An Android-Application to Assist Farmers Inagricultural Operations

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Abstract—*Agriculture accounts for 15% of the Gross Domestic Product (GDP) of India but employs close to 50% of theworking population. Average yield in India is quite low compared to other countries. Advances in Information anCommunication Technology (ICT) and the government initiatives in e-governance are only promoting e-agriculture in India.This can not only improve the condition of Indian agriculture but also the life and working conditions of the farmers. Thispaper is about an android application, using ICT, promoting e-governance by providing continuous information pertaining toagriculture like weather forecast, crop prices, news, government helplines, and an inventory database manager.*

I. INTRODUCTION

Agriculture, "The backbone of Indian economy", defined as an integrated system oftechniques to control the growth and harvesting ofanimal and vegetables. It is an uncomplicatedendeavor comprising of technical and practicalprocesses that helps in the maintenance of theecological balance and protects human resources most importantly it is a viable food production system.In 2012-13 agriculture contributed to 13.9% of thetotal GDP, and employed 47% of the total workforce population.The combined efforts ofCentral Government, State Governments and thefarming community have succeeded in achieving arecord production of 264 MT of food grains during2013-14.This record production has beenachieved through effective transfer of latest cropproduction technologies to farmers under various cropdevelopment schemes being implemented by theDepartment of Agriculture & Cooperation backed byremunerative prices for various crops throughenhanced minimum support prices. As Indianeconomy has diversified and grown, agriculture'scontribution to GDP has steadily declined from 1951to 2014, yet it is still the largest employment sourceand a significant piece of the overall socio-economicdevelopment of India. Crop

yield per unit area of allcrops have grown since 1950, due to the specialemphasis placed on agriculture in the five-year plansand steady improvements in irrigation, technology,application of modern agricultural practices andprovision of agricultural credit and subsidies since theGreen Revolution in India.However, Internationalcomparisons reveal the average yield in India isgenerally 30% to 50% of the highest average yield inthe world.In 2010, there were 38 crore mobile telephones inrural areas, 9 crore farm households and Internetpenetration is currently at 5% but improving.This increasing penetration of mobile networks inIndia therefore presents an opportunity to make usefulinformation more widely available and offer them opportunities in terms of improvingtheir quality of life. This could help agriculturalmarkets operate more efficiently, and overcome someof the hurdles faced by it.

II. OBJECTIVES

As discussed earlier, there is a need to exploit theadvances in ICT to foster e-governance which isimportant as the farmers need to work in tandem withthe government and take full advantage of the servicesprovided by it. The proposed mobile application actsas a farmer's assistant in the field. It provides essentialagriculture related information like weather forecasts,news, mandi (market) prices of crops to the farmer.There is also an in-built database in which the farmercan keep a track of his inventories, harvests, seeds andfertilizer purchases, vehicles and equipment, etc. Toreduce the amount of field work for the farmer theapplication also offers wireless switching on-off ofpumps for watering, irrigating. Wireless sensornetwork of soil moisture sensor, soil pH sensor andsoil temperature sensor is connected to an ArduinoMega 2560 microcontroller board. The androidapplication controls the pumps over GSM network viaSMS (which enables pump control over longdistances) and Bluetooth (when in close proximity forreal time diagnosis of the sensor

readings). We shallnext see each feature of the application in detail.

FLOW CHART DIAGRAM

III. SOFTWARE FEATURES

A. Registration and Signing into the application

The app requires the user to sign up with his mobilenumber and a 4 digit numerical password. The user isverified by sending a SMS to this number and detecting it. Upon successful verification, theregistration details are written through a PHP scriptand HTTP Client Server APIs into a MySQL databaseat a remote central server. Every time the user attempts to login, the database table is queried for theusername-password pair and accordingly grants further access or not.

FIG 1 : Login module

B. Weather forecast

HTTP Connection is made to the Open WeatherMap web service over WiFi/ GPRS which queries thedata from OpenWeatherMap servers. The data whichthe client gets regarding forecast is in the ExtensibleMarkup Language (XML) and JavaScript ObjectNotation (JSON) formats. XML provides a languagewhich can be used between different platforms andprogramming languages and still it can expresscomplex messages and functions. JSON is usedprimarily to transmit human-readable text consistingof attribute–value pairs between a server and webapplication. The weather data is in the form ofExtensible Markup Language (XML) which isparsed and displayed in the application screen. Usercan search based on current GPS location or directlyby city name; the 16 days' forecast includesinformation about – weather type, image, min-maxtemperature, pressure, wind speed, humidity, clouds; graphical trend over the next week of variousparameters are also available in the app for visual aid These data will enable the farmer to betterplan his actions during the agricultural cycle liketaking precautionary measures over a predictedhailstorm, and hence safeguard his interests.

FIG 2 : Weather forecast module

C. Commodity Market Prices

Agricultural commodities are traded in mandis(markets) at the district level. The government setssupport prices to stabilize the prices but the Mandiprices are dynamic. The farmer, to access these pricesenters the date, crop name and the Indian state. Theapplication uses APIs provided by Ministry ofAgriculture, govt. of India on Open Data to makeHTTP requests to the web servers from where data inXML format is received, which, after formatting, ismade available on the app in a human-readableform.The application displays a table contains information about market (districtname), arrival quantity (in MT), origin, variety, grade,minimum price, maximum price, and modal price With arough idea about theprices, the chances of a farmer being exploited andcheated are minimized.


FIG 3 : Market Price module

D. Agricultural News

In this module shows both tamil and English.Keeping oneself updated about the happenings in andaround the world is essential in taking precautions orplanning for a better produce. An HTTP Connection ismade to the database/ web server over WiFi/ GPRSwhich gets the data from websites.The data isin the form of RSS Feeds which is parsed and thendisplayed in viewable form News are obtainedusing RSSfeeds on 82 topics globally, national(pertaining to India) or regional (state-wise news).Clicking on the headlines takes the user to readthe complete article.

FIG 4: Agriculture news module
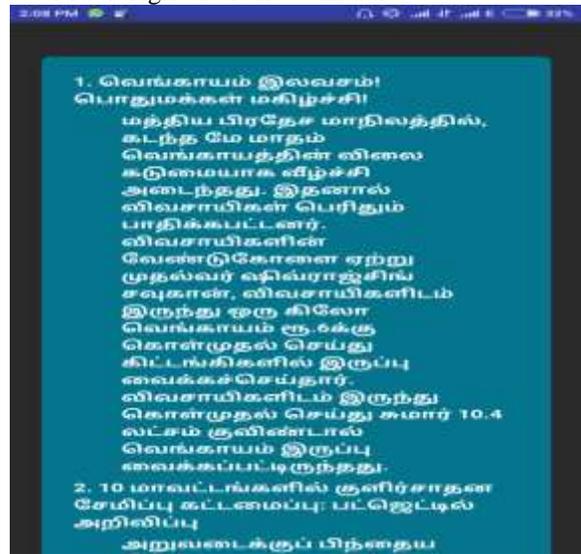
E. Map view of Field

Google Maps V2.0 API was used to display the areaaround the farmer's current position (supposedly nearhis field). The map features the terrain, normal,marker only views. The farmer can insert any markersto mark his field boundary. Also shown are the farmerand the robot's images at their GPS positions alongwith their speeds for better control

There isalso a map screenshot option to take timely snapshots during the crop cycle.The farmer will notonly be able to monitor his crop for any diseases, butalso make plans for next steps based on the gradualgrowth phases captured.
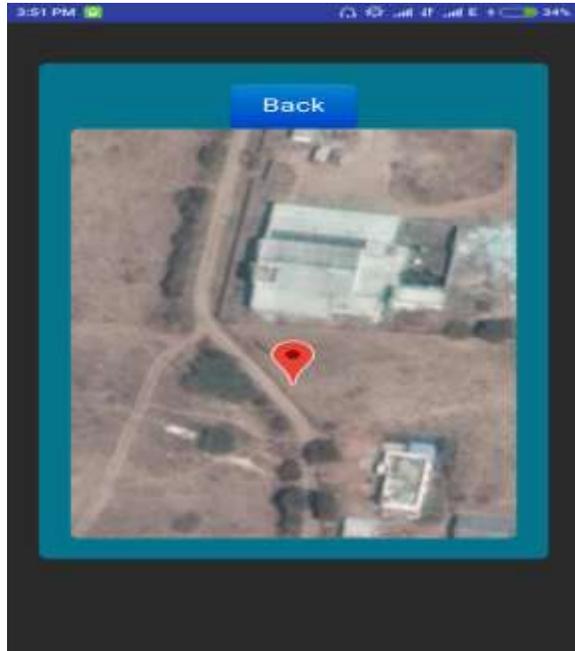

FIG 5 :Mapview module

F. Farmer Helplines and Services

As stated earlier, the Indian government comes upwith time to time schemes and farmer assisting centersfostering e-governance.E-governance is the effectivetransfer of knowledge and authentic informationdirectly to the consumers/ other businesses. TheIndian government has come up with KisanVikasKendras (KVK), and Kisan Call Centres (KCC) asadvisories to respond to issues raised by farmersinstantly as well as continuously in their locallanguages.There is a toll free helpline of theKCC set up by the government at the farmers'disposal. The application provides the state wiseaddresses and contact information of the various KVKs and KCCs in the country.

G. Farm Management

Farm Manager (Inventory management): Theapplication has an in-built farm manager module asproposed by Liopa-Tsakalidi (2013) with which theuser can bettermanage his field and crops. Thefarmer can keep a track of his assets, inventories andalso his cropping cycle.

1: Vehicles and attachments – name, id, purchasedate, cost, last, next servicing dates.

2: harvested crops – name, quantity, harvest date,amount unsold and check date.

3: seeds and fertilizers - name, quantity, purchasedate, cost, quantity remaining.

The app also generates alarms based on these dates toremind the farmer about upcoming servicing,maintenance dates. A SQLite database for android isused to manage (insert, edit, delete, view) the data.
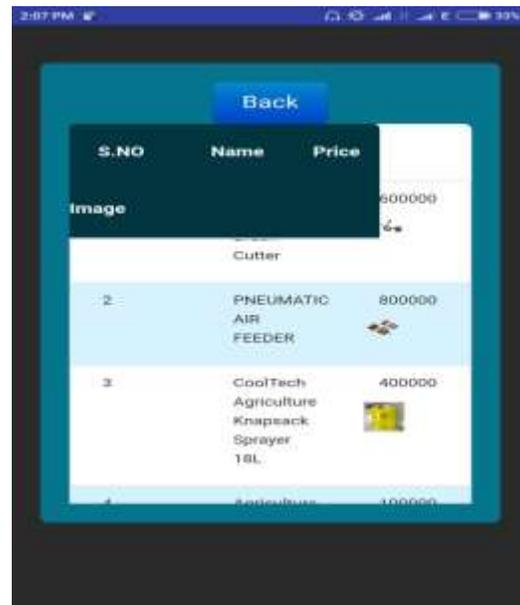
FIG 6 : Farm management module

CONCLUSION AND FUTURE WORK

The availability of agricultural information directly ina farmer's hand without him being dependent onneighbors or zamindars or even waiting for a SMSresponse from the mKisan portal like schemes, willenable the farmers to take better decisions in shorttime. This will not only foster greater productivity butwill improve a farmer's life reducing stress and alsoinstilling zeal to learn ne technology which isessential in this era of Digital Revolution. Some otherareas of agriculture whose information is frequentlyrequired by farmers are about seeds and fertilizers, theloan schemes, etc. The application currently is offeredin 8 Indian regional languages but agricultural datafrom web services is only in English. Future versionsand work on the application will be to incorporate theabove features. Switching pumps on and off from thecomfort of one's house or while away from town willenable multitasking reducing time wastage and hencemore productivity.

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