011). "Interactive Multimedia Instruction versus Traditional Training Programmes: Analysis of their Effectiveness and Perception." *The Journal of Agricultural Education and Extension* 17: 459–472. doi:10.1080/1389224X.2011.596708.

Rogers, Everett M. (1983). Diffusion of Innovations, 3rd edition. New York: Free Press.Van Mele, P., Wanvoeke, J., & Zossou, E. (2010). Enhancing rural learning, linkages and institutions: The rice videos in Africa. *Development in Practice, 20*, 414–421. http://dx.doi.org/10.1080/09614521003710021

Shaik. N. Meera, Anita Jhamtani, and D.U.M. Rao.,(2014). Information and Communication Technology in Agricultural Development: A Comparative Analysis of Three Projects from India

Sikei, G.,Owuor, B and Colin Poulton (2009). The Role and Performance of the Ministry of Agriculture in Rachuonyo District. Future Agricultures Consortium (FAC) Research Paper No. 016, October 2009. Available onwww.future-agricultures.org

Toyama, K., Gandhi, R., Veeraraghavan, R. and Ramprasad, V. (2009). Digital Green : Participatory Video and Mediated Instruction for Agricultural. *Information Technologies and International Development*, 5(1), pp.1–15.

Van de Fliert, E., Dung, N. T., Henriksen, O. and Dalsgaard, J. P. T.(2007). From collectives to collective decision-making and action: Farmer field schools in Vietnam. *The Journal of Agricultural Education and Extension*, 13(3): 245–256.

Van Mele, P., Wanvoeke, J., & Zossou, E. (2010). Enhancing rural learning, linkages and institutions: The rice videos in Africa. *Development in Practice, 20*, 414–421. http://dx.doi.org/10.1080/09614521003710021

Van Mele. (2011).Farmer to farmer video: final report: Video-mediated farmer-to-farmer learning for sustainable agriculture.

Witt, R., Pemsl, D. E. and Waibel, H. (2008). The farmer field school in Senegal: Does training intensity affect diffusion of innovation?. *Journal of International Agricultural and Extension Education*, 15(2): 47–60.

Zossou, E., Van Mele, P., Vodouhe, S. D., & Wanvoeke, J. (2009). Comparing farmer-to-farmer video with workshops to train rural women in improved rice parboiling in central Benin. *Journal of agricultural education and extension*,*15*(4), 329-339.