From motorbike to mobile phone: new extension services for rural farmers through mobile ICT

1. Systems of communication: how ICT can empower smallholder farmers

Challenges for agriculture

With 40 million people pushed into poverty since 2010, and a world population predicted to rise to 9 billion by 2050, the demands on already diminishing finite resources are growing (Qiang et al. 2012). Countries such as Brazil and the U.S. have maintained a constant rate of yield increase since 1949, whereas in the developing world productivity has declined along with decreasing soil fertility and water availability. The research and development to meet these challenges has already been done: new seed varieties, fertilizers and cropping systems exist, all of which can boost harvests that are currently one fifth of those in the U.S. (Thomson J, A. 2006). The question is why these innovations have not reached poorer countries. One key factor that is missing in sub-Saharan Africa is a system to transfer this knowledge in a way that smallholder farmers can easily access. The opportunity to improve food security and livelihoods exists, it just needs to be delivered.

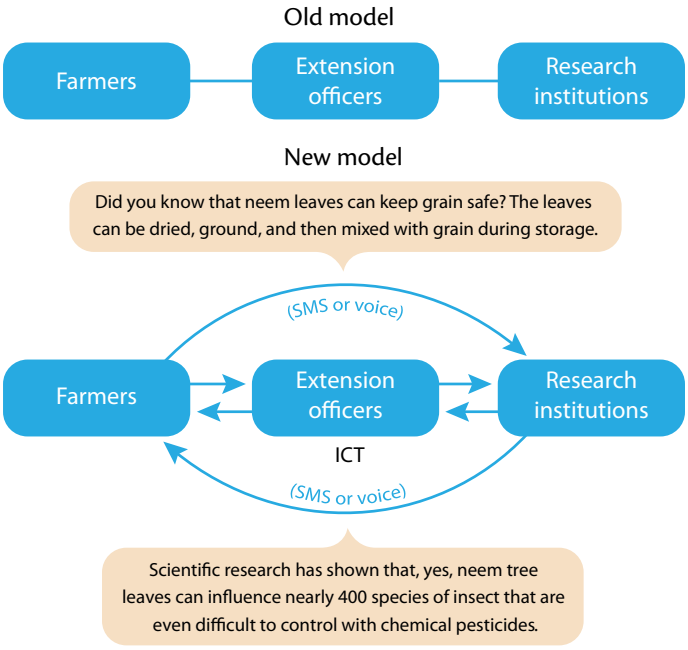

Figure 1. Old and new models of agricultural extension system

The opportunity of ICT

Mobile phone subscriptions numbered six billion worldwide in the first quarter of 2012, and have increased along with population growth. In sub-Saharan Africa the penetration rate for mobile phone has reached 50%, with 342.6 million subscriptions, as of 2010 (ITU 2012). With so many people using mobile phones, they have become an important tool for smallholder farmers, helping them to improve productivity, adapt to climate change, diversify crops and access market information.

New and old extension systems

Mobile phones are fast becoming the new agricultural extension service. Globally, traditional agricultural extension systems are in decline. While the number of farmers has increased and now stands at around 2.6 billion, the number of extension workers has decreased to approximately 500,000 (Gakuru et al. 2009, Anderson & Fedder 2007, Aker 2011). Furthermore, demand has multiplied for information on, for example, weather, pests, and cultivation practices (Aker 2011). In Uganda, ratios of one extension worker to 46,000 farmers are not uncommon (see section 2), and existing services typically involve an expert visiting communities on a motorbike.

Although local support systems do exist in many parts of Africa, farmers and extension workers don't have the answers they need to manage the new threats of changing seasonality and diminishing resources brought about by climate change.

In most sub-Saharan African countries the existing extension system is linear (see figure 1). Information flows from ministries of agriculture to extension workers, and finally to farmers. But this linear model has limited capacity to generate feedback on the quality of the advice, and new ideas and techniques only enter the system through ministries, which in themselves have limited ability to absorb new knowledge. Integrating mobile phones into the extension infrastructure helps to develop an open system in which the farmer is both the end-user as well as a contributor. The system can synergize both local and scientific knowledge so that farmers not only receive advice, but also give feedback on that advice, creating a 'virtuous circle'.

ICT business models

Mobile phones significantly reduce the cost of communication and information for the rural farmer. They also offer opportunities for farmers to access new sources of information in addition to extension services.

Innovative information initiatives that incorporate farmers' traditional knowledge are a vital part of new extension networks. The most effective and locally appropriate advice combines traditional and scientific knowledge (Gakuru et al. 2009). Farmers are not a single homogenous group: information must be locally relevant and tailored to the user – this is what the farmer will pay for. Therefore the mobile extension service must remain local, rather than national or regional, if it is to provide appropriate agricultural advice.

Literacy, trust and price

The major benefit of new extension systems for farmers is that they are users and choosers of advice rather than simply consumers. However, the downside is that these enhanced services often require payment. Because of this, it is essential that the mobile extension service fulfils the user's demands. Three areas are particularly important for achieving this:

Literacy: Advice must be in a language that the user is completely familiar with. A system using SMS and key-words will not work if the user cannot read or if it is written in a language the user does not understand, which is why it is so important to incorporate voice-based services into mobile ICT systems.

Trust: Without trust farmers will not use the advice or contribute to the system. Three things are crucial to building trust in the service: the advice itself must be effective; local voices speaking local dialects must be used; and traditional knowledge must be included as part of the advice (see figure 1).

Price: Without the right price smallholder farmers will simply not use the service. Commonly, the revenue derived from each SMS sent to a user is split between the service provider (the network) and the content provider, where the content provider typically receives an 18% share (Qiang et al. 2012). Only 29% of all agriculture and rural development (ARD) services receive funds from users via a revenue sharing agreement (Goyal 2011).

Governments and public-private partnerships can play a role in developing these new forms of communication by exploring ways to "quality-control" information. They could also cover the initial cost of access to content so that farmers can realize the benefits over one or two growing seasons before payment is required. Once a system is proven to work, taxes can be levied from data usage to cover costs and open revenue streams to developers.

Business development

Most donor-funded mobile ICT projects end before any major scaling up, usually because costs spiral as the need for more locally relevant content grows (Qiang et al. 2012). There are two main ways to develop these projects as businesses: either add value for existing customers through enhanced products, or add customers for the same product in different locations. Both options need further investment, but, as noted by Qiang et al. (2012), even when there has been sufficient funding at the pilot stage, most donors are "not operationally suited to provide long-term funding" – particularly to scale up.

Marketing is a vital to expansion, but donors find it difficult to justify funding it. Another barrier for donors is that issues that may not have been apparent during the initial stages of an enterprise, such as a lack of clear goals and poor performance monitoring, turn into serious obstacles as it grows.

What is clear is that content providers who started on limited funds, or on seed grants, are often much "fitter" for scale-up than those with long-term funding (as found in most donor-funded projects). It could be proposed that for some business development projects, long-term or sustained funding combined with a lack of business support can contribute to failure at scale up. It is essential for projects to develop a viable business plan from conception, which means specifying who will pay for a service and how much they will pay (Goyal 2011). There is also potential for content providers to renegotiate with their service providers for a larger share of the monies their content generates, especially if this is presented as a business case and based on accurate monitoring of the traffic a specific service draws to the network.

– – –

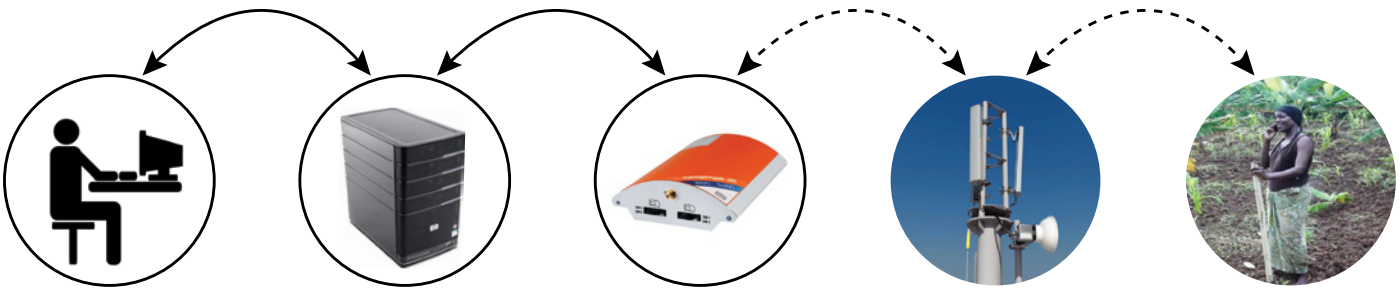

Figure 2. The route to the user: how knowledge is transferred along the data chain.

2. Case study: The Lifelong Learning for Farmers Programme in Uganda

The Lifelong Learning for Farmers (L3F) programme in the district of Kabale, Uganda, responds to a critical need: it enables farmers to use ICT technology – particularly mobile technology – to access information from agricultural research and development, which often doesn't travel the last mile to villages where it is most needed. L3F helps rural communities to receive, use and deploy appropriate technology-based open and distance education to improve their livelihoods. It allows farmers to share information among themselves from their own direct experience, and tackles the disconnect between scientists, extension officers and the farmers they are supposed to serve. This is especially important at a time when governments face challenges in funding adequate agricultural extension, and globalization is creating increasing competition for poor rural farmers. L3F is supported by Commonwealth of Learning (COL).

L3 Farmers empowers rural farmers to:

- gain knowledge
- create their own self-directed learning process
- organize themselves to solve problems around marketing their products and food security
- improve their living conditions, and
- increase their freedom and independence from government support.

In 2009 COL surveyed farmers in Kabale district to assess their information needs. Results indicated that conventional extension systems often have limited impact, and that there are serious gaps in understanding and communication between scientists, extension officers and the farmers they are supposed to serve. The survey also revealed the prevalence of mobile phone use among smallholder farmers, and the great potential of mobile technology to enable information exchange between them. This prompted COL to launch a pilot initiative on the use of mobile phones as tools for learning and disseminating information.

L3F Agriculture Information Mobile System (The Farmers' Phone)

COL initially invested USD 5,000 for the SMS service to pay for phone credit and radio advertisements, and hired two consultants to develop content on sorghum and potato management. The information the system provides is developed in consultation with farmers and covers an array of topics, including best agricultural practices, market information, fertilizer use, natural resource management, financial management, plant spacing and disease control (table 1). The content is translated into farmers' local dialects and edited into bite size chunks and distributed via SMS twice a week. The SMS system also allows farmers to retrieve content, through use of keywords, from a simple database populated with agricultural information. For example, a farmer can punch "potato diseases" into a phone, and send it to 6868. The farmer receives an instant response with relevant information, and diseases can be prevented.

Type of information	Percentage of farmers expressing a need for information
Market information	35
Soil fertility technologies	20
Crop management technologies	14
Fertilizers sources and use	11
Soil and water technologies	10
Crop variety technologies	9
Livestock: improved breeds	1

Table 1. Need for agricultural information as expressed by smallholder farmers in Kabale district, Uganda (COL survey 2009).

Farmers can also submit a question or advice through the system. The question or information is then shared with experts who provide a quick response. Typically a farmer might ask, "What causes my potatoes to wilt when they start flowering?" or, "Does planting my potatoes in lines increase yield?"

Impact of the programme

Since 2009, the SMS service has benefited more than 1,000 farmers in Kabale district. Apollo Kaboroga of Kacerere village said, "We have more than 46,000 farmers in our sub-county but we have only one extension officer to serve all of them. Yet, farmers have diverse enterprises which an extension officer may not handle even if he or she did reach them." Kaboraga continues, "Through the mobile phone service I have been able to get more income from my potatoes because the information helps us to link directly with buyers in Kampala. I can now sell a bag of potatoes for up to 80,000 shillings, compared to the paltry 50,000 or sometimes 40,000 that middlemen paid by taking advantage of our ignorance of market prices".

Charles Byarugaba, another user from Kacerere Parish, said, "The information we get has enabled us to produce more food, and also find markets in record time. I now know the right plant spacing, good harvesting methods, and how to deal with potato blight." Byarugaba also says there were challenges for some farmers who cannot read or retrieve messages from their handsets, but that voice messaging can take care of those who are illiterate.

Advantages of the system

The L3 Farmers programme offers many advantages over traditional means of communicating agricultural information. Crucially, research can be disseminated in such a way that it is easily understood by those not familiar with scientific jargon.

Furthermore, the system is non-linear and breaks with older, top-down ways to communicate. It offers people the opportunity share indigenous knowledge with fellow farmers and to integrate it into the research and extension system. For example, shared messages such as this – "Use neem tree leaves to keep your grain safe: dry the leaves, grind them and mix with the grain in the bags that you want to store" – represent the kind of knowledge that does not exist in the linear extension process, but which ICT makes available. The system can also deliver local market information in a timely way, which helps farmers make informed decisions on where to sell produce. This reduces transaction costs and increases profitability.

Tackling the limitations of SMS

Many smallholder farmers in Uganda are illiterate. Text messages also contain a maximum of 160 characters, which limits the amount of information that can be packaged into a single message.

The voice-based component of the system is built on a free and open source application called Freedom Fone. This software enables audio content to be created and shared using Interactive Voice Response (IVR), voicemail and SMS (figure 3). Audio content can be easily organized in multiple voice menus which are navigated via the keypad. This audio-based software has allowed L3F to create two-way phone-based communication services to interact with farmers in their local dialects at any time, and without recourse to the Internet or other media. The kind of voice menu used is commonly encountered on customer service helplines, where the caller may be asked to, "press 1 to change language, press 2 to speak to a representative, etc.".

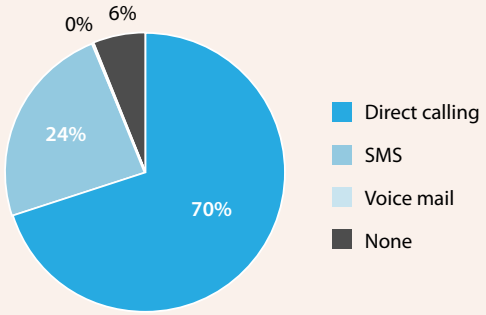

Figure 3. Proportion of farmers using different phone services to access agricultural information. A large majority of farmers use direct calling to access information, which justifies the need for voice-based systems (COL survey 2009).

The voice-based system runs on a computer connected to a GSM device through a USB connection. The GSM device takes in a cell phone sim card, and it is this number that farmers call to access the service.

The voice messaging application has been tested with over 500 farmers, and in the first month of its operation users made more than 100 calls to request information.

Scaling up

The L3F initiative has shown that the mobile phone is an ideal tool for rural learning, and that this technology should be integrated in conventional extension systems. How can it be scaled up to reach more people in a sustainable way? Below is a list of recommendations.

1. Bring telecom companies on board to agree on a revenue-sharing agreement as a means to sustain the initiative. Telecom companies could offer a waiver to farmers for calls to the service to make it more affordable.
2. Invest in more equipment so that a higher volume of calls can be handled simultaneously. The current GSM device can only handle one call at a time, which clogs up the system during hours of peak use. An alternative power source is also needed to ensure that the system is available at all times, even when there is a power outage.
3. Promote the service through available media, including radio and print, to attract usage and make a greater number of farmers aware of the service and how they can access it. This will drive more traffic to the service and create a more sustainable venture.
4. Integrate the service with research systems and government extension systems. This can be done through the National Agricultural Research Organisation (NARO) and National Agricultural Advisory Services (NAADS) that are responsible for research and extension in Uganda.

Published 3 September, 2012

References

Aker, J.C., 2011. Dial "A" for agriculture: using information and communication technologies for agricultural extension in developing countries. Conference Agriculture for Development-Revisited. University of California, Berkeley. 1–32.

Aker, J. C., and Mbiti, I., 2010. Mobile phones and economic development in Africa. Journal of Economic Perspectives. 24(3). 207–232.

Anderson J., and Feder G., 2007. Agricultural extension. Handbook of Agricultural Economics, vol. 3 Evenson R. E., Pingali P. (eds). Elsevier Science, Amsterdam, The Netherlands. 2343–2378.

Goyal, A., 2011. ICT in Agriculture Sourcebook: Connecting Smallholders to Knowledge, Networks, and Institutions. World Bank.

Gakuru, M., Winters, K. and Stepman, F., 2009. Inventory of innovative farmer advisory services using ICTs. Forum for Agricultural Research in Africa (FARA), Accra, Ghana:

ITU, 2012. The Little Data Book on Information and Communication Technology, 2012. International Telecommunication Union and World Bank. www.itu.int/ITU-D/ict/publications/material/LDB_ICT_2012.pdf

Thomson, J.A., 2006. GM Crops: The Impact and the Potential. CSIRO Publishing, Collingwood, Australia. 65–77.

Qiang, C. Z., S. C. Kuek, A. Dymond, and S. Esselaar. 2012. "Mobile Applications for Agriculture and Rural Development." World Bank.

Published by

SIANI
Stockholm Environment Institute
Kräftriket 2B
SE -106 91 Stockholm
Sweden
www.siani.se

Authors

Matthew Fielding & Daniel Ninsiima