

# Use of low cost information communication technologies for knowledge mobilization in agricultural communities in Sri Lanka

HACK Jayathilake<sup>1#</sup>, UK Jayasinghe-Mudalige<sup>2</sup>, GA Gow<sup>3</sup>, N Waidyanatha<sup>4</sup> and LDRD Perera<sup>5</sup>

<sup>1</sup>ICT Centre, Wayamba University of Sri Lanka, Gonawila, Sri Lanka

<sup>2</sup>Dept. of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Gonawila, Sri Lanka

<sup>3</sup>University of Alberta, Edmonton, Alberta, Canada

<sup>4</sup>LIRNEasia, 12 Balcombe Place, Colombo 8, Sri Lanka

<sup>5</sup>Dept. of Computing and Information Systems, Faculty of Applied Sciences, Wayamba University of Sri Lanka, Kuliypitiya, Sri Lanka

#hackjayathilake@gmail.com

**Abstract**— *The potential role and significance of mobilization of scientific and indigenous knowledge to promote sustainable agriculture is well recognized. Yet, the inherent features associated with traditional agricultural extension methods and high costs of information provision act as the major barriers to improving the livelihood of farmers, especially those from developing countries characterized by subsistence agricultural systems. On this rationale, this study examined empirically the potential use of low cost information communication technologies (ICTs) for knowledge mobilization in rural agricultural communities in Sri Lanka. A series of pilot-tested field experiments, termed as “campaigns” and each programmed to run within 2 to 3 months in a selected agricultural community, were carried out in the Batticaloa, Kurunegala and Matale districts during April to September 2014 to collect data from 210 households. Three identified low cost user-friendly Free and Open Source (FOSS) ICTs, namely: (1) Frontline SMS for text messaging; (2) Ushahidi for crowd mapping, and (3) Freedom Fone for interactive voice response were practiced in order to evaluate the use and relative effectiveness of ICTs for agricultural knowledge mobilization. The outcome of the study shows that ICTs interventions increase the information provided to the stakeholders in the agriculture sector by about 40% and, more importantly, diminish the transaction costs incurred in the process of knowledge mobilization (i.e. cost of searching, negotiating and verification of information) markedly; thereby, can act as a drive for positive changes in the livelihood of agriculture-based rural communities.*

**Keywords**— *Agricultural communities, Information Communication Technology (ICT), Knowledge mobilization*

## I. INTRODUCTION

Knowledge mobilization in support of sustainable agriculture has been identified as a vital activity that faces numerous challenges today (Aker, 2010), and Information and communication technologies (ICTs) have long been regarded as forces for positive change in agriculture and rural development (Duncombe, 2012). Constraints and limitations on traditional agricultural extension methods as well as high costs of information provision have been cited as barriers to improving the livelihood of farmers in developing countries (De Silva *et al.*, 2011; Rivera *et al.*, 2009).

ICTs are considered, particularly amongst the frontline development practitioners, as important tools for mobilizing knowledge, because, they can, from one hand, lower the ‘transaction costs’ associated with information seeking and/or introduce new ways to enhance farmer training through the use of audio visual media and Internet access, on the other (Anon, 2011).

Mobile phones can play an important role in advancing this approach, particularly in an agricultural context where collaborative work is commonplace across the value chain (De Silva *et al.*, 2011, Duncombe, 2012). Most recently, it has become the subject of intense focus within the information communication technology for development (ICT4D) community, because it is seen as a low cost and widely available communication tool that holds considerable promise for knowledge mobilization in the agriculture sector (Qiang *et al.*, 2011).

Recent attention in the ICT4D community has also turned toward the importance of promoting change at the grassroots level with direct participation of technology users, which is commonly referred to as ‘inclusive innovation’. In fact, this is a process that empowers users

to participate directly in the conceptualization and implementation of new ICT initiatives (Heeks *et al.*, 2013). New opportunities to promote inclusive innovation have opened with the availability of several low cost, open source software platforms that enable customized services for ‘text messaging’, ‘crowd mapping’, and ‘interactive voice response’ (IVR) systems. Despite the possibilities that these systems offer, enabling effective use of the technology and building capacity within local communities to innovate with them remains a significant challenge for ICT4D projects (Gurstein, 2003; Kleine, 2013). In light of above, this study was designed assess empirically the potential use of low cost information communication technologies for knowledge mobilization in rural agricultural communities in Sri Lanka. The identified low cost user-friendly ‘Free and Open Source’ ICTs include: “FrontlineSMS” for text messaging; “Ushahidi” for crowd mapping, and “FreedomFone” for interactive voice responses, and basic characteristics of each is described below in short.

FrontlineSMS (FLSMS) is free open source software enables users to connect a range of mobile devices to a computer to send and receive SMS text messages. The software works without an internet connection by connecting a device such as a cell phone or GSM modem with a local phone number. FLSMS can send and receive messages, group contacts, respond to messages, and trigger other events. If internet access is available, FLSMS can be connected to online SMS services and set up to feed incoming messages to other web or e-mail services. FrontlineSMS includes different features, which enable messages to be filtered by keyword, or allows the submission of java based forms with FLSMS Forms.

Ushahidi is FOSS built on the Kohana web framework, a fork of the Code Igniter framework. It includes built-in support for Nexmo wholesale SMS application program interface (API) and Clickatell SMS gateways. Furthermore, the official Ushahidi-hosted websites use the commercial service. Ushahidi provides the option of using OpenStreetMap maps in its user interface, but requires the Google Maps API for geocoding. Ushahidi is often set up using a local SMS gateway created by a local FrontlineSMS set-up.

FreedomFone (FF) is free and open source software that enables you to create and share audio content using IVR, voicemail and SMS. FF allows you to create two-way phone-based communication services to interact with

any audience, in any language, at any time and without recourse to internet or other media. There are no geographical limitations to FF, so it can be used in any country with mobile network coverage and runs on Debian and Ubuntu Linux operating systems.

## II. METHODOLOGY

The initial step towards planning this comprehensive study was to identify the interested parties to work in collaboration with the Wayamba University of Sri Lanka (WUSL) and University of Alberta, Canada. A national workshop was organized for this purpose at the WUSL that brought together a number of key stakeholders from an array of institutions representing the government as well as the non-governmental and private organizations. During the workshop, they were introduced to the new technologies and exposed to rapid prototype techniques with the text-messaging, crowd mapping, and IVR systems. At the end of this activity, eight organizations, as shown in Figure 1, have expressed their willingness to adopt the model in principle and were interested in further interactions related to the research.



Figure 1. Communities selected for pre-campaign

After the workshop, a series of discussions and meetings were held (i.e. Phase I) with three selected organizations and their communities from three districts, namely: (1) “Janthakshan” in Batticaloa; (2) Department of Export Agriculture in Kurunegala, and (3) “Rangiri Radio” in Matale. During each of these meetings, the research team was able to identify a one major problem from its community, and in turn, furnished quick solutions by configuring ICTs called ‘rapid prototyping’.

In Phase II, those selected organizations were committed in moving ahead with the “campaigns”, which is an

activity runs for a certain period of time (i.e. 2 to 3 months) and having a specific objective to reflect the need and wants of the respective community identified. Further, a Campaign consists of main four factors, including: (1) Sponsor; (2) Technology Steward (3) Community, and (4) Technology (Table 1).

Table 1. Campaign overview

Organization	Community location	Technology
Janathakshan	Kathiraweli, verugal, kirankullam	FLSMS, Ushahidi
Department of export agriculture (North)	Dambahera, madahapola, omaragolla,	FLSMS, FF, Ushahidi
Department of export agriculture (South)	Paragoda, hewanpola, madithiyawa	FLSMS
Rangiri radio	Island wide	FLSMS, FF

A face-to-face interview supported by a structured questionnaire was conducted with a purposively selected sample of 210 households from these three districts during the period of April to September 2014. The 'LIRNEasia Teleuse@BOP4' instrument was adopted, in particular, for the purpose of preparation of questionnaire to gather information pertaining to the socio-economic and demographic data of respondents as well as their behaviour on agriculture information seeking, ICT use and adoption (LIRNEasia, 2012).

### III. RESULTS & DISCUSSION

The types of agriculture related information expected from the surveyed community was illustrated in Figure 2.

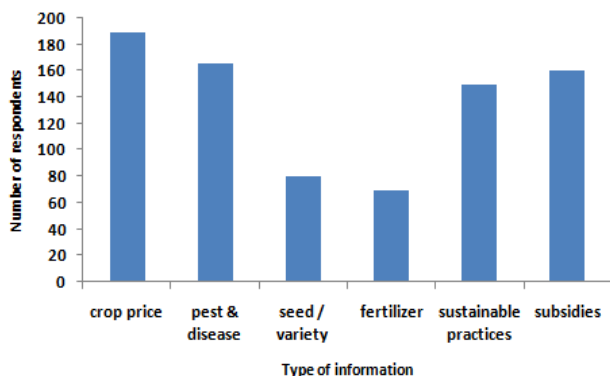


Figure 2. Type of information communities expected. It highlights that farmers were concerned about the accurate and reliable information on the prices of the crops, methods in pest and disease control, sustainable crop management practices, seed and plant materials,

and fertilizer and subsidiary schemes. They used to collect such information from various sources such as government officers and non-governmental organizations work in the respective geography, family members and fellow farmers, farmer organizations and market venders.

As shown in Figure 2, farmers were more concern in getting accurate and reliable information on crop prices (90%) mainly because of the fact that they were relatively away from the major markets. Information with regard to pest and disease control and subsidiary schemes were rated as other most important factors in this connection.

Figure 3 depicts the sources of agricultural information seek by the communities in concern. Farmers use various sources for getting valid and reliable information, and in fact, about 90 percent of farmers rely on government officers in the respective area, mainly the Extension Officer and Regional Development Officer, for this purpose. They used to have regular visits, depend on the need, to their offices, especially on Wednesdays or by appointment through a voice call. We found that all these attempts were relatively costly and the transaction costs (i.e. search, negotiation and verification) associated with such contracts was also considerably high.

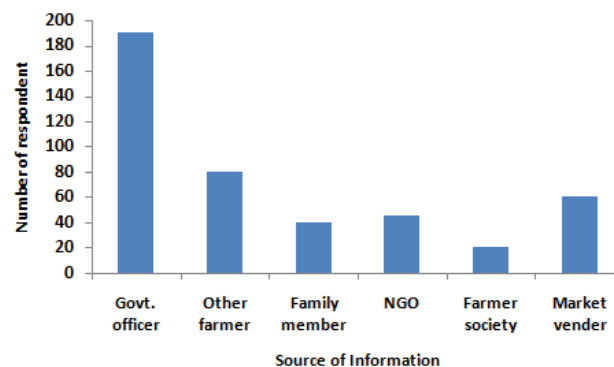


Figure 3. Source of agricultural information

Although farmers obtain information in need from fellow farmers and market venders (i.e. 38 and 29 percent in the sample, respectively), they were not seen as reliable as previous sources, Mostly, when they go especially such as such information obtain from the market venders as there may be a tendency to cheat farmers for mere advantage of selling their products to them (i.e. seeds, fertilizer etc.)

Figure 4 illustrates the modes of accessing these information sources by using ICT enable devices or services before the campaign. Radio, computer or cafe, voice call, SMS and internet were categorized as ICT enable devices or services.

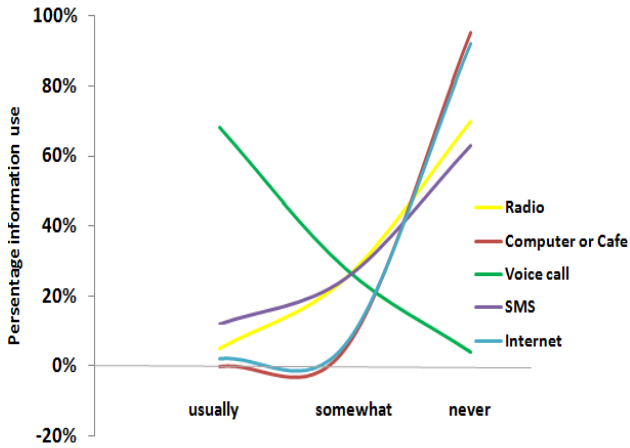


Figure 4. Mode of getting information pre-campaign

The pattern of transfer of messages in the process of implementation of low cost ICTs in selected organizations was shown in Figure 5, i.e. the overall message transfer during 10<sup>th</sup> April to 20<sup>th</sup> June 2014. During the campaign period farmers were regularly registered in campaign system and sent lots of messages in agricultural related activities.

Figure 6 depicted the modes of accessing these information sources by using ICT enable devices or services after the campaign.

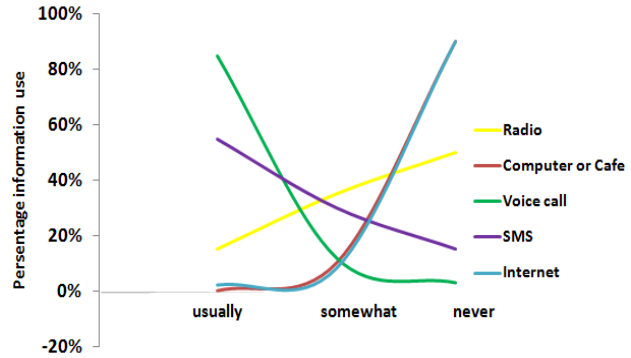


Figure 6. Mode of getting information post-campaign

With regard to the available ICT enable devices or services used by the farmers in the selected areas, about 68 and 12 percent of farmers use voice call and SMS, respectively, or other words, nearly 68 percent of farmers use mobile phones to facilitate their day-to-day activities. Interestingly, the rate of use of radio, computer and internet were reported “very low” amongst the farmers. High uses of mobile phones facilitate implementation of low cost ICTs such as text messaging and interactive voice responses for knowledge mobilization. During the campaign period, farmers have registered regularly in the campaign system.

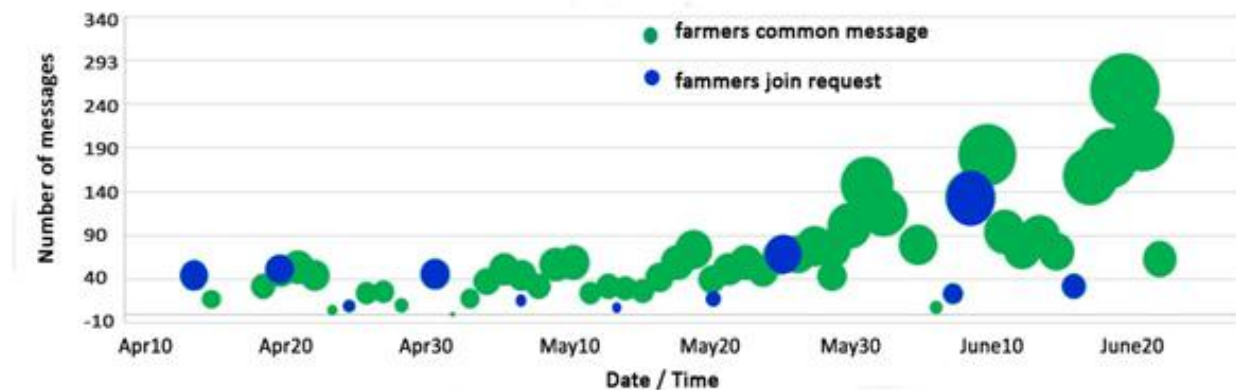


Figure 5. Message transfer during a campaign

They have, in fact, sent a large number of messages related to agricultural activities during this period as compared to 12 percent before the Campaign initiation. With regard to the use of SMS and Voice calls, they were increased from 12 to 55 percent and 68 to 85 percent, respectively, from pre- to post campaign period.

#### IV. CONCLUSION

The outcome of study shows that ICTs interventions increase the information provided to the stakeholders in agriculture sector by about 40 percent and, more importantly, diminish the transaction costs incurred in the process of knowledge mobilization (i.e. cost of searching, negotiating and verification of information) markedly; thereby, can act as a drive for positive changes in the livelihood of agriculture-based rural communities

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#### BIOGRAPHY OF AUTHORS



HACK Jayathilake is a Lecturer attached to the Information Communication Technology Center of the Wayamba University of Sri Lanka (WUSL) and currently pursues his Doctoral studies at the WUSL. He also serves as a Graduate

Research Associate to the research project carried out by 'ICT Rapid Prototyping Working Group' funded by the Social Science & Humanities Research Council (SSHRC) of Canada. He contributes to a wide range of academic, research and national development work related to the ICT for Agriculture Development (ICT4AD) arena.



Dr UK Jayasinghe-Mudalige is the Professor (Chair) of the Department of Agribusiness Management, Faculty of Agriculture & Plantation Management, Wayamba University of Sri Lanka. He served as a Fulbright. Visiting Professor to University of Massachusetts, USA in 2014/15. Currently, he engages in consultative and research work on agricultural economics and business, economics of

food-value chain, and environmental and climate change economics.



Gordon Gow is Associate Professor of Communication and Director of the Graduate Program in Communications and Technology in the Faculty of Extension at the University of Alberta, Canada. He is also affiliated with the Centre for Policy Research on Science and Technology (CPROST) at Simon Fraser University. His research interests revolve around the impact of social media and other new communication technologies in the areas of public safety, public health, and community engagement. His current projects include a SSHRC Partnership Development Grant on using low-cost communication technologies to support agricultural communities of practice in Sri Lanka.



Nuwan Waidyanatha is Sr. Research Manager, LIRNEasia with LIRNEasia. He has a background in Operations Research and Computer Engineering, and has been working in the ICT4D field since 2005. Much of his research with LIRNEasia takes place in the Asia Pacific but he collaborates with partners around the world. He actively contributes to several free and open source software communities and holds an official position with the Sahana Software Foundation.



Rohana Perera is a Senior Lecturer and Head of the Department of Computing & Information Systems, Faculty of Applied Sciences, Wayamba University of Sri Lanka. He holds a BSc (Hons) in Physics and MPhil from University of Kelaniya, Sri Lanka, and D.Eng. from Kyushu University, Japan. His research interests include Solar Energy conversion, solar cells and Electronic Devices.