

Building an agricultural extension services system supported by ICTs in Tanzania: Progress made, Challenges remain

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ABSTRACT

The conventional agricultural extension service in Tanzania is mainly provided by extension officers visiting farmers to provide agricultural advisory service. This system of extension service provision faces a number of challenges including the few number of extension officers and limited resources. This article assesses the effectiveness of an impact-driven, radio-based extension service delivery system that has been introduced in some rural areas of Tanzania. The system aims to enable extension officers to reach many farmers with minimum efforts. However little is known about the effectiveness of this new extension service delivery system. Structured questionnaire, focus group discussion, interviews and participant observation were used to collect data from 55 small holder farmers who had been receiving an impact-driven, radio-based extension services through Farmer Voice Radio project. Additional data were collected from interviewing extension officers and from archives of participating community radio stations. The results indicate that in some rural areas, farmers have started sharing agricultural information and best practices. Some farmers have also started to change their farming practices. This brings a new finding that farmers can adopt and practice easily what is aired by their fellow farmers in the community radio stations.

Keywords: *radio based system, extension service, ICT, farmer radio voice, Farmer Voice Radio, radio farmer, community radio station*

BACKGROUND INFORMATION

Agricultural extension service facilitate the transfer of knowledge and good practices to farmers. The traditional agricultural extension is mainly done by an extension officer visiting a farmer or farmer field schools (Stringfellow et al., 1997). However in most developing countries, there are few extension officers to serve many farmers (Due, Magayane and Temu, 1997). For example, in Kenya the ratio of farmers to extension officer is 753:1. There is a need to determine ways in which the same few extension officers can serve a larger group of farmers with minimum effort (Lwoga, Stilwell and Ngulube, 2011). This is possible if information and communication technologies (ICTs) can be incorporated in the conventional agricultural extension services system (Kaaya, 1999; Gakuru, Winters, Stepman, 2009). The most common available and accessible ICTs in Africa are the mobile phone and the radio (Chapman et al, 2003; TCRA, 2011). Thus, the specific objective (SP) of the Farmer Voice Radio (FVR) project was to identify and implement ICT options that will assist in disseminating agricultural extension services through community radio stations to a critical mass of farmers in a selected districts of Tanzania.

Malawi and Kenya have been involved in similar radio-based extension service projects (FVRPRS, 2012). Sokoine University of Agriculture (SUA) and the American Institutes of Research (AIR) have signed an agreement that enable SUA to join an international alliance tasked to develop and adopt a strategy for building an impact-driven, radio-based extension support system for rural farmers. The system is called Farmer Voice Radio project (FVR). FVR employs a new model of agricultural extension that builds around radio extension teams supported by ICTs. FVR links extension officers and farmers with radio based system supported

by mobile phones and desktop computers. Mobile phones are used in the process of giving feedback to the presenter while desktop computer are used in preparation of the presentation and archiving the radio programmes. In the FVR project the presentation of radio programme is done by the the farmer themselves. Thus FVR gives the farmers oppotunities to participate fully in identification of the topics and agenda to be aired to the radio according to the farming season. Also farmers are involved in development of the programmes with the help of experts in media, extension service and ICT. Furthermore farmers participate in implementing the aired programmes in their farms. The farmers who implement what is taught in the radio are called radio farmers and also, those farmers who are champion in agricultural activities are called star farmers.

The key features of FVR are:

- FVR allaince: FVR creates collaborators and partners who work together to improve the agricultural extension service using a radio based extension system mediated by ICT. The basis for alliance creation is different from other donor funding since each partner in FVR must be able to contribute and benefits from the resources provided by the project.
- radio extension officers (REO): this is essentially the same extension officer employed by the Government to work in a particular districts or ward or village. The only additional characteristic is that he / she is involved in visiting radio farmers, collecting information, analysing those information, proving the feedback via radio as well as back stopping the questions asked by farmers via radio – in case farmers themselves and the presenter don't have some answers.
- university researchers: these undertake on site visists to support REO and FVR broadcast partners.
- research desk: each FVR broadcast partner establishes a desk to receive and analyze the feedback from farmers via cellphones or questionnaires.
- listerner clubs: to enhance the communication aspect of the radio programmes, farmers participating in FVR are organized in listening clubs for peer support, easy adoption of what is taught via radio and problem solving.
- gender focus: in order to mainstream gender into FVR programmes there is panel for each districit working for gender equality for each activities done in the project.

SUA FVR is a partnership program with non-government organizations (NGOs) known as the Tanzania Farmer Radio Initiative (TAFRI) and Habari Maalum. Such partnership between community private and public organization in providing extension service is recommended by World bank since it has proved to bring a positive change (Critchley, 1999; Dina, 1997). In our case the public organisation was SUA while the private organisation were TAFRI and Habari Maalum. SUA FVR program has a group of staff having different skills such as agriculatural extension, ICT, continuing education and television and radio broadcasting specialists. The SUA research team has the following responsibilities among many: (i) work closely with the SUA FVR team to coordinate planned activities. (ii) coordinate the FVR research desk (iii) liaise with TAFRI in carrying out planned joint activities (iv) liaise with collaborating District Radio stations in implementing FVR activities (v) plan and organize regular internal meetings and serve as secretary to the SUA FVR team (vii) in partnership with TAFRI, plan and organize joint regular meetings, workshops, training and other fora.

This paper presents the results of assessment of the implementation of ICT mediated extension services which were completed by personnel at research desks of community radio stations located at Ruangwa, Ulanga, Kilosa Bomahai and Uzima. Data was collected from the fields and entered in the software called FVR-Softwhich was installed on computers at the radios stations.

The FVR-Soft was installed at each radio station and configured to match the requirements of each radio station. Thereafter, the information technology (IT) personnel of each radio station was taught how to use and maintain the software. The software was also installed on the laptop of the TAFRI radio extension officer (REO). This was done so that in future we can have synchronization of the data collection and data analysis from different participating community radio stations and that of the coordinating REO at TAFRI. Thus the purpose of FVR-Soft was to help in reporting and data analysis of the collected data from the fields.

The task of installing and configuring FVR-Soft to each radio station and teaching the IT personnel were done between April and May 2012. Other tasks completed at each radio station included technical assistant to staff dealing with IT at each community radio station, obtaining the reports (SMS and Query), arranging the interviews from farmers and filling the form from the field by farmers. The short message service (SMS) report contains message send by farmers to the specific community radio station as follow up advice or feedback. The query report consists of questions asked by farmers to react to the aired programmes and answers provided by either the radio presenter, star farmer or researcher.

Conceptual framework for FVR

The model for FVR has already been tested and developed in some countries by AIR. In this project we adopt it. The model comprises a project steering committee, local agricultural radio agenda (LARA) committee, gender advisory panel (GAP), local radio agricultural agenda committee (LRAAC), national agricultural radio agenda (NARA), research desk, production team, farmers and groups listening club.

In our case, the model comprises developing partners (e.g., donors) and implementing partners (e.g., SUA, TAFRI and Habari Maalum; project steering committee coordinating the region). The implementing partners were of two types: (i) Those in the field and (b) those at the radio station. In the field there were radio extension officers, radio farmers, LRAAC, GAP, LARA and NARA. The radio farmers include individual farmers or group of farmers who are willing to listen and implement what is taught from the community radio station programs. At the station there is a production team which consists of a radio presenter, radio program producer, REO and research desk support personnel. The research desk personnel ensure that there is a smooth communication channel for obtaining the feedback and storing the developed radio contents. The feedback can be received via small message service (SMS) or voice. Feedback must be disseminated to the stakeholders for follow up. The stakeholders could include radio farmers, farmer listening group/club or the production team.

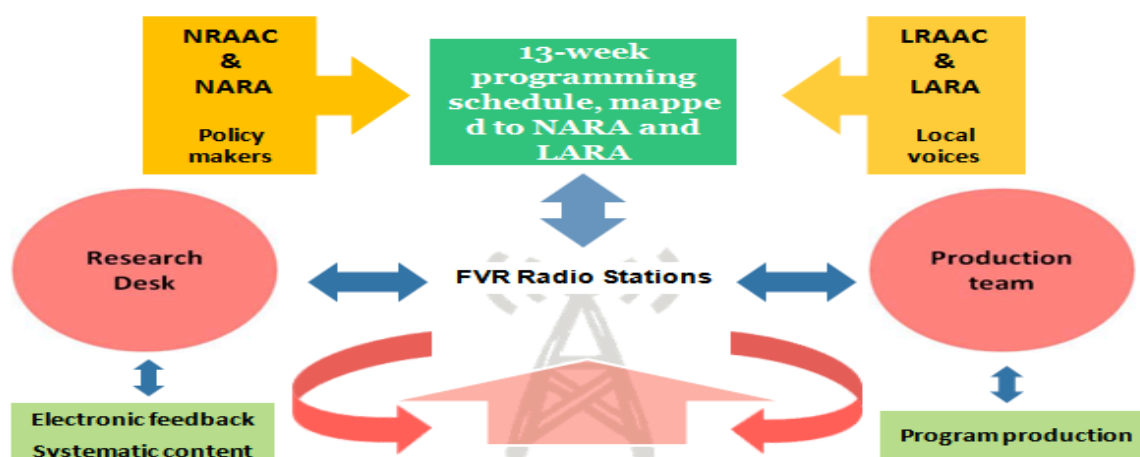


Figure 1: Farmer Voice Radio (FVR) Model (Adapted from www.farmvoiceradio.org)

The FVR conceptual model which includes the use of ICTs is far better than other models of agricultural extension services. It incorporates six extension models suggested by Eicher (2007). Eicher identified the six extension models that are being used in developing countries, namely: the national public extension model, the commodity extension and research model, the Training and Visit (T&V) extension model, the NGO extension model, the private extension model and the Farmer Field School (FFS) approach (model). These models are outlined below.

1. The national public extension model – part of this model is included in FVR when designing the National Agricultural Radio Agenda (NARA).
2. The commodity extension and research model – part of this model is included in FVR when researchers are part of LRAAC during identification, formation and development of local agenda.
3. The Training and Visit (T&V) extension model – part of this model is incorporated in FVR when the researchers from SUA and TAFRI visit radio stations to teach how to form LRAAC and a gender advisory plan. SUA researchers teach members of LRAAC how to develop agendas, how to create content for their agenda and how to schedule the programs and Ag-tips.
4. The NGO extension model – part of this model is incorporated in FVR when radio stations such as Uzima radio and Tumaini radio owned by church organizations become part of the project. Also, when NGO dealing with agricultural extension services (e.g. TAFRI) becomes partner of FVR project implementation team.
5. The private extension model – part of this model is included in FVR when staff from radio stations owned by church participates in FVR activities.
6. The Farmer Field School (FFS) approach (model) – part of this model is included in FVR when the REO visits some farmers to generate some concepts for LRAAC. Also, FFS is incorporated in FVR when REO visits farmers in their locality to teach good farming practices as well as to record programs to be aired on the radio. In addition, sometimes REO demonstrate good farming practices through radio presentation of the star farmer.

RELATED WORK

The applicability of ICT in extension services has been researched by many scholars (Ratnam et al., 2006; Colle, 2005; Sanga, Churi, and Tumbo, 2007; Eicher, 2007). Its importance in improving agriculture sector in developing countries is well documented by Richardson (2004). The biggest challenge to the development or adoption of ICTs for agriculture is that many ICTs solutions need to be specific to certain environments. "Specific environments dictate specific solutions" (Gelb and Bonati, 2007:1). Nevertheless, before ICT solution(s) could be designed and formulated as well as applied; the challenges need to be identified and properly analyzed for the sustainability of whatever effort for improvement is to be put in place. Currently, there are a number of studies which provide this information, but they do not describe the research methods and conceptual framework guiding what they proposed (Arokoyo, 2008; Frempong et. al., 2006). This research study was undertaken to answer the question – how the implementation of ICT mediated extension services can be done in some selected districts of Tanzania having community radio station?

RESEARCH METHODS

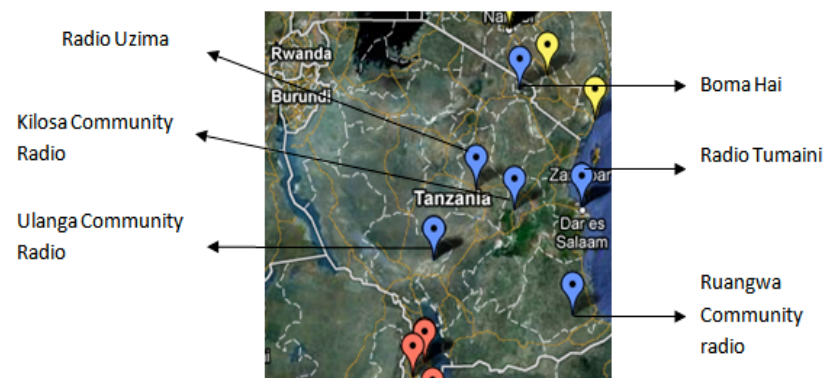
The research methods which was used in data collection and analysis consists of a mixed research methods. Different data collection and data analysis tools which were used are from those recommended by FVR central office in South Africa (see Appendix A and Appendix B).

i. Research design

The study used cross-sectional survey.

ii. Research areas

The community radio stations involving in FVR project participated in this study. The community radio stations were from Kilosa district, Ulanga district, Morogoro municipal, Ruangwa district, Dodoma municipal and Hai district. The justification for selecting these districts was that they have a well managed community radio stations with basic infrastructure. This helped to reduced the cost of starting up the FVR project in Tanzania. The radio programs produced by Farmer Voice Radio (FVR), Tanzania and distributed by Kilosa community radio, Ulanga community radio, Ruangwa community radio, Uzima radio and Bomahai radio were evaluated by their respective farmers.



Map1 : FVR Radio Stations in Tanzania (Source: FVRPRS, 2012)

iii. Duration

The research was conducted between April and May 2012.

iv. Data collection

Snowball sampling technique was used (Goodman, 1961). The researchers start collecting data by visiting the District Agricultural and Livestock Development Officer (DALDO) who directed the researcher to the coordinator of district agricultural extension officer (DAEO). DAEO was responsible to direct the researchers and research assistant and enumerator to the ward officer as well as to district executive who ended up directing to some farmers. The list of the respondents expanded by the farmer providing the names of their fellow farmer for interview and data collection.

Qualitative and quantitative data were collected from 55 farmers. In principle, each REO must interview at least 4 to 6 radio farmers per month to get their feedback while the radio farmer profile is updated after every 3 months.

Examples of the Qualitative data collection methods included observation, interviews (survey) and focus groups. Quantitative data collection included the use of different types of questionnaires.

The collected data were archived in different data formats (such as database format (.sql), spreadsheet format (.xls), word processing format (.doc) and portable data format (PDF)) for backup purposes.

v. Data analysis

The collected data using quantitative research method were analysed using the FVR-Soft to find the following: list of radio farmers, radio farmer profile, radio farmer profile statistics, radio farmer topics and radio farmer feedback statistics

The findings of the data analysis is as shown in the following section titled "results".

RESULTS AND DISCUSSION

The following shows the list of farmers whose profile have been added to the FVR-Soft. The profile shows the name of the farmer, gender, village and age.

To view a single farmer's details, double click on the row in the table below, [View All Statistics](#)

Search :

Id	Name	Gender	Village	Age	Date
32	55	Female	KWARE	50	5/19/2012 5:18:16 PM
33	56	Female	BOMAHAI	31	5/19/2012 3:15:16 PM
34	57	Female	BOMANG'OMBE	41	5/19/2012 5:16:32 PM
35	58	Male	BOMAHAI	40	5/19/2012 5:09:42 PM
36	59	Male	BOMANG'OMBE	50	5/19/2012 5:08:00 PM
37	60	Female	BOMAHAI	29	5/19/2012 5:06:06 PM
38	61	Female	BOMANG'OMBE	49	5/19/2012 5:04:04 PM
39	62	Female	BOMAHAI	67	5/19/2012 3:35:35 PM
40	63	Female	BOMAHAI	64	5/19/2012 3:39:50 PM
41	64	Male	DODOMA TOWN	34	5/20/2012 6:44:38 PM
42	65	Female	DODOMA TOWN	37	5/20/2012 6:42:12 PM
43	66	Male	DODOMA TOWN	40	5/20/2012 6:39:43 PM
44	67	Female	DODOMA TOWN	43	5/20/2012 6:47:33 PM

Figure 2: Farmer List

Figure 2 shows the window in FVR-Soft which helps the FVR research desk office to be able to search the particulars or profile of any farmer participating in the project. This is different to the former way of keeping farmer profile manually. It was difficult to search any information about farmer profile which was stored in different files.

The following figures show different graphs generated from the farmer profile statistics. They depict farmer profiles according to the following aspects: income earning, main farming reasons, ownership of mobile phone and radio.

Farmer Profile Statistics

Total Number of Farmers **44**

Total Number of Farmers Profiled **44**

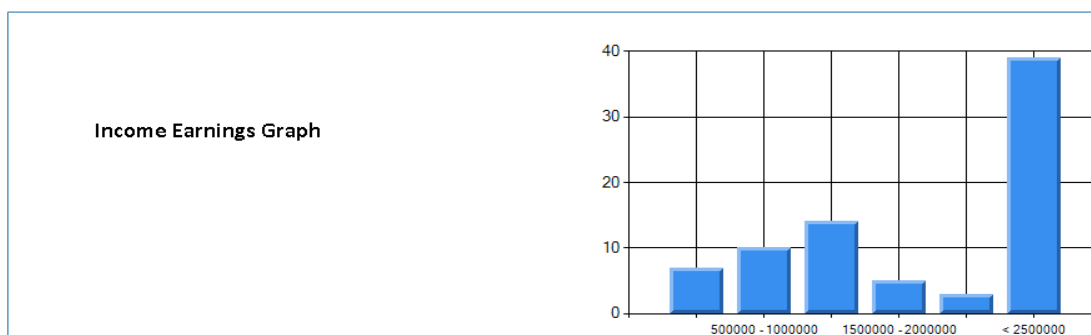


Figure 3: Farmer Profile Statistics

The Figure 3 shows that most of the farmer had earnings of 2,500,000Tanzania Shillings (Tshs). This is equivalent to 1652 US Dollar. The conversion factor was 1 US Dollar is equivalent to 1600 Tanzania shillings in May 2012.

Main Farming Reasons

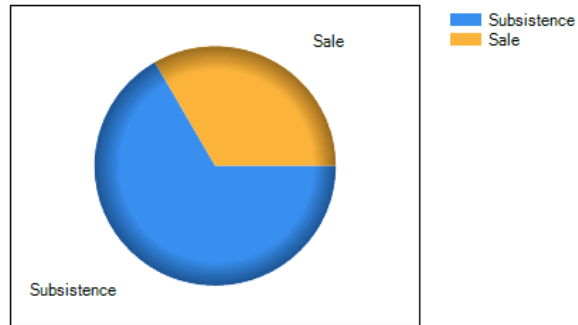
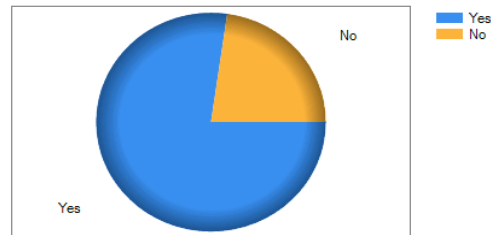


Figure 4: Farmer Profile Statistics

The Figure 4 depicts that most farmers indicated that the main reasons for farming is subsistence. This might be indicating that the farmers who were involved in this study were having other activities to earn some cash. Thus most of the respondents undertake agriculture for subsistence.

Own or have access to a mobile phone



Is head of the household

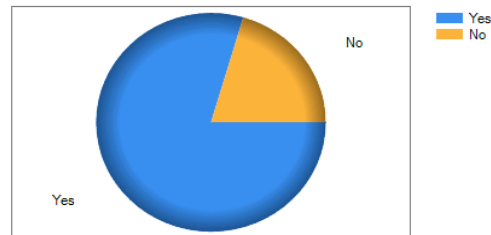


Figure 5: Farmer Profile Statistics

Figure 5 depicts that most of the farmers sampled did have either access or own a mobile phone. In addition, they were willing to use them to access agricultural services.

In addition, most of the surveyed respondents were the head of household. The household head can either be a woman or man depending on the status of marriage. For example for a family with a wife and husband according to many African culture the man is the head of family while for the widow and single mother the woman becomes the head of the family. This has implication on the ownership and use of the radio as well as to the decision making. From the focus group, the respondents said that in case the radio is needed by other family members the household head tend to deny the right to listen to agricultural radio programs. Thus in order to solve this problem authors advised the farmers to have listeners club where they can have equal rights on access and use of the radio.

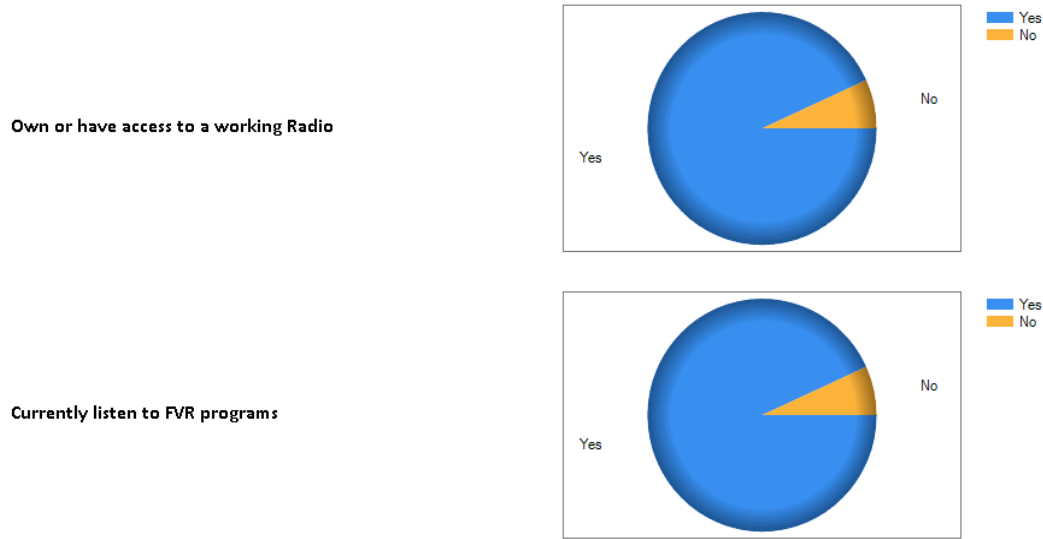


Figure 6: Farmer Profile Statistics

The percentage of farmers who are either owning or have access to a working radio is almost equal to those listening to Farmers’ Voice Radio programs. Due to limited space of the paper the findings from the impact assessment will be presented in future. In impact assessment, we interviewed 782 respondents who participated in FVR projects for more than one year and half. The essence of impact assessment was (i) to evaluate access and utilization of FVR programs, (ii) to establish access and receptiveness to FVR programs and (iii) to establish the change of behaviour in farming practices caused by the introduction of FVR programs

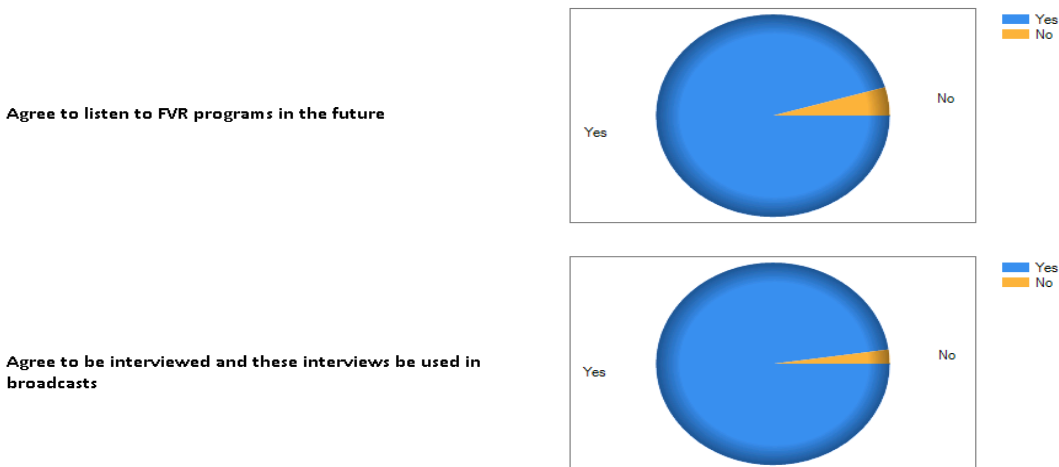


Figure 7: Farmer Profile Statistics

The Figure 7 shows the percentage of farmers who agree to listen to FVR program and those who agreed to be interviewed and permit their interviews to be used in FVR programs broadcasts. The research team obtained the consent of farmers who were interviewed and the consent of farmers whose interviews were used on-air.

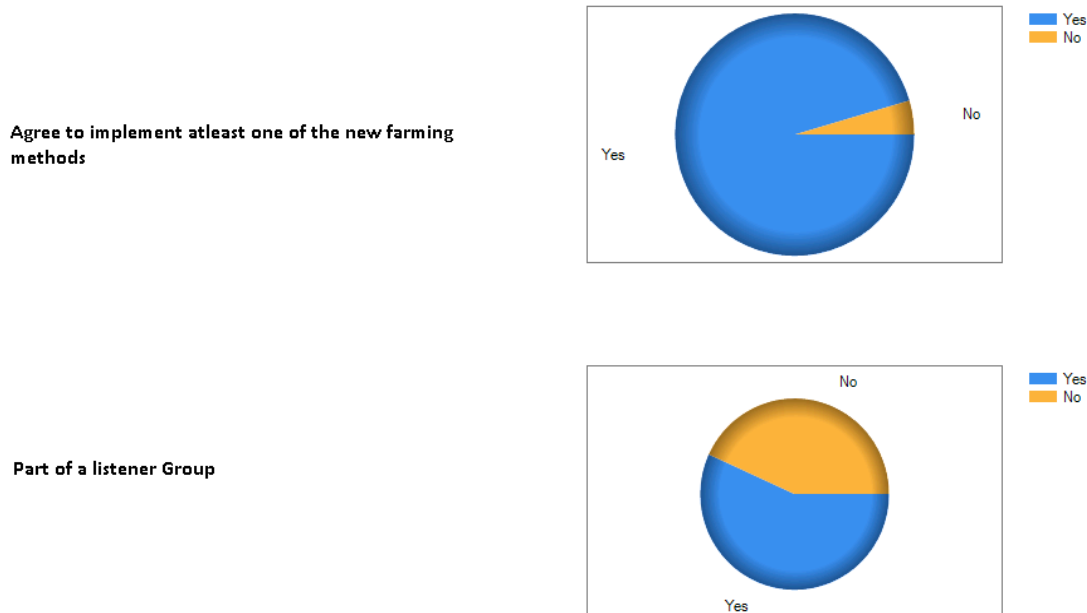


Figure 8: Farmer Profile Statistics

The Figure 8 shows that many farmers were willing to adopt at least one new farming methods taught via FVR broadcast.

Figure 9 shows that there are 55 records from radio farmer feedback form.

Radio Farmer feedback form (Stats)

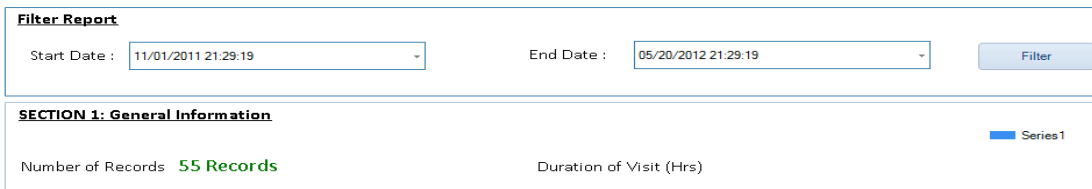


Figure 9: Radio Farmer feedback form (stats)

The radio farmer feedback statistics allows the user to search for the particulars of a farmer. This is shown below: The usefulness of this is that it is easy to look for particulars of the farmers involved in the project. Otherwise without this feature, it is difficult to search manually the profile of radio farmers.


Radio Farmer Feedback Surveys

Search :

Id	Date Added	Country	District
43	5/19/2012 12:00:00 AM	TANZANIA	kilosa
44	5/19/2012 12:00:00 AM	TANZANIA	kilosa
45	5/19/2012 12:00:00 AM	TANZANIA	ulanga
46	5/19/2012 12:00:00 AM	TANZANIA	kilosa
47	5/19/2012 12:00:00 AM	TANZANIA	ulanga
48	5/19/2012 12:00:00 AM	TANZANIA	kilosa
49	5/19/2012 12:00:00 AM	TANZANIA	ulanga
50	5/19/2012 12:00:00 AM	TANZANIA	kilosa
51	5/19/2012 12:00:00 AM	TANZANIA	kilosa
52	5/19/2012 12:00:00 AM	TANZANIA	kilosa
53	5/19/2012 12:00:00 AM	TANZANIA	kilosa
54	5/19/2012 12:00:00 AM	TANZANIA	kilosa
55	5/19/2012 12:00:00 AM	TANZANIA	hai

Figure 10: Radio Farmer Feedback Surveys

The following figure shows the farmer survey voice statistics from November 2011 to May 2012:

Start Date : End Date : 

How many farmers in the group....	YES(Male)	YES(Female)	NO(Male)	NO(Female)
1 ... listen to Radio Programs in order to get agricultural information	26.32%	20%	24.21%	29.47%
2 ... have listened any FVR Radio Programs	32.63%	26.32%	21.05%	20%
3 ... think the information given in the program was easy to understand	25.26%	29.47%	25.26%	20%
4 ... heard enough information in the program so that they would be able to implement the practice talked about	26.32%	33.68%	21.05%	18.95%
5 ... think that the information was repeated enough times?	26.32%	33.68%	21.05%	18.95%
6 ... believe that the information can be trusted	17.89%	10.53%	37.89%	33.68%
7 ... have tried to implement any new practices that they heard on FVR (please list any practices implemented below)	12.63%	7.37%	32.63%	47.37%
8 ... have even provided feedback about FVR or participated in programs to the radio station	37.89%	33.68%	15.79%	12.63%
9 ... would like to receive daily SMS ag-tips that describe about how to implement some of the technologies talked about on the radio	28.42%	36.84%	20%	14.74%
10 ... would you be willing to pay a small monthly subscription fee to receive these SMS's	30.53%	20%	25.26%	24.21%

Figure 11: Farmer Survey FVR Statistics

The Figure 11 depicts the information which was obtained as feedback from a group of farmers. The group interview was done to obtain the general feeling about the FVR programs. The enumerator helped the respondents in translating the questionnaire from English to Swahili (see Appendix B). This help to have uniform meaning of the questions.

The following shows the list of topics added to FVR-Soft.

Radio Farmer Topics

Enter New Set of Topics

Topic 1:

Topic 2:

Topic 3:

Topic 4:

Previous Topics

Id	Name	Status	Date Created
21	CHICKEN KEEPING - DODOMA	Not Active	5/19/2012 5:50:16 PM
22	MAIZE HARVESTING - ULANGA	Not Active	5/19/2012 5:50:16 PM
23	WEEDING PADDY - ULANGA	Not Active	5/19/2012 5:50:16 PM
24	PREPARATION FOR FARM-U...	Not Active	5/19/2012 5:50:16 PM
25	STORAGE OF MAIZE-ULANGA	Not Active	5/19/2012 5:50:16 PM
26	CHICKEN KEEPING - DODOMA	Active	5/20/2012 6:36:02 PM
27	MILLET FARMING - DODOMA	Active	5/20/2012 6:36:02 PM
28	PIG KEEPING - DODOMA	Active	5/20/2012 6:36:02 PM
29	SUNFLOWER FARMING - DO...	Active	5/20/2012 6:36:02 PM

Figure 12: Radio Farmer Topics

Figure 12 shows some of the topics which were developed by the LARA of different districts participating in the FVR project. The topics in each district were developed to be aired for 13 weeks. The topics have a range of information from farm operations, farm inputs and supplies, agricultural marketing and post-harvest. The Figure 12 helped to track the common topics (NARA) which can be aired by Radio Tumaini which covers the entire districts under the study.

CONCLUSION

The conventional agricultural extension system is done through the extension officer visiting farmers in their locality. This system of extension service is facing a number of problems; among them is the few number of extension officers (Rutarora and Matee, 2001; Isinika, 2005). This is the genesis of FVR project which aim to fill this gap by empowering the available extension officer so that they provide advisory services to many farmers using minimum efforts. The empowerment is done through the use of some information and communication technologies (ICTs) which are readily available to farmers (Kapange, 2004). The examples of these ICTs are community radio stations, mobile phones, digital recorder and desktop computers.

Using the methods employed by the American Institutes of Research (www.fvr.org), we attempted to ascertain if radio had an impact on agricultural extension service of rural farmers in Tanzania. Based on analyzing feedback provided by 55 randomly selected farmers listening to Ruangwa, Ulanga, Kilosa Bomahai and Uzima radios, we determined that, farm radio programs can help farmers to improve their farming practices. However, in order to achieve successes with farm radio programs, one must integrate different experts in a participatory way. If farmers are not involved in the development and presentation of radio programs, they tend to shy away from adopting the good innovations, practices and initiatives (Banjade, 2006). In the future, we expect to do a study on the impact assessment of the FVR project in Tanzania.

The findings obtained from the research desks of different radio stations in Tanzania show that the FVR project has succeeded in introducing new technologies for delivering agricultural extension services from different sources to farmers and livestock keepers in an integrated way. The introduced framework for ICT mediated extension services has been tested through pilot project and found to be efficient and effective in complementing the conventional extension services by reaching many farmers with the scarce resources available in the surveyed district.

Also, the project through research desk has been very useful in receiving queries as well as different questions from farmers and sending those questions to agricultural experts (this including the local REO, district REOs and researchers from SUA) for answers. The answers were brought back to farmers in appropriate time ready for its implementation in the farm. This was possible since all the partners agreed on the framework and worked on its implementation in a participatory manner.

Besides the above mentioned benefits, the project through research desk has succeeded to document and disseminated different agricultural policies to farmers (see Figure 1 up to Figure 12). The documentation has been done with the help of ICTs. The first step was to identify the topics / agenda in the LARA meeting and then to store in the desktop computer. The questionnaires for radio farmer profile and radio farmer feedback were analyzed by using FVR – Soft.

In addition, the tasks done at the research desks have helped to documents the information about radio farmer and the listeners' radio group. This information has helped the interested parties to track radio farmers, feedback information provided to radio farmers by the radio production team and agricultural experts about different programs aired by community radio stations. Due to participatory nature of the FVR project, the community feels that they are part and parcel of the radio programs and it is therefore easy for them to adopt and practice what is aired.

Furthermore, the FVR project through SUA research desk has helped to increase the capacity building of different IT personnel's of the community radio stations. This was done by teaching how to install, configure, and maintain FVR-Soft and FrontlineSMS (<http://www.frontlinesms.com>).

Moreover the FVR project through SUA FVR research team has indirectly contributed to the sustainability of the FVR research. This was done by material support and sharing our expertise to different stakeholders involved in this research project from different districts participating in this project.

Some of the ICTs were provided to radio stations. These included a desktop computer and sound recording equipment. As part of the activities of the SUA research desk, SUA personnel were required to help the IT personnel of some radio stations to train how to maintain the systems when they were not running.

Through radio advertisement, the FVR project indirectly contributed to the increase of income of the respectively districts Different stakeholders sponsored advertisements that dealt with farm inputs and the selling or purchasing of farm products.

The following are still the challenges that the community radio stations face:

1. Illiteracy of the farmers
2. Poor linkages between extension officers, researchers from higher learning institutes and farmers hinder the smooth operational of community radio stations.
3. Lack of radio and other tools related to ICT (e.g. mobile phones and desktop computer) by some farmers due to poverty
4. Training is needed to different groups. This requires a lot of money to train production team, presenters and listening clubs in different districts.
5. There is a need to officiate the use of ICT in extension services through changing the policies for extension service as well as for ICT. As it is now, it might be not legal for a coordinator of extension officers in district to sent official information through SMS.

RECOMMENDATIONS

From the above discussions, the objectives of FVR in Tanzania have just begun to be realized. Different Local Agricultural Radio Agenda (LARA) in the districts under FVR study has started to be generated, developed and packaged continuous and its implemented is going on. Similarly, the farmers have shown interest to the aired radio programs in districts which the FVR project is operational. The biggest challenge is that the project was in short time thus, in future study - we shall evaluate the impact of the project from those districts under the study and at the national level. This means the National Agricultural Radio Agenda (NARA) need to be incorporated in future studies. Thus, we recommend

1. The districts having the community radio station should educate smallholder farmers on the use of ICTs, especially the radio and mobile phones to communicate agricultural information for enhanced agricultural production.
2. The districts should mobilize NGOs, university researchers, private institutions as well as individuals to use the existing community radio stations in different Districts and support regular consultations between smallholder farmers and experts so that they can acquire radios, and use them in either dissemination or communication of agricultural information and research findings.
3. The Government of Tanzania should liaise with SUA and other research institutions, community radio station providers and develop local agricultural radio programs of the main agricultural activities to be fed to the community radio station and later aired / communicated to farmers in rural areas.

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REFERENCES

- Allahyari, M. S. and Chizari, M. (2010). Potentials of New Information and Communication Technologies (ICTS) in Agriculture Sector, Volume 4, No.4 (Serial No.29) Journal of Agricultural Science and Technology, ISSN 1939-1250, USA
- Annor-Frempong, F., Kwarteng, J., Agunga, R., & Zinnah, M. M. (2006). Challenges and prospects of infusing information communication technologies (ICTS) in extension for

- agricultural and rural development in Ghana. Proceedings of the Annual Conference of The International Association of Agricultural and Extension Education, 22, 36-46.
- Arokoyo, T. (2008). ICTs in the Transformation of Agricultural Extension: The Case of Nigeria. Available on http://www.cta.int/observatory2003/case_studies/Case_study_Nigeria.pdf
- Banjade, A. (2006). Voice to the Voiceless in Western Nepal: An Audience Survey of Community Radio Madanpokhara. *The Journal of Development Communication*, 17(1): 72-91.
- Chapman, R., Blench, R., Kranjac-Berisavljevic, G. & Zakariah, A. (2003). Rural radio in agricultural extension: the example of vernacular radio programmes on soil and water conservation in N. Ghana, Overseas Development Institute.
- Colle, R. (2005). Building ICT4D capacity in and by African universities. *International Journal of Education and Development using ICT* [Online], 1(1). Available: <http://ijedict.dec.uwi.edu/viewarticle.php?id=13>.
- Critchley, Will. (1999). Promoting farmer innovation. RELMA Workshop Report #2. Nairobi: Regional Management Unit (RELMA) in collaboration with UNDP.
- Due, J.M., Magayane. F. and Temu, A.A. (1997). Gender again—Views of female agricultural extension officers by smallholder farmers in Tanzania, *World Development*, 25(5):713-725.
- Eicher, C. K. (2007). *Agricultural extension in Africa and Asia*. East Lansing, MI: Michigan State University, Department of Agricultural Economics.
- FVRPRS - FVR Partner Radio Stations. (2012). URL: (<https://maps.google.com/maps/ms?ie=UTF8&t=h&oe=UTF8&msa=0&msid=202584035070701735696.0004bd530bd9075d55d5b>)
- Gakuru. M., Winters. K., Stepman, F. (2009). Innovative farmers' advisory services using ICT. Paper presented at W3C Workshop "Africa perspective on the role of mobile technologies in fostering social development", Maputo, Mozambique. pp. 1-2
- Gelb, E. & Bonati, G. (2007). Evaluating internet for extension in agriculture (1997). In *ICT in agriculture: perspectives of technological innovation*. N. Sadeh (ed.). Faculty of agriculture, Hebrew university of Jerusalem, Israel. URL: <http://departments.agri.huji.ac.il/economics/gelb-sum-12.pdf>
- Gelb, E. & Parker, C. (2007). Is ICT adoption for agriculture still an important issue? In *ICT in agriculture: perspectives of technological innovation*. N. Sadeh (ed.). Faculty of Agriculture, Hebrew university of Jerusalem, Israel. URL: <http://departments.agri.huji.ac.il/economics/gelb-gelb-parker.pdf>
- Goodman, L.A. (1961). "Snowball sampling". *Annals of Mathematical Statistics* 32 (1): 148–170. doi:10.1214/aoms/1177705148
- Isinika, A.C., Ngetti, M., Kimbi, G.G. and Rwambali, E.G. (2005). Contemporary challenges of agricultural advisory services delivery in Tanzania. In: *The 2nd National Agricultural Extension Symposium in Tanzania*. 24 -25 February 2005, Sokoine University of Agriculture, Morogoro, Tanzania. pp. 1 -13.
- Kaaya, J. (1999). Role of Information Technology in Agriculture, Proceedings of FoA Conference, Vol. 4, pp. 315-328
- Kapange, B. (2004). ICTs and national agricultural research systems –The case of Tanzania. Research and Development, Ministry of Agriculture and Food Security. <http://www.tzonline.org/pdf/ictsandnationalagriculturalresearchsystems.pdf>

- Lwoga, E. T, Stilwell, C. and Ngulube, P. (2011). "Access and use of agricultural information and knowledge in Tanzania." *Library Review* 60 (5): 3–3.
- Richardson, D. (2004) . How can agricultural extension best harness ICTs to improve rural livelihoods in developing countries?, URL: <http://departments.agri.huji.ac.il/economics/gelb-how-11.pdf>
- Rutarora, D. and Matee, A. (2001) Major agricultural extension providers in Tanzania. *African Study Monographs*, 22(4): 155-173, December 2001 155
- Sanga, C., Churi, A.J. and Tumbo, S. (2007). Status, Opportunities, Potential and Challenges of Technology-Mediated Open and Distance Education (Tech-MODE) for Agricultural Education and Improved Livelihoods A case study of Tanzania,. Commissioned by the Commonwealth of Learning (COL) for Technology-Mediated Open and Distance Education for Agricultural Education and Improved Livelihoods in Sub-Saharan Africa: country case studies, Vancouver, Canada. pp.113-133. URL: http://www.col.org/SiteCollectionDocuments/TechMODE_report_online.pdf
- Stringfellow, R., Coulter, J., Lucey, T., McKone, C. & Hussain, A. (1997). Improving the access of smallholders to agricultural services in sub-Saharan Africa: Farmer cooperation and the role of the donor community. *Natural Resource Perspectives* 20. Overseas Development Institute.
- TCRA. (2011). Reaching to Rural (R2R). Connecting the rural Tanzania through Telecentres Report on Joint Impact Assessment, Services Need Analysis and Designing Business Model Towards Developing A Sustainable Network of Telecentres in The United Republic of Tanzania August 16, 2011
- Umali-Deininger, Dina. (1997). Public and Private Agricultural Extension: Partners or Rivals?, *The World Bank Research Observer*, 12(2), 203-204
- Venkata Ratnam Bachu, Krishna Reddy Polepalli, and G.S. Reddy. (2006). eSagu: An IT based personalized agricultural extension system prototype - analysis of 51 farmers' case studies. *International Journal of Education and Development using ICT*, 2(1)

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APPENDIX A: FARMER VOICE RADIO PROFILE (to be completed when the farmer is recruited and every 3 months to update and do ratings)

TANZANIA

First Name: Please use block letters													
Last Name: Please use block letters													
Gender of Radio Farmer:	Male	Female											
Marital Status of Radio Farmer:			Age of Radio Farmer:										
Which radio stations do they listen to?													
How long have they been farming? (in years)													
What times do they listen to radio?	Morning			Afternoon			Evening						
Time of broadcasts listened to:													
How often do they receive extension services?	Never			Irregularly			Often (monthly)						
Location of Farm or farms (Rented and Owned):	Rent:			Own:									
Size of land under production:	Rent:			Own:									
Other income generating occupations if any:													
3 Main agricultural enterprises:	1												
	2												
	3												
Mobile Phone Number:	(+255)	0											
Alternative Mobile Phone Number:	(+255)	0											
How many members in your household?			Male			Female							
	Adults												
	Children												
Annual household income from ALL activities (±)													
Do you farm mainly for subsistence or for sale?													
Do you own or have access to this Mobile phone?	YES		NO										
Are you the head of the household?	YES		NO										
Do you own or have access to a WORKING radio?	YES		NO										
Are you part of a Listener Group?	YES		NO										
Do you currently listen to FVR Programming?	YES		NO										
Do you agree to listen to FVR Programs in future?	YES		NO										
												TOPICS OF INTEREST	

Do you agree to be interviewed and that these interviews may be used in broadcasts?	YES	NO	
Do you agree to implement at least one of the new farming practices every season if possible?	YES	NO	

REO FARMER RATING

	Very poor	Below Average	Average	Above Average	Excellent
1. applying modern technology and farming methods					
2. Information sharing with other farmers					
3. Extent of diversification of crops (plant & animal)					
4. Marketing information skills					
5. Following government and environmental policy					
6. Future planning and record keeping					
7. Level of food security in the household					

APPENDIX B: RADIO FARMER FEEDBACK FORM TANZANIA

This form must be filled out each month with each radio farmer (4 to 6 radio farmers
PER REO per month)

SECTION 1: General Information							
Name of Farmer:			Date of visit:				
Name of REO:			Was an interview done?		YES	NO	
Duration of visit:		Hour(s)	District:				
SECTION 2: Radio Programs							
Please select one of the options: the Radio Farmer ...			Not at all	Sometimes	Mostly	Always	
1	... has listened to all the FVR Radio Programs						
2	... has understood ALL of the content of the Programs						
3	... understood the technical language used in the programs						
4	... feels there was enough information provided in the program so that they could implement the practice talked about						
5	... believes that the information came from a reliable source						
6	... feels that the content was confusing and poorly explained						
7	... feels that the programs were engaging and kept them interested						
8	... participated in programs by sms or voice calls						
9	... was given the opportunity to provide feedback to the radio station						
10	... thinks that the information was repeated enough times						
11	If the answer to 10 is Not at all or sometimes, how many repeats would they like to hear?						
SECTION 3: List the topics that the Radio Farmer remembers hearing:							
Select codes from below :							
1	TOPIC	How much was RELEVANT to you				Implementation CODE	Program Type (PT)
		None	Some	Most	All		
2		None	Some	Most	All		
3		None	Some	Most	All		
4		None	Some	Most	All		

C O D E	1	I will try to implement this	5	I did not understand the information or how to implement it		
	2	I have already implemented this	6	The program did not provide enough information		
	3	The topic does not apply to the farming I do	7	I did not agree with the practice or information		
	4	I cannot implement this, lack of resources /finance/materials	8	I do not get to make decisions about practices in the household		
P T	A	Ag-tip	C	News casts	E	Anchor program
	B	Magazine Program	D	Mini-Drama	F	Other
SECTION 4: Have you noted any success stories or star practices on your visit (please indicated if it is from the radio farmer or other farmers).....						

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