

Agriculture Updates by SMS – A Cloud Computing Approach

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Abstract: India is the third largest economy in Asia after Japan and China, as measured in terms of its Gross Domestic Product (GDP) and it is continuing to grow rapidly. About 75% people are living in rural areas and are still dependent on Agriculture. About 43% of India's geographical area is used for agricultural activity. So as a whole in India there is a lot of contribution from the Agriculture Sector, this is our area of Interest here.

This paper discusses everything about providing the SMS updates on various agriculture products as per the user requirements on his GSM and/or GPRS mobile phone. The updates may vary from Pricing, Availability, Stocks, and Need of Various Products on the Market. Basically this will be expected to be helpful for Farmers around the state. Also since it works anywhere there's a mobile signal, it does not need Internet.

Cloud computing is clearly one of today's most enticing technology areas due, at least in part, to its cost-efficiency and flexibility. In this paper we glanced over the variation/category of cloud computing named Data-as-a-Service (DaaS), since we are providing Pricing Details to customer against the Database Queries. And also the Deployment Model we consider is Community Cloud. It's mainly concerned about a specific group of Customers which is in our case The Farmers.

1. Introduction

Agriculture has always been India's most important economic sector. India is one of the fastest growing economies of the world and is currently the focus of a great deal of international attention. In the mid-1990s, it provides approximately one third of the GDP (gross domestic product) and employs roughly two-thirds of the population. It is the seventh largest country in the world in terms of its geographical size. Agriculture still provides the bulk of wage goods required by the nonagricultural sector as well as numerous raw materials for industry. The indirect share of agricultural products in total exports, such as cotton textiles and jute goods, is taken into account, the percentage is much higher. With current population growth by 2025 India may even have caught up with China according to the UN.

In this paper we focus on agriculture and especially on agriculture trade. India has a large and diverse agriculture and is one of the world's leading producers. It is also a major consumer, with an expanding population to feed. For this reason and agricultural trade policy, its presence on the world market has been modest.

The leading forecasting institutions expect that India will play a bigger role in world markets in future. India's agriculture contributes to 24% of GDP, provides food to 1.2 Billion people, sustains 65% of the population and it helps alleviate poverty, produces 51 major crops, provides raw material to industries and also contributes to 1/6th of the export earnings. Also we have one of the 12 Bio-diversity centers in the world, with over 46,000 species of plants and 86,000 species of animal. In a number of markets it is expected to consolidate its position among the world's leading importers (vegetable oils) and exporters (rice).

Given the size of Indian agriculture, changes in its balance sheets for key commodities have a potentially large impact on world markets. Agriculture plays an important, though declining role in the economy. Its share in overall GDP fell from 30% in the early nineties, to below 17.5% in 2006. Agriculture will continue to play a central role as Asia pursues the complementary goals of poverty reduction, sustainable food security, environmental conservation, and increasing trade competitiveness.

According to the surveys new technologies, including crop biotechnology, will be essential to meet these challenges. The prospects for their utilization are particularly promising. Plant biotechnology will facilitate the farming of crops with multiple durable resistances to pests and diseases, particularly in the absence of pesticides. This is expected to be very much useful in the countries like India. There is a lot of work going on this field. Some examples like Golden Rice, BT Brinjal, and BT Cotton etc. can be considered. Now a day's various organizations, research Institutes, Universities & Government bodies are working on this.

2. Key Agriculture Sectors

India is among the world's leading producers of paddy rice, wheat, buffalo milk, cow milk and sugar cane. It is either the world leader or the second largest producer in eight out of its top ten products. Some of these are widely traded while others are more specialist products.

Table 1 show the composition of production by value for 2010, when paddy rice was the top sector, followed by buffalo milk and wheat. India is now the largest milk producer in the world and the second largest producer of paddy rice, sugar cane, wheat, cow milk, groundnuts and certain fresh vegetables. But it is also a leading consumer. Although it exports these products the quantities will vary depending on the size of the crop and demand.

Table 1: Major Agriculture Areas of India (FAOSTAT world rank calculated by DG AGRI, 2008)

Commodity	Rank India	Rank World	Product (MT)
Sugar cane	2	2	348188000
Rice, paddy	2	2	148770000
Wheat	3	2	78570200
Buffalo milk	4	1	60900000
Cow milk	5	2	44100000
Potatoes	6	2	34658000
Vegetables	7	2	31402000
Bananas	8	1	26217000
Maize	9	6	19730000
Mangoes, Guavas	10	1	13649400
Onions	11	2	13565000
Millet	12	1	11370000
Coconuts	13	3	10894000
Tomatoes	14	4	10303000
Soybeans	15	5	9910000

India is the largest producer in the world of fresh fruit, anise, fennel, coriander, tropical fresh fruit, jute, pigeon peas, pulses, spices, millets, castor oil seed, sesame seeds, safflower seeds, lemons, limes, cow's milk, dry chilies and peppers, chick peas, cashew nuts, okra, ginger, turmeric guavas, mangoes, goat milk and buffalo milk and meat and Coffee. It also has the world's largest cattle population (281 million). It is the second largest producer of cashews, cabbages, cotton seed and lint, fresh vegetables, garlic, eggplant, goat meat, silk, nutmeg, mace, cardamom, onions, wheat, rice, sugarcane, lentil, dry beans, groundnut, tea, green peas, cauliflowers, potatoes, pumpkins, squashes, gourds and inland fish.

The required level of investment for the development of marketing, storage and cold storage infrastructure is estimated to be huge. The government has not been able to implement various schemes to raise investment in marketing infrastructure. Among these schemes are Construction of Rural Godowns, Market Research and Information Network, and Development Strengthening of Agricultural Marketing Infrastructure, Grading and Standardization.

Reforms introduced in India in the early 1990s have greatly increased overall trade flows. However it has consistently run a trade deficit unlike China and Brazil (US\$35 billion in 2004-2005). The EU (27) ranks as India's largest trading partner accounting for about 21% of total Indian trade in 2005, ahead of the United States and China. Meanwhile India is the EU's tenth largest trading partner accounting for 1.8% of total trade. In 2005 its trade deficit with the EU was about €2 billion.

Price policy for agricultural commodities constitutes an important element of overall agricultural economic policy. Minimum Support Prices (MSPs) for important cereals, pulses, oilseeds, and other commercial crops, namely, cotton, jute and sugarcane, are fixed by the Government every year on the basis of the recommendations made by the Commission for Agricultural Costs and Prices (CACP). The list of 25 crops for which MSPs are recommended by CACP and announced by the Government is at Statement I annexed to this Note.

In India Agriculture continues to be a sore point. Agriculture sector needs protection from so many latest invasions. There is a need To Protect this sector from so many alien invasions. Yes, there is now the prospect or the threat of both food inflation and also uncertainty about food production targets. This is nothing new of course. The effectiveness of price policy in boosting production and productivity of agriculture in tune with domestic as well as external demand cannot be assessed in the absence of regular data on area, production and yield of different crops.

3. Challenges in the Agriculture Sector

It is clear that India's agricultural sector has made huge strides in developing its potential. The Green Revolution (1968) & Ever-Green Revolution (1996) massively increased the production of vital food grains and introduced technological innovations into agriculture.

Some of the difficulties faced are:

- Overregulation of agriculture has increased costs, price risks and uncertainty.
- Government intervenes in labor, land, and credit markets. India has inadequate infrastructure and services.
 - The irrigation infrastructure is deteriorating and it's almost inadequate in nature.
- The overuse of water is currently being covered by over pumping aquifers, but as these are falling by foot of groundwater each year, this is a limited resource.
- Illiteracy, general socio-economic backwardness, slow progress in implementing land reforms and inadequate or inefficient finance and marketing services for farm produce.
- The average size of land holdings is very small (less than 20,000 m²) and is subject to fragmentation, due to land ceiling acts and in some cases, family disputes.

- Inconsistent government policy. Agricultural subsidies and taxes often changed without notice for short term political ends.
- Adoption of modern agricultural practices and use of technology is inadequate, hampered by ignorance of such practices, high costs and impracticality in the case of small land holdings.

The above mentioned challenges are considered during the development of the new system. Our motto is to provide solutions to some of these challenges/difficulties. Some government organizations like “Indian Council of Agricultural Research (ICAR)” which is an autonomous organization & the “Department of Agricultural Research and Education (DARE)”, Ministry of Agriculture are also providing many contributions and sanctions on various improvements in the Agriculture Field. So, our system is also focus on the actual needs by these organizations to improve the Agriculture Research Activities.

4. Objectives of the Project

Now let us consider the major objectives of the project, which are designed after the study of the Agriculture challenges present in India especially in Karnataka state. The issue chosen to solve here is “Adoption of modern agricultural practices and use of technology”.

Our Project Objectives are:

- Analysis of activities and assessment of causes from agriculture sites, and plan strategies to collect and distribute them.
- Design and development of software tools for selected machines, their testing and standardization and popularization in rural areas.
- Collection and compilation of anthropometric data on Agricultural workers for design of stable working system and work spaces.
- Studies on man-machine-environment interaction and interfaces under different work situations for improvement in the design of agricultural and allied equipment.
- Provide easy-to-use interface for both Farmers and Agencies of concern.
- Updates on market status of various products as per the user choice on Daily or Weekly basis.
- Design and maintenance of a Backend Database of all the products whose control is given for the dealers.

To support these needs/objectives, the primary model of our project is developed under the guidance and coordination of “SELCO Pvt. Ltd”, a social enterprise established in 1995. The working model is developed and tested under the Innovation Lab provided by “SELCO Pvt. Ltd”. Our project team consists of 4 members basically; each one is working on different aspects of the project.

We are primarily concerned about Customer Requirements, Internal Database Design, User Interface Design, Product Related Issues, Website with Login, Customer Support & Interaction. Essential features are only considered among the above mentioned Objectives, since all may not be relevant or may be already implemented. The working model is built by incorporating the 3 individual modules which are developed in parallel.

5. Analysis and Comparison of Practical Implementation of the System

5.1 What are the Requirements to be considered?

The most of the requirements are obtained from the Agriculture product Marketing Center, Belthangadi (APMC) which is a talluk for Agro marketing in South Kanara Dist. According to the survey conducted by our team in the Belthangadi and nearby agriculture areas, the results were summarized as shown below,

Table 2: Perception about Quality of Current Services.

Questions Asked	Good%	Average %	Poor%
Methods of customer support	14	54	32
Interaction of officers	26	57	17
Use of supportive tools	12	59	29
Timely completion of the schemes	20	56	24
Availability of warehouses	56	39	5
Satisfaction with the Restroom & related facilities	31	62	7
Availability of Computer & internet	37	52	11
Medical & Remedial facilities	63	28	9
Examination & Quality clearance	14	81	5
Marketing & Pricing support	40	47	13

Along with this, a survey is also taken regarding the new services which we are planning to offer to the Farmers. Since it's a new system to the Agriculture area, this analysis from the farmers is very necessary. Most possible implementations are only covered during the survey, leaving the minor modifications. So, that there are no future complications. The questions are framed relative to the new implementations of our project & the response is noted down.

Table 3: Perception About new Services to be proposed

Questions Asked	Good%	Average %	Poor%
Automated updates	90	9	1
Very less or Free of Cost service	75	22	3
Customer care support	72	24	4
Timely delivery of Info and Prices	68	25	4
Natural language support(Kannada)	85	12	3
Various modifiable schemes	45	41	4
Technical support & guidance	70	22	8
Providing additional devices	54	37	9

Thus, from the above observations it's clear that currently available facilities are not up to the expectations of the Farmers. So, we planned to introduce our new system which rectifies the problems which exist in the Agriculture Marketing sector. The main concern is to help the Farmer to improve his Economical Status by eliminating the need of Brokers and also providing info about variety of Products, which makes ours a Unique Facility.

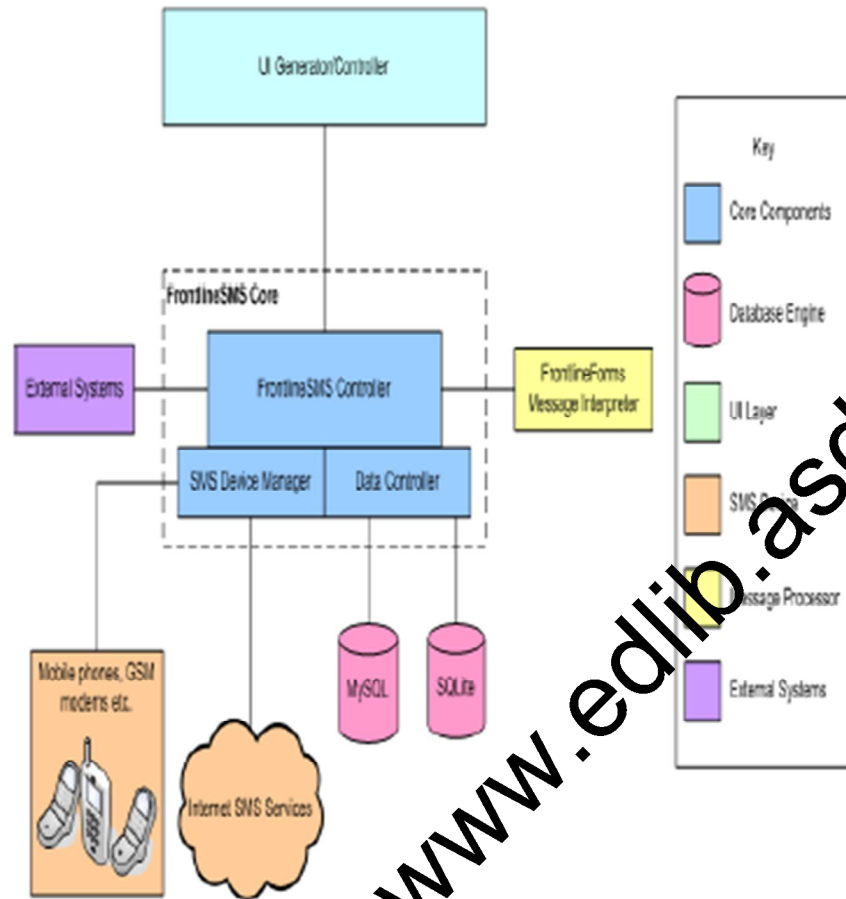
5.2 How the development is carried out?

The system is developed with 3 essential modules in mind namely:

- A Simple User Interface with SMS
- Linking between User & Database
- A Database System

So, all these independent components are necessary for the proper functionality of our system. All are initially tested independently and then they are combined together to form a working model.

A pictorial representation of the model can be given as below:



The various components involved are,

FrontlineSMS Controller- The FrontlineSMS Controller comprises the central part of the FrontlineSMS system, managing interaction between phones, stored data such as contact details, and an end-user's view and manipulation of the system.

SMS Device Manager- The SMS device manager is the interface through which all SMS messages are sent and received. It manages connections to hardware SMS devices, such as mobile phones connected via cable or Bluetooth, and software SMS devices such as Clickatell's HTTP service.

Data Controller- The data controller handles connections to the underlying database. Currently, SQLite and MySQL are fully supported. In the future, we are hoping to move database handling to a 3rd-party library, which should massively improve the supported platforms.

UI Generator/Controller- For the current UI layer, FrontlineSMS uses the ultra-lightweight Thinlet. It's a great little library - fast to get going and with great internationalization support - the FrontlineSMS UI is already translated into 8 languages.

External Systems- Keywords can trigger FrontlineSMS to make a call over HTTP or on the local machine with details of the message received. These systems can then process the message data, and respond to FrontlineSMS with instructions to send new messages.

Frontline Forms- Frontline Forms is a proprietary add-on for Frontline SMS allowing a mobile Java client to connect to FrontlineSMS and share data with it.

5.3 What are the key modules involved?

In the model along with the components indicated there are some additional modules which plays a vital role in implementation. Currently, we are working on simplifying these modules so that upgradation will be easy.

HTTP Trigger- HTTP Trigger allows developers with external applications to feed messages into FrontlineSMS for processing.

Keywords- Keywords is where you create Auto replies, subscriber lists, manage SMS-to-email settings and configure FrontlineSMS advanced features.

Command Line- It can be used for entering and executing the user defined commands and perform associated actions.

Finally, the website will be developed and implemented on the Server Side which incorporates the Database System containing all the Agriculture Details and other Information as per the design. Later in time Users, especially Farmers can register to the specific category of Product Updates as per their needs. The information to the database is fed by the APMC Data Sheets in a day-by-day manner either in a Automated way or with the Manual entry scheme.

The important feature of the website is that it contains information in both English and Kannada Language, which is very useful. The User can directly select the language version in the Welcome Page itself, so there will be no confusion. We developed the most of the website with HTML, PHP and JavaScript languages.

6. Why Cloud Computing?

We have chosen this technology, because it is ready to serve the small and medium business segment, which is our area of concern. As a future scope of this project, we can implement our system for the Large Scale also Cloud Computing Approach. The reason is that it is easy for expanding our project model for any other situations & vendors also. Cloud computing customers do not generally own the physical infrastructure serving as host to the software platform in question. The entire focus lies on the service provider who owns the huge scalable and variable host of infrastructure, software and bundle of other services.

Cloud computing is Network-based computing, whereby shared resources, software and information are provided to computers and other devices on-demand, like a public utility. Cloud computing enables users and developers to utilize services without knowledge of, expertise with, nor control over the technology infrastructure that supports them. The concept generally incorporates combinations of the following:

- Deployment Model
- Service Type

In our system we used the Deployment Model as the Community Cloud. A community cloud may be established where several people have similar requirements and seek to share infrastructure, so as to realize some of the benefits of cloud computing. Usually in this the costs are spread over fewer users than a public cloud. But more than a single user and it offers a higher level of privacy and security.

The Service Type is DaaS (Data-as-a-service), in which we provide various database updates to the customer in the form of SMS. The customer queries against the providers database.

6. Conclusion

Currently in Tamil Nadu the Project is first of its kind using the FrontlineSMS as platform. So, the response from the agriculture field may take time. However it has been tried to incorporate the project with NGO and some other institutions like SELCO itself.

Also based on the cost effectiveness of project it can be implemented in various other rural areas and Other parts, if necessary. The updates can also be given via Email which already tested. Not all the models of mobile phone support the updates via FrontlineSMS platform, which need enhancing the FrontlineSMS core.

FrontlineSMS is Open Source software to enable enterprise use of mobile payments by businesses and organizations serving the base of the pyramid.

The service will be product & market-specific. Which means the farmer can choose accordingly. Also, the farmer will not be loaded with irrelevant information. And the update SMS will be kept as small as possible, to avoid the irrelevant costs. A farmer can choose the market, as also decide on whether he should hold on his product.

So, We conclude that, this project model can be helpful in various stages of Agriculture. It involves the production of food, the organization of food supply chains, the communication between agriculture, food production and consumers and the organization of regional trade. Also it will be directly and increasingly depend on electronic information, communication and control.

7. Reference

1. Agriculture and rural development. http://ec.europa.eu/agriculture/about/index_en.ht.
2. Farmers community market. www.agriculture.com/consumer/farmers_market
3. FrontlineSMS Details <http://wiki.frontlinesms.com>
4. Website Development using Joomla <http://www.joomla.org/>
5. Agriculture & Industry Survey <http://www.agricultureinformation.com/>
6. Indian Agricultural Research Institute <http://www.iari.res.in/>
7. FAOSTAT statistics <http://faostat.fao.org/>
8. Cloud Computing with Ubuntu <http://www.ubuntu.com/cloud>
9. FAOSTAT statistics <http://faostat.fao.org/>