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VIRTUAL OUTREACH: USE OF MOBILE TECHNOLOGIES FOR KNOWLEDGE MANAGEMENT AND EXTENSION SERVICES IN RURAL COMMUNITIES

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ABSTRACT: Small farmers dominate farming in the Caribbean, where state extension and advisory services are financially stretched. The provision of timely, accurate advice, therefore, is less than adequate. The context of the problem investigated spans geographical locations with primary sites located in St. Vincent and with Trinidad and Tobago with secondary testing sites such as Belize, Kenya, and St. Kitts and Nevis. Agricultural field staff participated in the testing of the Virtual Outreach System. The Virtual Outreach System addresses the constraints and limitations of extension workers. Using a smart phone queries can be sent to a subject matter expert at the University of the West Indies, with or without a photo attached, and gets a response within 48 hours. Developed in September 2011, a virtual extension outreach pilot project was tested in St. Vincent and the Grenadines, Belize and Kenya between October 2011 and January 2012 allowing for modifications to meet farmers' specific needs. Positive results were obtained, showing that information and communication technologies (ICTs) could have substantial impact on agriculture, as it could improve institutional information management, and communication between regional cooperation institutions and farmers, promote trade, financial cooperation and efficiency in key sectors such as agriculture and education. Results obtained from the focus group used to evaluate the initiative were contrary to popular belief that farmers are typically stuck with the old fashioned mind set and prone to rigid behaviour as far as technology adoption is concerned. In fact, they were very eager to learn new techniques. Most of the farmers showed immense interest in getting latest information and learning techniques which could transform their "age-old" farming methods.

Keywords: Virtual extension, ICTs, communication, farmers, Extension staff, Caribbean.

Introduction

Knowledge can be defined as personal belief which increases an individual's ability to take effective action (Nonaka 1994); however, Vance (1997) defines knowledge from an information systems perspective as information that has been authenticated and thought to be true, thus implying that information becomes knowledge after it has been processed.

The accessibility of relevant knowledge and information to farmers is extremely poor in developing countries as both the infrastructure and the network are not well developed, used and managed (International Service for National Agricultural Service, EFITA 2006

Conference). The current contemporary approach to agricultural extension does not allow farmers to take advantage of the wealth of agricultural knowledge that exists, as there are not enough extension workers to service the farming community rendering a gap between keeping the extension workers up-to-date with the latest advances in agricultural technology and knowledge to identify and diagnose new pests and diseases.

“ICT (information and communications technology - or technologies) is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning” (Tech target 2011).

ICTs can assist in addressing this problem as they can disseminate most up-to-date information quickly and cost effectively. This modern information technology support gives organisations the ability to organise information and solve problems anywhere in the world at any time as it allows the exchange of knowledge amongst individuals and the growth of a knowledge base which promotes learning leading to further knowledge creation. Worldwide, our lives are becoming increasingly integrated into ICTs as it is an emerging avenue for the dissemination of agricultural information.

The majority of the rural population of St. Vincent farmers depend on agriculture as their main source of income. With particular emphasis on the banana industry, which currently faces major challenges in enhancing its production. ICT can play an important role in addressing this challenge as this research aims to assess the potential role of ICTs driven by mobile technology to: capture, store, access and disseminate relevant information in a timely fashion.

Methods

A virtual extension outreach pilot project was developed in September 2011 and tested on a focus group study carried out in St Vincent and the Grenadines between October 2011 and January 2012. Two mobile phones were provided to assess the information and communication technology (ICT) needs of farmers using a focus group made up of six female and three male farmers from Langley Park. The intension of the pilot project was to identify and analyze with the community members their constraints, opportunities, prospects and priorities with respect to Information Communication Technology (ICT) facilitated by the use of mobile phones. Participatory tools and techniques were utilized to explore relevant issues relating to the livelihoods, wealth, crop production, processing, marketing and problem prioritization which affected their agricultural enterprises.

Focus Group Discussion

A team familiar with the community visited the Fair trade banana community to recruit farmers for the focus group discussions. A focal person from the group was identified to

facilitate the process. The recruiter approached the focal person who introduced him to various farmers. Farmers were selected on selection criteria, availability and their consent to participate in the discussion. A brief questionnaire for profiling the farmers was filled for each farmer and they were guided about the details of the discussion. The discussions based on the broad guidelines were moderated by the researcher. Two different mobile phone sets and a computer were used to show the audio and video messages to the respondents and demonstrate its uses in the banana industry. The participants were shown examples of audio and video messages using two different mobile sets to gauge their level of expertise on various functions of the cell phone. The messages were tested for their clarity, comprehension and conception. Their acceptability and farmers' immediate reaction to the concept were also recorded. The farmers' body language and expression were recorded by the moderator to gauge their acceptability to the concept of using ICT's for information dissemination. The discussions were audio recorded for the purpose of transcription and report writing. The results of the focus group discussion was the baseline for the proposed system (Figure 1).

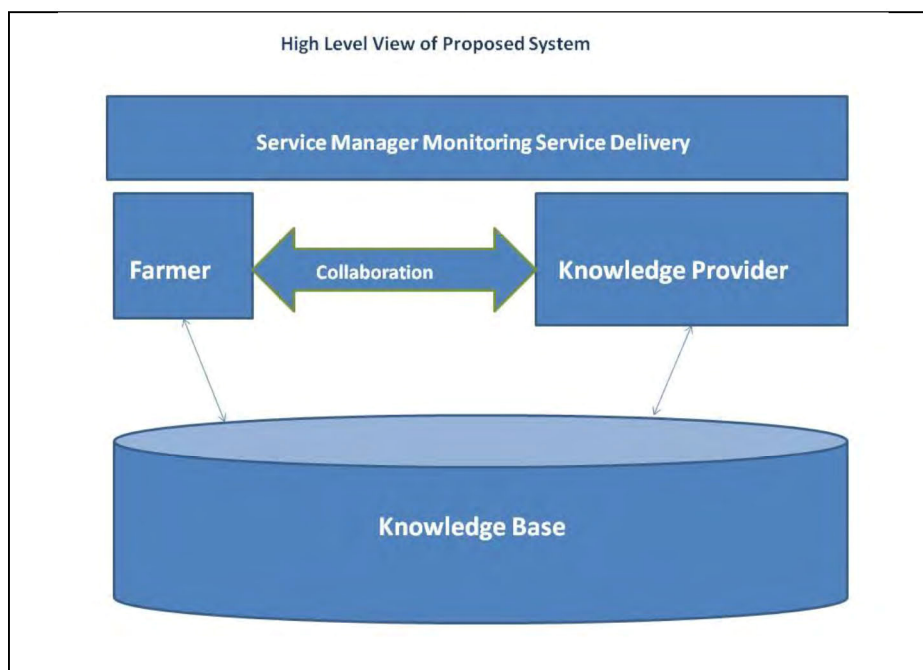


Figure 1. Illustrates the high-level view of the proposed system.

The Virtual Outreach System

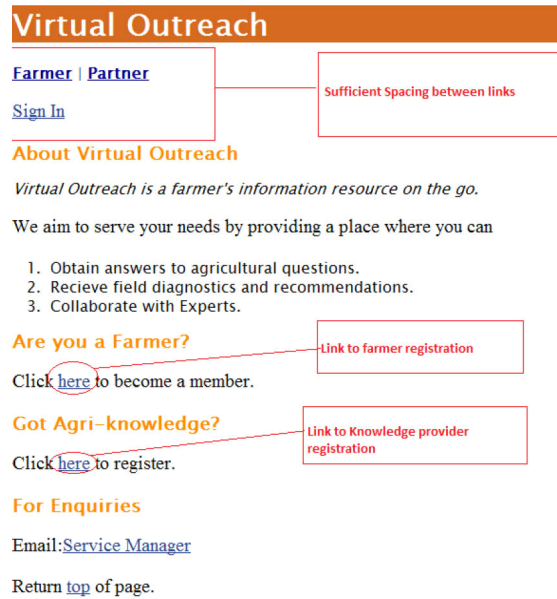


Figure 2. The Virtual Outreach System.

Based on the conceptual model derived from initial discussions amongst the team on the solution it was decided that Evolutionary Prototyping will be used with three major milestones (Figure 3). These phases are based on the implementation of modules:

- Question and Answers (Q&A) Services
- Field Diagnostics and Recommendation
- Collaborations and fostering Communities of Practice



Figure 3. Visual represent the development process of the three modules of the system.

Results and Discussion

The rapid spread of information and communication technologies (ICT) in developing countries over the past decade offers a unique opportunity to transfer knowledge via private and public information systems. Mobile phones provide new opportunities to compliment traditional agricultural extension programmes to rural farmers as they give access to information on agricultural extension systems in a cost effective manner. ICTs can be used in agricultural knowledge for the improvement of communication linkages between research and extension services to farmers, as it brings new information and technologies to these communities thus allowing improvement in their production and standards of farming.

In agriculture, extension plays a vital role in its development as it brings new information to farming communities (extension conference, 2011), allowing them to improve their production, income and standards of living. Buford (1990) highlighted the dependency of agricultural extension on information exchange between and among farmers and other individuals integrally involved in the agricultural sector.

The swift adaptation rates of smart phones and innovative technologies have transformed the mobile phone into a platform that is capable of supporting various activities ranging from commerce to entertainment. The advance computing platform of the smart phone has practically created limitless opportunities for application developers to construct new ways to support a variety of commercial industries, academia and personal usage.

The context of the problem domain spanned geographical locations with primary sites located in St. Vincent together with Trinidad and Tobago. There were also secondary testing sites such as Belize, Jamaica, and St. Kitts and Nevis; where agricultural personnel participated in the testing of the Virtual Outreach System.

Focus was placed on the primary sites the farming community based in St. Vincent, Langley Park while information providers resided at the University of West Indies (UWI), St. Augustine. Given the characteristics of the Langley Park community much of the people's livelihood are dependent on the production and quality of crops. However, the attacks of various diseases that often destroy their yield and potential income, possessed a major challenge for the village. In recognition of this difficulty in Langley Park as well as in other CARICOM states, a number of lectures within UWI Food Production and Agricultural Extension departments made it a mandate to offer outreach services to the rural communities of the CARICOM states. This service essentially pertained to the provisioning of critical information which assists farmers in diagnosing crop diseases, advice on preventing the spread of diseases as well as improving yield quality.

Key improvements stemmed from information about pest and disease control as this was the most pressing concern within the focus group, especially early warning

systems, new varieties, and new ways to optimize production (through training videos) so that their produce can be marketed on an international market. Awareness of up-to-date market information on prices for commodities were some of the queries sent via the virtual outreach system by the farmers; inputs and consumer trends, all of which can improve farmers', particularly females livelihoods' substantially and have a dramatic impact on their negotiating position in society. Such information which can be disseminated through the virtual outreach programme can be instrumental in making decisions about future crops and commodities and about the best time and place to sell and buy goods.

The Major Findings

Crop production and general farming activities were identified as the prominent sources of livelihood involving men and women, with more than 50% of the women engaged in banana production and other farming activities as their primary livelihood ventures. Crop production and farming account for more than 80% of the means of livelihood for both men and women. Similarly, cassava, yam, plantain and banana, were the priority food crops.

Among the banana enterprises, the priority activity of the community was the extraction of banana fiber. As agro tourism would be a major enterprise for them. Trading was the major non-farm livelihood activity for both groups.

The major problems with banana production, common to the community were weed problems, high cost of fertilizer, lack of capital/credit, improved varieties, and technical know-how. Proximity to the market as well as low and fluctuating prices was a major problem of marketing produce.

Appropriate strategies or development plans need to be carried out to meet both the banana production and processing needs of the farmers in St. Vincent.

Based on the results of the focus group discussions, the inability of farmers to use ICT was similar to the result of Gelb and Parker's (2006) workshop "*Questionnaire ICT Adoption Trends in Agriculture*". Placing personal impediments as the dominant factor over time, putting the challenge now to the ICT developers to integrate ICT into existing systems making the VO system more user friendly for stakeholders; apart from personal impediments the lack of time and availability of a wireless (Wifi) system, the backbone of the entire system is another constraint which needs to be resolved for the VO system to be a success and for ICT to be seen as a time saver.

The opportunity lied in increasing the efficiency, productivity and sustainability of small scale farms through technology transfer. The provision of this unique service through the use of ICTs in agricultural and rural extension to small farmers and the rural poor living far from the urban centres was able to promote non-formal education and information services. The results from the study was a clear indication that ICTs can make a significant contribution particularly in addressing the problem of the farmer:

extension officer ratio (500:1) in the Caribbean since it demonstrated that information can be transmitted simultaneously to more farmers compared to the traditional route of contacting them through site visits.

Generally, the results obtained from the focus group were contrary to popular belief that farmers are typically stuck with the old fashioned mindset and prone to rigid behaviour as far as technology adoption is concerned. In fact, they were very eager to learn new techniques. Most of the farmers showed immense interest in getting latest information and learning techniques which could transform their “age-old” farming methods.

Constraints in adopting ICT are not new, as it has been at the forefront of national and regional policies ever since computers became available for agricultural management and production (Gelb and Parker 2006). Griffin et al. (2004) argued that it is important to understand farmers’ reasons for non-adoption first and then try to help the farmers address their questions to make them more confident in adopting the technologies to use.

The Focus Group identified five areas of particular importance:

- Investments in training and research
- End user involvement in ICT development
- Use of ICT to facilitate end user needs
- Identifying participants roles in the ICT programme
- Adoption barriers and their limitation
- Constraints in obtaining the necessary tools

Barriers to the Uptake of the VO system

Farmers Profile

There were nine farmers in all who participated in Focus Group Discussions. Various angles of their profile have been discussed here.

Age profile

The age profile here is not indicative of the natural age distribution in the farmer category. As age can act as an agent of change, as it allows the researcher to gauge the behaviour and approach towards utilising new technologies. The greater proportion of farmers was of the age group 46-65 (56%).

Size of Farm

The land sizes documented here are those of the participant group and is not a clear indication of the average size of the land of the average farmer within the community, as there was no correlation between age and land size to draw a conclusion that older farmers tend to have more land, as farm land can be acquired through many mediums

such as personal investment to inheritance. The size of the farm differed amongst participants however it ranged from 1 to 5 acres.

Literacy Capability of the Participants

There were only two participants who had low levels of literacy. Overall the total sample had education levels providing them with the capability to read and write and operate the system. It was encouraging to note that there is a growing tendency among the farmers to educate their children. The families under interaction had very healthy education trends; the younger generation of farmers (35-45) were more likely to invest in the VO system.

Mobile Habits

The farmers in the community have access to a mobile phone. The attitude towards technology mediums has been discussed below:

- Farmers operate mobile phones, but most of them can only make phone calls. Despite this restricted knowledge, they do feel comfortable with sending queries on their mobile phone
- The usual span of having a mobile phone in their possession was always.
- The use of an email address was not popular amongst the group.

Sources of Information

The various formal sources of information reported by the 9 farmers were government extension workers, representatives of private agro-chemical companies, distributors/retailers of pesticides and fertilizers and other farmers; no one sought the internet, books or magazines for sources of information.

Farmers Perception Towards their Existing Level of Information and Knowledge

There was mixed reaction towards farmers' perception of the level of their existing information and knowledge. The most commonly reported response was that they are aware of the traditional farming methods as they grew up with them. However, almost all the farmers acknowledged the limitations of information on modern technologies.

They endorsed the fact that use of modern technologies (VO system) would largely affect their livelihood. However, it was recognised that the farmers need to be properly educated and trained on the system by practicing and utilizing the system, also the resources budget has a very strong influence as this very well thought out idea in theory would totally fall short if the farmer cannot afford it.



Figure 4. Framers from the focus group communicating via Skype

Finally, the concept of using mobile phones as a major tool for reaching out the farmers and transmitting timely and low cost information was highly accepted amongst the group and the use of mediums such as SKYPE and You tube can communicate with a large group at once without being physically present for a face to face meeting.

As most of the farmers had cell phones (very few had access to smart phones), after the training session the farmers became conscious about buying better quality phones, however, the fact that these devices were quite costly in their country along with the fact that the available data plans were also expensive proved to be a hindrance.

Generally, the results obtained from the focus group were contrary to popular belief that farmers are typically stuck with the old fashioned mindset and prone to rigid behaviour as far as technology adoption is concerned. In fact, they were very eager to learn new techniques. Most of the farmers showed immense interest in getting latest information and learning techniques which could transform their “age-old” farming methods.

Within the concept of the Virtual Outreach (VO) mobile system the main activities are data collection, processing and variable rate applications of inputs. The tools available consist of a wide range of techniques and technologies from information and communication technology.

The provision of extension services by an institution is intrinsically information intensive, and researchers and experts face many difficulties in efficiently managing the enormous amount of data they collect/receive. They may lack sufficient time or are reluctant to invest the time needed to analyze the data and interpret the information. Additionally, the economic benefits of VO practices have yet to be proven.

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