Mobibush: A Cloud Enabled Mobile App for Farmers

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ABSTRACT: Mobile technology is increasingly being adopted in the agricultural space as a measure to assist farmers in decision. In this regard, the MobiBush project was initiated by the researchers from the College of Agriculture at the University of Saskatchewan, Canada, and the Multi-Agent Distributed Mobile and Ubiquitous Computing (MADMUC) Lab. The aim of the project is to enable farmers to have mobile access to up to date information on pesticides and further make decisions on which pesticides to apply, how to apply them, when to apply them, and so on. Due to its complexity, MobiBush is designed as a mobile distributed system that follows a three-layered deployment; comprising of mobile nodes, a cloud-hosted middleware, and a cloud hosted database server. Since the data that is being pushed to the mobile is resident on the database server, caching methodology on the mobile has been proposed to support offline accessibility of pesticide information. However, there are challenges that arise due to the intermittent loss of connectivity which leads to stale data on the mobile. In this work, we have adapted the dual caching technique where we store data on the mobile and on the middleware. The approach makes the MobiBush architecture now robust and reliable for offline data accessibility.

KEYWORDS: Mobile devices, Middleware, Web services, Pesticides, Caching, Cloud Computing

I. INTRODUCTION

There is a relentless ascent in the quantity of horticulture applications that are beingconveyed. Because of the high differing qualities of the recorded, we have seenthe outline of versatile applications that guide agriculturalists to finish undertakings,for example, figurings, choice guides, compound audits, GPS-based administrations,thus on. Cell phones serve as an auspicious data access point and all the more essentially,they are advantageous to be conveyed around. Likewise, the late advances indistributed computing, the period where ICT-based administrations are outsourcedfrom suppliers over the Internet, is being grasped inside of the agrarian scene. Asindicated by the works in and further , distributed computing has seen three majortaxonomic layers known as the: Infrastructure as a Administration (IaaS) whereequipment and systems are offered as virtualized administrations, Platform as a Service(PaaS) where application advancement is facilitated by the supplier, and Programmingas a Service (SaaS) where programming is made usable to customers byadministration. Having seen the prospects, the MobiBush projectwas proposed asan appropriated portable application with cloud-arranged back-end. The objectiveof the MobiBush undertaking is to help crop ranchers to settle on snappy choices onpesticide applications. For the most part, the agriculturists are empowered to knowwhich pesticide to apply, when to apply the pesticide, how to blend chemicals, howto focus weeds, et cetera. Some of the screenshots of the MobiBush application. Inthe beginning outline of the application, the reserving strategy is proposed as a measureto bolster disconnected from the net availability of information in the case of asystem disengagement. The test however is that, the reserving technique can promptcircumstances of stale information on the portable, which implies, the agriculturistswon't have the capacity to get to crisp (redesigned) data yet obsolete data. Thiscircumstance emerges at the point when agriculturists are on the homestead wheresystem signs are feeble or absolutely distracted. Moreover, the at first planned storingredesign strategy is not helpful for data transfer capacity administration.

Mobibush consist of three main parts :**1.**Android application (user centric app)**2.**GSM toolkit**3.**Website

1.1Problem statement:

There are several ongoing works on promoting mobile technology usage in the fieldof agriculture. Mobile devices can play integral role in farm monitoring. We proposedan architecture that comprises of data acquisition layer and processing systems. Overall, the work can be monitored from several crop fields and their utilization.

1.2 Goals and objectives:

Goals:

A system of cultivation management, Agro-Sense, is proposed, which is developedto support efficient farming management. Farmers can upload their data onMobile Database. Data include parameters such as name of farmer, crop, season,time, pesticides and profit.A system of cultivation management, Agro-Sense, is proposed,which is developed to support efficient farming management. Data includeparameters such as name of farmer, crop, season, time, pesticides and profit. Thedata will be shared among all other farmers. Farmers on farmland can easily refer towork plans, enter field data into the Mobile system, and share them with head officein real time by using PC AND MOBILE.

1.3 Objectives:

The design and develop a system which enabling the MobiBush Appon the mobile as a self-contain application. This means, the entire business logic,storage, and presentation of the App reside on the mobile for farmer and farmingpurpose. Application also intended to share the pesticide information between themobile and the back-end instead of just delegating everything. To achieve this, themobile node has to be designed to have an execution state engine also designed onthe web-hosted middleware.

1.4 Statement of scope:

a. The standalone (network independent) farmer helping app
b. Soil Information analyser using Embedded Hardware Geological survey and analysis
c. Automated work management using Auto-Seed Planting ROBOT. WeatherForecasting
d. Distributed architecture through data offloading and data partitioning.

1.5 Major Constraints:

The crops are damaged in field itself due to disease attacks and lack of informationresources. So we are intended to use, monitored soil information using H/w Kit tocrop fields and their utilization as well as better crop growth analysis.The challengehowever is that, the caching methodology can lead to situations of stale data on themobile, which means, the farmers will not be able to access fresh (updated) informationbut outdated information. This situation arises when farmers are on the farmwhere network signals are weak or totally unavailable. Furthermore, the initially designedcaching update methodology is not convenient for bandwidth management.

1.6 Outcomes:

 a. Symptoms inference.
b. Symptoms diagnosis.
c. Geological positional survay.
d. Geological soil analysis.
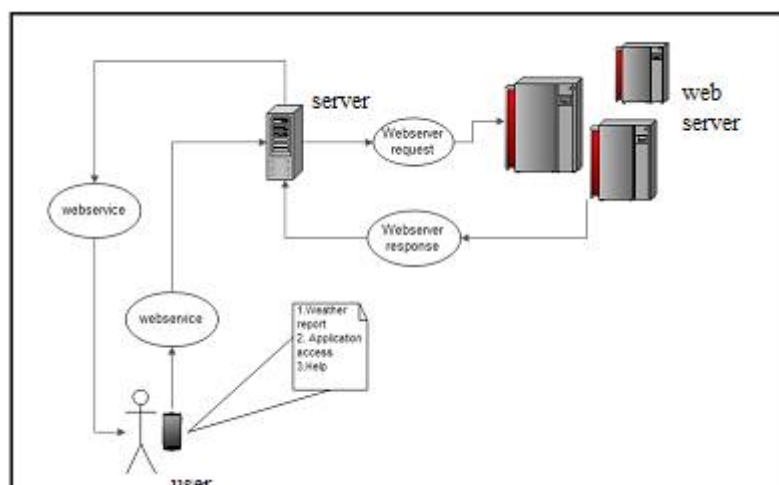e. Weather Forecasting

II. MOBIBUSH ARCHITECTURE

Fig.: Mobibush Architecture

In System Architecture we design and develop a system which enabling the Mobibush App on the mobile as a self-contain application. This means, the entire businesslogic, storage, and presentation of the App reside on the mobile for farmer and farmingpurpose. Application also intended to share the pesticide information betweenthe mobile and the back-end instead of just delegating everything. To achieve this,the mobile node has to be designed to have an execution state engine also designedon the web-hosted middleware.

III. MAJOR TASKS

3.1 Soil Property Analysis:

A row guidance method is presented toguide a platform which is designed independently to drive through the rowcrops in a field according to the design concept of open architecture. Thisroject is basically developed to implement a number of agricultural activitiesin many countries, such as ploughing, seed dispersing, picking, harvesting,weeding, pruning, planting, grafting, etc. In addition, the different agriculturalparameters such as moisture content of the soil, irrigation facilities and motorcontrol are also managed and the farmer is alerted about all the parameterswith the help of SMS sent through the GSM module.

Here we are proposing an agricultural autonomous Robot which will dispersethe seeds in an orderly manner. While doing so it will take into account thedistance between two seeds planted, the depth at which they are planted andthe number of plantations that it has completed. All these parameters can beadjusted using the switches provided. A row guidance method is presentedto guide the robot platform to plant the seeds in grid comprising of rows andcolumns. In addition to the seed dispensing mechanism it will also have awatering mechanism to water the seedlings as soon asthey are planted. So,altogether we can say that this is a completely an autonomous robot.

The main feature of this project is the parameter monitoring system for inductionmotor using the GSM module. Using this feature the farmer will bealerted via a message whenever there is an error in phase. Also the farmer canstart and stop the motor using his mobile phone. We can also incorporate astatus feedback system in this project. The farmer will get the updates on thepresent status of the motor such as the motor temperature by just sending amessage. In this project we will also be monitoring the drip irrigation facilitiesby measuring the moisture content of the soil using suitable and the waterlevel in the tank. After Receiving Data to from Kit , android app will be usedfor controlling and data management.

3.2 Data Collection:

Open Government Data (OGD) Platform India data.gov.in - is a platform for supporting Open Data initiative of Governmentof India. The portal is intended to be used by Government of India Ministries Departments their organizations to publish datasets, documents, services, toolsand applications collected by them for public use. It intends to increase transparencyin the functioning of Government and also open avenues for manymore innovative uses of Government Data to give different perspective. Thebase Open Government Data Platform India is a joint initiative of Governmentof India and US Government. Open Government Data Platform India is alsopackaged as a product and made available in open source for implementationby countries globally. Open Government Data Platform India has 4 (four) majormodules, as detailed below, implemented on a single Drupal instance AnOpen Source based Content Framework Solution Data Management System(DMS) Module for contributing data catalogs by various government agenciesfor making those available on the front end website after a due approvalprocess through a defined workflow. Content Management System (CMS)Module for managing and updating various functionalities and content typesof the Open Government Data Platform India Platform. Visitor RelationshipManagement (VRM) Module for collating and disseminating viewer feedbackon various data catalogs. Communities Module for community users to interactand share their zeal and views with others, who share common interests asthat of theirs.

Ministry of Agriculture, Department of Animal Husbandry, Dairying and FisheriesGet data on Estimates of yield rates, and share of ram/weather, ewe, lambin wool Production. It contains data of Ram/ Weather Average Yield/ season,Ram/WeatherWool Production, Ewes Average Yield/season, EwesWool Production,Lamb Sheeps shorn, Lamb Average Yld./ season, Lamb wool Production,Wool annual Estimates.

3.3 Data Upload:

Data transferring action is finished transmission of a document from Laboratoryframework to Cloud Server. From a system client's perspective, to transfera record is to send it to server, that is set up to get it. Individuals who offerinformation with others on transfer administrations (US) transfer records. TheFile Transfer Protocol (FTP) is the Internet facility for downloading and uploadingfiles. (If you are uploading a file to another site, you must usually

havepermission in advance to access the site and the directory where the file is tobe placed.) When you send or receive an attached file with an e-mail note,this is just an attachment, not a download or an upload. However, in practice,many people use "upload" to mean "send" and "download" to mean receive.The term is used loosely in practice and if someone says to you "Download(or upload) such–and-such a file to me" via e-mail, they simply mean "Send itto me."

3.4 Data Download:
As a apps store their data in a cloud Server, only work when an Internet connectionis available. But its a much (faster) user experience if your app canwork even without an Internet connection. The idea is to create a local serveror cache of your data so you can access it whether the user is online or offline.And then when the user is online, you synchronize the cache and the remotedatabase according to District and user position.

IV. DATA MODEL AND DESCRIPTION

4.1 Data Description:
Since some users may change their associated attributes at some point (for exampleoving their region), or some private keys might be compromised, key revocationor update) for each attribute is necessary in order to make systems secure. Thisimplies that revocation of any attribute or any single user in an attribute group wouldaffect the other users in the group. For example, if a user joins or leaves an attributegroup, the associated attribute key should be changed and redistributed to all theother members in the same group for backward or forward secrecy.

4.2 Data objects and Relationships:
1. User should be connected with application.
2. Application should be connected with server.
4.3 Functional Model and Description:
a. Authentication
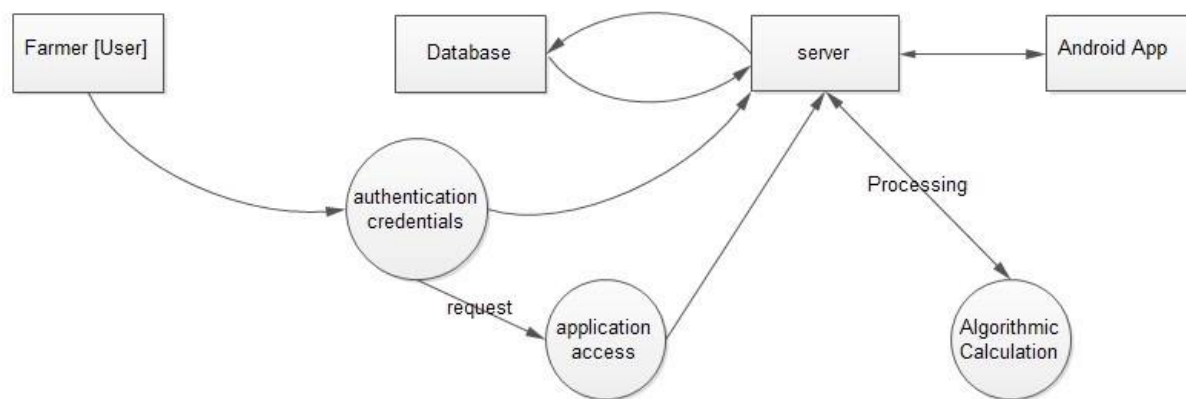b. Verification
c. Algorithm Calculation on Android App

Fig.: Functional Model of MobiBush

Weather Forcasting In India farmers rely on weather forecasts to decide as whatwork to do today and tomorrow. Whether to dry hey or keep it inside. The frost andfreeze damages the crops in spring and thus what is the condition for next few days.Hence, AgroMobile provides SaaS to monitor the weather conditions without typingany location or position as it will be automatically located using the mobile deviceGPS system. And also farmers can query for the temperature and humidity requiredfor the particular crop(s) as an Android application.

Crop Advice and Analysis India has mainly two agricultural seasons in a year the Kharif season or summer season and the Rabi seasons or winter season. Thus, aproper advice for the correct crop to plant is very much needed to fulfill the need of India. Farmers more than an age of fifty uses their own traditional way of cultivationand harvesting and may result good but the new farmers with young age group messupand results failure. Here, AgroMobile computing helps such farmers to look upthe correct crop to plant after a particular crop. This IaaS also provides informationfor a single,

double and multiple cropping and increase the knowledge of crop rotationand the mixed cropping. This all service is in real-time and on the users mobiledevice itself in a customized form.

V. TOOLS AND TECHNOLOGIES

5.1 Hardwares:

5.1.1 Moisture Sensor:
The moisture sensor measures the humidity content of the soil. The relativehumidity of the soil is represented in terms of the RH value which is convertedinto the appropriate voltage level by the sensor. The following are the specifications of the moisture sensor.
a. Output range 1.41V to 3.55V
b. High reliability and long term stability
c. Fast response time
d. Patented solid polymer structure
e. Suitable for linear voltage or frequency output circuitry

5.1.2 Temperature Sensor:
The LM35 make interfacing to readout or control circuitry especially easy. Thedevice is used with single power supplies, or with plus and minus supplies. Asthe LM35 draws only 60 A from the supply, it has very low self-heating of lessthan 0.1C in still air. The LM35 is rated to operate over a 55C to +150C temperaturerange, while the LM35C is rated for a 40C to +110C range (10 withimproved accuracy). The LM35 series is available packaged in hermetic TOtransistor packages, while the LM35C, LM35CA, and LM35D are also availablein the plastic TO-92 transistor package. The LM35D is also available inan 8-lead surface amount small outline package and a plastic TO-220 package.

5.1.3 MAX 232:
RS232 standards: To allow compatibility among data communication equipmentmade by various manufactures an interfacing standard called RS232 wasset by the Electronics Industries Association (EIA) in 1960. Today, RS232is the most widely used serial I/O interfacing standard. This standard is usedin PCs and numerous types of equipment. However, since the standard wasset long before the advent of the TTL logic family, its input and output voltagelevels are not TTL compatible. In RS232 , a 1 is represented by -3 to-25V,while a 0 bit is +3 to 25V, making -3 to +3 undefined. For this reason,to connect any RS232 to a microcontroller system we must voltage converterssuch as MAX232 to convert the TTL logic levels to the RS232 voltage levels,and vice versa. MAX232 IC chips are commonly referred to as line drivers.

5.1.4 Sensors:
System sensors are used for the farmer to perform easy operations in his farm. Temperaturesensor is used to detect motor temperature. If motor temperature increasesbeyond specific temperature then motor will turn off automatically. Humidity sensoris used to detect soil moisture. At the time system 3phase induction motor is in onstate. Humidity level of soil is full fill at that time motor will turn off automatically.Water level sensors are used for detect water tank level. Water tank level sensorsdetect full, middle and bottom level of tank gives information. If motor is in on statebut water tank level is below critical level. At that time motor operate on empty statethis is harmful for motor.

5.1.5 GSM Modem:
GSM (Global System for Mobile communication) is a digital mobile telephony system.With the help of GSM module interfaced, we can send short text messages tothe required authorities as per the application. GSM module provided by sim300uses the mobile service provider and send SMS to the respective authorities as perprogrammed. This technology enables the system a wireless system with no specifiedrange limits. GSM uses a variation of time division multiple access (TDMA) andis the most widely used of the three digital wireless telephony technologies (TDMA,GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channelwith two other streams of user data, each in its own time slot. It operates at eitherthe 900 MHz or 1800 MHz frequency band. It is a tri band GSM/GPRS modulewith keypad and LCD support and it has an embedded powerful TCP/IP protocolstack. It has a GSM multislot class 10/8. It can be controlled via AT commands. Itrequires 3.4 to 4.5 V power supply and can be operated between the normal temperaturerange of -20 to +60 C. It has a 60 pin board to board connector and two analogaudio interfaces.ever there is an error in phase. Also the farmer can start and stop the motor usinghis mobile phone. We can also incorporate a status feedback system in this project.The farmer will get the updates on the present status of the

motor such as the motortemperature by just sending a message. In this project we will also be monitoring thedrip irrigation facilities by measuring the moisture content of the soil using suitableand the water level in the tank.

In that module we can gives 3phasse connection means R, Y, B phase to thepin 'no. RA0, RA1, RA2 respectively. I can take the exact status of phase managethe start and stop situation via GSM module. GSM module connected at pin RC6and RC7 by using MAX232 IC. System is monitoring temperature of motor by sensingtemperature of motor I stop the motor when temperature will go on critical levelbecause of that I can protect motor overheating situation. Temperature sensor connectedat pin RA3. System is take humidity of farm soil. Monitoring soil moisturefarmer take decision about start motor or stop motor. Also when motor is in start positionthat time reading goes beyond the set humidity level motor stop automaticallyby microcontroller. Humidity sensor connect at pin System is also taking tank waterlevel status. Tank status farmer can manage motor controlling easily. Tank level is atfull and middle position motor start. At the time tank level down to bottom level thattime motor automatically stop. Also farmer can start motor via GSM module thattime module first send tank status. By using tank level farmer can protect his motor

Water tank level sensors connect at pin RC0, RC1, and RC2 i.e. Full, Middle, andBottom level respectively.

At the time of farmer can star motor that time motor not directly start therefor Igives RELAYON connection that connection continuously motor is in supply mode.RELAYON connect at pin RD0. Also message comes that time motor can start andstop for stop situation I gives supply to RELAY OFF pin. RELAY OFF pin connectat pin RD1 pin. Supply is gives to RELAY OFF pin this trigger the motor to stopposition. All sensors reading are displays on LCD display. LCD display can connectat PORT B. I can use a 4-bit data transfer mode can reduce these to 8 lines. Serialinterface is another option that can reduce the number of microcontroller pins neededfor LCD interface significantly. PORT B is 8-bit pin RB4, RB5, RB6 and RB7 whichuse for data transmission purpose and RB0, RB1,RB2, RB3 use for resister select,read/write, enable and back light control respectively. Also RB6 and RB7 pin use forprogram burning process. These two pins are connected to the switch when switch ison state then pins operate on program burning process and switch is in release statethen pin use for LCD connection.
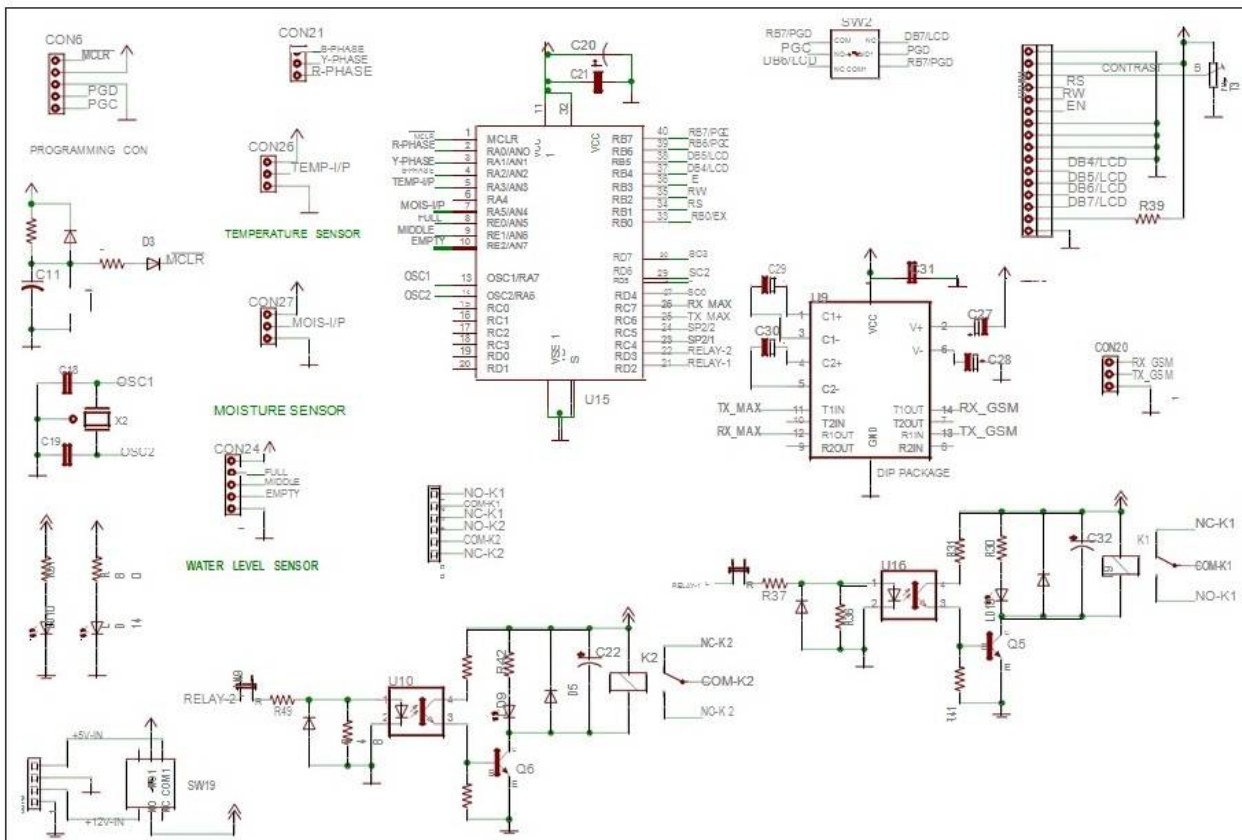

Fig.: Circuit diagram of GSM Toolkit

5.1.6 Supply Boards:

Reset is used for putting the microcontroller into a 'known' condition. That practicallymeans that microcontroller can behave rather inaccurately under certain undesirableconditions. In order to continue its proper functioning it has to be reset,meaning all registers would be placed in a starting position. Reset is not only usedwhen microcontroller doesn't behave the way we want it to, but can also be usedwhen trying out a device as an interrupt in program execution, or to get a microcontrollerready when loading a program. In order to prevent from bringing a logicalero to MCLR pin accidentally, MCLR has to be connected via resistor to the positivesupply pole and a capacitor from MCLR to the ground. Resistor should bebetween 5 and 10K and the capacitor can be in between 1f to 10 f. This kind ofresistor capacitor combination, gives the RC time delay for the c to reset properly.Pins OSC1 & OSC2 are provided for connecting a resonant network to form oscillator.Typically a quartz crystal and capacitors are employed. The crystal frequency isthe basic internal clock frequency of the microcontroller. The manufacturers makeavailable PIC designs that can run at specified maximum & minimum frequencies,typically 1 MHz to 16 MHz. Here we are connecting two ceramic capacitors whichare basically used for filtering. That is to give a pure square wave to the microcontroller.Serial data communication needs often dictate the frequency of the oscillatorbecause of the requirement that internal counters must divide the basic clock rate toyield standard communication baud rates. If the basic clock frequency is not divisiblewithout a reminder, then the resulting communication is not standard.

VI. RESULTS

After successful connection of mobibush application and GSM toolkit user has register first. After registration authentication is done by the server that user is valid. Successful validation gives permission to user to access mobibush application. With the help of this app user can check machine status that it is on or off. The machine can be start by pressing START button on the screen and get off by pressing STOP button. If user click on STATUS button message send to the GSM toolkit and it will reply the moisture of the soil, humidity, temperature of soil, water level. Also user will get the information about the crops, fertilizers details, disease details, weather report, disease list, expert advice, suggestions etc.
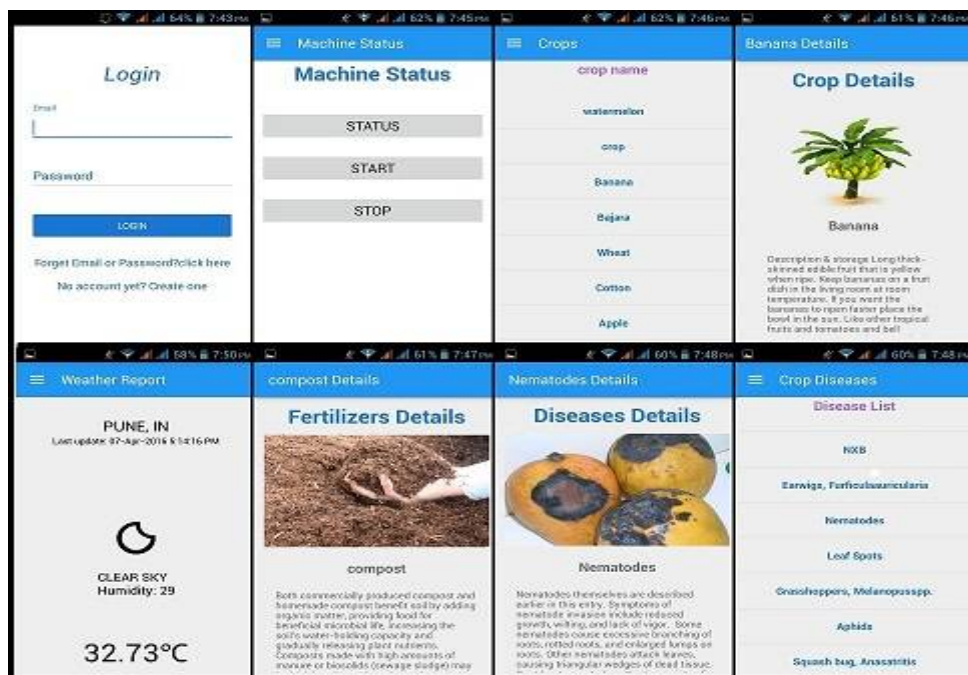

Fig. : Screenshots of MobiBush App

VII. CONCLUSION

Thus we conclude mobibush is a project that is aimed at supporting crop farmers to make decisions and caching technique is used to support offline acccessibility of pesticide information in the event of network loss we have studied quality attributes of the system.

VIII. ACKNOWLEDGMENT

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