

# Chapter 10

## Information Technologies for Rural Development in Africa: New Paradigms from Radio to Broadband

Heather E. Hudson

### Introduction

Developing regions face many critical challenges, of which the most basic is producing sufficient food for their people. Some 240 million people in sub-Saharan Africa don't have enough to eat; three-quarters of them live in rural areas. They depend on farming to feed themselves and to generate income for other needs on land that is often prone to natural disasters such as drought or floods. The UN's Food and Agriculture Organization (FAO) states that Africa is in a food security crisis (Food and Agriculture Organization 2012).

Many strategies have been developed that could address food security, such as selecting crops that provide more nutrition, using seeds and techniques that resist drought, using local products as fertilizer, and using improved methods of processing and storage. In addition to improving crop yield, farmers may need new strategies to generate income from their crops and livestock. Improvement in food security therefore requires transmission of information, so that farmers are aware of these new practices and techniques. Yet awareness alone is not sufficient; farmers must actually adopt these new practices.

Radio remains the most widely used medium in rural Africa, reaching people without electricity and those who are illiterate. In the communities participating in the project described below, approximately 76 % of households owned a radio (Farm Radio International 2011a). Radio therefore seemed an appropriate choice

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H.E. Hudson (✉)

Institute of Social and Economic Research, University of Alaska Anchorage, Anchorage, AK 99508, USA

e-mail: [heatherehudson@gmail.com](mailto:heatherehudson@gmail.com); [hehudson@uaa.alaska.edu](mailto:hehudson@uaa.alaska.edu)

for creating awareness of best practices to enhance food security among African farmers.

## **Radio for Development and ICT4D**

Electronic mass media have been used as a means of disseminating development information since the early days of radio broadcasting. Radio programs, often in conjunction with agricultural extension and other outreach activities, have been frequent components of agricultural campaigns. Radio broadcasts were included in development campaigns and as components of distance education curricula. Interactivity was found to increase learning and adoption of new practices through such techniques as listening groups, call-in programs, and classroom activities to accompany instructional radio programs. [See, for example, the writings of Schramm (1964) and the recent synthesis on media and development by McAnany (2012).]

In the past decade, mass media have been joined by other information and communication technologies (ICTs) that have been used for development initiatives and are referred to as ICT4D. [See a summary of this research by Hudson (2006).] Development agencies such as the FAO drew attention to the potential of new applications such as radio streaming and websites and other materials available online (Girard et al. 2003). In 2008, the Panos Institute of West Africa (PIWA) carried out a survey of 220 radio stations in seven West African countries concerning ICT use and Internet connectivity. The study noted the need to strengthen human capacity to use these new technologies for development: “The limitations are often due to the lack of awareness of the possibilities offered by ICTs, as well as a skill gap in the staff able to deliver expected services” (Ndiaye et al. 2008).

Examples of recent ICT innovations to support radio in developing regions include Gramin Inter-Networking System (GRINS), a software suite developed in India for community radio integrating mobile phone technology, and Freedom Fone, an open-source interactive voice response (IVR) system developed in Zimbabwe (Farm Radio International 2011a). The latter was included in the pilot projects described below.

## **The African Farm Radio Research Initiative**

Could radio also help to increase adoption of agricultural practices intended to improve food security in Africa? And what about newer technologies that might enhance radio’s effectiveness, such as mobile phones, portable digital audio recorders, and Internet access at radio stations? Farm Radio International (FRI), a Canada-based NGO which had provided training and agricultural program content for African radio stations for several decades, undertook a 4-year project called the

African Farm Radio Research Initiative (AFRRI) to answer these questions, with support from the Bill & Melinda Gates Foundation. Specifically, AFRRI addressed the following:

1. How effective is radio in enabling smallholder farmers in Africa to address food security challenges they face, with a particular focus on increasing/diversifying food production, improving land use management, and reducing post-harvest losses?
2. How can new technologies, such as cell phones and MP3 players, increase the effectiveness of radio as a sustainable, interactive development communications tool? (Farm Radio International 2011b)

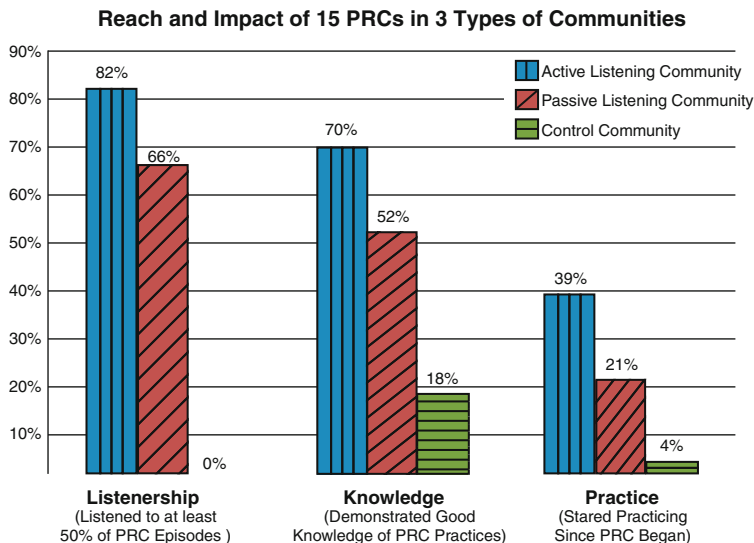
AFRRI partnered with 25 radio stations reaching an estimated 40 million farmers in five countries: Ghana, Malawi, Tanzania, Uganda, and Mali. One of the key elements of the project was participatory radio campaigns (PRCs) designed to involve farmers in every aspect of the planning and production of agricultural radio programs. A second was a radio-based information service to help farmers obtain current and relevant information on markets and prices for their produce. A third key element was ICT-enhanced farm radio, which involved testing various equipment packages at the radio stations.

The research methodology for the PRCs involved identifying three clusters of communities for each of the 25 radio stations. Active listening communities (ALCs) included farmers who were interviewed about their agricultural practices and needs and their radio listening habits. They then were invited to be involved in the design of a series of radio programs addressing a particular agricultural practice to help improve their livelihoods and ultimately their food security. A second cluster was designated passive listening communities (PLCs), where farmers listened to the programs but did not participate in planning or any interactive follow-up. A third cluster consisted of control communities that did not have access to the radio programs. Follow-up surveys after each of the two 16-week campaigns were designed to collect data on the extent to which farmers learned about the agricultural innovations and actually adopted the new agricultural practices.

Farmers engaged in the design and development of farm radio programming were almost 50 % more likely to take up agricultural practices deemed to improve their food security than passive listeners. Those in the ALCs were ten times more likely to adopt the practice than those farmers who had no access to the farm radio programs (see Chart 10.1).

## **Lessons from the AFRRI's Participatory Radio Campaigns**

FRI defined a PRC as “a planned, radio-based activity, conducted over a specific period of time, in which a broad population of farmers is encouraged to make an informed decision about adopting a specific improvement selected by their peers, based upon the best available information, to improve the food security of their



**Chart 10.1** Comparative impact in three types of communities. *Source:* Farm Radio International (2011b)

families. It then provides the adopting farmers with the information and other support they require to implement the improvement” (Ward 2010). This definition is not necessarily limited to farming; it could obviously be broadened to apply to a strategy to foster adoption of any practice by a specific target population.

Similarly, the lessons from the AFRRI’s PRC activities could also be generalized and adapted to other contexts. Among the best practices identified from the first set of campaigns were the following:

- *Using the farmers’ language:* More generically, it is important to use the language spoken and understood by the target audience.
- *Role of audience participation:* Consulting representatives of the target audience about the campaign and the programming can increase participation in the campaign.
- *Importance of audience voices:* Listeners like to hear their voices and voices of others facing similar problems. There are many ways of capturing these voices, through taped interviews, call-in and callout programs, and other techniques discussed in the ICT section below. As AFRRI points out: “These voices provide credibility and attractiveness and encourage farmers to engage in the campaign . . . They reveal the struggle each farmer undergoes as s/he works towards a decision about implementing the improvement. And these voices of farmers explain how they are implementing the improvement, and overcoming problems that crop up while they implement” (Ward 2010).
- *Role of expert information and advice:* Target audiences also need to hear from experts with knowledge relevant to the campaign. Experts can be interviewed in

the studio or in the field with a target group or wherever they may be using mobile phones. To be effective, these experts must have good presentation skills and use language and examples familiar to their audience in order not to bore or confuse the audience.

- *Role of entertainment*: Effective programs must be entertaining; in addition to relevant and well-presented information, they can include local music, stories, drama, humor, or other entertaining content.
- *Regularity and repetition*: Programs should be broadcast according to a regular schedule at a time when most of the audience can listen. Repetition is also important to catch audience members otherwise unavailable. In addition to repeat broadcasts, making programs available on portable audio players, or where facilities exist, through podcasts and audio streaming can increase audience access. Other techniques and media such as flyers, songs, and discussion groups can help to repeat and reinforce the campaign messages (Farm Radio International 2011b).

## ICT-Enhanced Radio Experiments

Another major component of AFRRI was a series of experiments to determine whether a combination of radio plus other ICTs could enhance the effectiveness of the PRCs. Radio is a one-way medium, whereas participation, as noted in the results of the PRC project above, can increase both awareness and adoption of new agricultural practices. Mobile phones are becoming increasingly available in Africa, including rural areas, and provide a means of interacting with the radio audience such as for call-in questions, callout interviews, and text messages to remind farmers about program schedules. Could they be part of a participation strategy? Radio stations in Africa typically have not had access to integrated mobile phone technology that would facilitate these applications; many may also not be able to afford significant mobile phone charges.

Also portable digital recorders (MP3 players/recorders) could be used not only for interviews with farmers but also for feedback from them on the radio programs. Digital players could also provide a form of radio-on-demand for farmers who missed the scheduled broadcasts. Software that runs on personal computers can be used for digital editing. However, as FRI notes: “There are still many radio stations in Africa that rely on tape recorders, large expensive batteries, and often broadcast direct-to-air. They lack editing equipment, and the skills to produce and prepare shows in advance of a broadcast. These processes limit the ability of radio stations to produce good farm radio programs for their listeners.” Internet connectivity could provide the radio stations with access to agricultural content, training materials, and inexpensive interaction with experts and colleagues through e-mail and Skype.

The purpose of the ICT experiments was to test how new ICTs could be integrated with radio to provide better interactive communication between the radio stations and their target farmer audience. AFRRI provided eight customized

ICT packages in experiments with the 25 radio stations in the project. The following were included in the various ICT packages:

- *Computer and Internet access*: Each partner radio station received a desktop computer and Internet access. Participating broadcasters received training in basic computer literacy, Internet search skills, and virus protection techniques. Some 68 % of 51 partner broadcasters surveyed identified the Internet as the most important ICT tool for production of farm radio programs (Farm Radio International 2011a).
- *Digital recording and editing equipment*: Rechargeable MP3 recorders were provided to all broadcasters participating in AFRRRI. They were very popular with the broadcasters, enabling them to capture high-quality audio such as interviews with farmers and extension agents, which could be edited into the radio programs. FRI notes: “The portability of MP3s allowed radio hosts to visit farmers in their fields and in their homes, increasing farmer participation in the radio broadcasts” (Farm Radio International 2011a).
- *Phone callouts to extension agents and experts*: Although many radio stations had started to include call-in comments from listeners with mobile phones, they had not used phones themselves to reach pre-identified resource people for interviews and commentary. Using mobile phones enabled extension agents to participate in the programs without having to travel to the stations, which was both time consuming for the agents and often expensive for the stations if they had to pay travel expenses. Of 41 extension agents surveyed, 61 % believed that the reach and impact of their extension work were substantially improved because they could be heard on radio programs through callout programs.
- *Phone callouts to farmers*: Callouts to farmers with mobile phones enabled farmers to learn from other farmers. Typically, broadcasters made prearranged calls to two or three farmers per weekly episode. AFRRRI evaluation found that callouts to farmers can significantly affect farming adoption rate of agricultural improvements (up to 14 %), increase their level of knowledge about the agricultural practice (up to 50 %), and improve their overall listenership (up to 22 %), when compared with stations that do not make callouts to farmers. There were also significant cost savings compared with traveling to villages; AFRRRI found that the cost of calling three farmers for 5 minutes each was approximately \$US8 compared to \$US75 to travel to three villages for interviews (Farm Radio International 2011a).
- *SMS alerts for farmers*: AFRRRI provided access to services that enabled broadcasters to send SMS alerts to listeners’ mobile phones 30 minutes before the program. Recipients were asked to share the reminder with their neighbors. AFRRRI found that these weekly SMS alerts were a cost-effective means of increasing listenership by up to 20 %; in turn, listening to more episodes was correlated with higher levels of adoption of the practices in the programs. Messages cost about \$US0.05 each, so that reminding a farmer who in turn shared the information with neighbors cost less than \$US1 for an 18-week campaign. However, several steps are required to implement this procedure,

such as compiling a database of phone numbers of farmers willing to participate and accessing a service that would automate the mass SMS calls [(for details on equipment and service, see Farm Radio International (2011a))].

- *Local agents with solar-powered radios/MP3 recorders and mobile phones:* Some communities nominated a local resident to be a radio agent to host listening sessions during campaign broadcasts, record programs for repeat listening at a later time, and provide access to a mobile phone for communication with the radio station. (This model of community listening groups has a long history in radio for rural development.) Radio agents were typically women; PRC research had found that in some communities men took family radios to the fields, thus depriving women of the opportunity to hear the programs. A radio with recording capacity enhanced the value for the listeners, as programs could also be recorded for later or repeat listening. Of farmers surveyed, 73 % reported that group listening helped them better understand the content through discussion with the group, while 46 % of the same group of farmers stated that listening in a group gave them encouragement to start practicing the agricultural improvement (Farm Radio International 2011a).
- *IVR:* Two radio stations, one in Ghana and the other in Tanzania, experimented with using interactive voice response, enabling farmers to call in from mobile phones and access agricultural information on demand through a series of menus. This experiment indicated that some farmers were willing to use mobile airtime to access agricultural information on demand or leave messages about content, but users tended to be younger males with secondary education, indicating that this type of ICT application was not as readily adopted as voice calling and text messaging. Also, some respondents including 35 % of women said that they could not afford the calls.
- *Connectivity: Satellite terminals and fixed wireless:* For some radio stations access to the Internet via satellite was the only option. AFRRRI experimented with technology that could enable such stations to sustain the costs for satellite access. Two radio stations, one in Tanzania and the other in Mali, were equipped with VSATs (small satellite terminals) and fixed wireless to extend Internet access. The stations set up and sold wireless access points to local customers and shared the Internet connection for a monthly fee. The Mali station set up a cybercafé at the radio station (Farm Radio International 2011a).

## Lessons from the AFRRRI Project

### *Production and Outreach*

Many of the skills and techniques involved in PRCs are likely to be new to broadcasters. FRI has developed week-long courses accompanied by training materials to help African radio broadcasters learn techniques they can use in PRCs. FRI is now developing an e-course to provide broadcasters with tools to

design effective and engaging agricultural programs (support for the e-course is from the Commonwealth of Learning: see <http://ecourse.farmradio.org/>).

FRI is also producing farm radio resource packs (FRRPs) available online that will focus on African agricultural value chains defined as “the people and activities that bring a basic agricultural product . . . from production in the field to the consumer, through stages such as processing, packaging, and distribution.” The resource packs will include information documents, sample radio scripts, materials on key issues, and other resource materials (see <http://www.farmradio.org/radio-resource-packs/>). These training materials and courses could be adapted to meet the needs of broadcasters in other developing regions who could put these concepts to use in other settings.

### *Training in Use of ICTs*

As AFRRRI points out: “Technology on its own cannot improve farm radio’s reach. Introduction of ICTs must be integrated with appropriate training on the use and maintenance of equipment, combined with sustainable ways for broadcasters to fund and own the technology” (Farm Radio International 2011a). Most broadcasters will need training in technologies and software which are new to them such as digital editing software, point-to-multipoint SMS, and IVR systems that were introduced in the AFRRRI project. However, broadcasters will also likely need training in how to use equipment that they are familiar with such as mobile phones, MP3 recorders, and Internet access to apply them for participatory media campaigns.

### *Capital Costs and Operating Costs*

In the AFRRRI project, participating radio stations were given the equipment they would be using during the project period and told that they would be able to keep the equipment afterwards. In some cases, this approach of donating equipment can lead to lack of concern about taking care of equipment or replacing worn-out or damaged parts. However, AFRRRI researchers reported that ownership contributed to a sense of responsibility for the equipment and encouraged some to explore innovative ways of using the technology. AFRRRI concluded: “When the station believes that the equipment belongs to them and not to an NGO or the government, and they see its value, they are more likely to take it upon themselves to seek solutions and fix problems” (Farm Radio International 2011a).

Of course, most radio stations would have to find the funds to buy their own equipment. But in the long run, the operating costs are likely to be much more of a significant challenge, whether or not the participants had up-front funding for equipment. For example, the author found in evaluating telecenter projects that



some managers did not budget to replace printer cartridges, although printing, photocopying, and desktop publishing were often the main revenue generators for the telecenter (Hudson 2001). In the AFRRI project, one of the ongoing costs was for connectivity—for Internet access and for mobile phone airtime for callouts, call-ins, SMS reminders, and staff coordination. Although mobile phones turned out to be very cost effective, airtime in many African countries can be expensive relative to salaries and other operating costs.

### *Appropriate Technology*

Identifying criteria for equipment selection that will help to minimize costs but also assure usability can be important in minimizing overall equipment costs while maximizing benefits. These criteria will vary depending on many local factors including equipment availability and pricing, physical conditions where equipment will be used in the studio and in the field, and ICT literacy of staff and of other users.

In the AFRRI project, considerations included availability of equipment and parts, serviceability, affordability, and simplicity of use. There are numerous examples in the developing world of donated equipment lying unused because spare parts are not available or prohibitively expensive to import, or no one has the technical expertise to fix the equipment. The AFRRI project attempted to procure equipment that was both durable and repairable locally; AFRRI also provided technical training to those who would be using the equipment.

### *Sustainability and Entrepreneurship*

Small and nonprofit radio stations face the challenge of ongoing sustainability to cover their operating costs, regardless of whether they receive donated equipment or supplies. Of course, paid advertising and announcements are well-known means of generating revenue, but they may not be appropriate for nonprofit stations or generate much revenue in small markets. The AFRRI project explored some innovative approaches to generate revenue using ICTs:

- *On-air classified ads:* A radio program in Tanzania announces classified ads received throughout the day by SMS messages sent to the broadcaster's phone. The customer who wishes to place an ad on the radio program must pay 2,000 Tanzanian shillings (about \$US1.25). The payment is actually made by sending mobile phone airtime credit to the broadcaster's phone. Once the ad and the payment are received, the ad is read on the air.
- *On-air greetings via SMS:* Another Tanzania radio station charges for messages such as prayers and greetings sent to family and friends around the country.

A person who wants a message read on the air pays for a premium SMS (approximately \$US.30) sent to a special number at the radio station. The revenue from this SMS is then divided between the radio station and the mobile phone company (Farm Radio International 2011a).

- *Hosting IVR services*: A Ghanaian radio station that continued to provide IVR services which farmers could access to get information on demand found that other organizations and businesses became interested in offering IVR services. Freedom Fone technology used for AFRRRI's IVR experiments allows radio stations to host and support IVR services virtually by assigning a unique SIM card for each local client. The station planned to develop other value-added services such as co-designing the IVR for clients, supplying information for the audio menus, recording/producing the audio menus, and offering discounts on radio spots to advertise clients' IVR service and phone number (Farm Radio International 2011a).
- *Cybercafé at the radio station*: A radio station set up an Internet café on its premises and used the revenue to cover its own Internet costs and pay an in-house technician.
- *Wireless Internet service provider (WISP)*: A radio station may be able to become a WISP by setting up a Wi-Fi transmitter and selling access to its Internet connection. For example, an AFRRRI radio station used wireless access points to make its Internet connection available to surrounding businesses, government offices, and schools. This cost-sharing model enabled the stations to cover the \$US250 monthly Internet fees plus additional revenue to pay technical staff at the radio station. (However, reselling Internet access may not be legal in some jurisdictions.)

## The Potential of Video Broadband

In industrialized countries, television broadcasting was the initial means of disseminating video content to households. Mobile phones brought voice and text messages, and smartphones are becoming platforms for video. However, in rural Africa access to broadcast television remains limited because over-the-air signal coverage outside of cities is often poor and a majority of rural Africans still lack electricity. TV sets must be run from generators or solar panels that require conversion to AC current. But mobile phone penetration has increased dramatically so that even in low-income rural areas, access is almost universal (although relatives may share phones). As smartphones become cheaper, they are likely to become the most accessible platform for video in rural Africa.

In addition to providing news and entertainment, mobile video could be a powerful tool for rural development. Much as audio MP3 players were used with AFRRRI, community members could record video clips for others to view and could see examples of farming practices and stories of successful farmers and entrepreneurs. The AFRRRI project also introduced IVR so that farmers could use

their mobile phones to seek information using audio menus. However, video could be much more effective in illustrating responses.

Also YouTube has become an important repository for training materials. Indigenous broadcasters in northern Canada who make training materials in native languages now post the videos online on YouTube so that they are available on demand for all communities in the region (Hudson 2011). This approach could be very useful in Africa for agricultural development as well as for public health education and vocational instruction. Many of the lessons of the AFRRI project are relevant for such video applications.

Mobile broadband could also extend the reach of Internet content beyond cyber cafés that are available only in towns and schools where access is often limited to students, and facilities are typically available only during school hours.

However, the price of connectivity is likely to be the most significant constraint. Rural residents use phone cards that require prepayment for voice calls and text messaging. The price of these basic services often forces rural residents with very limited cash incomes to go without mobile service until they can afford to recharge their phone cards. Even where mobile networks are being upgraded to carry broadband, their use will be severely constrained if current pricing models from the industrialized world apply.

## Mobile Broadband for Development

The AFRRI project has shown that radio plus interactive ICTs can increase not only awareness but also adoption of farming practices to improve food security in rural Africa. Access to video, most likely through mobile broadband, can build on AFRRI experience with the potential to provide relevant information to farmers with limited formal education, and while enabling them to exchange their own video content to enhance social entrepreneurship.

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