

Increasing Agricultural Productivity using Software Engineering Strategies

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ABSTRACT

Software engineering is the science of engineering to the design, development and upholding of software. Software engineering is of huge importance also in the field of agriculture. It provides a platform for people related to agriculture and similar fields to have a source of information which can be helpful to them in one way or another. This paper will focus on software strategies through which information of the same kind can be transmitted easily, efficiently and made available ubiquitously by developing mobile and web applications which will be integrated with database management systems, analytical models and graphics. Considering the main focus of these applications will not only increase rural agricultural productivity but it will also benefit farmers of the urban areas. The key problems militating against the use of this information in the remote areas are poor income, lack of computer knowledge and poor power supply. It is advised to create information centers by authorities to convey the same as it will create more awareness among people and will also be helpful in creating rural employment.

Keywords

Software Engineering, Agriculture Productivity, Information, Awareness, Employment.

1. INTRODUCTION

Today a new paradigm of agricultural development is emerging in areas where the rural agricultural development is touching new levels, higher than ever. The same case is with India, which is rich in its agriculture resources and techniques. India needs to get on a plan to build up and commercialize modernism in high-growth sectors, including information technology, biotechnology, medicine, and new energy sources. The bulk of companies engage in developing and commercializing proprietary industrial technologies. Most of them are spin-offs from universities, research institutes and state-owned enterprises. India made a good beginning but in a country where agriculture accounts for 13% GDP, it is not enough. Agriculture sector employs 60% of the population who are mostly small scale farmers and depend on agriculture for their livelihood. People not only in rural areas but also in the urban areas are deeply indulged in agricultural related activities may it be a small scale or a large scale.

And on the opposite side of agriculture there is software engineering which has transformed the whole world through its power of providing information efficiently. The latest advances in software engineering are becoming the major reasons for socio-economic advancements. Software engineering offers new trends of exchanging information, and transacting business, changes the nature of the financial and other service sectors and provides proficient means of using the human and institutional capabilities of countries in both public and private sectors. The world is rapidly heading towards knowledge-based economic structures and information societies, which comprise networks of individuals, firms and countries that are linked electronically and in interdependent relationships [1].

So how can we integrate software engineering with agriculture productivity?

The agricultural result which will come out from the inputs will be agricultural information and this information, for example: what is the ideal crop that can be grown on a particular land, list of all the nearby machine shops, watershed management process etc, are the key determinants which increases the productivity of the agricultural land.

Nowadays agricultural information focuses on improving small-scale agricultural production and linking augmented production to remunerative markets, thus leading to improved rural livelihoods, food security and national economies. Enhancement of agricultural productivity will be realized when farmers will start practicing according to this kind of information. However, one major problem still lies in many rural regions, farmers and small entrepreneurs generally have no way of knowing significant prices before they travel to market due to poor communication facilities. They habitually rely on middlemen who take advantage of this lack of knowledge. In particular, small-scale farmers have poor market infrastructure, inadequate marketing experience, and agricultural inputs [2].

2. PROPOSED CONCEPT

- The main objective of these papers to provide free, easy and efficient information about agriculture and related fields such that the productivity of the agricultural field increases.
- To provide details of the available resources required in nearby place.
- To provide information about the right kind of agricultural technique that can be used.
- To provide information of all markets for a particular crop grown and right prices for the same.
- To provide a complete land analysis of the agricultural land.
- To provide a way where farmers can see the efficient farming methods.

3. DESIGNING

3.1 Use Case Diagrams

The below two use case diagram shows the basic functionalities of the user that is farmer and the authorities

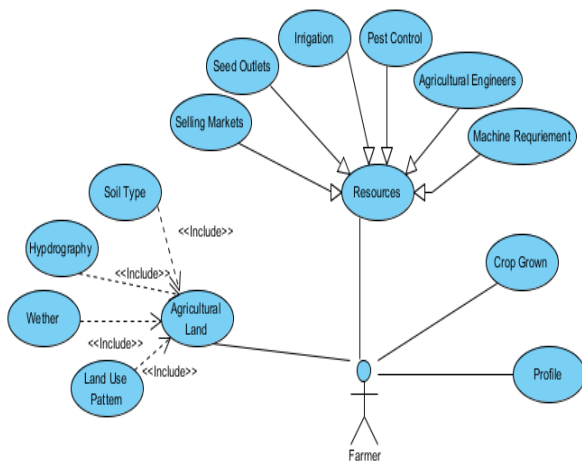


Fig 1:Famer's Use-Case

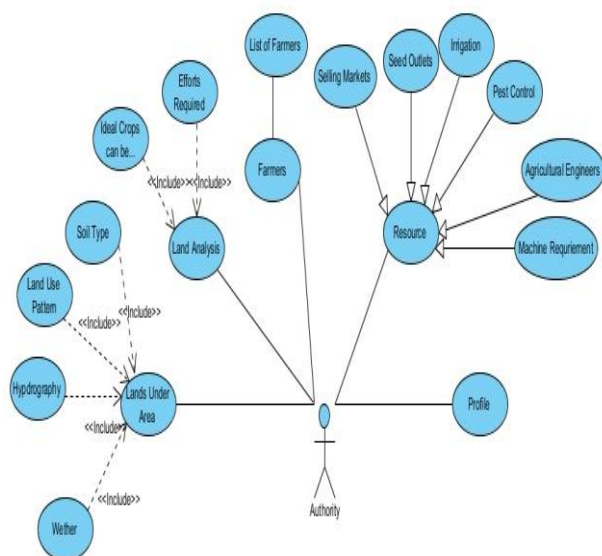


Fig 2: Authority's Use-Case

3.2 Description of Modules

Table 1.Agricultural Land

Basic Description	The basic requirement of agriculture is of having a land for practicing it.
Actors	Farmers
Flow Of Control	
1. Basic Flow: User enters all the data of his/her agricultural land.	
2. Alternate Flow: Data can also be taken from the database if the user is already registered.	
Special Requirements	Land particularly for agriculture.
Pre-Condition	Knowledge of all the data of the land.
Post-Condition	Knowledge of agricultural techniques.
Extension Points	None

Table 2.Resources

Basic Description	The things required for carrying out agricultural activities.
Actors	Farmers, Authority.
Flow Of Control	
1. Basic Flow: List of all the resources is available in the application.	
2. Alternative Flow: Special request can also be made for specific resource.	
Special Requirements	None
Pre-Condition	Detailed information of all the resources and markets.
Post-Condition	Understanding of the information obtained.
Extension Points	None

Table 3.Land Analysis

Basic Description	Analyze the agricultural inputs and give agricultural information to increase productivity of the land.
Actors	Farmer, Authority
Flow Of Control	
1. Basic Flow: User can get the information on the basis of the inputs provided by him/her.	
2. Alternative Flow: User can also request the authorities to give land analysis.	
Special	Understanding the application.

Requirements	
Pre-Condition	Information regarding all the inputs required.
Post-Condition	Understanding of the information obtained.
Extension Points	None

Table 4.Lands under Area

Basic Description	Information of all the agricultural lands under the area of authority.
Actors	Authority
Flow Of Control	1. Basic Flow: Authority can enter the land data through their survey. 2. Alternative Flow: Lands can also be added on requests by the farmer.
Special Requirements	None
Pre-Condition	Able to distinguish between normal land and agricultural land.
Post-Condition	Understanding of the information obtained.
Extension Points	Agricultural Land

4. ANALYSIS

4.1 Providing Information

The main objective of this paper is to provide free, easy and efficient information about agriculture and related fields such that the productivity of the same increases, this can be done by developing an easy web as well as mobile based application which will be easily available to all the farmers of every part of the country. The application will be integrated with database, graphics and analytical models such that it becomes more interactive to farmers. This application will provide hands on experiences of various experts which will be available to all. This application will analyze the information according to data entered by the farmer and give the most effective answer which can help the farmer or authority in achieving higher productivity.

After the analysis of agricultural land the farmer is also advised with the right and the most efficient technique that he/she can use for increasing his/her productivity. Demonstrations of techniques will also be shown to the farmer such that he/she doesn't misunderstand anything.

Fig 3: Example showing how information will be provided to the farmer.

4.2 Providing Resources Details

As the application will have a huge database and consist of all the information regarding resources that can be needed for agricultural related activities, farmer can get detailed result of any resource present which he/she may need, near the place he wants to look at. This will be a huge benefit for the farmers as after getting into this application he doesn't have to look separately for various resources and he is also getting the information quickly and efficiently which in turn increases his/her productivity.

The application will also provide details of all market places near the farmer so that he/she never misses any market for better price of the agricultural produce. The application will also notify the farmer for any type of market related activities. It also gives farmer the correct price details of his/her production. Therefore, this will make the process more transparent and if the farmer is paid well in the market the level of his/her motivation rises which will in return raise the productivity.

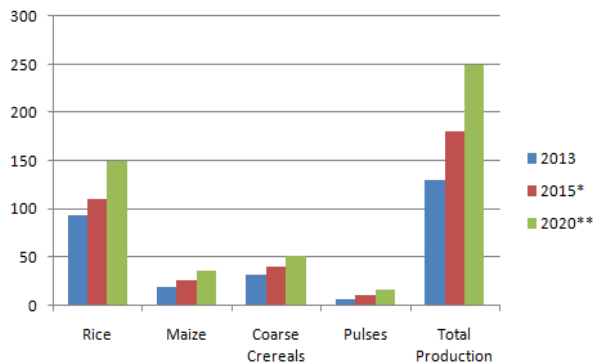
S.No	Shop Name	Address	Phone
1	Jk Tractors	3/4 Main Market, Rudrapur	9868584835
2	Sonika Tractors	Shop No. 5 Main Market, Rudrapur	9854712563
3	Mahindra Tractors	Shop No. 345 Gupta Market, Haldwani	01345-2547865
4	Horsewood Enterprise	Shop No. 12 Teen Pani, Haldwani	8475686215
5	Golden Wheels	Shop No. 1 Gupta Market, Rudrapur	985147523
6	Sonia Tractors	Shop No. 34 Choti Market, Kichha	8456325412
7	Bhawani Enterprise	Shop No. 3 Rampur Road, Udham Singh Nagar	978441256

Fig 4: Example showing how the nearby resource information will be provided to the farmer.

4.3 Providing Authority Help to Increase Productivity

The application will set up an agricultural land use area pattern for every district which would help the authorities in maintaining a proper record of total agricultural production from the area and this can also help the farmers whose production is suffering. This will make the process effective from both sides from farmers and authorities which will have a common result that is the productivity of the land will increase.

4.4 Impact on Production



*Expected result after two years of implementing.

**Expected results after five years of implementing.

Fig 4: Comparison of net production of various crops before and after implementing the application.[3]

5. IMPLEMENTATION

This application was implemented to fifty farmers, showing them the latest technologies for their crop production and complete analysis of their land. They implemented this technique to their land and found considerable rise their crop production. They were also shown the correct market price for their crop, till then they were getting much lesser price for the same crop.

6. CONCLUSION

In the recent decades, use of fertilizers, pesticides and other similar kind of chemicals have increased the agricultural production to a significant level. Due to continuously growing local consumption and contribution in the country's GDP there should be some other ways to increase the agricultural production up by a level. Following the current trends, agricultural information can play a considerable role in increasing the crop production and the management of natural resources. The technology mentioned in this paper has the potential to do the same. Also the use of this technology will also play a significant role in management of the natural resources and their best and efficient use. This technology allows authorities to examine and handle a wider range of databases and provide a good solution to almost every kind of farmer's query.

Impact of this technology is presented by a graph above and it is assumed that if this software strategy is implemented uniformly in the country the increase in agricultural production is beyond expectations, which will in return increases the farmer's motivation. And considering the country point of view, the increasing local demands can be easily met and there will be rise in the exports of agricultural products.

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