ICT intervention for Agricultural Development: Exploring Prospects for Pakistani Farmers

Syed Ali, Haris Durrani, Muhammad Naeem, Waleed Riaz, and Suleman Shahid*
Department of Computer Science, School of Science and Engineering (SBASSE)
Lahore University of Management Sciences
Lahore, Pakistan
{16100249, 16100206,16100201, 15030029, suleman.shahid}@lums.edu.pk

*Tilburg center for Cognition and Communication
Department of Communication and Information Sciences
Tilburg University, The Netherlands
s.shahid@uvt.nl

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Abstract
In this paper, we highlight the core agricultural information needs of the farmers of central Punjab. We briefly discuss how an application, which addressed the primary crop related problems of Pakistani farmers, was developed and appreciated by the farmers. The results of our work in progress show that there is a lot of room for ICT intervention for agricultural development in Pakistan. Most importantly our results show that many of the challenges faced by Pakistani farmers are actually common among the countries of the South East Asia region. This demand's for a more open, broader and systematic approach for solving common issues.

Author Keywords
Punjab; Farmers; ICT intervention; Pakistan

ACM Classification Keywords
H.5.2 [User interfaces]: prototyping, evaluation / methodology.

Introduction
Despite Pakistan being a predominantly agrarian which shares a major input to the country's GDP, it is far behind its neighboring countries in terms of per acre

yield [1]. For the past few years, Agricultural sector throughout the world has undergone significant improvements owing to the incorporation of technology with agriculture. With the availability of real time information about best farming practices, farmers can make better decisions and adopt methods that are best suited for the enhanced productivity of their crops. However in Pakistan, no prior work has been done for the integration of technology with agriculture sector and traditional means of information dissemination are still prevalent. The current methods for information retrieval by farmers are either through radio and television or in a word of mouth fashion by fellow farmers and retailers [2]. In the current era of science and technology, these methods have a limited scope [1] and suffer the problem of unreliability in case information is attained through peers or retailers. Conversely, many studies conducted in the developing world have shown that the intervention of Information and Communication Technology (ICT) in agricultural sector improves the farming standards and enhances productivity [3, 4]. Such systems have also been keenly adopted by the farmers as no prior technical knowledge is required.

User Research

The goal of user research phase was to identify the core information requirements of the farming community and to determine the usage of ICT as a medium to transmit such information.

Participants and Procedure

We chose central Punjab (Faisalabad District) to conduct the interviews as this region has a large belt of cultivable land including crops such as wheat, cotton, rice, sugarcane etc. The participants chosen had a minimum of 5 years of agricultural experience and had to be a thekay-daar (farmer who heads the land and has the decision making power). Due to their experience, these participants could rightly point out the problems or information requirements. Thirteen farmers were voluntarily interviewed, among which some were semi- or completely illiterate. The interviews consisted of open-ended questions to engage the farmers in discussions.

User Research Findings

Some of the key findings are:

Weather Uncertainty

The interviews indicate that farmers face the problem of weather uncertainty during whole farming cycle especially in sowing and harvesting phase. The farmers pointed out that weather uncertainty can be adverse to the production of their crops e.g. *"The rainfall should not occur at least one week after sowing the seeds of wheat"* (P #3, 5). The farmers claimed that if they know of the forecast beforehand they can irrigate their crops accordingly.

Unreliable Pesticide, Fertilizer and Seed Information System

One of the problems faced by farmers includes the limited pesticide information. Many famers pointed out that when their crop is facing pests attack, they have to rely on the dealers in the market for pesticides because they don't know what remedies to apply for certain pests. *"We cannot claim any damages to our crops due to ineffective or wrong pesticide provided by the retailer"* (P#9). There is no standardized information available to them. This result is in accordance to the

studies conducted in [3] which indicate that farmers are sometimes abused by retailers who can give them adulterated and substandard sprays that can spoil their crops.
Similarly, information regarding fertilizers is also scarce and the farmers have no credible source to retrieve information regarding the usage, prices and the location of purchase outlets of the fertilizers and seeds.

Canal Scheduling System
The ground water is salty in the rural areas of the Faisalabad district, as a result of which irrigation is highly dependent on the canal system. The canal (Upper Bari Doab) is closed for a month each year, but often the schedule is changed and the canal is closed for a longer period of time. No credible mechanism to disseminate changes in the schedule is in place for the farmers.

Design and Evaluation

In the first part of our project, we designed a touch based real-time KIOSK application because a KIOSK has an increased visibility, which can help our targeted audience to easily adopt and obtain any information as compared to other information retrieval mechanisms e.g. smart phones apps etc.

The key features of the KIOSK include 1) a weather forecast information option through which farmers can view the forecast and plan their farming activities accordingly, 2) a fertilizers information option along with its usage details and prices, 3) a pesticides information option categorized according to crops that can help farmers to adopt remedies. As the farmers primary language is Urdu, the interface was entirely in Urdu. To facilitate the illiterate farmers, images were used, alongside text, to map input options and an audio response system, in Punjabi, was employed throughout the design.

Results of the first evaluation round showed that farmers were very interested in the system because this was the first time they could access 'real-time' agricultural information on demand. They want such a system to be deployed in their nearby *Mandi* (vegetable/grain market) where these farmers visit frequently. Majority of the participants, who used such an ICT system for the first time, mentioned that some basic training would be sufficient to get well acquainted to the system. Overall the feedback of the farmers was satisfactory as most of them deemed the design to be simple and easy to operate due to presence of visual aid along with audio support.

We learnt that farmers consistently ask for government intervention and support. They, almost all of them, believe that such systems would be successful if the government 'systematically' supports them. Moreover it was clear that only such ICT support is not enough for them. They link any such intervention with the general improvement in their lifestyle, which they claim is only possible if they get clear financial benefits.

Work in Progress

As part of a broader 'ICT intervention for Agricultural Development' program in Pakistan, we started working on identifying the prospects of ICT intervention for Pakistani farmers. In the first round we designed a KIOSK application that disseminates real time and credible information for the farmers of central Punjab. The system is still under evaluation and will be improved in an iterative manner. Early results showed

that such a system is viable solution, which can be effectively used after basic training. However, it is important that such a system is maintained properly and framers perceive that it will be installed on long term basis and will bring clear financial benefits. Most importantly our results confirm that many of the challenges faced by Pakistani farmers are actually common among the countries of the South East Asia region. This demand's for a more open, broader and collaborative approach for solving common issues.

This is the first time such an ICT intervention is taking place in Pakistan and we are unsure of how Pakistani farmers would react to such a system. Moreover, unlike other countries Pakistan still upholds a landlord/*thekaydaar* system where decisions are made in the top-down fashion. If the *thekaydaar* of the land see an added value in the system, the chances of acceptance are higher. In our future work, we will not solely rely on tele-centers. We might need to fuse in more technologies e.g. IVR system (Interactive Voice Response) and consequently there is a greater need to develop an eco-system where farmers' needs are met at different touch points.

By the help of this workshop, we aim to establish new collaborations for starting joint projects. We believe that HCI for development workshop will provide an excellent platform for sharing our interests and insights with the wider community, which we gained while working with a diverse community from a very specific and relevant region. Finally, in order to help advance our understanding of this field, such an avenue and platform for discussion is essential.

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