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# "There is No Program Without Farmers": Interactive Radio for Forest Landscape Restoration in Mount Elgon Region, Uganda

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**ABSTRACT**

Increase in ownership and use of radios and mobile phones in Uganda may present opportunities for interactive and efficient agricultural extension services. Yet the impact of interactive radio on rural development has rarely been evaluated. In a participatory project, the International Union for the Conservation of Nature together with Farm Radio International and stakeholders from local government, radio, and community-based organizations promoted the increased use of forest landscape restoration activities though interactive rural radio programs, including innovative methods to reach populations not covered by radio. An evaluation found that 98% of people who listened to most or all of the broadcasts carried out one of the practices, whereas 84% of those who had listened to only one episode had used one of the practices. Inclusion of a wide range of community stakeholders from project inception was vital for presenting the project and embedding it within local institutional contexts.

More than 75% of households in developing countries have access to a radio (UNESCO 2012). Over the last decade, radio has been revitalized in many low-income countries as a result of new information and communication technologies (ICTs) that can significantly transform how radio programs are researched, prepared, delivered, received, monitored, and evaluated. Nongovernmental organizations (NGOs), private and community radio stations, and private companies, as well as some state broadcasters, have all played a role in these changes. The widespread use of mobile phones in Sub-Saharan Africa has led to even the smallest community radio stations hosting call-in shows, allowing listeners to directly contribute to programs (Sullivan 2011; Gilberds and Myers 2012). The "blending" of radio with new ICTs is common across the globe; however, new ICTs are used differently by different radio stations, according to capacities and listener preferences. This article describes how a participatory radio project in Uganda, building upon existing knowledge on forest landscape restoration (FLR) practices, encouraged active participation from listeners, enabling listeners to influence radio program content, and facilitated discussion among listeners about FLR. As a result, a significant number of households started to practice FLR approaches. The article commences with a review of the literature on interactive radio and

participative development approaches, with a focus on theories of learning. We then provide some background to the case study, in terms of the environmental context and rural livelihoods in the Mount Elgon region, the FLR approach, the multistakeholder project design process, and the specific practices being promoted on the radio. Turning to the project methods, we describe the mechanisms used to gather quantitative and qualitative data on project outcomes and present the findings regarding radio listenership and FLR knowledge and practices. The discussion section identifies the reasons for the project's success, through reference to the literature on learning, and examines the remaining limitations of this approach. The conclusion reiterates the primary learning points from the article and suggests areas for further development and research.

## ICTs, Active Learning, and Participatory Development

Few projects using radio for rural agricultural development have conducted systematic outcome evaluations, due to "unavailability of effective evaluation instruments," or because they include evaluation activities as an "afterthought" (Manyozo 2008). Recently, NGOs have started to conduct outcome evaluations indicating that radio can have positive impacts on decision making and uptake of promoted practices. However, relatively few such studies have been published.[1] Moreover, little attention has been paid to learning lessons through information exchange or through process evaluation and documentation (Chavez-Tafur et al. 2007). This is partly because many externally funded "communication for development" projects are small-scale and piecemeal (Graves 2007).

There has been a tendency, particularly in the ICT policy literature, to focus on "access to technologies." However, the concept of "access" has been critiqued by those placing greater emphasis on how individuals "engage" with ICTs. Assuming that providing "access" to ICTs to particular individuals or communities will have particular effects is a form of functionalism (Gilberds and Myers 2012) or "technological determinism" (Tacchi 2006). As noted by Granqvist (2005), technologies should be seen as socially embedded, and the social context in which they are used is important to our understanding their impacts. Effective engagement with ICTs, including participatory radio activities, depends on a degree of media literacy (Tacchi 2006). The issue is not only "access," but difficulties in integrating ICTs into broader development strategies. Key obstacles to the use of ICTs for development in rural Africa include lack of Internet connectivity (cellphone coverage is increasing rapidly); lack of reliable electricity; affordability; capabilities of potential users (i.e., skills and knowledge to effectively use them); and the policy environment (Emmanuel and Lwoga 2007), including journalistic freedom and availability of broadcast licenses. These obstacles have gender dimensions. For example, compared to men, women may have restricted mobility due to a high domestic workload and some sociocultural factors (which limit their access to telecenters, cellphone charging kiosks, etc.), fewer financial resources, and less time to access radio or ICTs (Emmanuel and Lwoga 2007). Illiteracy may be more common among women than men and may prevent ICT use.

Radio is often understood to be a channel for information dissemination, rather than as a platform for discussion, dialogue, and decision making. Some organizations see radio as a "quick fix" for the sharing of particular messages, rather than investing in community radio stations to develop sustained, effective programming (Center for International Media Assistance [CIMA] 2007). It is therefore questionable whether some approaches are

genuinely "participatory" (Cooke and Kothari 2001; Hickey and Mohan 2004). Researchers have developed hierarchies of "levels" of participation in agricultural research (see, e.g., Ashby 1996 and Lambrou 2001, both cited in Dyball, Brown, and Keen 2009; Neef and Neubert 2011), but others argue that a more nuanced understanding of participation, which recognizes the strengths and weaknesses of different combinations of "participation" by different actors, allows for projects to be designed according to the context and objectives (Neef and Neubert 2011). Participatory methods within rural development programming generally (e.g., outside of the radio-based sphere) are strongly associated with positive learning experiences, though debates persist about what constitutes participation, or project "success." Many participatory development approaches stem from the arguments of Chambers (1983; Chambers, Pacey, and Thrupp 1989), developed further by others (e.g., Scoones and Thompson 1994; Sumberg and Thompson 2012) and now integrated into much everyday development practice (Cornwall 2006). Reflecting on various contested interpretations of participation, Carpentier (2011) argues that "participative" activities should involve attention to reducing power imbalances. Further, while "minimalist" participation focuses largely on co-production of project content, maximalist versions involve participants in decision-making processes about project design and management, as well as content (Carpentier 2011) Involving stakeholders in production of learning materials enhances the potentials for those stakeholders to learn and alter their behaviors (Tacchi 2011, 660).

Forms of "participation" in radio-based projects vary. Many donor-funded "community radio projects" involve diffusion of prepackaged programs with limited input from radio stations or audiences; where content is generated by radio stations, this process is often tightly managed by donors (Gilberds and Myers 2012). There are therefore concerns that such projects are guided by donor, corporate, and NGO agendas rather than by farmer preferences (Moyo 2013; Willems 2013; Conrad 2014). The ability for local community radio stations to lead program production can be limited by lack of editing equipment and other resource or capacity constraints (Myers 2009). Funding is often inadequate to permit radio station staff to travel to rural areas to record material, for example (Manyozo 2009). Obstacles to "participation" are not only technical or economic; there may be tensions between local customs and beliefs, and the values and approaches communicated. Dralega (2009) provides examples from community radio in Nakaseke, Uganda, where programs on safe motherhood, family planning, and HIV prevention conflicted with roles and beliefs of traditional birth attendants. The question of "participation" must therefore be understood in specific sociopolitical and cultural terms.

The experience of Farm Radio International (FRI) and other organizations (Masuki et al. 2010) suggests that many farmers in Africa have a preference for listening to other farmers talking on the radio, rather than to professional "experts" or radio presenters (Perkins, Ward, and Leclair 2011). This highlights the importance of including farmers as guests, or using "call-ins" or recorded messages. Moreover, radio programs created by members of rural communities tend to attract large audiences from those communities (Manyozo 2008). A sustained approach, which allows listeners to tune in over a long period, can impact knowledge, attitudes and practices more effectively than a shorter, more intense "campaign" (Manyozo 2008; Perkins et al. 2011). As noted in the preceding, the use of "new" ICTs by radio stations and radio listeners has made radio much more interactive. Two-way communication occurs not only through call-in shows but also by the use of

mobile phones through short message service (SMS) or "beep" services.[2] These can be used to request further information, to be connected to a specific service. For example, radio hosts can request listeners to "beep" if they would like more programs on a particular topic, thus helping the station to select popular themes. Such interactive radio experiences are thought to promote further interpersonal dialogue (i.e., discussion of the programs with others), which makes behavior change more likely (Myers 2009). Adoption or application of particular practices is therefore not a matter only of diffusion of information from the radio station to the individual listener, but an outcome of interactions between many actors, often called "social learning" (Wals 2009; Pauker and Musiime 2013). Indeed, the importance of discussion to the learning process has led some to claim that any kind of learning is "social" in nature (Loeber et al. 2009). An emphasis on the "learning cycle," which involves experimentation, observation, analysis of results, and changes to method as a result of the learning achieved (Loeber et al. 2009), reminds us that learning is a continuous, "active, dynamic process rather than a passive end-product of a particular set of learning experiences" (Bransford, Brown, and Cocking 2000, 53). On-farm experimentation and adaptation are a reality of farming life in Africa, and local agricultural knowledge is shared primarily with "family, farmers' groups, group members, and neighbors who have similar customs, values, and beliefs" (Munyua and Stilwell 2013, 331). Farmers are therefore used to informally discussing farming issues with others, and facilitating discussion of "new" practices makes sense within this context.

## Study Context

### *Farming, ICTs, and Environmental Conservation in Mount Elgon Region*

In Uganda, ICT interventions including village information centers (Masuki et al. 2010) and telecentres (Dralega 2009) have provided information on agricultural and natural resource management. Other sources of information include radio, NGOs, and fellow farmers (Pauker and Musiime 2013).[3] The government extension service reaches few farmers, given the high ratio of farmers to extension workers (Pauker and Musiime 2013). This has reportedly worsened since the National Agricultural Advisory Services (NAADS) system was recently scaled down.[4] Scholars have also drawn attention to political interference in the NAADS system (Joughina and Kjær 2010; Danielsen, Matsiko, and Kjær 2014), though space restrictions prevent further exploration of this here.

The Mount Elgon ecosystem is a major water catchment straddling the Kenya–Uganda border, and is an important conservation area with many endemic plants and animals (Barrow, Fisher, and Gordon 2012, citing Howard 1991; Davenport, Howard, and Dickenson 1996). The ecosystem and three river microcatchments (Ngenge, Sippi, and Kaptokwoi) have been identified as high-risk areas by a vulnerability impact assessment conducted by the International Union for Conservation of Nature (IUCN), which involved local communities and policymakers in analyzing vulnerability and capacities to adapt to climate change.

The population of Mount Elgon is almost entirely rural and dependent on subsistence agriculture (IUCN, United Nations Environment Progamme [UNEP], and United Nations Development Programme [UNDP] n.d.). Population density is high and competition for land in the region is relatively intense, due partly to the eviction and exclusion of the

indigenous Benet communities and Bagisu communities from Mt. Elgon National Park and a nearby forest reserve (Nakangu and Barrow 2008). Most of the land in the region is held under customary land tenure systems (Soini 2007). Women do not own land under customary systems, though they have access to family land. Agriculture expansion, poor land management, deforestation, and uncontrolled grazing have been identified as causes of soil degradation in the area (Barrow, Fisher, and Gordon 2012). Partly as a consequence, local farmers face frequent crop failures, risks of landslides, increased food shortages, and reduced soil fertility. Communities living near Mount Elgon National Park depend on forested landscapes for medicinal plants, firewood, livestock grazing, and craft materials (IUCN, UNEP, and UNDP n.d.). There have been disputes over unclear park boundaries and community "encroachment" on the protected area (Sassen et al. 2013; Nakakaawa et al. 2015).

## The Forest Landscape Restoration Approach

Forest landscape restoration (FLR) is one response to these challenges. An early definition of FLR was "a planned process that aims to regain ecological integrity and enhance human well-being in deforested or degraded landscapes" (World Wildlife Fund [WWF] and IUCN 2000, cited in Dudley, Mansourian, and Vallauri 2005). Tree planting is an important part of this, as is conservation agriculture and soil conservation. There is no dominant definition of the dimensions of a landscape, but in general, landscapes involve different land uses that share "a specific set of ecological, cultural and socioeconomic characteristics" (Maginnis et al. 2004, cited in Barrow et al. 2012).

At the landscape level, FLR projects must be cognizant of different "influences, pressures, stakeholders, and habitats" (Dudley, Mansourian, and Vallauri 2005, 6); sometimes FLR has been criticized for not taking account of underlying drivers of deforestation (Dudley, Mansourian, and Vallauri 2005). FLR must account for different land uses, and should benefit local livelihoods as well as the ecosystem functions of the landscape. Within an East African context of historical eviction and exclusion of local communities from protected areas, dating from the colonial period to the present day, some areas may be classed as "political forests" (Peluso and Vandergeest 2001), and forestry issues are inherently controversial. Dispute resolution and negotiation are important aspects of FLR (Fisher et al. 2008), and local people should be included as much as possible within decision-making systems. Proponents argue that FLR is most viable "when initiators are motivated by both environmental and social issues" (Menz, Dixon, and Hobbs 2013).

To restore ecosystems at landscape level while benefiting local livelihoods, projects can facilitate changes in agriculture and livestock practices, or institutional changes, such as in decision-making processes or land policies (Barrow, Fisher, and Gordon 2012). Studies on tree planting behavior by landholders have shown that the availability of information and access to information are key factors that determine the success of restoration activities. FLR "does not necessarily aim to return forest landscapes to their original state, but rather is a forward looking approach to strengthen the resilience of forested landscapes and keep future options open for optimizing the delivery of forest-related goods and services at the landscape level" (Maginnis et al. 2007, cited in Barrow, Fisher, and Gordon 2012).

### Multi-Stakeholder Collaboration on an Interactive Radio Series

IUCN's Forest Conservation Program has been working in the Mount Elgon region of Uganda since 1988 (Soini 2007), facilitating participatory processes to identify forest restoration activities. Key activities include construction of contours on erosion-prone slopes, and planting of fodder trees such as grevillea or makhamia lutea on the contours (Nakangu, Awadh, and Kelleher 2012). In 2012 IUCN launched the Knowledge for Forests project (KNOW-FOR), which assists practitioners and policymakers in 15 countries in Africa, Asia, and Latin America to mobilize support and pledges for the Bonn Challenge target to restore 150 million hectares of deforested and degraded lands by 2020.

In 2014, IUCN began working with FRI to promote the use of radio to contribute to the KNOW-FOR project by promoting forest landscape restoration practices. FRI planned an interactive and participatory radio project, including an evaluation. The radio programs were co-designed and broadcast by Kapchorwa Trinity Radio (KTR), a community radio station located in the region. Kapchorwa Trinity Radio broadcasts in the main local language (Kupsapiny) and in English (Kawachi 2010).

The project targeted more than 4,000 households in 89 communities (villages) within three microcatchment areas (Sipi and Kaptokwoi in Kapchorwa District and Ngenge in Kween District). The radio programs were broadcast once per week between January and June 2015. Using the open-source geographic information system (GIS) mapping program QGIS, FRI estimated that 980,000 people lie within the reach of KTR. Therefore, although the project particularly targeted 4,000 households, the population reached was much larger.

It was envisaged that the radio programs would enable local people to receive information about forest restoration, hear different opinions, ask questions, share concerns, and reach a greater understanding of the topic. Specific practices discussed included digging trenches, planting Napier grass (to reduce erosion and to feed livestock), maintaining buffer zones adjacent to rivers, mulching, using energy-efficient stoves, planting fruit trees, and kitchen gardening. Information on the likely impacts of climate change was also provided.

Project participants, alongside FRI and IUCN, included the Mount Elgon stakeholder forum; the district administration (e.g., district natural resources department, disaster risk reduction committee, extension services), which provided technical support and integration into district plans; community-based organizations such as the Kapchorwa Commercial Farmers Association, which encouraged active farmer involvement and participation; the Ministry of Agriculture; and the Ministry of Water and Environment.

The project was designed and implemented by Farm Radio International in collaboration with IUCN to make connections with ongoing interventions supported by IUCN, and to use the program to address some of the challenges and knowledge gaps. Inclusion of relevant stakeholders at all stages was key to project design. As such, FRI worked closely with local partners, including radio station personnel, to present the project to stakeholders through an Inception Meeting; conduct formative audience research within target communities to find out about listeners' current knowledge, attitudes, and practices, and their trusted radio stations and preferred time of day for listening; provide direct training to producers and presenters at Kapchorwa Trinity Radio; facilitate a detailed

and comprehensive design for the radio program together with all stakeholders; and identify local subject-matter specialists to provide accurate and relevant technical information to listeners. Whilst the program was on air, the station and project partners gathered and shared feedback from listeners and other stakeholders (by visiting communities, and through weekly polling or call-ins during the radio show) so that producers could adapt and improve their programs each week. FRI facilitated the use of innovative ICT tools such as beep-to-vote, SMS polling, and interactive voice-based services to encourage a two-way learning process and make programs responsive to listeners. Four additional radio programs (of a total of 23 in the series) were commissioned to respond to listener feedback and requests for further information, which came in through beep-to-vote and phone calls.[5] An early monitoring visit found that some target communities were not being reached by KTR. In response, the District Assistant Forestry Officer collected a recording of the radio program each week and took it to the community on his "boda boda" (motorbike)—a system FRI calls "Radio Boda Boda." FRI provided this group with a solar-powered radio set that can record and replay programs using an SD memory card. The forestry officer listened to the show with the group, facilitated a discussion, recorded their comments and questions, and took recordings back to station personnel, who responded to these issues during the following show.

## Methods

Quantitative and qualitative data on outcomes were gathered through a summative evaluation, an outcome evaluation survey with individual interviews among a representative sample of listeners and nonlisteners, and a documentation exercise to evaluate the process. These are summarized next, in turn.

### Quantitative Data Collection

The outcome evaluation survey assessed the effectiveness and reach of the project in terms of increased awareness of the IUCN project, improved knowledge of FLR, and the uptake or improvement of FLR practices among listeners. The contribution and effectiveness of ICTs was also assessed. As FRI did not conduct a baseline survey, evaluation focused on the counterfactual and the difference between those who listened and those who did not.[6]

A semistructured questionnaire was administered by a trained team of enumerators in four communities in Kapchorwa and two communities in Kween District. The field team used smartphone-based survey tools, called Mobenzi. A sample size of 413 farmers from the communities surrounding the radio station was achieved, split among three sample groups.[7] Communities were categorized as follows:

1. "Active" listening communities (ALC), which had been involved in IUCN or FRI project activities.
2. "Passive" listening communities (PLC), which had no direct involvement with IUCN or FRI project activities but had access to the radio signal.
3. "Control" communities (CC), which were outside the reach of the radio stations' broadcasts, or otherwise unable to hear or understand the broadcasts.

The passive communities represent the large majority of listeners. All communities were broadly comparable in terms of agro-ecological conditions and the type and quality of extension services available. The sampling of communities was done in a purposive manner to ensure that the ALC, PLC, and CC split was represented. Within communities a systematic random sampling procedure was used with the aid of district-level household lists.

Data gathered from the face-to-face questionnaire were uploaded from mobile phones to the Mobenzi Researcher data management system. The final data set was downloaded, cleaned, and prepared for analysis via SPSS. An external consultant at the Carleton University Survey Centre (Ottawa, Canada) did descriptive analysis. All private information (e.g., phone numbers, names) were removed before any analysis and kept strictly confidential.

## Qualitative Data Collection

Qualitative data were gathered, using focus-group discussion (FGDs) in two passive and two active communities, on the changes in knowledge, awareness, and practice related to FLR and the effectiveness of radio programs in raising awareness of FLR. In total, 93 randomly selected people (53e women and 39 men) were involved in gender-differentiated FGDs.

The process documentation exercise (using a simplified method adapted from Chavez-Tafur et al. 2007) was conducted at the community level and at the institutional level. The community-level evaluation involved a meeting of farmers, district technical leaders, extension workers, researchers, and radio-station staff. Participants discussed project activities with a critical eye, and provided feedback about the process, while FRI and Kapchorwa Trinity Radio thanked the community members for their input and briefed them on project results. For the institutional process documentation, FRI organized a 1-day meeting involving IUCN staff from Washington, DC, and Mbale, Uganda, FRI national and regional staff, Kapchorwa Trinity Radio staff, and relevant district authorities to analyze the project process, and identify challenges and success factors.

## Outcomes

The project outcome survey found that of the respondents who lived in areas where the radio broadcasts could be received, 77% had listened to the program. Among those who were aware of the program, 95% listened to at least one show, and men and women who were aware of the program were equally likely to listen.

Knowledge rates were very similar in all three types of community, with 96, 91, and 97% of respondents (control, passive, and active listeners, respectively) scoring more than 60% in the knowledge quiz. These scores are much higher than is typical in similar FRI projects and indicate a prior understanding of FLR. Knowledge rates were slightly higher among women. Knowledge rates did not vary much according to number of episodes listened to when knowledge scores were above 60%, nor in fact did knowledge rates differ greatly between listeners and nonlisteners. This is different from similar projects where FRI finds on average that the more episodes listened to, the higher is the knowledge score and that more listeners score over 60% than nonlisteners. This high level of knowledge among listeners and nonlisteners alike is probably due to the FLR activities conducted by IUCN since 2007.

With knowledge and understanding of FLR established, the results show that the radio programs encouraged listeners to use FLR practices. Of those who listened to most or all of the broadcasts, 98% had carried out one of the practices in the previous 5 months, whereas 84% of those who had listened to only one episode had used one of the practices (see Figure 1). When asked "Have you tried any FLR practices since listening to the radio program?" 64% of women said yes, compared to 51% of men. Almost all (99%) of those respondents who had carried out an FLR practice planned to continue or expand this practice in the next season. Of those who planned to decrease FLR practices, 38% said that they did not have adequate labor, while 11% said that they did not have the necessary information, and 7% said that they could not acquire the necessary inputs.[8] Practices include constructing contour trenches or bunds, planting fruit trees and Napier grass, and intercropping. It is also likely that these results occurred because programs were directly responsive to farmers' expressed needs and concerns, not only for information but for access to seedlings, for example.

Only 67% of respondents owned a radio, although an additional 14% could access one through a family member, friend, or other person. Although 72% of men owned a radio, only 61% of women owned one. Gender disparity in mobile phone ownership was greater than for radio ownership: Only 31% of women own a phone, compared to 65% of men. However, women are more likely to have access to a phone through a relative or friend (27% of female respondents, compared to just 8% of male respondents).

Overall, radio was rated by respondents as the most important influence on their decision to carry out an FLR practice, with women rating this particularly highly. Eighty-two percent of women, and 73% of men, stated that radio was a "very important" influence. Some 62% of respondents stated that the IUCN project was a "very important" influence. All male respondents rated "friends and neighbors" as very important influences, whereas only 70% of women felt this way. Nonlisteners were slightly more likely than listeners to rate the agricultural extension worker as a very important influence.

Respondents who listened to the program were more likely to intend to practice an FLR technique the following season than those who didn't listen.
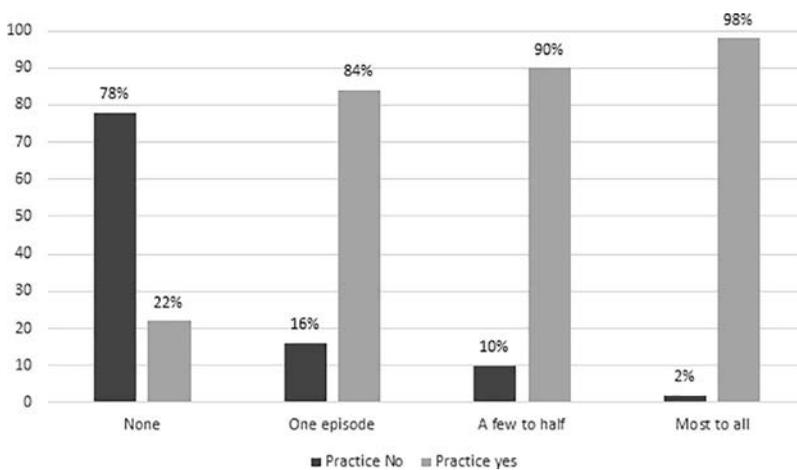


**Figure 1.** Percentage of respondents that reported practicing FLR in the past 5 months vs. number of episodes listened to.

### Process

The process evaluation revealed that, as a whole, partners found the project to be effective, although there were some suggested improvements. Some key themes emerged:

### Inclusiveness

All participants emphasized the value of the inception meeting. By engaging stakeholders and answering questions openly, this activity helped to gain local acceptance for project activities at different levels. Similarly, participation by many stakeholders (IUCN staff, farmers, station staff, and local government) in the radio program design and broadcast (i.e., during formative research, or selecting topics via phone) helped foster a sense of investment in the project. The programs used songs and poems by local schoolchildren, and drama performances from local communities. Strong involvement of the target audience was identified as a key project strength. Mechanisms that enabled listeners to participate in programs at no cost (e.g., beep-to-vote and Radio Boda Boda), collection of farmer testimony for broadcast, and participation of farmers as guests live on air were all recognized as contributing to the success of the program.

As identified in the introduction, some tensions between project goals and local cultural norms were evident. In Kapchorwa, certain trees are customarily thought to have the power to kill members of the family, or to cause conflict. These beliefs were addressed directly by broadcasters and program participants. Listeners' views were sought on these issues through the beep-to-vote mechanism. Farmers involved in the qualitative outcome evaluation stated that they agreed with the views expressed by the participants in the radio programs.

### Gender Dimensions

Kapchorwa Trinity Radio made efforts to ensure that women were heard on air, by frequently inviting women to call in, and establishing a specific phone line to receive calls from women. However, some obstacles to women's participation were noted, due to either cultural factors or security concerns. For example, some married women were prevented by their husbands from traveling to the radio station to speak on the evening broadcast.

### Interactivity of Radio Programs

All parties acknowledged the contribution of the ICTs to promote interaction and learning. Voting in the programs and receiving a text by return motivated farmers to pay closer attention to the show. In total, 1385 unique callers interacted with the radio program between January 2015 and June 2015. There were 4247 total "beeps" in response to polls set by the radio presenters, and 4743 cellphone text messages sent out to farmers using Telerivet.[9] Given that the project aimed to reach 4000 households in the target 89 IUCN communities, this number of interactions is reasonably high. The text messages included reminders to tune in, and agricultural tips. KTR noted that it now receives calls from further afield than previously. KTR now plans the programs carefully with run sheets,[10] and ensures the participation of farmers in every show ("it is important their voices are heard … we don't do [programs] without the farmers").[11]

### Monitoring Activities

Monitoring visits are much appreciated by the communities involved. Two monitoring visits, carried out jointly by IUCN and FRI, helped to identify gaps and take timely corrective

measures such as asking the broadcasters to send some SMS messages in English, rather than the local language, which many people find hard to read.

## Discussion

The practice rates and qualitative information show the effectiveness of a participatory and responsive approach to developing interactive radio activities. With knowledge about FLR already widespread due to IUCN's long-standing presence, radio was used to fill "gaps" in farmer knowledge of the FLR practices through discussions based on audience demand, and therefore to encourage decision making, rather than promoting new practices. The project achieved this by conducting audience research to understand existing knowledge, designing programs accordingly, commissioning additional programs to respond to farmer feedback and demands, developing new interactive tools to foster interpersonal dialogue (identified in the preceding as a key element in behavioral change), and providing specific information needed to overcome obstacles to uptake of FLR (such as customary beliefs around the negative effects of trees).

Inclusion of a wide range of community stakeholders from project inception was vital for embedding the project within local institutional contexts and gaining necessary support. Village inhabitants, leaders, and other local stakeholders were involved in decisions over which radio station would develop and deliver the programs, for example. Radio is only one of several sources of information and opinions available to farmers in Kapchorwa, and coordination between different channels (such as agricultural extension systems, and activities run by IUCN) made the program more effective in influencing practice. The topics for each radio program were selected by multiple stakeholders (including farmers) during audience research early in the project, and the radio station took the lead in developing content once the program was on air, ensuring fit to local seasonality and context, and participation of farmers and local content specialists in every show. Program content was adapted each week in response to feedback, establishing a functioning feedback loop that influenced project activities. For example, extra programs were added specifically to respond to farmers' questions, consolidating the two-way learning process. Farmers noted that they enjoy listening to other farmers talk on the radio, especially when it was a voice they recognized. Due to demand among listeners for fruit-tree seeds, FRI set up a beep-for-seedlings service, where farmers placed a missed call and received contacts for tree and fruit seedling suppliers.

District natural resources officers, forestry officers, community development workers, and local council leaders reported that the FLR radio programs helped them reach more farmers compared to their face-to-face extension services. The use of ICTs has made the local government more responsive. By including both male and female farmers as guests on radio shows, having call-ins and interactivity tools (e.g., beep-to-vote), and allowing for two-way communications, a dialogue was established that created a positive environment for not only learning, but action. Discussions of customary beliefs about trees represent double-loop learning, as they challenge "underlying assumptions" (Dyball, Brown, and Keen 2009, 189).

While the use of ICTs was new to the station, as it is to many community radio stations, KTR responded quickly to training and now uses the techniques in other shows. Farmers interviewed in the evaluation said that they feel part of the show when they receive an SMS alert reminding them to listen or thanking them for their vote.[12]

Issues remain around how to increase accessibility. For example, the local language, while widely spoken, is rarely written (Kawachi 2010), so that listeners preferred to send and receive SMS messages in English. This illustrates a dimension of "meaningful access" to ICTs (Warschauer 2003): People in the project area needed to be literate in English to benefit from the use of SMS. Generally, access was increased by using toll-free methods, or methods that do not require literacy (such as beep-to-vote). Gender dimensions need further consideration, as obstacles still exist that prevent women from taking a more active role in programs—including access to mobile phones, access to radios, literacy, mobility (especially at night), and cultural issues. For example, women are more likely to access a phone through sharing than men; research has shown that such access may involve less use of phone features (such as messaging), and that women tend to have mobile phone sharing roles "that entailed lesser determinative control over the device" (Burrell 2010).

## Conclusions

There are many positive lessons to be found in this interactive approach to radio as an extension and communication for development tool, which reinforce existing evidence on the impacts of greater "audience" participation in the development of pedagogical material on learning outcomes, as well as the importance of "social learning" (e.g., discussion with peers).

The base of knowledge in the communities was a solid foundation for the project to build on, but this project demonstrates that knowledge is a necessary but not sufficient aspect of adoption of new practices: The interactive and participatory approach helped to encourage and support high numbers of listeners to practice FLR, for example, by facilitating the identification of obstacles and finding solutions. The response of the radio station and partners to farmers' needs fostered a sense of inclusion and ownership among farmers. The provision of various feedback mechanisms and positive response to these encouraged peer to peer learning. As the programs responded directly to farmers concerns, this undoubtedly influenced knowledge and practice rates.

A major learning point is the imperative to include multiple stakeholders in the radio strategy from the beginning of the project, which ensured local and political buy-in to the project. These relationships were crucial to ensuring that the radio strategy existed as a coherent component of the local extension system, as opposed to a "stand-alone" activity. Another key finding is that obstacles to women's participation should be addressed through tailoring interactivity tools (ICTs) and activities (appearing on the show, providing weekly feedback) to suit women and allowing them to have more active roles (e.g., use of women-only phone lines, visiting women in the community to collect their voices, facilitating women's listening groups).

Areas for further development and research include:

- Assessing whether farmers who actively interact with the radio shows (e.g., through calling in or beep-to-vote) are more likely to adopt the techniques being promoted, or whether application rates are the same for those who listen to an interactive program without personally interacting.
- Developing a suite of interactivity tools for radio stations to access, master, and adapt according to need, particularly open-source or affordable software solutions, which can encourage widespread uptake of the approaches.

- Conducting further research around how farmers learn and how they translate new knowledge into decisions—do they learn better in groups or as individuals? Do farmers learn effectively through audio only or are there circumstances where visuals are needed? Do they need support from face-to-face extension activities?

## Notes

1. For example, Development Media International claims that "Radio and TV campaigns that encourage healthy behaviours can reduce under-five deaths by up to 23%" (Development Media International, 2015), and Farm Radio International's unpublished reports show that on average, listeners are five times more likely than nonlisteners to take up a practice featured in a participatory radio campaign.
2. A "beep" is a missed call, which is monitored by the station. The beep-to-vote system was pioneered by Farm Radio International. See also http://www.farmradio.org/ourblog/2013/06/06/audio-postcard-what-the-beep-interactive-radio-using-mobile-voting.
3. In 2006, about 61% of Ugandan households owned a radio (Ssewanyana 2007).
4. Comments by district government personnel, summative evaluation workshop of the IUCN-FRI Forest Land Restoration project in Kapchorwa, Noah's Ark Hotel, Kapchorwa town, Uganda, June 19, 2015.
5. For 2013/2014, there were a total of 19,244,020 mobile subscriptions in Uganda, of a total adult population of around 19 million. Radio and mobile ownership rates are constantly increasing (Akue-Kpakpo 2013).
6. Control communities that do not have access to the radio signal were identified, so that outcome could be measured against a context where the radio intervention did not occur.
7. The breakdown by community type was ALC: 133, PLC: 154, CC: 126.
8. The remaining 44% gave no answer or said "other.".
9. Telerivet is an online platform designed to manage various ICT interactions and databases using an Android phone.
10. A run sheet is a simple tool used to plan the flow of a radio show.
11. See http://www.farmradio.org/ourblog/2015/07/09/in-station-training-boosts-broadcasters-confidence-on-air-and-in-their-community.
12. FRI Uganda Qualitative Evaluation Report May 2015, internal report.

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## References

Akue-Kpakpo, A. 2013. *Study on international Internet connectivity in sub-Saharan Africa.* Geneva, Switzerland: International Telecommunication Union.

Ashby, J. A. 1996. What do we mean by participatory research in agriculture? In New frontiers in participatory research and gender analysis, Proceedings of the International Seminar on Participatory Research and Gender Analysis (PRGA), 9–14 September 1996, ed. CIAT (Centro Internacional de Agricultura Tropical), 15–22. Cali, Colombia: CIAT

Barrow, E., R. Fisher, and J. Gordon. 2012. *Improving ecosystem functionality and livelihoods: Experiences in forest landscape restoration and management.* Gland, Switzerland: IUCN.

Bransford, J. D., A. L. Brown, and R. R. Cocking. ed. 2000. *How people learn: Brain, mind, experience, and school.* Washington, DC: National Research Council.

Burrell, J. 2010. Evaluating shared access: Social equality and the circulation of mobile phones in rural Uganda. *Journal of Computer-Mediated Communication* 15 (2):230–50. doi:10.1111/j.1083-6101.2010.01518.x

Carpentier, N. 2011. The concept of participation. If they have access and interact, do they really participate? *Communication Management Quarterly* 21 (2011):13–36.

Center for International Media Assistance. 2007. *Community radio: Its impact and challenges to its development.* Washington, DC: Center for International Media Assistance.

Chambers, R. 1983. *Rural development: Putting the last first.* London, UK: Intermediate Technology Publications.

Chambers, R., A. Pacey, and L. A. Thrupp. ed. 1989. *Farmer first.* London, UK: Intermediate Technology Publications.

Chavez-Tafur, J., K. Hampson, R. Thijssen, and A. Ingevall. 2007. *Learning from experience: A manual for organising, analysing and documenting field based information.* Wageningen,, The Netherlands: Centre for Learning on Sustainable Agriculture (ILEIA).

Conrad, D. 2014. Deconstructing the community radio model: Applying practice to theory in East Africa. *Journalism* 15 (6):773–789.

Cooke, B., and U. Kothari. ed. 2001. *Participation: The new tyranny?.* New York, NY: Zed Books.

Cornwall, A. 2006. Historical perspectives on participation in development. *Commonwealth & Comparative Politics* 44 (1):62–83. doi:10.1080/14662040600624460

Danielsen, S., F. Matsiko, and A. Kjær. 2014. Implementing plant clinics in the maelstrom of policy reform in Uganda. *Food Security* 6 (6):807–18. doi:10.1007/s12571-014-0388-7

Davenport, T., P. Howard, and C. Dickenson. 1996. *Mount Elgon biodiversity report.* Kampala, Uganda: Forest Department, Republic of Uganda.

Development Media International. 2015. Measuring impact. http://www.developmentmedia.net/measuring-impact (accessed October 25, 2015).

Dralega, C. A. 2009. Participatory ethos, multimedia experiments, and disjunctures in community media in Uganda. *Ecquid Novi: African Journalism Studies* 30 (1):24–41. doi:10.3368/ajs.30.1.24

Dudley, N., S. Mansourian, and D. Vallauri. 2005. Forest landscape restoration in context. In *Forest restoration in landscapes: Beyond planting trees*, ed. S. Mansourian, D. Vallauri, and N. Dudley, 3–7. New York, NY: Springer.

Dyball, R., V. A. Brown, and M. Keen. 2009. Towards sustainability: Five strands of social learning. In *Social learning: Towards a sustainable world*, ed. A. Wals, 181–94. Wageningen, The Netherlands: Wageningen University.

Emmanuel, G., and E. T. Lwoga. 2007. Information communication technologies and environmental conservation: Challenges for developing countries. *University of Dar es Salaam Library Journal* 9 (2):20–39.

Fisher, R., S. Maginnis, W. Jackson, E. Barrow, and S. Jeanrenaud. 2008. *Linking conservation and poverty reduction: Landscapes, people and power.* London, UK: Earthscan.

Gilberds, H., and M. Myers. 2012. Radio, ICT convergence and knowledge brokerage: Lessons from Sub-Saharan Africa. *IDS Bulletin* 43 (5):76–83. doi:10.1111/j.1759-5436.2012.00366.x

Granqvist, M. 2005. Assessing ICT in development: A critical perspective. In *Media & global change: Rethinking communication for development*, ed. O. Hermer and T. Tufte, 285–96. Buenos Aires, Argentina: CLACSO.

Graves, P. 2007. *U.S. public and private funding of independent media development abroad.* Washington, DC: Center for International Media Assistance.

Hickey, S., and G. Mohan. ed. 2004. *Participation: From tyranny to transformation?.* New York, NY: Zed Books.

Howard, P. C. 1991. *Nature conservation in Uganda's tropical reserves.* Luzira, Uganda: Forest Department/Ministry of Environment Protection.

International Union for Conservation of Nature, United Nations Environment Programme, and United Nations Development Programme. n.d. *Ecosystem-based adaptation in mountain*

ecosystems: Challenges and opportunities in Nepal, Peru and Uganda. Ecosystem-based adaptation in mountain ecosystems project policy brief. Gland, Switzerland: IUCN.

Joughina, J., and A. M. Kjær. 2010. The politics of agricultural policy reform: The case of Uganda. Forum for Development Studies 37 (1):61–78. doi:10.1080/08039410903558277

Kawachi, K. 2010. An overview of the sociolinguistic situation of Kupsapiny, a Southern Nilotic language of Uganda. African Study Monographs 31 (3):127–37.

Lambrou, Y. 2001. A typology: Participatory research and gender analysis in natural resource management research. Working document No. 15. Cali, Colombia: CGIAR Participatory Research and Gender Analysis Program, CIAT (Centro Internacional de Agricultura Tropical).

Loeber, A., B. van Mierlo, J. Grin, and C. Leeuwis. 2009. The practical value of theory: Conceptualising learning in the pursuit of a sustainable development. In Social learning: Towards a sustainable world, ed. A. Wals, 83–98. Wageningen, The Netherlands: Wageningen University.

Maginnis, S., J. Reitbergen-McCracken, and W. Jackson. 2007. What is FLR and how does it differ from current approaches?. In The forest landscape restoration handbook, ed. J. Rietbergen-McCracken, S. Maginnis, and A. Sarre, 5–20. London, UK: Earthscan.

Maginnis, S., Jackson, W. and N. Dudley. 2004. Conservation landscapes. Whose landscapes? Whose trade-offs? In: Getting Biodiversity Projects to Work: Towards More Effective Conservation and Development, eds. T.O. McShane and M.P. Wells. New York: Columbia University Press.

Manyozo, L. 2008. Communicating with radio: What do we know? Findings from selected rural radio effectiveness evaluations. African Farm Radio Research Initiative (AFRRI) eport. Farm Radio International, Ottawa, ON, Canada.

Manyozo, L. 2009. Mobilizing rural and community radio in Africa. Ecquid Novi: African Journalism Studies 30 (1):1–23. doi:10.3368/ajs.30.1.1

Masuki, K. F. G., J. G. Mowo, R. Kamugisha, J. Tanui, J. Tukahirwa, and E. O. Adera. 2010. Integrated information and communication technologies for farm-level access to natural resource management information. Paper presented at 6th Annual International Conference on Computing and ICT Research, 1–4 August, 2010, Makere University, Uganda.

Menz, M. H. M., K. W. Dixon, and R. J. Hobbs. 2013. Hurdles and opportunities for landscape-scale restoration. Science 339 (6119):526–27. doi:10.1126/science.1228334

Moyo, L. 2013. The digital turn in radio: A critique of institutional and organizational modeling of new radio practices and cultures. Telematics and Informatics 30 (2013):214–22. doi:10.1016/j.tele.2012.10.003

Munyua, H., and C. Stilwell. 2013. Three ways of knowing: Agricultural knowledge systems of small-scale farmers in Africa with reference to Kenya. Library & Information Science Research 35 (2013):326–37. doi:10.1016/j.lisr.2013.04.005

Myers, M. 2009. Radio and development in Africa: A concept paper (Revised version). International Development Research Centre, Ottawa, ON, Canada.

Nakangu, B., C. Awadh, and S. Kelleher. 2012. Rights, resources and rewards: Lessons learned on rehabilitating landscapes for livelihoods in the Benet landscape, Uganda. Gland, Switzerland: IUCN.

Nakangu, B., and E. Barrow. 2008. Agriculture and conservation—Finding positive linkages in Uganda. Arborvitae 37:3.

Nakakaawa, C., R. Moll, R. Vedeld, E. Sjaastad, and J. Cavanagh. 2015. Collaborative resource management and rural livelihoods around protected areas: A case study of Mount Elgon National Park, Uganda. Forest Policy and Economics 57:1–11. doi:10.1016/j.forpol.2015.04.002

Neef, A., and D. Neubert. 2011. Stakeholder participation in agricultural research projects: A conceptual framework for reflection and decision-making. Agriculture and Human Values 28 (2):179–94. doi:10.1007/s10460-010-9272-z

Pauker, E., and D. Musiime. 2013. Getting on the same wavelength: Convergence and the communication of livelihoods information in rural Uganda. Nokoko 2013 (3):39–69.

Peluso, N., and P. Vandergeest. 2001. Genealogies of forest law and customary rights in Indonesia, Malaysia, and Thailand. Journal of Asian Studies 60 (3):761–812.

Perkins, K., D. Ward, and M. Leclair. 2011. Participatory radio campaigns and food security. http://www.farmradio.org/wp-content/uploads/farmradio-prcreport20111.pdf (accessed June 29, 2015).

Sassen, M. D., K. E. Sheil, C. J. Giller, and F. Ter Braak. 2013. Complex contexts and dynamic drivers: Understanding four decades of forest loss and recovery in an East African protected area. *Biological Conservation* 159:257–68. doi:10.1016/j.biocon.2012.12.003

Scoones, I., and J. Thompson. 1994. *Beyond farmer first: Rural people's knowledge, agricultural research and extension practice*. London, UK: Intermediate Technology Publications.

Soini, E. 2007. Land tenure and land management in the districts around Mount Elgon (MERECP). ICRAF Working Paper no. 49. World Agroforestry Centre, Nairobi, Kenya.

Ssewanyana, J. K. 2007. ICT access and poverty in Uganda. *International Journal of Computing and ICT Research* 1 (2):10–19.

Sullivan, B. 2011. *The new age of radio: How ICTs are changing rural radio in Africa*. Ottawa, ON, Canada: Farm Radio International.

Sumberg, J., and J. Thompson. 2012. *Contested agronomy: Agricultural research in a changing world*. London, UK: Routledge.

Tacchi, J. 2006. New forms of community access. *Proceedings of UNESCO IPDC/IFAP Joint Thematic debate: Giving voice to local communities: From community radio to blogs*. Paris, France: UNESCO.

Tacchi, J. 2011. Open content creation: The issues of voice and the challenges of listening. *New Media & Society* 14 (4):652–68. doi:10.1177/1461444811422431

United Nations Educational, Scientific and Cultural Organization (UNESCO). 2012. *Education for All Global Monitoring Report*, 2012. Paris: UNESCO.

Wals, A. ed. 2009. *Social learning: Towards a sustainable world*. Wageningen, The Netherlands: Wageningen University.

Warschauer, M. 2003. *Technology and social inclusion: Rethinking the digital divide*. Cambridge, MA: MIT Press.

Willems, W. 2013. Participation—In what? Radio, convergence and the corporate logic of audience input through new media in Zambia. *Telematics and Informatics* 30 (3):223–31. doi:10.1016/j.tele.2012.02.006

World Wildlife Fund, and International Union for Conservation of Nature. 2000. *Minutes, restoration workshop*, Segovia, Spain (Internal Document).