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Crop Recommendation System for Precision Agriculture

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***Abstract*:** Crop forecasting or prediction is the art of predicting crop yields and production before the harvest actually takes place, typically a couple of months in advance. Crop forecasting relies on computer programs that describe the plant-environment interactions in quantitative terms. The soil testing program starts with the collection of a soil sample from a field. The first basic principle of soil testing is that a field can be sampled in such a way that chemical analysis of the soil sample will accurately reflect the field's true nutrient status.

***Keywords* -** Precision Agriculture, Recommendation system, Ensemble model, Majority Voting technique, K-Nearest Neighbour.

I. Introduction

India is one among the oldest countries which is still practicing agriculture. But in recent times the trends in agriculture has drastically evolved due to globalization. Various factors have affected the health of agriculture in India. Many new technologies have been evolved to regain the health. One such technique is precision agriculture. Precision agriculture is budding in India Precision agriculture is the technology of "site-specific" farming. It has provided us with the advantage of efficient input, output and better decisions regarding farming. Although precision agriculture has delivered better improvements it is still facing certain issues. There exist many systems which propose the inputs for a particular farming land. Systems

Propose crops, fertilizers and even farming techniques. Recommendation of crops is one major domain in precision agriculture. Recommendation of crops is dependent on various parameters. Precision agriculture aims in identifying these parameters in a site-specific manner in order to resolve issues regarding crop selection. The "site-specific" technique has improved the results yet there is a need to supervise the results of such systems. Not all precision agriculture systems provide accurate results. But in agriculture it is important that the recommendations made are accurate and precise because in case of errors it may lead to heavy material and capital loss. Many research works is being carried out, in order to attain an accurate and efficient model for crop prediction. ensembling is one such technique that is included in such research works. Among these various machine learning techniques that are being used in this field; this paper proposes a system that uses the voting method to build an efficient and accurate model.

II. Literature Survey

The paper [1] states the requirements and planning needed for developing a software model for precision farming is discussed. It deeply analyses the basics of precision farming. The author's start from the basics of precision farming and move towards developing a model that would support it. This paper describes a model that applies Precision Agriculture (PA) principles to small, open farms at the individual farmer and crop level, to affect a degree of control over variability. The comprehensive objective of the model is to deliver direct advisory services to even the smallest farmer at the level of his/her smallest plot of crop, using the most accessible technologies such as SMS and email. This model has been designed for the scenario in Kerala State where the average holding size is much lower than most of India. Hence this model can be deployed elsewhere in India only with minor modifications.

The paper [2] makes a comparative study of classification algorithms and their performance in yield prediction in precision agriculture. These algorithms are implemented in a data set collected for several years in yield prediction on soya bean crop. The algorithms used for yield prediction in this paper are Support Vector Machine, Random Forest, Neural Network, REPTree, Bagging, and Bayes. The conclusion drawn at the end is that bagging is the best algorithm for yield prediction among the above stated algorithms since the error deviation in bagging is minimum with a mean absolute error of 18985. 7864.

The paper [3] states the necessity for crop yield prediction and its help in a nation's strategic policy making in agriculture. A framework eXtensible Crop Yield Prediction Framework (XCYPF) is developed. It facilitates flexible inclusion of various techniques towards crop yield prediction. A tool was also developed that would help people to predict crop yield for various crops with dependant and independent variables.

The paper [4] states the usage of agricultural data with data mining and visual data mining techniques are depicted. This paper reduces the high dimensional agricultural data to smaller size to acquire useful knowledge related to yield, input application(like fertilizers).The techniques used is Self-organizing maps and multi-dimensional scaling techniques (Sammon's mapping) to reduce the data. The conclusion derived is that Self-organizing maps is suitable when dataset is large and Sammon's mapping is suitable when data set is small.

III. Proposed System

First the farmers will take some soil of the agricultural field and get it tested by the lab. This process is called soil testing. An accurately calibrated soil test will indicate the degree of nutrient deficiency in a soil and estimate the nutrient rate required to optimize crop productivity. An efficient way to improve accuracy and efficiency in this process is to create a dataset with the data values collected over the years. By the use of technology and data mining concepts, we can create an application which has the ability to suggest the best suitable crop.

The main inputs to the system will be the diagnosed nutritional features in soil directly from the lab test reports. We are using the data mining concept and Naive Bayes Algorithm which can give the accurate output. The system based on dataset, will suggest the crops which can suit this soil type and can give profits to the farmer. The admin will manage the entire application by adding the different crop types, different soil and features of the soil. The farmer will take his field soil to lab, get the results, feed to the system and can view the results. As farmer will not be aware of this system, we try to feed these information by the help of other person.

Data Flow Diagram

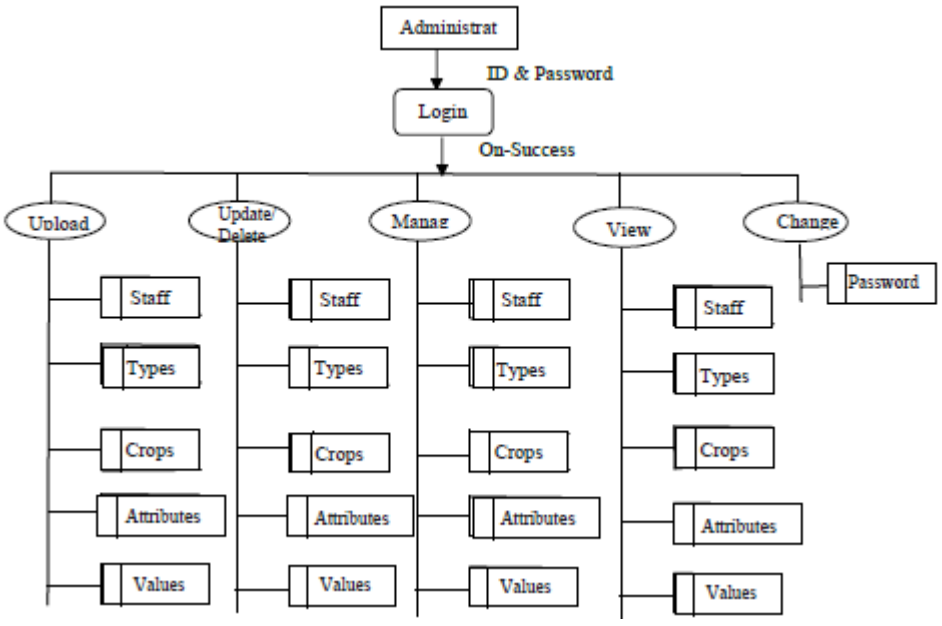


Figure1: Data Flow of Administrator

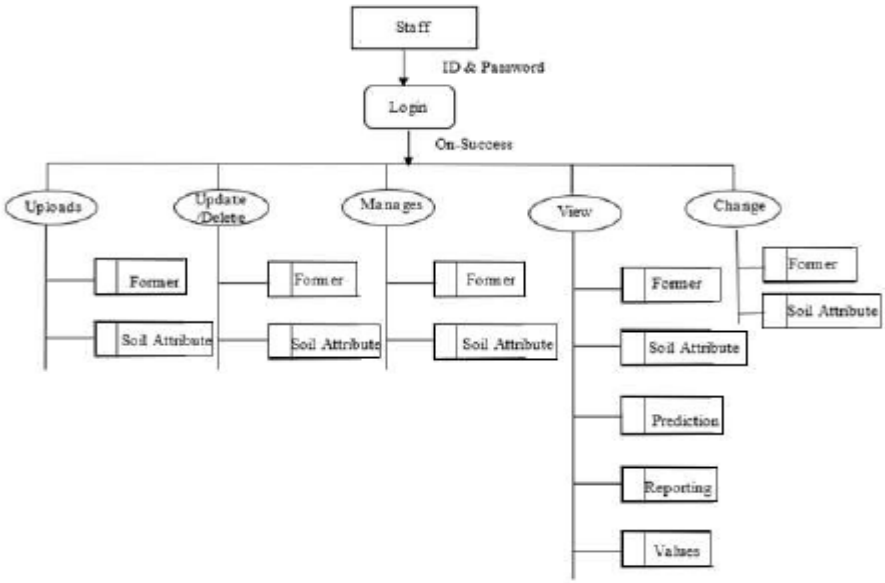


Figure 2: Data Flow of Staff

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system. DFDs can also be used for the visualization of data processing (structured design). On a DFD, data items flow from an external data source or an internal data store to an internal data store or an external data sink, via an internal process. A DFD provides no information about the timing of processes, or about whether processes will operate in sequence or in parallel. It is therefore quite different from a flowchart, which shows the flow of control through an algorithm, allowing a reader to determine what operations will be performed, in what order, and under what circumstances, but not what kinds of data will be input to and output from the system, nor where the data will come from and go to, nor where the data will be stored.

Context Data Flow Diagram

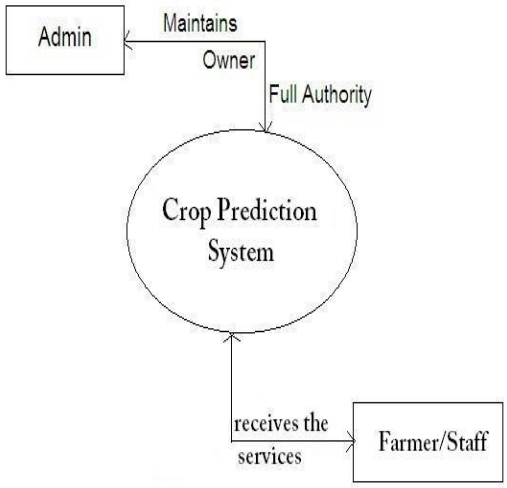
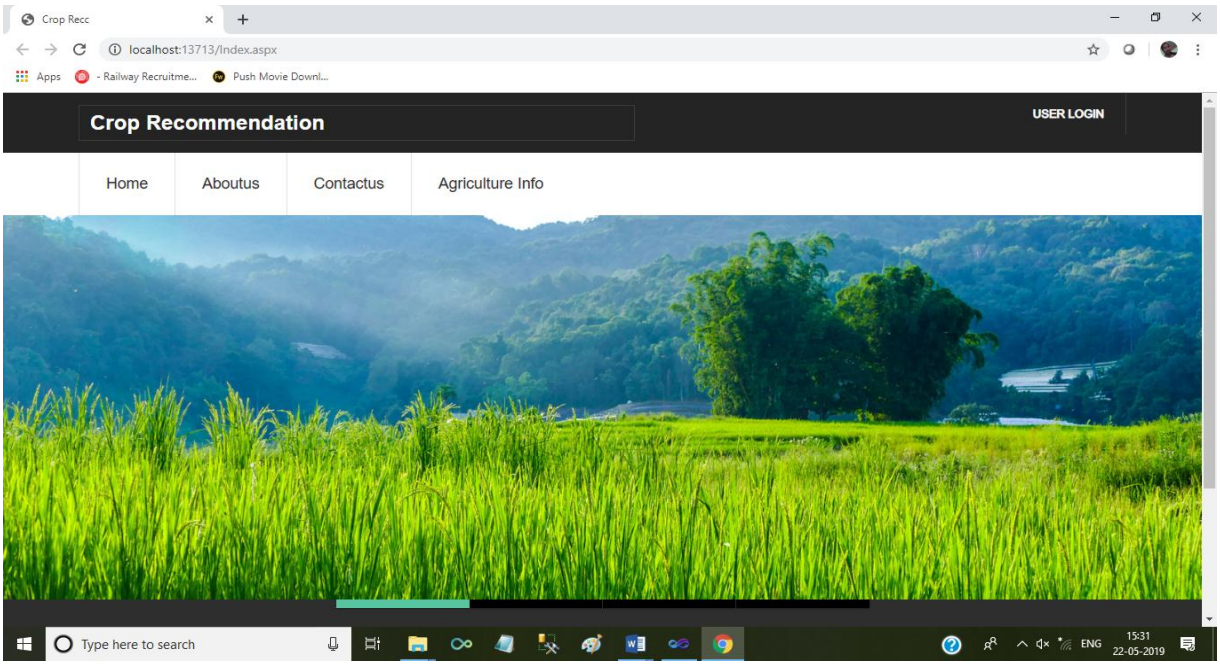


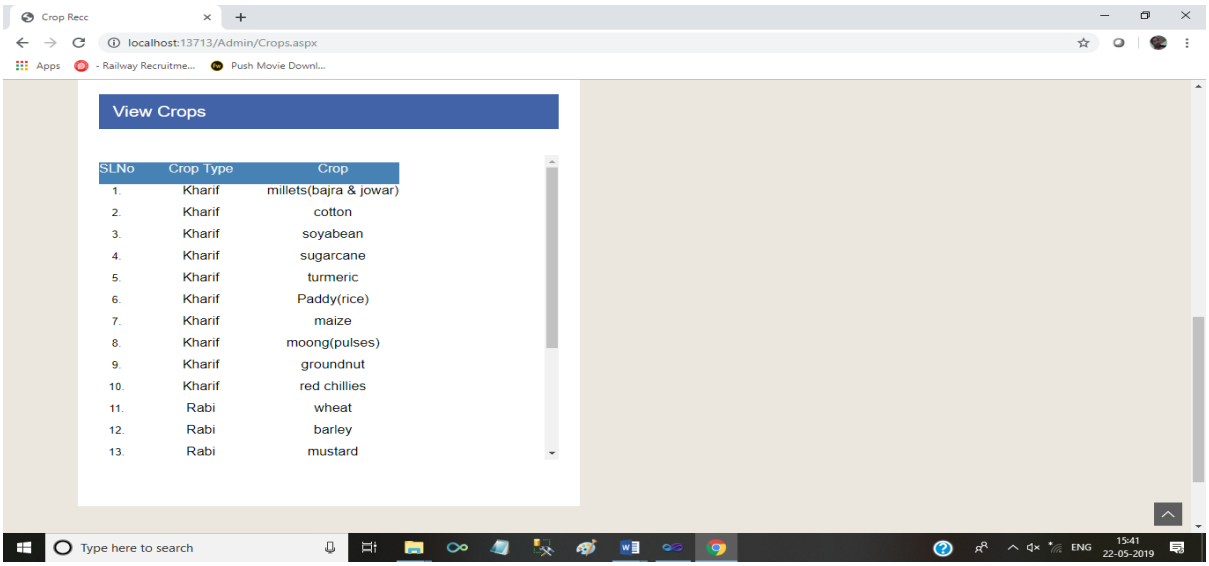
Figure 3: Context Data Flow Diagram

It is common practice to draw a context-level data flow diagram first, which shows the interaction between the system and external agents which act as data sources and data sinks. On the context diagram (also known as the 'Level 0 DFD') the system's interactions with the outside world are modelled purely in terms of data flows across the system boundary. The context diagram shows the entire system as a single process, and gives no clues as to its internal organization. This context-level DFD is next "exploded", to produce a Level 1 DFD that shows some of the detail of the system being modelled. The Level 1 DFD shows how the system is divided into sub-systems (processes), each of which deals with one or more of the data flows to or from an external agent, and which together provide all of the functionality of the system as a whole. It also identifies internal data stores that must be present in order for the system to do its job, and shows the flow of data between the various parts of the system.

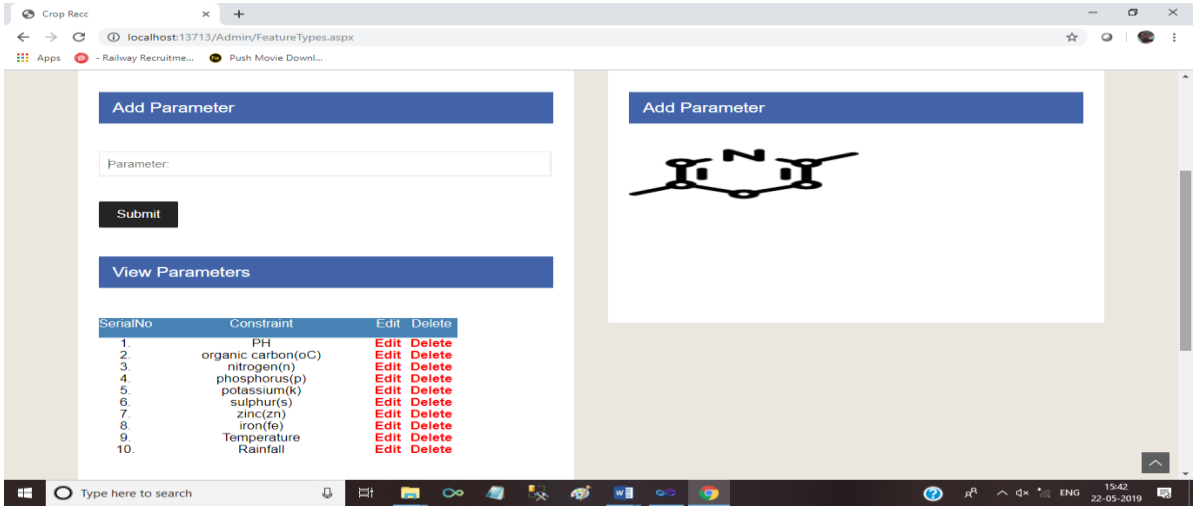
Snap-Shots



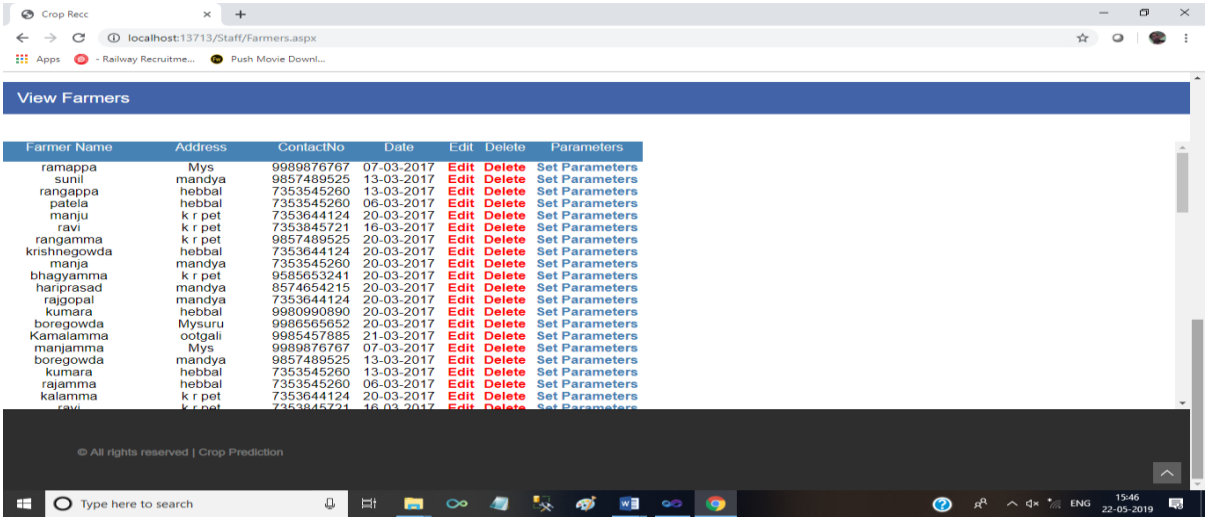
Home Page



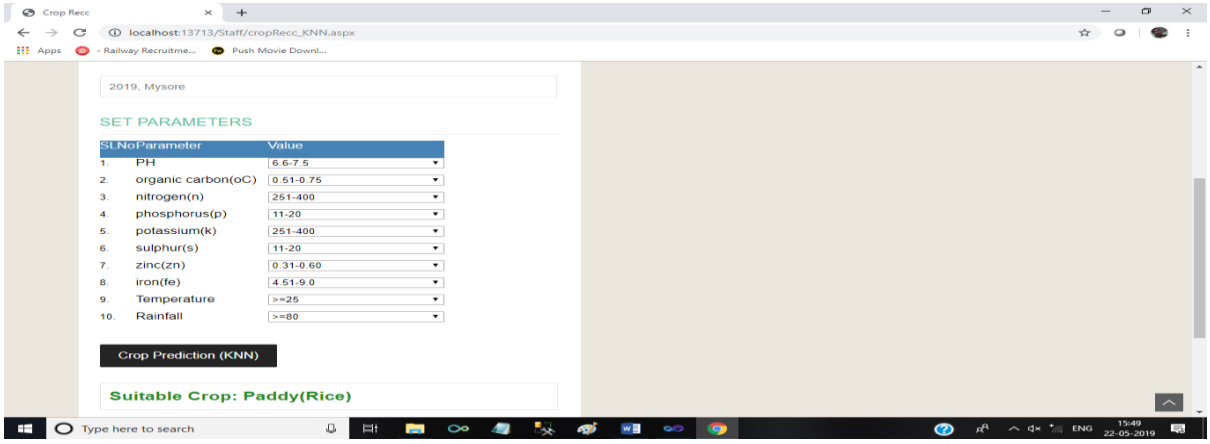
Crops Added in Data Base



Parameters Considered Recommending the Crop



Historical Datasets



Crop Prediction Result

IV. CONCLUSION

Now-a-days farmers facing lots of problems and they don't know the proper information regarding crops to grow and to cultivate. This proposed system helps farmers to know the right crop to grow. Proposed system predicts the crops using data mining techniques based on the soil tested results. This system also useful to agriculture departments to predicts the right crop in right time. If we have such kind of automation, will be useful to farmers and agricultural field. The goals that have been achieved by the developed system are, simplified and reduced the manual work, Large volumes of data can be stored and It provides Smooth workflow.

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